Aria Reference Manual

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Contents

Chapter 1

ARIA overview

1.1 Introduction

Welcome to ARIA. The software is an object-oriented, robot control applications-programming interface for ActivMedia Robotics' line of intelligent mobile robots.

Written in the C++ language, ARIA is client-side software for easy, high-performance access to and management of the robot server, as well as to the many accessory robot sensors and effectors. Its versatility and flexibility makes ARIA an excellent foundation for higher-level robotics applications, including SRI International's Saphira and the ActivMedia Robotics Basic Suite.

ARIA can be run multi- or single-threaded, using its own wrapper around Linux pthreads and WIN32 threads. Use ARIA in many different ways, from simple command-control of the robot server for direct-drive navigation, to development of higher-level intelligent actions (aka behaviors). For a description of how to integrate parts of ARIA with your other code, see **Piecemeal Use of ARIA** (p. 20).

This document contains an overview of ARIA. If you are browsing it in HTML, click a class or function link to view its detail pages. New users should view this document along with the ARIA examples.

You can download new versions of **Aria** (p. 205) from `http://robots.activmedia.com/ARIA`

1.2 ARIA, Java, Python, Saphira, Colbert and the ActivMedia Basic Suite

ARIA is for C++ object-oriented programmers who want to have close control of their robot. ARIA also is for those who have prepared robot-control software and want to quickly and easily deploy it on one or more ActivMedia Robotics mobile robot platforms.

ARIA now works in Java and Python! It has a Java wrapper and a Python wrapper included with the base release. This means that you can write ARIA programs in Java or Python as if ARIA itself was written in these languages. This wrapper is automatically generated by SWIG (`http://www.swig.org`) at each release, meaning that unlike three different implementations its consistent between languages, all three languages get new features and are maintained, and the many examples written for C++ ARIA are valid in the other languages.

There are a couple of more complicated/advanced features that don't work yet in these languages (you can use the classes in C++ that use the features, but you can't reimplement these features in the other languages). The only unimplemented feature of SWIG is virtual function overloading which means that you will not be able to make your own ArActions in Java or Python, but you can always add them to the C++ library and use them in Java or Python. For this deficiency the SWIG teams seems to be working on it so likely it will disappear in the future. You also will not be able to make your own ArFunctors for callbacks, but again where thats needed you can make objects in the C++ library and use them in Java or Python. For this deficiency language specific workarounds could likely be written by users, which I could incorporate or if there are large numbers of people using these wrappers we may develop these on our own. Also if the SWIG team solves virtual function overloading then simple classes to inherit from will remove the need for ArFunctors. Again though, you can use any of the existing modules in C++ that use these advanced features you just can't use these advanced features in Java or Python.

Look in the javaExamples/README.txt file for directions on how to use the Java wrapper and in the pythonExamples/README.txt for directions on how to use the python wrapper.

For creating applications with built-in advanced robotics capabilities, including gradient navigation and localization, as well as GUI controls with visual display of robot platform states and sensor readings, consider using SRI International's Saphira version 8 or later. Saphira v8 is built on top of ARIA, so you have access to all of ARIA's functionality, as well as its Saphira enhancements.

Non-programmers may create their own robot-control routines easily and simply with Saphira Colbert activity-building language. A Colbert editor, as well as some very advanced robot control applications including Navigator and World-Link, come in the Saphira/ARIA-based ActivMedia Basic Suite software. They give you GUI access to all the features of your ActivMedia robot, including remote access across the global Internet.

Browse ActivMedia Robotics' support webpages `http://www.activrobots.com` and `http://robots.activmedia.com` for these and many other mobile robotics resources.

1.3 License and Sharing

ARIA is released under the GNU Public License, which means that if you distribute any work which uses ARIA, you must distribute the entire source code to that work. Read the included LICENSE text for details. We open-sourced ARIA under GPL not only for your convenience, but also so that you will share your enhancements to the software. If you wish your enhancements to make it into the ARIA baseline, you will need to assign the copyright on those changes to ActivMedia, contact `aria-support@activmedia.com` with these changes or with questions about this.

Accordingly, please do share your work, and please sign up for the exclusive `ARIA-users@activmedia.com` newslist so that you can benefit from others' work, too.

ARIA may be licensed for proprietary, closed-source applications. Contact `sales@activmedia.com` for details.

1.4 The ARIA Package

1.4.1 ARIA/

```
LICENSE    GPL license; agree to this to use ARIA
INSTALL    Step-wise instructions for installing ARIA
README     Also see READMEs in advanced/, examples/, and tests/
docs/      Extensive documentation in HTML and PDF format
bin/       Win32 binaries and dlls (Linux binaries in src/)
examples/  ARIA examples -- a good place to start; see examples README
include/   ARIA include files, of course
lib/       Win32 .lib files and Linux .so files
params/    Robot definition (parameter) files (p2dx.p, for example)
src/       ARIA source (*.cpp) files and Linux executables
```

1.4.2 Other ARIA Files of Note

```
ARIA.dsp   MSVC++ project file for building the ARIA libraries and examples
ARIA.dsw   Associated MSVC++ workspace for building ARIA and examples
```

```
Makefile     Linux makefile for building ARIA and examples
Makefile.dep  Linux dependency
run          Linux-only; builds and executes your ARIA applcation
tests/       Test files, somewhat esoteric but useful during ARIA development
utils/       Utility commands, not generally needed
advanced/    Advanced demos, not for the faint of heart (or ARIA novice)
```

1.5 Documentation and Coding Convention

For clarity while you read this technical document, we follow common C++ coding conventions:

1) Class names begin with a capital letter. 2) Enums either begin with a capital letter or are all in caps. 3) Avoid defines whenever possible. 4) Member variables in classes are prefixed with 'my'. 5) Static variables in classes are prefixed with 'our'. 6) Member function names start with a lower case. 7) Capitalize each word except the first one in a name; likeThisForExample. 8) Write all code so that it can be used threaded.

1.6 ARIA Client-Server

For those of you who are familiar with SRI International's Saphira software and ActivMedia Robotics' mobile robots and their related technologies, the underlying client-server control architecture for the mobile platform, sensors, and accessories hasn't changed much in ARIA. It's just gotten a lot better and more accessible.

The mobile servers, embodied in the Pioneer 2 and AmigoBot Operating System software and found embedded on the robot's microcontroller, manage the low-level tasks of robot control and operation, including motion, heading and odometry, as well as acquiring sensor information (sonar and compass, for example) and driving accessory components like the PTZ camera, TCM2 compass/inclinometer, and the Pioneer 5-DOF Arm. The robot servers do not, however, perform robotic tasks.

Rather, it is the job of an intelligent client running on a connected PC to perform the full gamut of robotics control strategies and tasks, such as obstacle detection and avoidance, sensor fusion, localization, features recognition, mapping, intelligent navigation, PTZ camera control, Arm motion, and much more. ARIA's role is on that intelligent client side.

Nearest the robot, ARIA's **ArDeviceConnection** (p. 124) class, at the behest of your application code, establishes and maintains a communication channel with the robot server, packaging commands to (**ArRobotPacketSender** (p. 411)) and decoding responses (**ArRobotPacketReceiver** (p. 408)) from the robot in safe and reliable packet formats (**ArRobotPacket** (p. 406)) prescribed by the client-server protocols.

At its heart, ARIA's **ArRobot** (p. 355) class collects and organizes the robot's operating states, and provides clear and convenient interface for other ARIA components, as well as upper-level applications, to access that robot state-reflection information for assessment, planning, and ultimately, intelligent, purposeful control of the platform and its accessories.

ArRobot (p. 355)'s heart metaphor is particularly apt, too, since one of its important jobs is to maintain the clockwork cycles and multi-threaded rhythms of the robot-control system. Keyed to the robot's main information-packet cycle (hence, no longer a fixed timing cycle), **ArRobot** (p. 355)'s syncronous tasks (**ArSyncTask** (p. 475)) include the robot server-information packet handlers, sensor interpreters, action handlers, state reflectors, user tasks, and more. And your software may expand, replace, remove, and rearrange the list of synchronized tasks through **ArRobot** (p. 355)'s convenient sensor interp (**ArRobot::addSensorInterpTask** (p. 374)) and user task (**ArRobot::addUserTask** (p. 375)) related methods.

Through its Action class, ARIA provides a flexible, programmable mechanism for behavior-level control of the robot server. An associated Resolver class lets you organize and combine actions, for coordinated motion control and intelligent guidance. With ARIA actions, you easily develop integrated guarded-teleoperation and color-blob tracking applications, for example.

ARIA also includes clear and convenient interface for applications to access and control ActivMedia Robotics accessory sensors and devices, including operation and state reflection for sonar and laser range finders, pan-tilt units, arms, inertial navigation devices, and many others.

The versatility and ease of access to ARIA code (sources included!) makes it the ideal platform for robotics client applications development.

1.7 Robot Communication

One of the most important functions of ARIA, and one of the first and necessary things that your application must do, is to establish and manage client-server communications between your ARIA-based software client and the robot's onboard servers and devices.

1.7.1 Connecting with a Robot or the Simulator

ArDeviceConnection (p. 124) is ARIA's communications object; **ArSerialConnection** (p. 424) and **ArTcpConnection** (p. 481) are its built-in children most commonly used to manage communication between an ActivMedia robot or the SRIsim robot simulator, respectively. These classes are not device-specific, however, so use **ArSerialConnection** (p. 424), for instance, to also configure a serial port and establish a connection with a robot accessory, such as with the SICK laser range finder.

You can also use a convenience class called **ArSimpleConnector** (p. 459) to do the connection for you, this is used in examples/demo, examples/wander, examples/teleop to name a few. This also will take and parse command line arguments so that you don't need to recompile to change where you want to connect. Among other benefits the **ArSimpleConnector** (p. 459) will try to connect to a simulator if one is running otherwise it'll connect to a serial port... so you don't have to recompile your program for either mode, just don't have a simulator running, or have one running.

Do note that some accessories, such as the P2 Gripper, PTZ camera, P2 Arm, compass, and others, which attach to the robot's microcontroller AUX serial port, are controlled through the client-side device connection with the robot. Use different methods and procedures other than **ArDeviceConnection** (p. 124) to communicate with and manage those devices through ARIA.

1.7.2 Opening the Connection

After creating and opening a device connection, associate it with its ARIA device handlers, most commonly with **ArRobot::setDeviceConnection** (p. 398) for the robot or the simulator.

For example, early in an ARIA program, specify the connection device and associate it with the robot:

```
ArTcpConnection (p. 481) con;
ArRobot (p. 355) robot;
```

Later in the program, after initializing the ARIA system (ARIA::Init(); is mandatory), set the Connection port to its default values (for TCP, host is "localhost" and port number is 8101), and then open the port:

```
con.setPort();
if (!con.openSimple())
 {
   printf("Open failed.");
   ARIA::shutdown();
   return 1;
 }
```

TCP and Serial connections have their own implementation of open which is not inherited, but has default arguments that make the generic open work for the all default cases. And open returns a status integer which can be passed to the re-implemented and inherited **ArDeviceConnection::getOpenMessage** (p. 126) in order to retrieve related status string, which is useful in reporting errors to the user without having to know about the underlying device.

1.7.3 Robot Client-Server Connection

After associating the device with the robot, now connect with the robot's servers, **ArRobot::blockingConnect** (p. 377) or **ArRobot::asyncConnect** (p. 376), for example, to establish the client-server connection between ARIA **ArRobot** (p. 355) and the ActivMedia robot microcontroller or SRIsim simulated server. The blockingConnect method doesn't return from the call until a connection succeeds or fails:

```
robot.setDeviceConnection(&con);
if (!robot.blockingConnect())
{
  printf("Could not connect to robot... Exiting.");
   Aria::shutdown()  (p. 209);
  return 1;
}
```

The previous examples connect with the SRIsim simulator through a TCP socket on your PC. Use tcpConn.setPort(host, port) to set the TCP hostname or IP address and related socket number to another machine on the network. For instance, use tcpConn.setPort("bill", 8101); to connect to the Simulator which is running on the networked computer "bill" through port 8101.

Replace **ArTcpConnection** (p. 481) con; with **ArSerialConnection** (p. 424) con; to connect with a robot through the default serial port /dev/ttyS0 or COM1, or another you specify with con.setPort, such as con.setPort("COM3");.

At some point, you may want to open the port with the more verbose con.open();.

1.7.4 Connection Read, Write, Close and Timestamping

The two main functions of a device connection are **ArDeviceConnection::read** (p. 128) and **ArDeviceConnection::write** (p. 128). Simple enough. **ArDeviceConnection::close** (p. 126) also is inherited and important. You probably won't use direct read or write to the robot device, although you could. Rather, **ArRobot** (p. 355) provides a host of convenient methods that package your robot commands, and gather and distribute the various robot information packets, so that you don't have to attend those mundane details. See the next section for details.

All **ArDeviceConnection** (p. 124) subclasses have support for timestamping (**ArDeviceConnection::getTimeRead** (p. 127)). With the robot connection, timestamping merely says what time a robot SIP came in, which can be useful for interpolating the robot's location more precisely.

1.8 ArRobot

As mentioned earlier, **ArRobot** (p. 355) is the heart of ARIA, acting as client-server communications gateway, central database for collection and distribution of state-reflection information, and systems synchronization manager. **ArRobot** (p. 355) is also the gathering point for many other robot tasks, including syncTasks, callbacks, range-finding sensor and Actions classes.

1.8.1 Client Commands and Server Information Packets

Client-server communications between applications software and an ActivMedia robot or the Simulator must adhere to strict packet-based protocols. The gory details can be found in several other ActivMedia Robotics publications, including the Pioneer 2 Operations Manual and the AmigoBot Technical Manual. Suffice it to say here that **ArRobot** (p. 355) handles the low-level details of constructing and sending a client-command packets to the robot as well as receiving and decoding the various Server Information Packets from the robot.

1.8.2 Packet Handlers

Server Information Packets (SIPs) come from the robot over the robot-device connection and contain operating information about the robot and its accessories. Currently, there are two types of SIPs: the standard SIP and extended SIPs. The standard SIP gets sent by the robot to a connected client automatically every 100 (default) or 50 milliseconds. It contains the robot's current position, heading, translational and rotational speeds, freshly accumulated sonar readings, and much more. These data ultimately are stored and distributed by **ArRobot** (p. 355)'s State Reflection (see **State Reflection** (p. 10) below).

Extended SIPs use the same communication-packet protocols as the standard SIP, but with a different "type" specification and, of course, containing different operating information, such as I/O port readings or accessory device states like for the Gripper. And, whereas the standard SIP gets sent automatically once per cycle, your client controls extended packet communications by explicitly requesting that the server send one or more extended SIPs.

ArRobot (p. 355)'s standard SIP handler automatically runs as an **ArRobot** (p. 355) synchronized task. Other SIP handlers are built in, but your client must add each to the connected robot object, and hence to the SIP handler sync task list, for it to take effect. See examples/gripperDemo.cpp for a good example.

You also may add your own SIP handler with **ArRobot::addPacketHandler** (p. 374). **ArListPos** (p. 230) keeps track of the order by which **ArRobot** (p. 355) calls each handler. When run, your packet handler must test the SIP type (**ArRobotPacket::getID** (p. 406)) and return true after decoding your own packet type or return false, leaving the packet untouched for other handlers.

1.8.3 Command Packets

From the client side going to the robot server, your ARIA program may send commands directly, or more commonly, use ARIA's convenience methods (Motion Commands and others) as well as engage Actions which ARIA ultimately converts into Direct Commands to the robot. See **Commands and Actions** (p. 12) for details. At the ARIA-robot interface, there is no difference between Action- or other ARIA convenience-generated commands and Direct Commands. However, upper-level processes aren't necessarily aware of extraneous Direct or Motion Commands your client may send to the robot. Motion Commands in particular need special attention when mixing with Actions. See **Commands and Actions** (p. 12) below for more details.

Once connected, your ARIA client may send commands to the robot server nearly at will, only limited by communication speeds and other temporal processes and delays. Similarly, the server responds nearly immediately with a requested SIP, such as a GRIPPERpac or IOpac which describe the P2 Gripper or Input/Output port states, respectively.

However, general information from the robot server about its odometry, current sonar readings, and the many other details which comprise its "standard" SIP automatically get sent to the ARIA client on a constant 100 or 50 millisecond cycle. This requires some synchronization with **ArRobot** (p. 355).

1.8.4 Robot-ARIA Synchronization

ArRobot (p. 355) runs a processing cycle: a series of synchronized tasks, including SIP handling, sensor interpretation, action handling and resolution, state reflection, and user tasks, in that order. By default, **ArRobot** (p. 355) performs these sequenced tasks each time it receives a standard SIP from the robot. Its cycle is thereby triggered by the robot so that the tasks get the freshest information from the robot upon which to act.

Of course, syncTasks runs without a connection with a robot, too. It has its own default cycle time of 100 milliseconds which you may examine and reset with **ArRobot::getCycleTime** (p. 385) and **ArRobot::setCycleTime** (p. 397), respectively. **ArRobot** (p. 355) waits up to twice that cycle time for a standard SIP before cycling automatically.

ArRobot (p. 355)'s synchronization task list is actually a tree, with five major branches. If a particular task is not running, none of its children will be called. Each task has an associated state value and a pointer to an **ArTaskState::State** (p. 480) variable, which can be used to control the process, by turning it on or off, or to see if it succeeded or failed. If the pointer is NULL, then it is assumed that the task does not care about its state, and a local variable will be used in the task structure to keep track of that tasks state.

For each branch, tasks get executed in descending order of priority.

ARIA provides convenient methods to add your own sensor-interpretation and user tasks. Create an ARIA function pointer (**Functors** (p. 17)) and then add your sensor interpreter (**ArRobot::addSensorInterpTask** (p. 374)) or user task (**ArRobot::addUserTask** (p. 375)) to the list of syncTasks. These tasks can be removed; use **ArRobot::remSensorInterpTask** (p. 395) or **ArRobot::remUserTask** (p. 396) to remove sensor interpreter or user tasks, respectively, by name or by functor.

The intrepid ARIA programmer can add or prune branches from the **ArRobot** (p. 355) task list, as well as leaves on the branches. Do these things by getting the root of the tree with **ArRobot::getSyncTaskRoot** (p. 388), and then using the **ArSyncTask** (p. 475) class to do the desired manipulation.

You may disassociate **ArRobot** (p. 355)'s syncTask from firing when the standard SIP is received, through **ArRobot::setCycleChained** (p. 367). But in doing so, you may degrade robot performance, as the robot's cycle will simply be run once every **ArRobot::getCycleTime** (p. 385) milliseconds.

1.8.5 State Reflection

State reflection in the **ArRobot** (p. 355) class is the way ARIA maintains and distributes a snapshot of the robot's operating conditions and values, as extracted from the latest standard SIP. **ArRobot** (p. 355) methods for examining these values include **ArRobot::getPose** (p. 358), **ArRobot::getX** (p. 358), **ArRobot::getY** (p. 358), **ArRobot::getTh** (p. 358), **ArRobot::getVel** (p. 359), **ArRobot::getRotVel** (p. 359), **ArRobot::getBatteryVoltage** (p. 359), **ArRobot::isLeftMotorStalled** (p. 359), **ArRobot::isRightMotorStalled** (p. 359), **ArRobot::getCompass** (p. 360), **ArRobot::getAnalogPortSelected** (p. 360), **ArRobot::getAnalog** (p. 360), **ArRobot::getDigIn** (p. 360), **ArRobot::getDigOut** (p. 360).

The standard SIP also contains low-level sonar readings, which are reflected in **ArRobot** (p. 355) and examined with the methods: **ArRobot::getNumSonar** (p. 361), **ArRobot::getSonarRange** (p. 387), **ArRobot::isSonarNew** (p. 391), **ArRobot::getSonarReading** (p. 388), **ArRobot::get-**

ClosestSonarRange (p. 362), **ArRobot::getClosestSonarNumber** (p. 362). This information is more useful when applied to a range device; see **Range Devices** (p. 11) for details. And read the link pages for **ArRobot** (p. 355) state reflection method details.

ARIA's **ArRobot** (p. 355) also, by default, reflects in the State Reflection **Robot-ARIA Synchronization** (p. 9) syncTask the latest client Motion Command to the robot server at a rate set by **ArRobot::setStateReflectionRefreshTime** (p. 401). If no command is in effect, the **ArCommands::PULSE** (p. 119) Direct Command gets sent. State reflection of the motion command ensures that the client-server communication watchdog on the robot won't time out and disable the robot.

You may turn the motion-control state reflector off in the **ArRobot::ArRobot** (p. 371) constructor (set doStateReflection parameter to false). This will cause Motion Commands to be sent directly to the robot whenever they are called. State Reflection will send a PULSE command to the robot at **ArRobot::getStateReflectionRefreshTime** (p. 388) milliseconds to prevent the watchdog from timing out.

1.9 Range Devices

Range devices (**ArRangeDevice** (p. 312)) are abstractions of sensors for which there are histories of relevant readings. Currently, there are two ARIA RangeDevices: sonar (**ArSonarDevice** (p. 468)) and the SICK laser (**ArSick** (p. 431)). All range devices are range-finding devices that periodically collect 2-D data at specific global coordinates, so the RangeDevice class should work for any type of two-dimensional sensor.

Attach a RangeDevice to your robot with **ArRobot::addRangeDevice** (p. 363) and remove it with **ArRobot::remRangeDevice** (p. 395). Query for RangeDevices with **ArRobot::findRangeDevice** (p. 383). **ArRobot::hasRangeDevice** (p. 389) will check to see if a particular range device (the given instance) is attached to the robot. A list of range devices can be obtained with **ArRobot::getRangeDeviceList** (p. 387).

Note that sonar are integrated with the robot controller and that their readings automatically come included with the standard SIP and so are handled by the standard **ArRobot** (p. 355) packet handler. Nonetheless, you must explicitly add the sonar RangeDevice with your robot object to use the sonar readings for control tasks. ARIA's design gives the programmer ultimate control over their code, even though that means making you do nearly everything explicitly. Besides, not every program needs to track sonar data and there are some robots don't even have sonar.

Each RangeDevice has two sets of buffers (**ArRangeBuffer** (p. 305)): current and cumulative, and each support two different reading formats: box and polar (**ArRangeDevice::currentReadingPolar** (p. 317), **ArRangeDevice::currentReadingBox** (p. 317), **ArRangeDevice::cumulativeReadingPolar** (p. 316), **ArRangeDevice::cumulativeReadingBox** (p. 315)). The current buffer contains the most recent reading; the cumulative buffer contains several readings over time, limited by **ArRangeBuffer::setSize** (p. 311).

Useful for collision avoidance and other object detection tasks, apply the checkRangeDevices methods to conveniently scan a related buffer on all range devices attached to the robot for readings that fall within a specified range, including **ArRobot::checkRangeDevicesCurrentPolar** (p. 379), **ArRobot::checkRangeDevicesCurrentBox** (p. 379), ArRobot::checkRangesDevicesCumulativePolar, **ArRobot::checkRangeDevicesCumulativeBox** (p. 378).

Note that each range device also has a threading mutex (**ArRangeDevice::lockDevice** (p. 318) and **ArRangeDevice::unlockDevice** (p. 319)) associated with it, so that sensors can be used in a thread-safe manner. For example, if a laser device gets added that runs in its own thread, the checkRangeDevice functions on the robot lock the device so it can poke at the laser device without running into any issues, unlocking the device when it is done. If you want to understand why this locking is good, see **ARIA Threading** (p. 19).

1.10 Commands and Actions

Your ARIA client drives the robot and runs its various accessories through Direct and Motion Commands, as well as through Actions.

1.10.1 Direct Commands

At the very lowest level, you may send commands directly to the robot server through **ArRobot** (p. 355). Direct commands consist of a 1-byte command number followed by none or more arguments, as defined by the robot's operating system, including P2OS and AmigOS. For example, the command number 4, aka ENABLE, enables the robot's motors if accompanied by the argument 1, and disables the motors with the argument 0.

Direct commands to the robot come in five flavors, each defined by its command argument type and length: Use **ArRobot::com** (p. 380) for commands that have no argument, such as PULSE; **ArRobot::comInt** (p. 381) for a 2-byte integer argument, signed or unsigned, such as the motors ENABLE command; **ArRobot::com2Bytes** (p. 380) for when you want to define each of the two bytes in the argument, such as the VEL2 command; and **ArRobot::comStr** (p. 381) or **ArRobot::comStrN** (p. 381) for a null-terminated or defined-length

(N extra argument) string argument, respectively, such as the sonar POLLING sequencing command.

The **ArCommands** (p. 119) class contains an enum with all the direct commands; **ArCommands::ENABLE** (p. 119), for example. Although identical in syntax and effect when supported, not all Direct Commands are included with every ActivMedia robot. Fortunately, unrecognized or otherwise malformed client commands are benign since they get ignored by the server. Please consult your robot's technical manual for details, such as the "Pioneer 2 Operating System" Chapter 6 in the Pioneer 2 Operations Manual, for client command numbers and syntax.

1.10.2 Motion Commands

At a level just above **ArRobot** (p. 355)'s Direct Commands are the Motion Commands. These are explicit movement commands. Some have identical Direct Command analogues and act to immediately control the mobility of your robot, either to set individual-wheel, or coordinated translational and rotational velocities (**ArRobot::setVel2** (p. 402), **ArRobot::setVel** (p. 401), **ArRobot::setRotVel** (p. 401), respectively); change the robot's absolute or relative heading (**ArRobot::setHeading** (p. 400) or **ArRobot::setDeltaHeading** (p. 398), respectively); move a prescribed distance (**ArRobot::move** (p. 392)); or just stop (**ArRobot::stop** (p. 402)).

Examine the directMotionDemo.cpp example file to to see Motion Commands at work.

Be aware that a Direct or a Motion Command may conflict with controls from Actions or other upper-level processes and lead to unexpected consequences. Use **ArRobot::clearDirectMotion** (p. 380) to cancel the overriding effect of a Motion Command so that your Action is able to regain control the robot. Or limit the time a Motion Command prevents other motion actions with **ArRobot::setDirectMotionPrecedenceTime** (p. 399). Otherwise, the Motion Command will prevent actions forever. Use **ArRobot::getDirectMotionPrecedenceTime** (p. 386) to see how long a Motion Command takes precedence.

1.10.3 Actions

Instead of using Direct or Motion Commands, we prefer that your ARIA client software use Actions to drive the robot. **ArAction** (p. 39) is the base class; **ArAction::fire** (p. 42) is the only function that needs to be overloaded for an action to work. ARIA includes a number of built-in actions; look for them in the ARIA sources (the inheritance diagram on the **ArAction** (p. 39) page will show you which they are as well). And see the actionExample program to discover how to create your own actions.

Actions are added to robots with **ArRobot::addAction** (p. 371), including a priority which determines its position in the action list. **ArAction::setRobot** (p. 41) is called on an action when it is added to a robot. You can override this. For example, this would be useful to add a connection callback, if there were some calculations you wished to do upon connection to the robot.

Actions are evaluated by the resolverin descending order of priority (lowest priority goes last) in each **ArRobot** (p. 355) syncTask cycle just prior to State Reflection. The resolver goes through the actions to find a single end actionDesired (**ArActionDesired** (p. 51)). Depending on its current state, an action contributes particular actionDesired movement values and strengths to the final action desired. After this final action desired has been calculated, it is stored and later gets passed to the State Reflector and on to the robot as motion commands.

At each stage when the resolver is evaluating an action it passes in the current action desired of the higher priority actions, this is the currentDesired. For example, a stall-recovery action probably should be programmed not to exert its motion effects if it has been pre-empted by a stop action, so the stall-recovery action can check and see if either the strength is used up or if there is a maximum velocity, and if so it can reset its state. However, there is no need for an action to pay attention to the currentDesired. The resolver could also simply pass a ArActionDesired.reset() to the actions if it did not want the actions to know about its state.

1.10.4 Action Desired

ArActionDesired (p. 51) is the meat of actions. Desired actions should be reset (**ArActionDesired::reset** (p. 51)) before they are used or reused.

There are six desired action channels: velocity (**ArActionDesired::setVel** (p. 56)), relative heading (**ArActionDesired::setDeltaHeading** (p. 55)), absolute heading (**ArActionDesired::setHeading** (p. 55)), maximum forward translational velocity (**ArActionDesired::setMaxVel** (p. 56)), maximum reverse translational velocity (**ArActionDesired::setMaxNegVel** (p. 55)), and maximum rotational velocity (**ArActionDesired::setMaxRotVel** (p. 55)).

Your action gives each channel a strength of 0.0, the lowest, to 1.0, the highest. Strengths are used by the resolver to compute the relative effect the actionDesired channel setting will have on the current translational velocity and heading of the robot, as well as the speed limits for those movements. (Note that deltaHeading and heading are treated as the same channel for strength purposes, and that these are simply alternate ways of accessing the same channel.)

The maximum velocity, maximum negative velocity, and maximum rotational velocity channels simply impose speed limits and thereby indirectly control the robot.

For more advanced usage, desired actions can be merged (**ArActionDesired::merge** (p. 54)) and averaged (**ArActionDesired::startAverage** (p. 56), **ArActionDesired::addAverage** (p. 54), **ArActionDesired::endAverage** (p. 54)).

1.10.5 Resolvers

ArResolver (p. 325) is the base action-resolver class. **ArPriorityResolver** (p. 297) is the default resolver. **ArResolver::resolve** (p. 325) is the function that **ArRobot** (p. 355) calls with the action list (actually **ArResolver::ActionMap** (p. 325)) in order to combine and thereby resolve the actionDesired movement controls into State Reflection motion commands to the robot server.

There may only be one resolver per robot, which is set with **ArRobot::setResolver** (p. 366). However, a resolver could be created to contain multiple resolvers of its own. Also note that though a robot has particular resolver bound to it, a resolver instance is not tied to any robot. Thus, if you had some adapative resolver, you could set it to work for all robots.

The resolver works by setting each of the currentDesired channels to the contributing actionDesired values in proportion to their respective strenghts and priority, adjusting each movement channel's currentDesired value until the individual strength becomes 1.0 or the list is exhausted. Same-priority actions get averaged together (if they are competing) before being resolved with higher-priority results.

The following table illustrates the steps and currentDesired setVel results when the resolver combines four fictional actionDesired setVel channel values and their relative strengths:

step #	action	priority	Desired::setVel	strength	currentDesired	strength
1	4	4	-400	0.25	-400	0.25
2	3	3	-100	1.0	(combine to 2&3)	
3	2	3	200	0.50	(combine to 2&3)	
4	2&3	3	0	0.75	-100	1.0
5	1	1	500	0.50	-100	1.0

Notice in the example that the same-priority actions 2 and 3 are combined before being resolved with the higher priority action 4. Also notice that action 1 has no effect since the currentDesired channel strength reaches 1.0 before that lowest-priority action gets considered by the resolver.

1.10.6 Movement and Limiting Actions

For programming convenience, ARIA has defined two useful types of actions: Movement and Limiting. There are no classes for limiting or movement actions.

Built in movement actions have an **ArAction** (p. 39) prefix and act to set either or both the translational velocity (setVel) and heading (setDeltaHeading and setHeading) channels. Built in limiting actions are prefixed with ArActionLimiter and act to set one or more of the maximum translational and rotational velocity channels.

1.10.7 Mixing Actions

Actions are most useful when mixed. The teleop program is a good example of mixing limiting and movement actions. In the code, there are many limiting actions, including Limiter, LimiterFar, and so on. And there are two movement actions, joydriveAct and keydriveAct. The limiting actions have higher priority than the movement ones, thereby making sure the way is safe before allowing the robot to drive.

The example also illustrates fundamental, yet very powerful features of ARIA actions and how they contribute to the overall behavior of the mobile robot. Because they are individuals, contributing discretely to the movements of the robot, actions are easily reusable. The limiting action in the teleop example that prevents the robot from crashing into a wall when translating forward, can be copied, as is, into another ARIA program and have the identical effect, except that instead of driving the robot with a joystick, the new program's lower-priority movement action might use color-tracking to have the robot follow a rolling ball. The ball-following action doesn't needs to know anything about the finer arts of safe navigation–the higher-priority limiting actions take care of that.

Another ARIA example program called wander.cpp demonstrates how different movement actions can be used and how they interact. The stall-recover action in wander (**ArActionStallRecover** (p. 83)) influences the robot's movements only when the motors are stalled, disabling the lower priority actions by using up all translational and rotational strength until the robot has extracted from the stall. You should also examine ArActionStallRecover.cpp in the src/ directory for actionDesired details on how the action changes its motion control influences based on the stall state.

Also note how **ArActionAvoidFront** (p. 43) and **ArActionConstantVelocity** (p. 49) interact.

1.11 Robot Callbacks

There are a number of useful callbacks in the ARIA system, including **ArRobot::addConnectCB** (p. 372), **ArRobot::remConnectCB** (p. 393), **ArRobot::addFailedConnectCB** (p. 373), **ArRobot::remFailedConnectCB** (p. 394), **ArRobot::addDisconnectNormallyCB** (p. 372), **ArRobot::remDisconnectNormallyCB** (p. 394), **ArRobot::addDisconnectOnErrorCB** (p. 373), **ArRobot::remDisconnectOnErrorCB** (p. 394), **ArRobot::addRunExitCB** (p. 374), **ArRobot::remRunExitCB** (p. 395). Read their individual documentation pages for details.

Examples of callbacks are in the directMotionDemo and in joydriveThreaded. Also, **ArGripper** (p. 196) uses a connectCB as a way to find out when to poll the robot – a good use of callbacks. Just make sure that any modular code you have removes callbacks if you use them.

1.12 Functors

Functor is short for function pointer. A Functor lets you call a function without knowing the declaration of the function. Instead, the compiler and linker figure out how to properly call the function.

Function pointers are fully supported by the C language. C++ treats function pointers like C, but adds in the concept of member functions and the 'this' pointer. C++ does not include the 'this' pointer in the function pointer, which can cause all sorts of problems in an object-oriented program. Hence, we created functors. Functors contain both the function pointer and the pointer to the object which contains the function, or what the function uses as its 'this' pointer.

ARIA makes use of functors as callback functions. In most cases, you will only need to instantiate callback functors and pass them off to various parts of ARIA. To instantiate a functor, you first need to identify how many parameters the function needs and if it returns a value. Most ARIA functions take a pointer to **ArFunctor** (p. 139). This is the base class for all the different functors. Its for a function that has no parameters and no return value.

But you can not create an **ArFunctor** (p. 139), because it is an abstract base class. Rather, you need to instantiate one of these classes:

ArFunctorC (p. 165), **ArFunctor1C** (p. 144), **ArFunctor2C** (p. 150), **ArRetFunctorC** (p. 352), **ArRetFunctor1C** (p. 330), **ArRetFunctor2C** (p. 336)

The 'C' in the name means that it's an instance of the functor that knows about the class of a member function. These are templatized classes so need to be instantiated. For example:

```
ExampleClass obj;
 ArFunctorC (p. 165)<ExampleClass> functor(obj, &ExampleClass::aFunction);
```

ExampleClass is a class which contains a function called aFunction. Once the functor is created in this fashion, it can now be passed off to an ARIA function that wants a callback functor. And the function ExampleClass::aFunction will be called when the functor is invoked.

The code that uses the callback functor only needs to know about these templatized classes: **ArFunctor** (p. 139), **ArFunctor1** (p. 142), **ArFunctor2** (p. 148), **ArRetFunctor** (p. 327)<ReturnType>, **ArRetFunctor1** (p. 328)<ReturnType>, and **ArRetFunctor2** (p. 334)<ReturnType>. These functors take 0-2 parameters and have no return or a return value.

To invoke the functors, simply call the invoke function on the functor. If it takes parameters, call invoke with those parameters. If the functor has a return value, call invokeR. The return value of the function will be passed back through the invokeR function.

1.13 User Input

There are two different ways to get user input into **Aria** (p. 205), from a joystick and from a keyboard. With a joystick is most useful for driving the robot around. There is a class set up that interfaces to the OS for joystick controls, this is **ArJoyHandler** (p. 214), the important functions are ArJoyHandler::getButtons, **ArJoyHandler::getAdjusted** (p. 216), **ArJoyHandler::setSpeeds** (p. 214), and **ArJoyHandler::getDoubles** (p. 217). With a keyboard is most useful for setting and changing modes, and exiting the program, but it it can also be used to drive the robot as well (with the arrow keys and the space bar typically), **ArKeyHandler** (p. 220) is the class which deals with interfacing to the keyboard. ArKeyhandler is directed towards capturing single key presses, not towards reading in sets of text, you can use the normal OS functions to do this. The important functions in **ArKeyHandler** (p. 220) is **ArKeyHandler::addKeyHandler** (p. 222), which binds a specific key to a given functor, also look at the enum **ArKeyHandler::KEY** (p. 221) for values to pass in for special keys. You also need to attach a key handler to some robot with **ArRobot::attachKeyHandler** (p. 377). **ArActionJoydrive** (p. 70) will use the joystick to drive the robot around, while **ArActionKeydrive** (p. 74) will use the arrow keys and spacebar to drive the robot around, both of these are employed in the teleop example. The keyboard control is also a nice way to exit cleanly in Windows since control C or just clicking on the program box won't cleanly disconnect from the robot, by default if you connect an **ArKeyHandler** (p. 220) to a robot, escape will exit the program, however you can chage this behavior when you attach the key handler to the robot if you wish.

1.14 ARIA Threading

ARIA is highly multi-threaded. This section presents some of the critical concepts behind writing threaded ARIA code.

ARIA provides a number of support classes to make it easier to write object-oriented threaded code. They are: **ArASyncTask** (p. 110), **ArCondition** (p. 122), **ArMutex** (p. 266), and **ArThread** (p. 487).

Thread-safe code mostly means proper coordination between threads when handling the same data. You want to avoid the obvious problem of one or more threads reading the data at the same time others write the data. To prevent this problem from happening, the data needs to be protected with synchronization objects.

1.14.1 Synchronous Objects

In ARIA, the synchronization objects are **ArMutex** (p. 266) and **ArCondition** (p. 122). **ArMutex** (p. 266) is the most useful one. Mutex is short for mutual exclusion. It guarantees that only one thread will use its data at a time. The proper way to use a mutex is to attempt to lock it right before accessing its shared data. If the mutex is not in use, ARIA then grants exclusive access by the requesting thread. If the mutex is locked, the access request gets blocked, and the thread must wait until the mutex gets free. When the thread that has access to the mutex is finished with the data, it must unlock the mutex and thereby make the data available to other threads. If it is not unlocked, the program will become deadlocked and hang. See the mutex example in the ARIA distribution for more details.

ArCondition (p. 122) is useful for delaying the execution of a thread. A thread suspends execution while waiting on an **ArCondition** (p. 122) until another thread wakes it up. For instance, use **ArCondition** (p. 122) while waiting for a mutex to become free. Performance is better, too. **ArCondition** (p. 122) puts the thread to sleep. The processing expensive alternative is to have the thread continously check for a change in condition. **ArCondition** (p. 122) notifies only those threads that are currently waiting on it at the time the condition changes.

See the ARIA condition example.

1.14.2 Asynchronous Tasks

Unlike the cyclical tasks in the syncTask list, asynchronous tasks run in their own threads. And an ARIA **ArASyncTask** (p. 110) needs to have a thread under its control for the full lifetime of the program.

To create an ansynchronous task, derive a class from **ArASyncTask** (p. 110) and override the **ArASyncTask::runThread**() (p. 111) function. (The function automatically is called within the new thread, when the **ArASyncTask** (p. 110) gets created.) To create and start the thread, call **ArASyncTask::create**() (p. 110). When the **ArASyncTask::runThread**() (p. 111) function exits, the thread will exit and be destroyed.

This class is mainly a convenience wrapper around **ArThread** (p. 487) so that you can easily create your own object that encapsulates the concept of a thread.

1.15 ARIA Global Data

ARIA contains a list of all the **ArRobot** (p. 355) instances. Use the ARIA::findRobot() to find a robot by name, or use ARIA::getRobotList() to get a list of the robots.

Use ARIA::getDirectory() to find ARIA's top-level path (C:**Aria** (p. 205) or /usr/local/**Aria** (p. 205), typically). This is useful, for instance, to locate robot parameter files for individual operational details. Use ARIA::setDirectory() to change this path for the run of the program if you feel the need to override what **Aria** (p. 205) has decided.

1.16 Piecemeal Use of ARIA

The most basic layer of ARIA is its deviceConnections, which handles low-level communication with the robot server. On top of the connection layer, we have a packet layer–**ArBasePacket** (p. 112) and **ArRobotPacket** (p. 406)–the basic algorithms for constructing command packets and decoding server information packets.

Above the packet layer is the packet handler classes, **ArRobotPacketReceiver** (p. 408) and **ArRobotPacketSender** (p. 411), when send and receive packets to and from the robot. Finally, on top of all these lowest layers is **ArRobot** (p. 355), which is a gathering point for all things, but can be used in a quite basic format without all of the bells and whistles. **ArRobot** (p. 355) has builtin tasks, actions, state reflection and so forth, all of which can be disabled from the constructor (**ArRobot::ArRobot** (p. 371)) and ignored or reimplemented.

Also note that if all you do is turn off state reflection, which only affects sending **ArRobot** (p. 355)-mediated motion commands to the robot, not receiving SIPs from the robot, none of the other activities which **ArRobot** (p. 355) engages on its loop will take up hardly any time, so it probably isn't worth building your own set of tasks, but the power to do so is there for the intrepid.

One other thing worth noting is that you can call **ArRobot::loopOnce** (p. 392) and it will run through its loop a single time and return. This is so that you can use ARIA from your own control structure. If you are using loopOnce you may also find it beneficial to call **ArRobot::incCounter** (p. 368), so that the loop counter will be updated. You could also just call **ArRobot::packetHandler** (p. 393), **ArRobot::actionHandler** (p. 371), or **ArRobot::stateReflector** (p. 402) on your own, as these are the most important internal functions, though if you make your own loop you should probably call **ArRobot::incCounter** (p. 368) any way that you do it, as this is how sonar are known to be new or not, and such.

We recommend that whatever you do you use the same type of strict threading/locking that ARIA observes.

1.17 Robot Parameter Files

Found in the **Aria** (p. 205)/params directory, generic, as well as individually named robot parameter files contain default and name-specific robot information that ARIA uses to characterize the robot and correctly interpret the server information that a robot sends back to the client.

Every robot has a type and subtype, such as Pioneer and P2AT, as well as a user-modifiable name, embedded in its FLASH parameters. These parameters get sent to the ARIA client right after establishment of the client-server connection. ARIA retrieves parameter files in the following order– built in defaults, subtype parameter file, and finally name parameter file–setting and resetting global variables based on the contents of each file. Accordingly, subtype may add or change the settings derived from the default, and a named parameter file has the very last say over things.

ARIA has default generic type parameters, and generic subtype robot files, such as p2at.p, p2de.p or p2pp.p for the Pioneer 2-AT, and Pioneer 2-DE and Performance PeopleBot subtypes, respectively, in the parameters directory. You may change their contents to better match your specific robot. Or, better, either create a new one or copy the contents to a file which name matches your robot's FLASH parameter name, adding the ".p" parameter file suffix. Then change and add to the generic factors section those accessory or other operational details that best define that specific robot.

For example, ARIA uses RobotRadius to determine the robot's turn limits in most of the obstacle avoidance routines. The default for the P2AT robot doesn't account for bumper accessories. Accordingly, you might create a new parameter file that redefines RobotRadius for that specific robot.

ARIA uses the values in the conversion factors section of a parameter file to transform the robot-dependent server information data into normal dimensions and rates. For example, the DistConvFactor converts the robot's position data, measured in encoder ticks, into millimeters.

ARIA consults the accessories section of a robot's parameter file to determine what accessories a robot might have that cannot be told by other means. For example, the P2 bumper values appear in the standard SIP stall values, but if a bump ring isn't connected, these values float and vacillate between on and off. An accessory definition in the parameter file clues ARIA to use or not use the bumper values.

Finally, the sonar section of the parameter file contains information about the sonar number and geometry so that ARIA can relate sonar readings with position relative to the center of the robot.

1.17.1 How the parameter file works

The parameter file is very much like a Windows INI file in format. It contains sections and keyword/data pairs. Comments start with a semi-colon. A section identifier is a bracketed keyword, such as:

```
[ConvFactors]
```

Keywords and data are separated by one or more spaces on a single line, and may include several defining data values. Each keyword has its own behavior with how it parses the data. For example:

```
KeyWord data1 data2 data3 ...
```

Case matters for both section identifiers and keyword names. Some parameters can have multiple instances in the file. SonarUnit is a good example of this. The multiple instances of the parameter need to be surrounded by a '@start' and '@end' block. For example:

```
@start
SonarUnit 0 73 105 90
SonarUnit 1 130 78 41
@end
```

See ArPreferences.h for additional details.

1.18 Utility Classes

Some of the utility classes are **ArMath** (p. 238), **ArUtil** (p. 497), **ArTime** (p. 491), **ArPose** (p. 285), and **ArSectors** (p. 418).

1.19 Sockets

The **ArSocket** (p. 461) class is a wrapper around the socket network communication layer of your operating system. ARIA mostly uses **ArSocket** (p. 461) to open a server port and to connect to another server port.

To connect to a port, simply construct a socket containing the hostname or IP address of the host, a port number, and the ARIA socket type (TCP or UDP). For example:

```
ArSocket (p. 461) sock("host.name.com", 4040, ArSocket::TCP);
```

Or call the **ArSocket::connect**() (p. 461) function, such as:

```
ArSocket (p. 461) sock;
    sock.connect("host.name.com", 4040, ArSocket::TCP);
```

To open a server port, simple construct a socket:

```
ArSocket (p. 461) sock(4040, true, ArSocket::TCP);
```

Or call:

```
ArSocket::open(4040, ArSocket::TCP);
```

1.19.1 Emacs

Here is the configuration specification the developers at ActivMedia Robotics use in their .emacs files, in case you want to modify the code using emacs and not deal with differences in indentation and such.

```
(setq c-default-style '((other . "user")))
(c-set-offset 'substatement-open 0)
(c-set-offset 'defun-block-intro 2)
(c-set-offset 'statement-block-intro 2)
(c-set-offset 'substatement 2)
(c-set-offset 'topmost-intro -2)
(c-set-offset 'arglist-intro '++)
(c-set-offset 'statement-case-intro '*)
(c-set-offset 'member-init-intro 2)
(c-set-offset 'inline-open 0)
(c-set-offset 'brace-list-intro 2)
(c-set-offset 'statement-cont 0)
(defvar c-mode-hook 'c++-mode)
```

1.20 Non-everyday use of C++

1.20.1 Standard Template Library

ARIA makes heavy use of the C++ standard template library. So you should understand the STL in order to get the best use from some of the more advanced parts of ARIA. A reference many developers have found useful is http://www.sgi.com/tech/stl/, this is documentation to SGI's implementation, but other than the SGI specific templates which are explicitly stated as being SGI only, the documentation is quite helpful.

1.20.2 Default Arguments

Default arguments work like the following, in the function delcaration a parameter is specified, and given a default value at the same time. If the function is then used the parameters which have been given a value do not need to be given values when the function is used.

For example, after defining foo, it can be used in two differnt manners:

```
void foo(int number = 3);
// ...later
foo();
// or
foo(int);
```

This behavior is quite useful for having defaults that most people will not need to change, but allowing people to change them if they desire.

Also note that the function definition must not have the assignment in it, only the declaration, otherwise Windows compilers will not work and will report a not entirely useful error message.

1.20.3 Constructor Chaining

Constructor chaining is quite simple though little used. Each contructor can give arguments to the constructors of the member variables it contains and to the constructors which it inherits. For example if you have:

```
class BaseClass
{
public:
  BaseClass(int someNumber);
};
```

and

```
class SubClass : public BaseClass
{
public:
  SubClass(void);
  int anotherNumber;
};
```

When you write your constructor for subClass. you can intialize both baseClass and anotherNumber:

```
SubClass::SubClass(void) : BaseClass(3), anotherNumber(37)
{
    // ...
}
```

Note how the constructors to be initialized must follow a colon (:) after the constructor, and be separated by commas? For member variables they must also be initialized in the order they are in the class. Note that intializing integers is not all that unique or useful, but using this to initialize callback **Functors** (p. 17) is quite useful.

Constructor chaining is used in many many places by ARIA, thus it must be understood in order to understand ARIA, but the above is all that really needs to be known.

1.20.4 Chars and Strings, Win workaround

During development problems were encountered with windows if std::strings were passed into a dll. Thus for all input to ARIA const char ∗s are used, but for all internal storage and all reporting std::strings are passed back out of ARIA.

1.20.5 AREXPORT

Because of the Windows set up for using DLLs, is a macro used to take care of the requirements for DLLs. Largely users do not need to worry about AREXPORTs, but only functions which have AREXPORTs or inline functions are usable with DLLs in windows (all of the functions which are documented are usable).

Chapter 2

Aria Hierarchical Index

2.1 Aria Class Hierarchy

This inheritance list is sorted roughly, but not completely, alphabetically:

Chapter 3

Aria Compound Index

3.1 Aria Compound List

Here are the classes, structs, unions and interfaces with brief descriptions:

Chapter 4

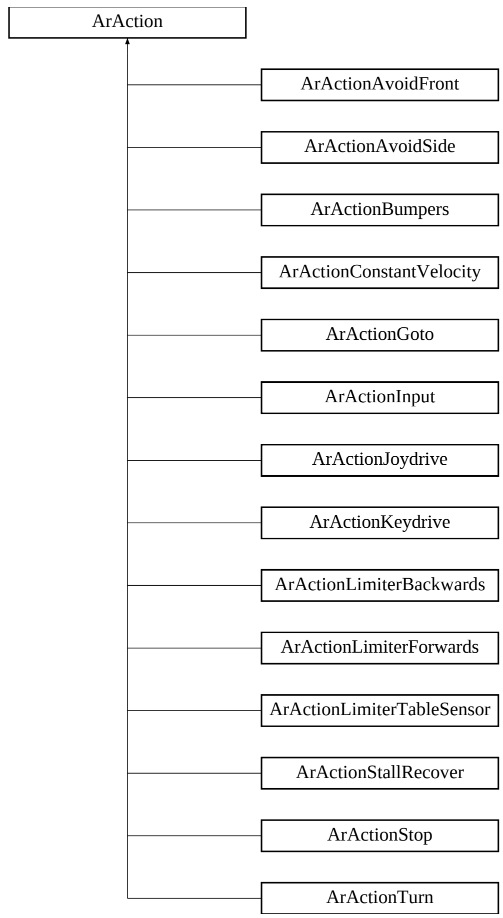
Aria Class Documentation

4.1 ArAction Class Reference

Action class, what typically makes the robot move.

`#include <ArAction.h>`

Inheritance diagram for ArAction::



Public Methods

- **ArAction** (const char ∗name, const char ∗description="")

  Constructor.

- virtual ∼**ArAction** ()

  Desructor.

- virtual bool **isActive** (void) const

  Finds out whether the action is active or not.

- virtual void **activate** (void)

  Activate the action.

- virtual void **deactivate** (void)

  Deactivate the action.

- virtual **ArActionDesired** ∗ **fire** (**ArActionDesired** currentDesired)=0

  Fires the action, returning what the action wants to do.

- virtual void **setRobot** (**ArRobot** ∗robot)

  Sets the robot this action is driving.

- virtual int **getNumArgs** (void) const

  Find the number of arguments this action takes.

- virtual const **ArArg** ∗ **getArg** (int number) const

  Gets the numbered argument.

- virtual **ArArg** ∗ **getArg** (int number)

  Gets the numbered argument.

- virtual const char ∗ **getName** (void) const

  Gets the name of the action.

- virtual const char ∗ **getDescription** (void) const

  Gets the long description of the action.

- virtual **ArActionDesired** ∗ **getDesired** (void)

  Gets what this action wants to do (for display purposes).

- virtual void **log** (bool verbose=true) const

  ArLog::log (p. 232) *s the actions stats.*

Protected Methods

- void **setNextArgument** (**ArArg** const &arg)

  Sets the argument type for the next argument (only use in constructor).

4.1.1 Detailed Description

Action class, what typically makes the robot move.

4.1.2 Member Function Documentation

4.1.2.1 virtual ArActionDesired∗ ArAction::fire (ArActionDesired *currentDesired*) [pure virtual]

Fires the action, returning what the action wants to do.

Parameters:

currentDesired this is what the current resolver has for its desired, this is SOLELY for the purpose of giving information to the action

Returns:

pointer to what this action wants to do, NULL if it wants to do nothing

Reimplemented in **ArActionAvoidFront** (p. 44), **ArActionAvoidSide** (p. 46), **ArActionBumpers** (p. 48), **ArActionConstantVelocity** (p. 50), **ArActionGoto** (p. 59), **ArActionInput** (p. 69), **ArActionJoydrive** (p. 72), **ArActionKeydrive** (p. 75), **ArActionLimiterBackwards** (p. 78), **ArActionLimiterForwards** (p. 80), **ArActionLimiterTableSensor** (p. 82), **ArActionStallRecover** (p. 84), **ArActionStop** (p. 86), and **ArActionTurn** (p. 88).

The documentation for this class was generated from the following files:

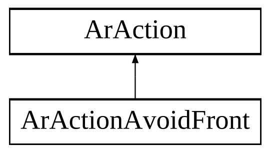
- ArAction.h
- ArAction.cpp

4.2 ArActionAvoidFront Class Reference

This action does obstacle avoidance, controlling both trans and rot.

```
#include <ArActionAvoidFront.h>
```

Inheritance diagram for ArActionAvoidFront::



Public Methods

- **ArActionAvoidFront** (const char *name="avoid front obstacles", double obstacleDistance=450, double avoidVelocity=200, double turnAmount=15, bool useTableIRIfAvail=true)

  Constructor.

- virtual ~**ArActionAvoidFront** ()

  Destructor.

- virtual **ArActionDesired** * **fire** (**ArActionDesired** currentDesired)

  Fires the action, returning what the action wants to do.

- virtual **ArActionDesired** * **getDesired** (void)

  Gets what this action wants to do (for display purposes).

4.2.1 Detailed Description

This action does obstacle avoidance, controlling both trans and rot.

This action uses whatever available range device have been added to the robot to avoid obstacles. See the ArActionAvoidFront constructor documentation to see the parameters it takes.

Also note that this action does something most others don't, which is to check for a specific piece of hardware. This is the tableSensingIR. If this is set up in the parameters for the robot, it will use DigIn0 and DigIn1, where the tableSensingIRs are connected. Note that if you make useTableIRIfAvail false in the constructor it'll ignore these. Whether the action thinks the robot has them or not depends on the value of tableSensingIR in the parameter file for that robot.

4.2.2 Constructor & Destructor Documentation

4.2.2.1 ArActionAvoidFront::ArActionAvoidFront (const char * *name* = "avoid front obstacles", double *obstacleDistance* = 450, double *avoidVelocity* = 200, double *turnAmount* = 15, bool *useTableIRIfAvail* = true)

Constructor.

Parameters:

name the name of the action

obstacleDistance distance at which to turn. (mm)

avoidVelocity Speed at which to go while avoiding an obstacle. (mm/sec)

turnAmount Degrees to turn relative to current heading while avoiding obstacle (deg)

useTableIRIfAvail Whether to use the table sensing IR if they are available

4.2.3 Member Function Documentation

4.2.3.1 ArActionDesired * ArActionAvoidFront::fire (ArActionDesired *currentDesired*) [virtual]

Fires the action, returning what the action wants to do.

Parameters:

currentDesired this is what the current resolver has for its desired, this is SOLELY for the purpose of giving information to the action

Returns:

pointer to what this action wants to do, NULL if it wants to do nothing

Reimplemented from **ArAction** (p. 42).

The documentation for this class was generated from the following files:

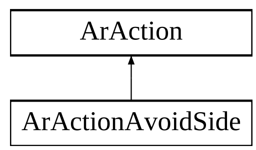
- ArActionAvoidFront.h
- ArActionAvoidFront.cpp

4.3 ArActionAvoidSide Class Reference

Action to avoid impacts by firening into walls at a shallow angle.

```
#include <ArActionAvoidSide.h>
```

Inheritance diagram for ArActionAvoidSide::



Public Methods

- **ArActionAvoidSide** (const char ∗name=”Avoid side”, double obstacle-Distance=300, double turnAmount=5)

  Constructor.

- virtual ∼**ArActionAvoidSide** ()

  Destructor.

- virtual **ArActionDesired** ∗ **fire** (**ArActionDesired** currentDesired)

  Fires the action, returning what the action wants to do.

- virtual **ArActionDesired** ∗ **getDesired** (void)

  Gets what this action wants to do (for display purposes).

4.3.1 Detailed Description

Action to avoid impacts by firening into walls at a shallow angle.

This action watches the sensors to see if it is close to firening into a wall at a shallow enough angle that other avoidance may not avoid.

4.3.2 Constructor & Destructor Documentation

4.3.2.1 ArActionAvoidSide::ArActionAvoidSide (const char ∗ *name* = ”Avoid side”, double *obstacleDistance* = 300, double *turnAmount* = 5)

Constructor.

Parameters:

name name of the action

obstacleDistance distance at which to start avoiding (mm)

turnAmount degrees at which to turn (deg)

4.3.3 Member Function Documentation

4.3.3.1 ArActionDesired ∗ ArActionAvoidSide::fire (ArActionDesired *currentDesired*) [virtual]

Fires the action, returning what the action wants to do.

Parameters:

currentDesired this is what the current resolver has for its desired, this is SOLELY for the purpose of giving information to the action

Returns:

pointer to what this action wants to do, NULL if it wants to do nothing

Reimplemented from **ArAction** (p. 42).

The documentation for this class was generated from the following files:

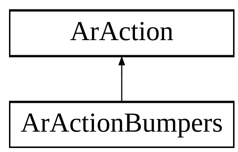
- ArActionAvoidSide.h
- ArActionAvoidSide.cpp

4.4 ArActionBumpers Class Reference

Action to deal with if the bumpers trigger.

`#include <ArActionBumpers.h>`

Inheritance diagram for ArActionBumpers::



Public Methods

- **ArActionBumpers** (const char ∗name="bumpers", double backOffSpeed=100, int backOffTime=2500, int turnTime=500, bool setMaximums=false)

  Constructor.

- virtual ∼**ArActionBumpers** ()

  Destructor.

- virtual **ArActionDesired** ∗ **fire** (**ArActionDesired** currentDesired)

  Fires the action, returning what the action wants to do.

- virtual **ArActionDesired** ∗ **getDesired** (void)

  Gets what this action wants to do (for display purposes).

4.4.1 Detailed Description

Action to deal with if the bumpers trigger.

This class basically responds to the bumpers the robot has, what the activity things the robot has is decided by the param file. If the robot is going forwards and bumps into something with the front bumpers, it will back up and turn. If the robot is going backwards and bumps into something with the rear bumpers then the robot will move forward and turn.

4.4.2 Constructor & Destructor Documentation

4.4.2.1 ArActionBumpers::ArActionBumpers (const char * *name* = "bumpers", double *backOffSpeed* = 100, int *backOffTime* = 2500, int *turnTime* = 500, bool *setMaximums* = false)

Constructor.

Parameters:

name name of the action

backOffSpeed speed at which to back away (mm/sec)

backOffTime number of msec to back up for (msec)

turnTime number of msec to alow for turn (msec)

4.4.3 Member Function Documentation

4.4.3.1 ArActionDesired * ArActionBumpers::fire (ArActionDesired *currentDesired*) `[virtual]`

Fires the action, returning what the action wants to do.

Parameters:

currentDesired this is what the current resolver has for its desired, this is SOLELY for the purpose of giving information to the action

Returns:

pointer to what this action wants to do, NULL if it wants to do nothing

Reimplemented from **ArAction** (p. 42).

The documentation for this class was generated from the following files:

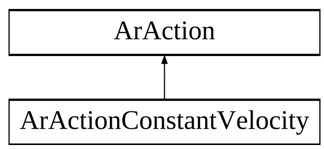
- ArActionBumpers.h
- ArActionBumpers.cpp

4.5 ArActionConstantVelocity Class Reference

Action for going straight at a constant velocity.

#include <ArActionConstantVelocity.h>

Inheritance diagram for ArActionConstantVelocity::



Public Methods

- **ArActionConstantVelocity** (const char *name="Constant Velocity", double velocity=400)

  Constructor.

- virtual ~**ArActionConstantVelocity** ()

  Destructor.

- virtual **ArActionDesired** * **fire** (**ArActionDesired** currentDesired)

  Fires the action, returning what the action wants to do.

- virtual **ArActionDesired** * **getDesired** (void)

  Gets what this action wants to do (for display purposes).

4.5.1 Detailed Description

Action for going straight at a constant velocity.

This action simply goes straight at a constant velocity.

4.5.2 Constructor & Destructor Documentation

4.5.2.1 ArActionConstantVelocity::ArActionConstantVelocity (const char * *name* = "Constant Velocity", double *velocity* = 400)

Constructor.

Parameters:

name name of the action

velocity velocity to travel at (mm/sec)

4.5.3 Member Function Documentation

4.5.3.1 ArActionDesired * ArActionConstantVelocity::fire (ArActionDesired *currentDesired*) [virtual]

Fires the action, returning what the action wants to do.

Parameters:

currentDesired this is what the current resolver has for its desired, this is SOLELY for the purpose of giving information to the action

Returns:

pointer to what this action wants to do, NULL if it wants to do nothing

Reimplemented from **ArAction** (p. 42).

The documentation for this class was generated from the following files:

- ArActionConstantVelocity.h
- ArActionConstantVelocity.cpp

4.6 ArActionDesired Class Reference

Class used to say what movement is desired.

`#include <ArActionDesired.h>`

Public Methods

- **ArActionDesired** ()

  Constructor.

- virtual ~**ArActionDesired** ()

  Destructor.

- virtual void **setVel** (double vel, double strength=MAX_STRENGTH)

  Sets the velocity (mm/sec) and strength.

- virtual void **setDeltaHeading** (double deltaHeading, double strength=MAX_STRENGTH)

  Sets the delta heading (deg) and strength.

- virtual void **setHeading** (double heading, double strength=MAX_STRENGTH)

  Sets the absolute heading (deg).

- virtual void **setMaxVel** (double maxVel, double strength=MAX_STRENGTH)

  Sets the maximum velocity (+mm/sec) and strength.

- virtual void **setMaxNegVel** (double maxVel, double strength=MAX_STRENGTH)

  Sets the maximum velocity for going backwards (-mm/sec) and strength.

- virtual void **setMaxRotVel** (double maxVel, double strength=MAX_STRENGTH)

  Sets the maximum rotational velocity (deg/sec) and strength.

- virtual void **reset** (void)

  Resets the strengths to 0.

- virtual double **getVel** (void)

  Gets the translational velocity desired (mm/sec).

- virtual double **getVelStrength** (void)

  Gets the strength of the translational velocity desired.

- virtual double **getHeading** (void)

  Gets the heading desired (deg).

- virtual double **getHeadingStrength** (void)

  Gets the strength of the heading desired.

- virtual double **getDeltaHeading** (void)

  Gets the delta heading desired (deg).

- virtual double **getDeltaHeadingStrength** (void)

  Gets the strength of the delta heading desired.

- virtual double **getMaxVel** (void)

  Gets the desired maximum velocity (mm/sec).

- virtual double **getMaxVelStrength** (void)

  Gets the maximum velocity strength.

- virtual double **getMaxNegVel** (void)

  Gets the desired maximum negative velocity (-mm/sec).

- virtual double **getMaxNegVelStrength** (void)

  Gets the desired maximum negative velocity strength.

- virtual double **getMaxRotVel** (void)

  Gets the maximum rotational velocity.

- virtual double **getMaxRotVelStrength** (void)

  Gets the maximum rotational velocity strength.

- virtual void **merge** (ArActionDesired ∗actDesired)

  Merges the given ArActionDesired into this one (this one has precedence), internal.

- virtual void **startAverage** (void)

  Starts the process of avereraging together different desireds.

- virtual void **addAverage** (ArActionDesired ∗actDesired)

  Adds another actionDesired into the mix to average.

- virtual void **endAverage** (void)

  Ends the process of avereraging together different desireds.

- virtual void **accountForRobotHeading** (double robotHeading)

  Accounts for robot heading, mostly internal.

- **ArActionDesiredChannel** ∗ **getVelDesiredChannel** (void)

  Accessor for the channel structor for merge, internal.

- **ArActionDesiredChannel** ∗ **getDeltaHeadingDesiredChannel** (void)

  Accessor for the channel structor for merge, internal.

- **ArActionDesiredChannel** ∗ **getMaxVelDesiredChannel** (void)

  Accessor for the channel structor for merge, internal.

- **ArActionDesiredChannel** ∗ **getMaxNegVelDesiredChannel** (void)

  Accessor for the channel structor for merge, internal.

- **ArActionDesiredChannel** ∗ **getMaxRotVelDesiredChannel** (void)

  Accessor for the channel structor for merge, internal.

4.6.1 Detailed Description

Class used to say what movement is desired.

This class is use by actions to report what they want to want to do (hence the name).

The way it works, is that translational (front/back) and rotational (right/left) are seperate. Translational movement uses velocity, while rotational movement uses change in heading from current heading. Translational and rotational each have their own strength value. Both translational and rotational movement have maximum velocities as well, that also have their own strengths.

The strength value reflects how strongly an action wants to do the chosen movement command, the resolver (**ArResolver** (p. 325)) will combine these strengths and figure out what to do based on them.

For all strength values there is a total of 1.0 strength to be had. The range for strength is from 0 to 1. This is simply a convention that ARIA uses by default, if you don't like it, you can override this class and make an **ArResolver** (p. 325).

4.6.2 Member Function Documentation

4.6.2.1 virtual void ArActionDesired::accountForRobotHeading (double *robotHeading*) `[inline, virtual]`

Accounts for robot heading, mostly internal.

This accounts for the robots heading, and transforms the set heading on this actionDesired into a delta heading so it can be merged and averaged and the like

Parameters:
robotHeading the heading the real actual robot is at now

4.6.2.2 virtual void ArActionDesired::addAverage (ArActionDesired ∗ *actDesired*) `[inline, virtual]`

Adds another actionDesired into the mix to average.

For a description of how to use this, see startAverage.

Parameters:
actDesired the actionDesired to add into the average

4.6.2.3 virtual void ArActionDesired::endAverage (void) `[inline, virtual]`

Ends the process of avereraging together different desireds.

For a description of how to use this, see startAverage.

4.6.2.4 virtual void ArActionDesired::merge (ArActionDesired ∗ *actDesired*) `[inline, virtual]`

Merges the given ArActionDesired into this one (this one has precedence), internal.

This merges in the two different action values, accountForRobotHeading MUST be done before this is called (on both actions), since this merges their delta headings, and the deltas can't be known unless the account for angle is done.

Parameters:
actDesired the actionDesired to merge with this one

4.6.2.5 virtual void ArActionDesired::setDeltaHeading (double *deltaHeading*, double *strength* = MAX_STRENGTH) `[inline, virtual]`

Sets the delta heading (deg) and strength.

Parameters:

deltaHeading desired change in heading (deg)

strength strength given to this, defaults to MAX_STRENGTH (1.0)

4.6.2.6 virtual void ArActionDesired::setHeading (double *heading*, double *strength* = MAX_STRENGTH) `[inline, virtual]`

Sets the absolute heading (deg).

This is a way to set the heading instead of using a delta, there is no get for this, because accountForRobotHeading MUST be called (this should be called by all resolvers, but if you want to call it you can, thats fine).

Parameters:

heading desired heading (deg)

strength strength given to this, defaults to MAX_STRENGTH (1.0)

4.6.2.7 virtual void ArActionDesired::setMaxNegVel (double *maxVel*, double *strength* = MAX_STRENGTH) `[inline, virtual]`

Sets the maximum velocity for going backwards (-mm/sec) and strength.

Parameters:

maxVel desired maximum velocity for going backwards (-mm/sec)

strength strength given to this, defaults to MAX_STRENGTH (1.0)

4.6.2.8 virtual void ArActionDesired::setMaxRotVel (double *maxVel*, double *strength* = MAX_STRENGTH) `[inline, virtual]`

Sets the maximum rotational velocity (deg/sec) and strength.

Parameters:

maxVel desired maximum rotational velocity (deg/sec)

strength strength given to this, defaults to MAX_STRENGTH (1.0)

4.6.2.9 virtual void ArActionDesired::setMaxVel (double *maxVel*, double *strength* = MAX_STRENGTH) [inline, virtual]

Sets the maximum velocity (+mm/sec) and strength.

Parameters:

maxVel desired maximum velocity (+mm/sec)

strength strength given to this, defaults to MAX_STRENGTH (1.0)

4.6.2.10 virtual void ArActionDesired::setVel (double *vel*, double *strength* = MAX_STRENGTH) [inline, virtual]

Sets the velocity (mm/sec) and strength.

Parameters:

vel desired vel (mm/sec)

strength strength given to this, defaults to MAX_STRENGTH (1.0)

4.6.2.11 virtual void ArActionDesired::startAverage (void) [inline, virtual]

Starts the process of avereraging together different desireds.

There is a three step process for averaging actionDesireds together, first startAverage must be done to set up the process, then addAverage must be done with each average that is desired, then finally endAverage should be used, after that is done then the normal process of getting the results out should be done.

The documentation for this class was generated from the following files:

- ArActionDesired.h
- ArActionDesired.cpp

4.7 ArActionDesiredChannel Class Reference

Class used by **ArActionDesired** (p. 51) for each channel, internal.

`#include <ArActionDesired.h>`

4.7.1 Detailed Description

Class used by **ArActionDesired** (p. 51) for each channel, internal.

4.7.2 Member Data Documentation

4.7.2.1 const double ArActionDesiredChannel::MAX_STRENGTH [static]

Initial value:

```
ArActionDesired::MAX_STRENGTH
```

4.7.2.2 const double ArActionDesiredChannel::MIN_STRENGTH [static]

Initial value:

```
ArActionDesired::MIN_STRENGTH
```

4.7.2.3 const double ArActionDesiredChannel::NO_STRENGTH [static]

Initial value:

```
ArActionDesired::NO_STRENGTH
```

The documentation for this class was generated from the following files:

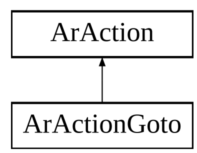
- ArActionDesired.h
- ArActionDesired.cpp

4.8 ArActionGoto Class Reference

This action goes to a given **ArPose** (p. 285) very naively.

```
#include <ArActionGoto.h>
```

Inheritance diagram for ArActionGoto::



Public Methods

- bool **haveAchievedGoal** (void)

  Sees if the goal has been achieved.

- void **cancelGoal** (void)

  Cancels the goal the robot has.

- void **setGoal** (**ArPose** goal)

  Sets a new goal and sets the action to go there.

- **ArPose getGoal** (void)

  Gets the goal the action has.

- void **setCloseDist** (double closeDist)

  Set the distance which is close enough to the goal (mm);.

- double **getCloseDist** (void)

  Gets the distance which is close enough to the goal (mm).

- void **setSpeed** (double speed)

  Sets the speed the action will travel to the goal at (mm/sec).

- double **getSpeed** (void)

  Gets the speed the action will travel to the goal at (mm/sec).

- virtual **ArActionDesired** ∗ **fire** (**ArActionDesired** currentDesired)

  Fires the action, returning what the action wants to do.

- virtual **ArActionDesired** ∗ **getDesired** (void)

  Gets what this action wants to do (for display purposes).

4.8.1 Detailed Description

This action goes to a given **ArPose** (p. 285) very naively.

This action naively drives straight towards a given **ArPose** (p. 285)... the action stops when it gets closeDist away... it travels to the point at speed mm/sec.

You can give it a new goal with setGoal, cancel its movement with cancelGoal, and see if it got there with haveAchievedGoal.

This doesn't avoid obstacles or anything, you could have an avoid routine at a higher priority to avoid on the way there... but for real and intelligent looking navigation you should use something like Saphira's Gradient navigation.

4.8.2 Member Function Documentation

4.8.2.1 ArActionDesired ∗ ArActionGoto::fire (ArActionDesired *currentDesired*) [virtual]

Fires the action, returning what the action wants to do.

Parameters:

currentDesired this is what the current resolver has for its desired, this is SOLELY for the purpose of giving information to the action

Returns:

pointer to what this action wants to do, NULL if it wants to do nothing

Reimplemented from **ArAction** (p. 42).

The documentation for this class was generated from the following files:

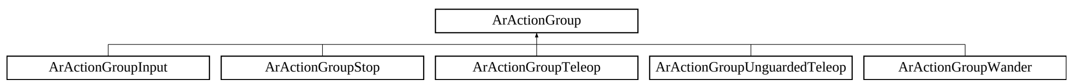
- ArActionGoto.h
- ArActionGoto.cpp

4.9 ArActionGroup Class Reference

Class for groups of actions to accomplish one thing.

`#include <ArActionGroup.h>`

Inheritance diagram for ArActionGroup::



Public Methods

- **ArActionGroup** (**ArRobot** ∗robot)

  Constructor.

- virtual ∼**ArActionGroup** ()

  Destructor, it also deletes the actions in its group.

- virtual void **addAction** (**ArAction** ∗action, int priority)

  Adds the action to the robot this group uses with the given priority.

- virtual void **remAction** (**ArAction** ∗action)

  Removes the action from the robot this group uses.

- virtual void **activate** (void)

  Activates all the actions in this group.

- virtual void **activateExclusive** (void)

  Activates all the actions in this group and deactivates all others.

- virtual void **deactivate** (void)

  Deactivates all the actions in this group.

- virtual void **removeActions** (void)

  Removes all the actions in this group from the robot.

- virtual std::list< **ArAction** ∗> ∗ **getActionList** (void)

  Gets the action list (use this to delete actions after doing removeActions).

4.9.1 Detailed Description

Class for groups of actions to accomplish one thing.

This class is used to have a group of ArActions and turn them on and off in aggregate... this is so that you can say have a group of like 5 behaviors for teleop or wander, and just turn 'em all on and off at once. Note that the destructor by default will delete the actions added to the group, this is controlled with a flag to the constructor though, so you can have it how you want.... this is nice though so you can just do addAction(new ArActionWhatever(blah, blah, blah), 90); and not worry about the deletion (since the destructor will do it), just delete the group... if for some reason (I'd advise against it) you are using one action in multiple groups, don't use this feature, ie pass in false to the constructor for it or you'll wind up with a crash when the action is deleted by both groups (again, you should probably only have an action in one group).

4.9.2 Constructor & Destructor Documentation

4.9.2.1 ArActionGroup::ArActionGroup (ArRobot * *robot*)

Constructor.

@param robot The robot that this action group is attached to

@param deleteActionsOnDestruction if this is true then when the destructor is called the actions that this group has will be deleted

4.9.3 Member Function Documentation

4.9.3.1 void ArActionGroup::addAction (ArAction * *action*, int *priority*) `[virtual]`

Adds the action to the robot this group uses with the given priority.

@param action the action to add to the robot @param priority the priority to give the action @see **ArRobot::addAction** (p. 371)

4.9.3.2 void ArActionGroup::remAction (ArAction * *action*) `[virtual]`

Removes the action from the robot this group uses.

@param action the action to remove from the robot @see **ArRobot::remAction** (p. 393)

The documentation for this class was generated from the following files:

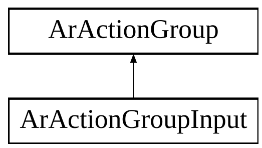
- ArActionGroup.h
- ArActionGroup.cpp

4.10 ArActionGroupInput Class Reference

Input to drive the robot.

#include <ArActionGroups.h>

Inheritance diagram for ArActionGroupInput::



4.10.1 Detailed Description

Input to drive the robot.

This class is just useful for teleoping the robot under your own joystick and keyboard control... Note that you the predefined ArActionGroups in ARIA are made only to be used exclusively... they won't combine.

The documentation for this class was generated from the following files:

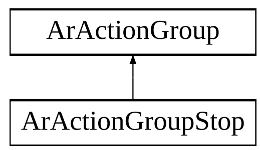
- ArActionGroups.h
- ArActionGroups.cpp

4.11 ArActionGroupStop Class Reference

Stop the robot.

```
#include <ArActionGroups.h>
```

Inheritance diagram for ArActionGroupStop::



4.11.1 Detailed Description

Stop the robot.

This class is just useful for having the robot stopped... Note that you the predefined ArActionGroups in ARIA are made only to be used exclusively... they won't combine.

The documentation for this class was generated from the following files:

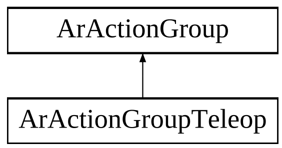
- ArActionGroups.h
- ArActionGroups.cpp

4.12 ArActionGroupTeleop Class Reference

Teleop the robot.

`#include <ArActionGroups.h>`

Inheritance diagram for ArActionGroupTeleop::



4.12.1 Detailed Description

Teleop the robot.

This class is just useful for teleoping the robot and having these actions read the joystick and keyboard... Note that you the predefined ArActionGroups in ARIA are made only to be used exclusively... they won't combine.

The documentation for this class was generated from the following files:

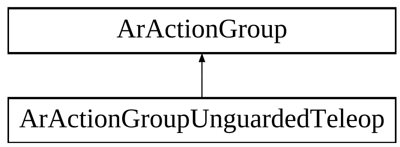
- ArActionGroups.h
- ArActionGroups.cpp

4.13 ArActionGroupUnguardedTeleop Class Reference

Teleop the robot in an unguarded and unsafe manner.

`#include <ArActionGroups.h>`

Inheritance diagram for ArActionGroupUnguardedTeleop::



4.13.1 Detailed Description

Teleop the robot in an unguarded and unsafe manner.

This class is just useful for teleoping the robot in an unguarded and unsafe manner and having these actions read the joystick and keyboard... Note that you the predefined ArActionGroups in ARIA are made only to be used exclusively... they won't combine.

The documentation for this class was generated from the following files:

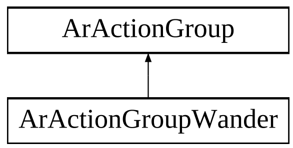
- ArActionGroups.h
- ArActionGroups.cpp

4.14 ArActionGroupWander Class Reference

Has the robot wander.

`#include <ArActionGroups.h>`

Inheritance diagram for ArActionGroupWander::



4.14.1 Detailed Description

Has the robot wander.

This class is useful for having the robot wander... Note that you the predefined ArActionGroups in ARIA are made only to be used exclusively... they won't combine.

The documentation for this class was generated from the following files:

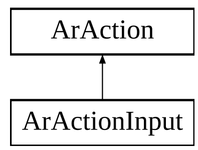
- ArActionGroups.h
- ArActionGroups.cpp

4.15 ArActionInput Class Reference

Action for stopping the robot.

#include <ArActionInput.h>

Inheritance diagram for ArActionInput::



Public Methods

- **ArActionInput** (const char *name="Input")

  Constructor.

- virtual ~**ArActionInput** ()

  Destructor.

- void **setVel** (double vel)

  Set velocity (cancels deltaVel).

- void **deltaVel** (double delta)

  Increment/decrement the velocity (cancels setVel).

- void **deltaHeading** (double delta)

  Increment/decrement the heading.

- void **deltaHeadingFromCurrent** (double delta)

  Increment/decrement the heading from current.

- virtual **ArActionDesired** * **fire** (**ArActionDesired** currentDesired)

  Fires the action, returning what the action wants to do.

- virtual **ArActionDesired** * **getDesired** (void)

  Gets what this action wants to do (for display purposes).

- void **activate** (void)

  Activate the action.

4.15.1 Detailed Description

Action for stopping the robot.

This action simply sets the robot to a 0 velocity and a deltaHeading of 0.

4.15.2 Constructor & Destructor Documentation

4.15.2.1 ArActionInput::ArActionInput (const char ∗ *name* = "Input")

Constructor.

Parameters:
name name of the action

4.15.3 Member Function Documentation

4.15.3.1 ArActionDesired ∗ ArActionInput::fire (ArActionDesired *currentDesired*) `[virtual]`

Fires the action, returning what the action wants to do.

Parameters:
currentDesired this is what the current resolver has for its desired, this is SOLELY for the purpose of giving information to the action

Returns:
pointer to what this action wants to do, NULL if it wants to do nothing

Reimplemented from **ArAction** (p. 42).

The documentation for this class was generated from the following files:

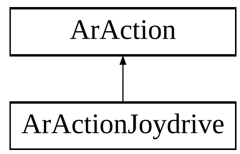
- ArActionInput.h
- ArActionInput.cpp

4.16 ArActionJoydrive Class Reference

This action will use the joystick for input to drive the robot.

```
#include <ArActionJoydrive.h>
```

Inheritance diagram for ArActionJoydrive::



Public Methods

- **ArActionJoydrive** (const char *name="joydrive", double transVelMax=400, double turnAmountMax=15, bool stopIfNoButtonPressed=true, bool useOSCalForJoystick=true)

  Constructor.

- virtual ~**ArActionJoydrive** ()

  Destructor.

- virtual **ArActionDesired** * **fire** (**ArActionDesired** currentDesired)

  Fires the action, returning what the action wants to do.

- bool **joystickInited** (void)

  Whether the joystick is initalized or not.

- void **setSpeeds** (double transVelMax, double turnAmountMax)

  Set Speeds.

- void **setStopIfNoButtonPressed** (bool stopIfNoButtonPressed)

  Set if we'll stop if no button is pressed, otherwise just do nothing.

- bool **getStopIfNoButtonPressed** (void)

  Get if we'll stop if no button is pressed, otherwise just do nothing.

- void **setThrottleParams** (int lowSpeed, int highSpeed)

  Sets the params on the throttle (throttle unused unless you call this).

- void **setUseOSCal** (bool useOSCal)

Sets whether to use OSCalibration the joystick or not.

- bool **getUseOSCal** (void)

  Gets whether OSCalibration is being used for the joystick or not.

- **ArJoyHandler** ∗ **getJoyHandler** (void)

  Gets the joyHandler.

- virtual **ArActionDesired** ∗ **getDesired** (void)

  Gets what this action wants to do (for display purposes).

4.16.1 Detailed Description

This action will use the joystick for input to drive the robot.

This class creates its own **ArJoyHandler** (p. 214) to get input from the joystick. Then it will scale the speed between 0 and the given max for velocity and turning, up and down on the joystick go forwards/backwards while right and left go right and left. You must press in one of the two joystick buttons for the class to pay attention to the joystick.

NOTE: The joystick does not save calibration information, so you must calibrate the joystick before each time you use it. To do this, press the button for at least a half a second while the joystick is in the middle. Then let go of the button and hold the joystick in the upper left for at least a half second and then in the lower right corner for at least a half second.

4.16.2 Constructor & Destructor Documentation

4.16.2.1 ArActionJoydrive::ArActionJoydrive (const char ∗ *name* = "joydrive", double *transVelMax* = 400, double *turnAmountMax* = 15, bool *stopIfNoButtonPressed* = true, bool *useOSCalForJoystick* = true)

Constructor.

This action is for driving around the robot with a joystick, you must hold in a button on the joystick and then lean the joytsick over to have it drive. You need to calibrate the joystick for it to work right, for details about this see **ArJoyHandler** (p. 214).

Parameters:

name the name of this action

transVelMax the maximum velocity the joydrive action will go, it reachs this when the joystick is all the way forwards

turnAmountMax the maximum amount the joydrive action will turn, it reachs this when the joystick is all the way forwards

stopIfNoButtonPressed if this is true and there is a joystick and no button is pressed, the action will have the robot stop... otherwise it'll do nothing (letting lower priority actions fire)

See also:
ArJoyHandler::setUseOSCal (p. 219)

4.16.3 Member Function Documentation

4.16.3.1 ArActionDesired ∗ ArActionJoydrive::fire (ArActionDesired *currentDesired*) `[virtual]`

Fires the action, returning what the action wants to do.

Parameters:

currentDesired this is what the current resolver has for its desired, this is SOLELY for the purpose of giving information to the action

Returns:
pointer to what this action wants to do, NULL if it wants to do nothing

Reimplemented from **ArAction** (p. 42).

4.16.3.2 bool ArActionJoydrive::getUseOSCal (void)

Gets whether OSCalibration is being used for the joystick or not.

See also:
ArJoyHandler::getUseOSCal (p. 218)

4.16.3.3 void ArActionJoydrive::setUseOSCal (bool *useOSCal*)

Sets whether to use OSCalibration the joystick or not.

See also:
ArJoyHandler::setUseOSCal (p. 219)

The documentation for this class was generated from the following files:

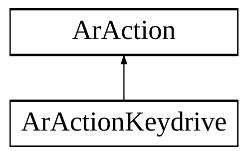
- ArActionJoydrive.h
- ArActionJoydrive.cpp

4.17 ArActionKeydrive Class Reference

This action will use the keyboard arrow keys for input to drive the robot.

#include <ArActionKeydrive.h>

Inheritance diagram for ArActionKeydrive::



Public Methods

- **ArActionKeydrive** (const char *name="keydrive", double transVelMax=400, double turnAmountMax=24, double velIncrement=25, double turnIncrement=8)

  Constructor.

- virtual ~**ArActionKeydrive** ()

  Destructor.

- virtual **ArActionDesired** * **fire** (**ArActionDesired** currentDesired)

  Fires the action, returning what the action wants to do.

- void **setSpeeds** (double transVelMax, double turnAmountMax)

  For setting the maximum speeds.

- void **setIncrements** (double velIncrement, double turnIncrement)

  For setting the increment amounts.

- virtual **ArActionDesired** * **getDesired** (void)

  Gets what this action wants to do (for display purposes).

- virtual void **setRobot** (**ArRobot** *robot)

  Sets the robot this action is driving.

- virtual void **activate** (void)

  Activate the action.

- virtual void **deactivate** (void)

Deactivate the action.

- void **takeKeys** (void)

  Takes the keys this action wants to use to drive.

- void **giveUpKeys** (void)

  Gives up the keys this action wants to use to drive.

- void **up** (void)

  Internal, callback for up arrow.

- void **down** (void)

  Internal, callback for down arrow.

- void **left** (void)

  Internal, callback for left arrow.

- void **right** (void)

  Internal, callback for right arrow.

- void **space** (void)

  Internal, callback for space key.

4.17.1 Detailed Description

This action will use the keyboard arrow keys for input to drive the robot.

4.17.2 Member Function Documentation

4.17.2.1 ArActionDesired * ArActionKeydrive::fire (ArActionDesired *currentDesired*) `[virtual]`

Fires the action, returning what the action wants to do.

Parameters:

currentDesired this is what the current resolver has for its desired, this is SOLELY for the purpose of giving information to the action

Returns:

pointer to what this action wants to do, NULL if it wants to do nothing

Reimplemented from **ArAction** (p. 42).

The documentation for this class was generated from the following files:

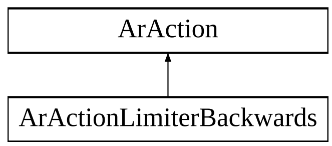
- ArActionKeydrive.h
- ArActionKeydrive.cpp

4.18 ArActionLimiterBackwards Class Reference

Action to limit the backwards motion of the robot.

#include <ArActionLimiterBackwards.h>

Inheritance diagram for ArActionLimiterBackwards::



Public Methods

- **ArActionLimiterBackwards** (const char ∗name="speed limiter", double stopDistance=-250, double slowDistance=-600, double maxBackwardsSpeed=-250)

  Constructor.

- virtual ∼**ArActionLimiterBackwards** ()

  Destructor.

- virtual **ArActionDesired** ∗ **fire** (**ArActionDesired** currentDesired)

  Fires the action, returning what the action wants to do.

- virtual **ArActionDesired** ∗ **getDesired** (void)

  Gets what this action wants to do (for display purposes).

4.18.1 Detailed Description

Action to limit the backwards motion of the robot.

This class limits the backwards motion of the robot according to the parameters given.

4.18.2 Constructor & Destructor Documentation

4.18.2.1 ArActionLimiterBackwards::ArActionLimiterBackwards (const char * *name* = "speed limiter", double *stopDistance* = -250, double *slowDistance* = -600, double *maxBackwardsSpeed* = -250)

Constructor.

Parameters:

name name of the action

stopDistance distance at which to stop (mm)

slowDistance distance at which to slow down (mm)

maxBackwardsSpeed maximum backwards speed, speed allowed scales from this to 0 at the stop distance (mm/sec)

4.18.3 Member Function Documentation

4.18.3.1 ArActionDesired * ArActionLimiterBackwards::fire (ArActionDesired *currentDesired*) `[virtual]`

Fires the action, returning what the action wants to do.

Parameters:

currentDesired this is what the current resolver has for its desired, this is SOLELY for the purpose of giving information to the action

Returns:

pointer to what this action wants to do, NULL if it wants to do nothing

Reimplemented from **ArAction** (p. 42).

The documentation for this class was generated from the following files:

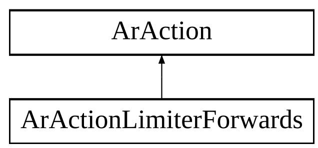
- ArActionLimiterBackwards.h
- ArActionLimiterBackwards.cpp

4.19 ArActionLimiterForwards Class Reference

Action to limit the forwards motion of the robot.

#include <ArActionLimiterForwards.h>

Inheritance diagram for ArActionLimiterForwards::



Public Methods

- **ArActionLimiterForwards** (const char *name="speed limiter", double stopDistance=250, double slowDistance=600, double slowSpeed=250, double widthRatio=1.5)

  Constructor.

- virtual ~**ArActionLimiterForwards** ()

  Destructor.

- virtual **ArActionDesired** * **fire** (**ArActionDesired** currentDesired)

  Fires the action, returning what the action wants to do.

- virtual **ArActionDesired** * **getDesired** (void)

  Gets what this action wants to do (for display purposes).

4.19.1 Detailed Description

Action to limit the forwards motion of the robot.

This action uses the sensors to find a maximum speed to travel at

4.19.2 Constructor & Destructor Documentation

4.19.2.1 ArActionLimiterForwards::ArActionLimiterForwards (const char * *name* = "speed limiter", double *stopDistance* = 250, double *slowDistance* = 600, double *slowSpeed* = 250, double *widthRatio* = 1.5)

Constructor.

Parameters:

name name of the action

stopDistance distance at which to stop (mm)

slowDistance distance at which to slow down (mm)

slowSpeed speed allowed at slowDistance, scales to 0 at slow distance (mm/sec)

4.19.3 Member Function Documentation

4.19.3.1 ArActionDesired * ArActionLimiterForwards::fire (ArActionDesired *currentDesired*) `[virtual]`

Fires the action, returning what the action wants to do.

Parameters:

currentDesired this is what the current resolver has for its desired, this is SOLELY for the purpose of giving information to the action

Returns:

pointer to what this action wants to do, NULL if it wants to do nothing

Reimplemented from **ArAction** (p. 42).

The documentation for this class was generated from the following files:

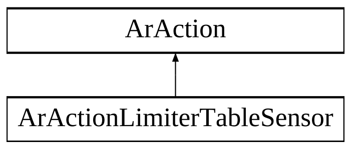
- ArActionLimiterForwards.h
- ArActionLimiterForwards.cpp

4.20 ArActionLimiterTableSensor Class Reference

Action to limit speed based on whether there the table-sensors see anything.

#include <ArActionLimiterTableSensor.h>

Inheritance diagram for ArActionLimiterTableSensor::



Public Methods

- **ArActionLimiterTableSensor** (const char *name="TableSensor-Limiter")

  Constructor.

- virtual ~**ArActionLimiterTableSensor** ()

  Destructor.

- virtual **ArActionDesired** * **fire** (**ArActionDesired** currentDesired)

  Fires the action, returning what the action wants to do.

- virtual **ArActionDesired** * **getDesired** (void)

  Gets what this action wants to do (for display purposes).

4.20.1 Detailed Description

Action to limit speed based on whether there the table-sensors see anything.

This action limits speed to 0 if the table-sensors see anything in front of the robot. The action will only work if the robot has table sensors, meaning that the robots parameter file has them listed as true.

4.20.2 Member Function Documentation

4.20.2.1 ArActionDesired * ArActionLimiterTableSensor::fire (ArActionDesired *currentDesired*) [virtual]

Fires the action, returning what the action wants to do.

Parameters:

currentDesired this is what the current resolver has for its desired, this is SOLELY for the purpose of giving information to the action

Returns:

pointer to what this action wants to do, NULL if it wants to do nothing

Reimplemented from **ArAction** (p. 42).

The documentation for this class was generated from the following files:

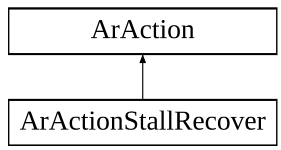
- ArActionLimiterTableSensor.h
- ArActionLimiterTableSensor.cpp

4.21 ArActionStallRecover Class Reference

Action to recover from a stall.

`#include <ArActionStallRecover.h>`

Inheritance diagram for ArActionStallRecover::



Public Methods

- **ArActionStallRecover** (const char *name="stall recover", double obstacleDistance=225, int cyclesToMove=50, double speed=150, double degreesToTurn=45)

  Constructor.

- virtual ~**ArActionStallRecover** ()

  Destructor.

- virtual **ArActionDesired** * **fire** (**ArActionDesired** currentDesired)

  Fires the action, returning what the action wants to do.

- virtual **ArActionDesired** * **getDesired** (void)

  Gets what this action wants to do (for display purposes).

4.21.1 Detailed Description

Action to recover from a stall.

This action tries to recover if one of the wheels has stalled, it has a series of actions it tries in order to get out of the stall.

4.21.2 Constructor & Destructor Documentation

4.21.2.1 AREXPORT ArActionStallRecover::ArActionStallRecover (const char * *name* = "stall recover", double *obstacleDistance* = 225, int *cyclesToMove* = 50, double *speed* = 150, double *degreesToTurn* = 45)

Constructor.

Parameters:

name name of the action

obstacleDistance distance at which not to move because of obstacle. (mm)

cyclesToMove number of cycles to move (# of cycles)

speed speed at which to back up or go forward (mm/sec)

degreesToTurn number of degrees to turn (deg)

4.21.3 Member Function Documentation

4.21.3.1 AREXPORT ArActionDesired * ArActionStallRecover::fire (ArActionDesired *currentDesired*) `[virtual]`

Fires the action, returning what the action wants to do.

Parameters:

currentDesired this is what the current resolver has for its desired, this is SOLELY for the purpose of giving information to the action

Returns:

pointer to what this action wants to do, NULL if it wants to do nothing

Reimplemented from **ArAction** (p. 42).

The documentation for this class was generated from the following files:

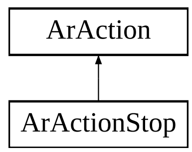
- ArActionStallRecover.h
- ArActionStallRecover.cpp

4.22 ArActionStop Class Reference

Action for stopping the robot.

#include <ArActionStop.h>

Inheritance diagram for ArActionStop::



Public Methods

- **ArActionStop** (const char ∗name=”stop”)

  Constructor.

- virtual ∼**ArActionStop** ()

  Destructor.

- virtual **ArActionDesired** ∗ **fire** (**ArActionDesired** currentDesired)

  Fires the action, returning what the action wants to do.

- virtual **ArActionDesired** ∗ **getDesired** (void)

  Gets what this action wants to do (for display purposes).

4.22.1 Detailed Description

Action for stopping the robot.

This action simply sets the robot to a 0 velocity and a deltaHeading of 0.

4.22.2 Constructor & Destructor Documentation

4.22.2.1 ArActionStop::ArActionStop (const char ∗ *name* = ”stop”)

Constructor.

Parameters:

name name of the action

4.22.3 Member Function Documentation

4.22.3.1 ArActionDesired * ArActionStop::fire (ArActionDesired *currentDesired*) [virtual]

Fires the action, returning what the action wants to do.

Parameters:

currentDesired this is what the current resolver has for its desired, this is SOLELY for the purpose of giving information to the action

Returns:

pointer to what this action wants to do, NULL if it wants to do nothing

Reimplemented from **ArAction** (p. 42).

The documentation for this class was generated from the following files:

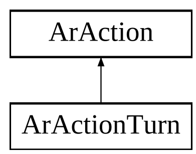
- ArActionStop.h
- ArActionStop.cpp

4.23 ArActionTurn Class Reference

Action to turn when the behaviors with more priority have limited the speed.

`#include <ArActionTurn.h>`

Inheritance diagram for ArActionTurn::



Public Methods

- **ArActionTurn** (const char ∗name="turn", double speedStartTurn=200, double speedFullTurn=100, double turnAmount=15)

  Constructor.

- virtual ∼**ArActionTurn** ()

  Destructor.

- virtual **ArActionDesired** ∗ **fire** (**ArActionDesired** currentDesired)

  Fires the action, returning what the action wants to do.

- virtual **ArActionDesired** ∗ **getDesired** (void)

  Gets what this action wants to do (for display purposes).

4.23.1 Detailed Description

Action to turn when the behaviors with more priority have limited the speed.

This action is basically made so that you can just have a ton of limiters of different kinds and types to keep speed under control, then throw this into the mix to have the robot wander. Note that the turn amount ramps up to turnAmount starting at 0 at speedStartTurn and hitting the full amount at speedFullTurn.

4.23.2 Member Function Documentation

4.23.2.1 ArActionDesired * ArActionTurn::fire (ArActionDesired *currentDesired*) [virtual]

Fires the action, returning what the action wants to do.

Parameters:

currentDesired this is what the current resolver has for its desired, this is SOLELY for the purpose of giving information to the action

Returns:

pointer to what this action wants to do, NULL if it wants to do nothing

Reimplemented from **ArAction** (p. 42).

The documentation for this class was generated from the following files:

- ArActionTurn.h
- ArActionTurn.cpp

4.24 ArACTS_1_2 Class Reference

Driver for ACTS.

`#include <ArACTS.h>`

Public Types

- enum **ActsConstants** { **NUM_CHANNELS** = 32, **MAX_BLOBS** = 10, **BLOB_DATA_SIZE** = 16, **DATA_HEADER** = NUM_-CHANNELS * 4, **MAX_DATA** = 5300 }

Public Methods

- **ArACTS_1_2** ()

  Constructor.

- virtual ~**ArACTS_1_2** ()

  Destructor.

- bool **openPort** (**ArRobot** *robot, const char *host="localhost", int port=5001)

  Opens the connection to ACTS.

- bool **closePort** (void)

  Closes the connection.

- bool **isConnected** (void)

  Finds out whether there is connection.

- **ArRobot** * **getRobot** (void)

  Gets the robot this class is connected to.

- void **setRobot** (**ArRobot** *robot)

  Sets the robot this class is connected to.

- bool **requestPacket** (void)

  Requests another packet.

- bool **requestQuit** (void)

  Requests that ACTS quits.

- bool **receiveBlobInfo** (void)

  Gets the blob information from the connection to acts.

- int **getNumBlobs** (int channel)

  Gets the number of blobs for the given chanel.

- bool **getBlob** (int channel, int blobNumber, **ArACTSBlob** ∗blob)

  Gets the given blob from the given channel.

- void **actsHandler** (void)

  A function that reads information from acts and requests packets.

- void **invert** (int width=160, int height=120)

  This will make the image stats inverted (for use with an inverted camera).

Protected Methods

- int **getData** (char ∗rawData)

  an iternal function to strip out the information from some bytes.

4.24.1 Detailed Description

Driver for ACTS.

4.24.2 Member Enumeration Documentation

4.24.2.1 enum ArACTS_1_2::ActsConstants

Enumeration values:

NUM_CHANNELS Number of channels there are.

MAX_BLOBS Number of blobs per channel.

BLOB_DATA_SIZE Size of the blob data.

DATA_HEADER Size of the data header.

MAX_DATA Maximum amount of data.

4.24.3 Member Function Documentation

4.24.3.1 bool ArACTS_1_2::closePort (void)

Closes the connection.

Closes the port to the ACTS server

Returns:
true if the connection was closed properly, false otherwise

4.24.3.2 bool ArACTS_1_2::getBlob (int *channel*, int *blobNumber*, ArACTSBlob * *blob*)

Gets the given blob from the given channel.

Gets the blobNumber from the channel given, fills the information for that blob into the given blob structure.

Parameters:
channel the channel to get the blob from
blobNumber the number of the blob to get from the given channel
blob the blob instance to fill in with the data about the requested blob

Returns:
true if the blob instance could be filled in from the

4.24.3.3 int ArACTS_1_2::getNumBlobs (int *channel*)

Gets the number of blobs for the given chanel.

Returns:
the number of blobs on the channel, or -1 if the channel is invalid

4.24.3.4 void ArACTS_1_2::invert (int *width* = 160, int *height* = 120)

This will make the image stats inverted (for use with an inverted camera).

This inverts the image, but since ACTS doesn't tell this driver the height or width, you need to provide both of those for the image, default is 160x120.

Parameters:
width the width of the images acts is grabbing (pixels)
height the height of the images acts is grabbing (pixels)

4.24.3.5 bool ArACTS_1_2::openPort (ArRobot * *robot*, const char * *host* = "localhost", int *port* = 5001)

Opens the connection to ACTS.

Opens the port to the ACTS server

Parameters:

robot the robot to attach this to, which puts a sensorInterp on the robot so that ArACTS will always have fresh data from ACTS... giving a NULL value is perfectly acceptable, in this case ArACTS will not do any processing or requesting and you'll have to use receiveBlobInfo and requestPacket (or just call actsHandler)

port the port the ACTS server is running on, default of 5001

host the host the ACTS server is running on, default is localhost (ie this machine)

Returns:

true if the connection was established, false otherwise

4.24.3.6 bool ArACTS_1_2::receiveBlobInfo (void)

Gets the blob information from the connection to acts.

Checks the connection to the ACTS server for data, if data is there it fills in the blob information, otherwise just returns false

Returns:

true if there was new data and the data could be read succesfully

4.24.3.7 bool ArACTS_1_2::requestPacket (void)

Requests another packet.

Requests a packet from the ACTS server, specifically it sends the request to the acts server over its connection

Returns:

true if the command was sent succesfully, false otherwise

4.24.3.8 bool ArACTS_1_2::requestQuit (void)

Requests that ACTS quits.

Sends a command to the ACTS server requesting that ACTS quit

Returns:
true if the request was sent succesfully, false otherwise

The documentation for this class was generated from the following files:

- ArACTS.h
- ArACTS.cpp

4.25 ArACTSBlob Class Reference

A class for the acts blob.

`#include <ArACTS.h>`

Public Methods

- **ArACTSBlob** ()
  Constructor.
- virtual ~**ArACTSBlob** ()
  Destructor.
- int **getArea** (void)
  Gets the number of pixels (area) covered by the blob.
- int **getXCG** (void)
  Gets the X Center of Gravity of the blob.
- int **getYCG** (void)
  Gets the Y Center of Gravity of the blob.
- int **getLeft** (void)
  Gets the left border of the blob.
- int **getRight** (void)
  Gets the right border of the blob.
- int **getTop** (void)
  Gets the top border of the blob.
- int **getBottom** (void)
  Gets the bottom border of the blob.
- void **setArea** (int area)
  Sets the number of pixels (area) covered by the blob.
- void **setXCG** (int xcg)
  Sets the X Center of Gravity of the blob.
- void **setYCG** (int ycg)
  Sets the Y Center of Gravity of the blob.

- void **setLeft** (int left)
  Sets the left border of the blob.
- void **setRight** (int right)
  Sets the right border fo the blob.
- void **setTop** (int top)
  Sets the top border of the blob.
- void **setBottom** (int bottom)
  Sets the bottom border of the blob.
- void **log** (void)
  Prints the stats of the blob.

4.25.1 Detailed Description

A class for the acts blob.

The documentation for this class was generated from the following file:

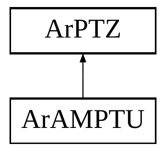
- ArACTS.h

4.26 ArAMPTU Class Reference

Driver for the AMPUT.

#include <ArAMPTU.h>

Inheritance diagram for ArAMPTU::



Public Methods

- **ArAMPTU** (**ArRobot** ∗robot, int unitNumber=0)
  Constructor.
- virtual ∼**ArAMPTU** ()
  Destructor.
- virtual bool **init** (void)
  Initializes the camera.
- virtual bool **pan** (int deg)
  Pans to the given degrees.
- virtual bool **panRel** (int deg)
  Pans relative to current position by given degrees.
- virtual bool **tilt** (int deg)
  Tilts to the given degrees.
- virtual bool **tiltRel** (int deg)
  Tilts relative to the current position by given degrees.
- virtual bool **panTilt** (int panDeg, int tiltDeg)
  Pans and tilts to the given degrees.
- virtual bool **panTiltRel** (int panDeg, int tiltDeg)
  Pans and tilts relatives to the current position by the given degrees.

- bool **panSlew** (int deg)

  Sets the rate that the camera pans at.

- bool **tiltSlew** (int deg)

  Sets the rate the camera tilts at.

- virtual bool **canZoom** (void) const

  Returns true if camera can zoom (or rather, if it is controlled by this).

- virtual int **getMaxPosPan** (void) const

  Gets the highest positive degree the camera can pan to.

- virtual int **getMaxNegPan** (void) const

  Gets the lowest negative degree the camera can pan to.

- virtual int **getMaxPosTilt** (void) const

  Gets the highest positive degree the camera can tilt to.

- virtual int **getMaxNegTilt** (void) const

  Gets the lowest negative degree the camera can tilt to.

- bool **pause** (void)

  Stops current pan/tilt, can be resumed later.

- bool **resume** (void)

  Resumes a previously paused pan/tilt.

- bool **purge** (void)

  Stops motion and purges last command.

- bool **requestStatus** (void)

  Retrieves the camera status.

- virtual int **getPan** (void) const

  Gets the angle the camera is panned to.

- virtual int **getTilt** (void) const

  Gets the angle the camera is tilted to.

4.26.1 Detailed Description

Driver for the AMPUT.

4.26.2 Constructor & Destructor Documentation

4.26.2.1 ArAMPTU::ArAMPTU (ArRobot * *robot*, int *unitNumber* = 0)

Constructor.

Parameters:

robot the robot to attach to

unitNumber the unit number for this packet, this needs to be 0-7

The documentation for this class was generated from the following files:

- ArAMPTU.h
- ArAMPTU.cpp

4.27 ArAMPTUCommands Class Reference

A class with the commands for the AMPTU.

`#include <ArAMPTU.h>`

Public Types

- enum { **ABSTILT** = 0x35, **RELTILTU** = 0x36, **RELTILTD** = 0x37, **ABSPAN** = 0x31, **RELPANCW** = 0x32, **RELPANCCW** = 0x33, **PANTILT** = 0x28, **PANTILTUCW** = 0x29, **PANTILTDCW** = 0x2A, **PANTILTUCCW** = 0x2B, **PANTILTDCCW** = 0x2C, **ZOOM** = 0x3F, **PAUSE** = 0x39, **CONT** = 0x3A, **PURGE** = 0x3B, **STATUS** = 0x3C, **INIT** = 0x3D, **RESP** = 0x3E, **PANSLEW** = 0x34, **TILTSLEW** = 0x38 }

4.27.1 Detailed Description

A class with the commands for the AMPTU.

4.27.2 Member Enumeration Documentation

4.27.2.1 anonymous enum

Enumeration values:

ABSTILT Absolute tilt.

RELTILTU Relative tilt, up.

RELTILTD Relative tilt, down.

ABSPAN Absolute pan.

RELPANCW Relative pan, clockwise.

RELPANCCW Relative pan, counter clockwise.

PANTILT Pan and tilt absolute.

PANTILTUCW Relative tilt up, pan clockwise.

PANTILTDCW Relative tilt down, pan clockwise.

PANTILTUCCW Relative tilt up, pan counter-clockwise.

PANTILTDCCW Relative tilt down, pan counter-clockwise.

ZOOM Zoom.

PAUSE Pause the current movement.

CONT Continue paused movement.

PURGE Stops movement and purges commands.

STATUS Requests a status packet.

INIT Initializes the camera.

RESP Response.

PANSLEW Sets the pan slew rate.

TILTSLEW Sets the tilt slew rate.

The documentation for this class was generated from the following file:

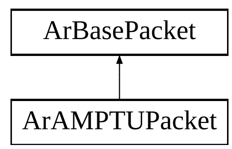
- ArAMPTU.h

4.28 ArAMPTUPacket Class Reference

A class for for making commands to send to the AMPTU.

`#include <ArAMPTU.h>`

Inheritance diagram for ArAMPTUPacket::



Public Methods

- **ArAMPTUPacket** (**ArTypes::UByte2** bufferSize=30)

  Constructor.

- virtual ~**ArAMPTUPacket** ()

  Destructor.

- unsigned char **getUnitNumber** (void)

  Gets the unit number this packet is for.

- bool **setUnitNumber** (unsigned char unitNumber)

  Sets the unit number htis packet is for.

- virtual void **byteToBuf** (**ArTypes::Byte** val)

  Puts **ArTypes::Byte** (p. 496) *into packets buffer.*

- virtual void **byte2ToBuf** (**ArTypes::Byte2** val)

  Puts **ArTypes::Byte2** (p. 496) *into packets buffer.*

- virtual void **finalizePacket** (void)

  MakeFinals the packet in preparation for sending, must be done.

4.28.1 Detailed Description

A class for for making commands to send to the AMPTU.

There are only a few functioning ways to put things into this packet, you MUST use thse, if you use anything else your commands won't work. You must use byteToBuf and byte2ToBuf.

See also:
getUnitNumber (p. 102) , **setUnitNumber** (p. 102)

4.28.2 Member Function Documentation

4.28.2.1 unsigned char ArAMPTUPacket::getUnitNumber (void)

Gets the unit number this packet is for.

Each AMPTU has a unit number, so that you can daisy chain multiple ones together. This number is incorporated into the packet header, thus the packet has to know what the number is.

Returns:
the unit number this packet has

4.28.2.2 bool ArAMPTUPacket::setUnitNumber (unsigned char *unitNumber*)

Sets the unit number htis packet is for.

Each AMPTU has a unit number, so that you can daisy chain multiple ones together. This number is incorporated into the packet header, thus the packet has to know what the number is.

Parameters:
unitNumber the unit number for this packet, this needs to be 0-7

Returns:
true if the number is acceptable, false otherwise

The documentation for this class was generated from the following files:

- ArAMPTU.h
- ArAMPTU.cpp

4.29 ArArg Class Reference

Argument class, mostly for actions, could be used for other things.

`#include <ArArg.h>`

Public Types

- enum **Type** { **INVALID**, **INT**, **DOUBLE**, **STRING**, **BOOL**, **POSE** }

Public Methods

- **ArArg** ()

  Default empty contructor.

- **ArArg** (const char *name, int *pointer, const char *description="")

  Constructor for making an integer argument.

- **ArArg** (const char *name, double *pointer, const char *description="")

  Constructor for making a double argument.

- **ArArg** (const char *name, std::string *pointer, const char *description="")

  Constructor for making a string argument.

- **ArArg** (const char *name, bool *pointer, const char *description="")

  Constructor for making a boolean argument.

- **ArArg** (const char *name, **ArPose** *pointer, const char *description="")

  Constructor for making a position argument.

- **ArArg** (const ArArg &arg)

  Copy constructor.

- virtual ~**ArArg** ()

  Destructor.

- **Type getType** (void) const

  Gets the type of the argument.

- const char * **getName** (void) const

Gets the name of the argument.

- const char * **getDescription** (void) const

  Gets the long description of the argument.

- void **setInt** (int val)

  Sets the argument value, for int arguments.

- void **setDouble** (double val)

  Sets the argument value, for double arguments.

- void **setString** (const char *str)

  Sets the argument value, for string arguments.

- void **setBool** (bool val)

  Sets the argument value, for bool arguments.

- void **setPose** (**ArPose** pose)

  Sets the argument value, for **ArPose** (p. 285) *arguments.*

- int **getInt** (void) const

  Gets the argument value, for int arguments.

- double **getDouble** (void) const

  Gets the argument value, for double arguments.

- const char * **getString** (void) const

  Gets the argument value, for string arguments.

- bool **getBool** (void) const

  Gets the argument value, for bool arguments.

- **ArPose getPose** (void) const

  Gets the argument value, for pose arguments.

- void **log** (void) const

  Logs the type, name, and value of this argument.

- void **clearPointers** (void)

  Internal helper function.

4.29.1 Detailed Description

Argument class, mostly for actions, could be used for other things.

This is designed to be easy to add another type to the arguments... All you have to do to do so, is add an enum to the Type enum, add a newType getNewType(void), add a void setNewType(newType nt), and add a case statement for the newType to ArArg::print. You should probably also add an

See also:
newType to the documentation for **ArArg::getType** (p. 105).

4.29.2 Member Enumeration Documentation

4.29.2.1 enum ArArg::Type

Enumeration values:

INVALID An invalid argument, the argument wasn't created correctly.

INT Integer argument.

DOUBLE Double argument.

STRING String argument.

BOOL Boolean argument.

POSE **ArPose** (p. 285) argument.

4.29.3 Member Function Documentation

4.29.3.1 ArArg::Type ArArg::getType (void) const

Gets the type of the argument.

See also:
INVALID (p. 105) , **INT** (p. 105) , **DOUBLE** (p. 105) , **STRING** (p. 105) , **BOOL** (p. 105) , **POSE** (p. 105)

The documentation for this class was generated from the following files:

- ArArg.h
- ArArg.cpp

4.30 ArArgumentBuilder Class Reference

This class is to build arguments for things that require argc and argv.

`#include <ariaUtil.h>`

Public Methods

- **ArArgumentBuilder** (size_t argvLen=256)
  Constructor.
- virtual ∼**ArArgumentBuilder** ()
  Destructor.
- void **add** (char ∗str,...)
  Adds the given string, with varargs, seperates if there are spaces.
- void **addPlain** (char ∗str)
  Adds the given string, without varargs (wrapper for java).
- void **log** (void) const
  Prints out the arguments.
- size_t **getArgc** (void) const
  Gets the argc.
- char ∗∗ **getArgv** (void) const
  Gets the argv.
- void **removeArg** (size_t which)
  Delete a particular arg, you MUST finish adding before you can remove.

4.30.1 Detailed Description

This class is to build arguments for things that require argc and argv.

The documentation for this class was generated from the following files:

- ariaUtil.h
- ariaUtil.cpp

4.31 ArArgumentParser Class Reference

Class for parsing arguments.

`#include <ariaUtil.h>`

Public Methods

- **ArArgumentParser** (int *argc, char **argv)

  Constructor, takes the argc argv.

- **ArArgumentParser** (**ArArgumentBuilder** *builder)

  Constructor, takes an argument builder.

- ~**ArArgumentParser** ()

  Destructor.

- bool **checkArgument** (char *argument)

  Returns true if the argument was found.

- char * **checkParameterArgument** (char *argument)

  Returns the word/argument after given argument or NULL if it is not present.

- size_t **getArgc** (void) const

  Gets how many arguments are left in this parser.

- void **log** (void) const

  Prints out the arguments left in this parser.

4.31.1 Detailed Description

Class for parsing arguments.

This class is made for parsing arguments form an argc/argv set... if you're using a winmain you can first toss your string at the **ArArgumentBuilder** (p. 106) above class ArArgumentParser and then use this parser on it

4.31.2 Constructor & Destructor Documentation

4.31.2.1 ArArgumentParser::ArArgumentParser (int * *argc*, char ** *argv*)

Constructor, takes the argc argv.

Parameters:

argc a pointer to the argc used

argv argv

4.31.2.2 ArArgumentParser::ArArgumentParser (ArArgumentBuilder * *builder*)

Constructor, takes an argument builder.

Parameters:

argc a pointer to the argc used

argv argv

4.31.3 Member Function Documentation

4.31.3.1 bool ArArgumentParser::checkArgument (char * *argument*)

Returns true if the argument was found.

Parameters:

argument the string to check for, if the argument is found its pulled from the list of arguments

Returns:

true if the argument was found, false otherwise

4.31.3.2 char * ArArgumentParser::checkParameterArgument (char * *argument*)

Returns the word/argument after given argument or NULL if it is not present.

Parameters:

argument the string to check for, if the argument is found its pulled from the list of arguments

Returns:

NULL if the argument wasn't found, the argument after the one given if the argument was found, or NULL again if the argument was found as the last item

The documentation for this class was generated from the following files:

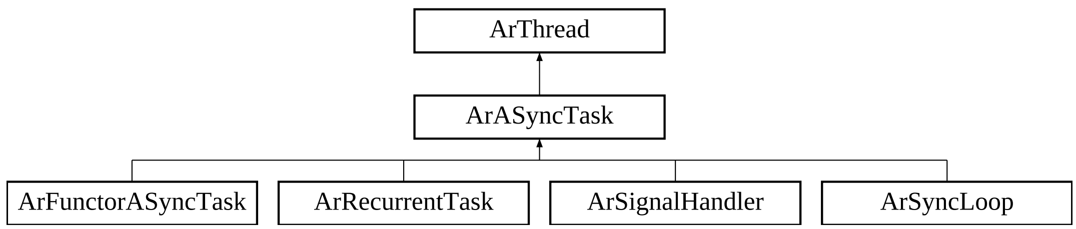
- ariaUtil.h
- ariaUtil.cpp

4.32 ArASyncTask Class Reference

Asynchronous task (runs in its own thread).

`#include <ArASyncTask.h>`

Inheritance diagram for ArASyncTask::



Public Methods

- **ArASyncTask** ()

  Constructor.

- virtual ~**ArASyncTask** ()

  Destructor.

- virtual void * **runThread** (void *arg)=0

  The main run loop.

- virtual void **run** (void)

  Run in this thread.

- virtual void **runAsync** (void)

  Run in its own thread.

- virtual void **stopRunning** (void)

  Stop the thread.

- virtual int **create** (bool joinable=true, bool lowerPriority=true)

  Create the task and start it going.

- virtual void * **runInThisThread** (void *arg=0)

  Run the code of the task syncronously.

4.32.1 Detailed Description

Asynchronous task (runs in its own thread).

The ArAsynTask is a task that runs in its own thread. This is a rather simple class. The user simply needs to derive their own class from ArAsyncTask and define the **runThread**() (p. 111) function. They then need to create an instance of their task and call run or runAsync. The standard way to stop a task is to call **stopRunning**() (p. 110) which sets **ArThread::myRunning** (p. 489) to false. In their run loop, they should pay attention to the **getRunning**() (p. 488) or the **ArThread::myRunning** (p. 489) variable. If this value goes to false, the task should clean up after itself and exit its **runThread**() (p. 111) function.

4.32.2 Member Function Documentation

4.32.2.1 void ∗ ArASyncTask::runInThisThread (void ∗ *arg* = 0) `[virtual]`

Run the code of the task syncronously.

This will run the code of the ArASyncTask without creating a new thread to run it in. It performs the needed setup then calls **runThread**() (p. 111). This is good if you have a task which you wish to run multiple instances of and you want to use the main() thread instead of having it block, waiting for exit of the program.

Parameters:

arg the argument to pass to the **runThread**() (p. 111)

4.32.2.2 virtual void∗ ArASyncTask::runThread (void ∗ *arg*) `[pure virtual]`

The main run loop.

Override this function and put your taskes run loop here. Check the value of **getRunning**() (p. 488) or myRunning periodicly in your loop. If the value goes false, the loop should exit and **runThread**() (p. 111) should return.

Reimplemented in **ArFunctorASyncTask** (p. 164), **ArRecurrentTask** (p. 324), and **ArSignalHandler** (p. 457).

The documentation for this class was generated from the following files:

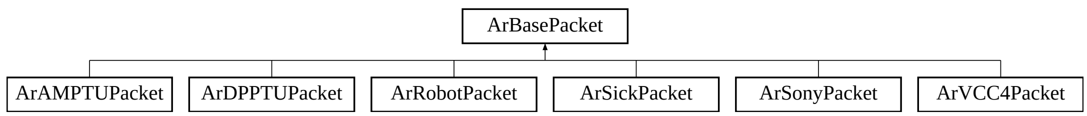
- ArASyncTask.h
- ArASyncTask.cpp

4.33 ArBasePacket Class Reference

Base packet class.

`#include <ArBasePacket.h>`

Inheritance diagram for ArBasePacket::



Public Methods

- **ArBasePacket** (**ArTypes::UByte2** bufferSize=0, **ArTypes::UByte2** headerLength=0, char *buf=NULL, **ArTypes::UByte2** footerLength=0)

  Constructor.

- virtual ~**ArBasePacket** ()

  Destructor.

- virtual void **empty** (void)

  resets the length for more data to be added.

- virtual void **finalizePacket** (void)

  MakeFinals the packet in preparation for sending, must be done.

- virtual void **log** (void)

  ArLogs the contents of the packet.

- virtual void **printHex** (void)

  ArLogs the contents of the packet in hex.

- virtual void **byteToBuf** (**ArTypes::Byte** val)

  Puts **ArTypes::Byte** (p. 496) *into packets buffer.*

- virtual void **byte2ToBuf** (**ArTypes::Byte2** val)

  Puts **ArTypes::Byte2** (p. 496) *into packets buffer.*

- virtual void **byte4ToBuf** (**ArTypes::Byte4** val)

  Puts **ArTypes::Byte4** (p. 496) *into packets buffer.*

- virtual void **uByteToBuf** (**ArTypes::UByte** val)

  Puts **ArTypes::UByte** (p. 496) *into packets buffer.*

- virtual void **uByte2ToBuf** (**ArTypes::UByte2** val)

  Puts **ArTypes::UByte2** (p. 496) *into packet buffer.*

- virtual void **uByte4ToBuf** (**ArTypes::UByte4** val)

  Puts **ArTypes::UByte** (p. 496) *4 into packet buffer.*

- virtual void **strToBuf** (const char *str)

  Puts a string into packet buffer.

- virtual void **strNToBuf** (const char *str, int length)

  Copies length bytes from str into packet buffer.

- virtual void **strToBufPadded** (const char *str, int length)

  Copies length bytes from str, if str ends before length, pads data.

- virtual void **dataToBuf** (const char *data, int length)

  Copies length bytes from data into packet buffer.

- virtual **ArTypes::Byte bufToByte** (void)

  Gets a **ArTypes::Byte** (p. 496) *from the buffer.*

- virtual **ArTypes::Byte2 bufToByte2** (void)

  Gets a **ArTypes::Byte2** (p. 496) *from the buffer.*

- virtual **ArTypes::Byte4 bufToByte4** (void)

  Gets a **ArTypes::Byte4** (p. 496) *from the buffer.*

- virtual **ArTypes::UByte bufToUByte** (void)

  Gets a **ArTypes::UByte** (p. 496) *from the buffer.*

- virtual **ArTypes::UByte2 bufToUByte2** (void)

  Gets a **ArTypes::UByte2** (p. 496) *from the buffer.*

- virtual **ArTypes::UByte4 bufToUByte4** (void)

  Gets a **ArTypes::UByte4** (p. 496) *from the buffer.*

- virtual void **bufToStr** (char *buf, int len)

  Gets a string from the buffer.

- virtual void **bufToData** (char ∗data, int length)

  Gets length bytes from buffer and puts them into data.

- virtual void **resetRead** (void)

  Restart the reading process.

- virtual **ArTypes::UByte2 getLength** (void)

  Gets the total length of the packet.

- virtual **ArTypes::UByte2 getDataLength** (void)

  Gets the length of the data in the packet.

- virtual **ArTypes::UByte2 getReadLength** (void)

  Gets how far into the packet that has been read.

- virtual **ArTypes::UByte2 getDataReadLength** (void)

  Gets how far into the data of the packet that has been read.

- virtual **ArTypes::UByte2 getHeaderLength** (void)

  Gets the length of the header.

- virtual **ArTypes::UByte2 getFooterLength** (void)

  Gets the length of the header.

- virtual **ArTypes::UByte2 getMaxLength** (void)

  Gets the maximum length packet.

- virtual const char ∗ **getBuf** (void)

  Gets a pointer to the buffer the packet uses.

- virtual void **setBuf** (char ∗buf)

  Sets the buffer the packet is using.

- virtual bool **setLength** (**ArTypes::UByte2** length)

  Sets the length of the packet.

- virtual void **setReadLength** (**ArTypes::UByte2** readLength)

  Sets the read length.

- virtual bool **setHeaderLength** (**ArTypes::UByte2** length)

  Sets the length of the header.

- virtual void **duplicatePacket** (ArBasePacket *packet)

  Makes this packet a duplicate of another packet.

4.33.1 Detailed Description

Base packet class.

This class is a base class for all packets... most software will never need to use this class, it is there mostly to help people do more advanced client and server communications.

All of the functions are virtual so it can be completely overridden if desired... but the few most likely ones to be overridden are empty and makeFinal...

The theory of the packet works like this, the packet has a buffer, headerLength, readLength, length, and a maxLength. When the packet is initialized it is given a buffer and its maxLength. All of the functions that are somethingToBuf put data in at the current length of the packet, and advance the length. All of the functions that do bufToSomething get the data from where readLength points, and advance read length. resetRead sets readLength back to the header (since no one outside of the person who writes the class should touch the header). empty likewise sets the length back to the header since the header will be calculated in the finalizePacket method.

The base class and most classes of this kind will have an integer before the string, denoting the strings length... this is hidden by the function calls, but something someone may want to be aware of... it should not matter much as this same packet class should be used on both sides.

Uses of this class that don't get newed and deleted a lot can just go ahead and use the constructor with buf = NULL, as this will have the packet manage its own memory, making life easier.

4.33.2 Constructor & Destructor Documentation

4.33.2.1 ArBasePacket::ArBasePacket (ArTypes::UByte2 *bufferSize* = 0, ArTypes::UByte2 *headerLength* = 0, char * *buf* = NULL, ArTypes::UByte2 *footerLength* = 0)

Constructor.

Parameters:

bufferSize size of the buffer

headerLength length of the header

buf buffer packet uses, if NULL, instance will allocate memory

4.33.3 Member Function Documentation

4.33.3.1 void ArBasePacket::bufToData (char ∗ *data*, int *length*) [virtual]

Gets length bytes from buffer and puts them into data.

copies length bytes from the buffer into data, length is passed in, not read from packet

Parameters:

data character array to copy the data into

length number of bytes to copy into data

4.33.3.2 void ArBasePacket::bufToStr (char ∗ *buf*, int *len*) [virtual]

Gets a string from the buffer.

puts a string from the packets buffer into the given buffer, stopping when it reaches the end of the packets buffer or the length of the given buffer or a '\0'

4.33.3.3 void ArBasePacket::dataToBuf (const char ∗ *data*, int *length*) [virtual]

Copies length bytes from data into packet buffer.

puts data into the buffer without putting in length first

Parameters:

data chacter array to copy into buffer

legnth how many botes to copy from data into packet

4.33.3.4 void ArBasePacket::duplicatePacket (ArBasePacket ∗ *packet*) [virtual]

Makes this packet a duplicate of another packet.

Copies the given packets buffer into the buffer of this packet, also sets this length and readlength to what the given packet has

Parameters:

packet the packet to duplicate

4.33.3.5 void ArBasePacket::empty (void) `[virtual]`

resets the length for more data to be added.

Sets the packet length back to be the packets header length again

4.33.3.6 void ArBasePacket::resetRead (void) `[virtual]`

Restart the reading process.

Sets the length read back to the header length so the packet can be reread using the other methods

Reimplemented in **ArSickPacket** (p. 449).

4.33.3.7 void ArBasePacket::strNToBuf (const char * *str*, int *length*) `[virtual]`

Copies length bytes from str into packet buffer.

first puts the length of the string into the buffer, then puts in string

Parameters:

str character array to copy into buffer

length how many bytes to copy from the str into packet

4.33.3.8 void ArBasePacket::strToBuf (const char * *str*) `[virtual]`

Puts a string into packet buffer.

first puts the length of the string into the buffer, then puts in string

Parameters:

str string to copy into buffer

4.33.3.9 void ArBasePacket::strToBufPadded (const char * *str*, int *length*) `[virtual]`

Copies length bytes from str, if str ends before length, pads data.

first puts the length of the string into the buffer, then puts in string, if string ends before length it pads the string

Parameters:

str character array to copy into buffer

length how many bytes to copy from the str into packet

The documentation for this class was generated from the following files:

- ArBasePacket.h
- ArBasePacket.cpp

4.34 ArCommands Class Reference

A class with an enum of the commands that can be sent to the robot.

`#include <ArCommands.h>`

Public Types

- enum **Commands** { **PULSE** = 0, **OPEN** = 1, **CLOSE** = 2, **POLLING** = 3, **ENABLE** = 4, **SETA** = 5, **SETV** = 6, **SETO** = 7, **MOVE** = 8, **ROTATE** = 9, **SETRV** = 10, **VEL** = 11, **HEAD** = 12, **DHEAD** = 13, **SAY** = 15, **CONFIG** = 18, **ENCODER** = 19, **RVEL** = 21, **DCHEAD** = 22, **SETRA** = 23, **SONAR** = 28, **STOP** = 29, **DIGOUT** = 30, **VEL2** = 32, **GRIPPER** = 33, **ADSEL** = 35, **GRIPPERVAL** = 36, **GRIPPERPACREQUEST** = 37, **IOREQUEST** = 40, **PTUPOS** = 41, **TTY2** = 42, **GETAUX** = 43, **BUMPSTALL** = 44, **TCM2** = 45, **JOYDRIVE** = 47, **ESTOP** = 55 , **LOADPARAM** = 61, **ENDSIM** = 62, **LOADWORLD** = 63, **STEP** = 64, **CALCOMP** = 65, **SETSIMORIGINX** = 66, **SETSIMORIGINY** = 67, **SETSIMORIGINTH** = 68, **RESETSIMTOORIGIN** = 69, **SOUND** = 90, **PLAYLIST** = 91, **SOUNDTOG** = 92 }

4.34.1 Detailed Description

A class with an enum of the commands that can be sent to the robot.

A class with an enum of the commands that can be sent to the robot, see the operations manual for more detailed descriptions.

4.34.2 Member Enumeration Documentation

4.34.2.1 enum ArCommands::Commands

Enumeration values:

PULSE none, keep alive command, so watchdog doesn't trigger.

OPEN none, sent after connection to initiate connection.

CLOSE none, sent to close the connection to the robot.

POLLING string, string that sets sonar polling sequence.

ENABLE int, enable (1) or disable (0) motors.

SETA int, sets translational accel (+) or decel (-) (mm/sec/sec).

SETV int, sets maximum velocity (mm/sec).

SETO int, resets robots origin back to 0, 0, 0.

MOVE int, translational move (mm).

ROTATE int, set rotational velocity, duplicate of RVEL (deg/sec).

SETRV int, sets the maximum rotational velocity (deg/sec).

VEL int, set the translational velocity (mm/sec).

HEAD int, turn to absolute heading 0-359 (degrees).

DHEAD int, turn relative to current heading (degrees).

SAY string, makes the robot beep. up to 20 pairs of duration (20 ms incrs) and tones (halfcycle)

CONFIG int, request configuration packet.

ENCODER int, > 0 to request continous stream of packets, 0 to stop.

RVEL int, set rotational velocity (deg/sec).

DCHEAD int, colbert relative heading setpoint (degrees).

SETRA int, sets rotational accel(+) or decel(-) (deg/sec).

SONAR int, enable (1) or disable (0) sonar.

STOP int, stops the robot.

DIGOUT int, sets the digout lines.

VEL2 2bytes, independent wheel velocities, first byte = right, second = left

GRIPPER int, gripper server command, see gripper manual for detail.

ADSEL int, select the port given as argument.

GRIPPERVAL p2 gripper server value, see gripper manual for details.

GRIPPERPACREQUEST p2 gripper packet request.

IOREQUEST request iopackets from p2os.

PTUPOS most-sig byte is port number, least-sig byte is pulse width.

TTY2 string, send string argument to serial dev connected to aux1.

GETAUX int, requests 1-200 bytes from aux1 serial channel, 0 flush.

BUMPSTALL int, stop and register a stall if front (1), rear (2), or both (3) bump rings are triggered, Off (default) is 0

TCM2 TCM2 module commands, see p2 tcm2 manual for details.

JOYDRIVE Command to tell p2os to drive with the joystick plugged into the robot

ESTOP none, emergency stop, overrides decel.

LOADPARAM string, Sim Specific, causes the sim to load the given param file.

ENDSIM none, Sim Specific, causes the simulator to close and exit.

LOADWORLD string, Sim Specific, causes the sim to load given world.

STEP none, Sim Specific, single step mode.

CALCOMP int, commands for calibrating compass, see compass manual.

SETSIMORIGINX int, sets the X origin in the simulator.

SETSIMORIGINY int, sets the Y origin in the simulator.

SETSIMORIGINTH int, sets the heading at origin in the simulator.

RESETSIMTOORIGIN int, resets the sim robots poseiton to origin.

SOUND int, AmigoBot specific, plays sound with given number.

PLAYLIST int, AmigoBot specific, requests name of sound, 0 for all, otherwise for specific sound

SOUNDTOG int, AmigoBot specific, enable(1) or diable(0) sound.

The documentation for this class was generated from the following file:

- ArCommands.h

4.35 ArCondition Class Reference

Threading condition wrapper class.

`#include <ArCondition.h>`

Public Types

- enum **typedef** { **STATUS_FAILED** = 1, **STATUS_FAILED_DESTROY**, **STATUS_FAILED_INIT**, **STATUS_WAIT_TIMEDOUT**, **STATUS_WAIT_INTR**, **STATUS_MUTEX_FAILED_INIT**, **STATUS_MUTEX_FAILED** }

Public Methods

- **ArCondition** ()

  Constructor.

- virtual ~**ArCondition** ()

  Desctructor.

- int **signal** ()

  Signal the thread waiting.

- int **broadcast** ()

  Broadcast a signal to all threads waiting.

- int **wait** ()

  Wait for a signal.

- int **timedWait** (unsigned int msecs)

  Wait for a signal for a period of time in milliseconds.

- const char * **getError** (int messageNumber) const

  Translate error into string.

4.35.1 Detailed Description

Threading condition wrapper class.

4.35.2 Member Enumeration Documentation

4.35.2.1 enum ArCondition::typedef

Enumeration values:

STATUS_FAILED General failure.

STATUS_FAILED_DESTROY Another thread is waiting on this condition so it can not be destroyed.

STATUS_FAILED_INIT Failed to initialize thread. Requested action is imposesible.

STATUS_WAIT_TIMEDOUT The timedwait timed out before signaling.

STATUS_WAIT_INTR The wait was interupted by a signal.

STATUS_MUTEX_FAILED_INIT The underlying mutex failed to init.

STATUS_MUTEX_FAILED The underlying mutex failed in some fashion.

The documentation for this class was generated from the following files:

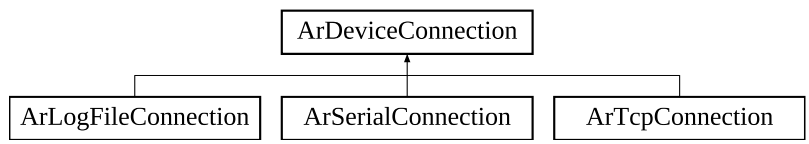
- ArCondition.h
- ArCondition_LIN.cpp
- ArCondition_WIN.cpp

4.36 ArDeviceConnection Class Reference

Base class for device connections.

`#include <ArDeviceConnection.h>`

Inheritance diagram for ArDeviceConnection::



Public Types

- enum **Status** { **STATUS_NEVER_OPENED** = 1, **STATUS_OPEN**, **STATUS_OPEN_FAILED**, **STATUS_CLOSED_NORMALLY**, **STATUS_CLOSED_ERROR** }

Public Methods

- **ArDeviceConnection** ()

  constructor.

- virtual ∼**ArDeviceConnection** ()

  destructor also forces a close on the connection.

- virtual int **read** (const char ∗data, unsigned int size, unsigned int msWait=0)=0

  Reads data from connection.

- virtual int **writePacket** (**ArBasePacket** ∗packet)

  Writes data to connection.

- virtual int **write** (const char ∗data, unsigned int size)=0

  Writes data to connection.

- virtual int **getStatus** (void)=0

  Gets the status of the connection, which is one of the enum status.

- const char ∗ **getStatusMessage** (int messageNumber) const

  Gets the description string associated with the status.

- virtual bool **openSimple** (void)=0

  Opens the connection again, using the values from setLocation or.

- virtual bool **close** (void)

  Closes the connection.

- virtual const char * **getOpenMessage** (int messageNumber)=0

  Gets the string of the message associated with opening the device.

- virtual **ArTime** **getTimeRead** (int index)=0

  Gets the time data was read in.

- virtual bool **isTimeStamping** (void)=0

  sees if timestamping is really going on or not.

4.36.1 Detailed Description

Base class for device connections.

Base class for device connections, this is mostly for connections to the robot or simulator but could also be used for a connection to a laser or other device

Note that this is mostly a base class, so if you'll want to use one of the classes which inherit from this one... also note that in those classes is where you'll find setPort which sets the place the device connection will try to connect to... the inherited classes also have an open which returns more detailed information about the open attempt, and which takes the parameters for where to connect

4.36.2 Member Enumeration Documentation

4.36.2.1 enum ArDeviceConnection::Status

Enumeration values:

STATUS_NEVER_OPENED Never opened.

STATUS_OPEN Currently open.

STATUS_OPEN_FAILED Tried to open, but failed.

STATUS_CLOSED_NORMALLY Closed by a close call.

STATUS_CLOSED_ERROR Closed because of error.

4.36.3 Member Function Documentation

4.36.3.1 virtual bool ArDeviceConnection::close (void) `[inline, virtual]`

Closes the connection.

Returns:
whether the close succeeded or not

Reimplemented in **ArLogFileConnection** (p. 234), **ArSerialConnection** (p. 426), and **ArTcpConnection** (p. 483).

4.36.3.2 virtual const char* ArDeviceConnection::getOpenMessage (int *messageNumber*) `[pure virtual]`

Gets the string of the message associated with opening the device.

Each class inherited from this one has an open method which returns 0 for success or an integer which can be passed into this function to obtain a string describing the reason for failure

Parameters:
messageNumber the number returned from the open

Returns:
the error description associated with the messageNumber

Reimplemented in **ArLogFileConnection** (p. 235), **ArSerialConnection** (p. 427), and **ArTcpConnection** (p. 483).

4.36.3.3 virtual int ArDeviceConnection::getStatus (void) `[pure virtual]`

Gets the status of the connection, which is one of the enum status.

Gets the status of the connection, which is one of the enum status. If you want to get a string to go along with the number, use getStatusMessage

Returns:
the status of the connection

See also:
getStatusMessage (p. 127)

Reimplemented in **ArLogFileConnection** (p. 235), **ArSerialConnection** (p. 427), and **ArTcpConnection** (p. 484).

4.36.3.4 const char * ArDeviceConnection::getStatusMessage (int *messageNumber*) const

Gets the description string associated with the status.

Parameters:

messageNumber the int from getStatus you want the string for

Returns:

the description associated with the status

See also:

getStatus (p. 126)

4.36.3.5 virtual ArTime ArDeviceConnection::getTimeRead (int *index*) `[pure virtual]`

Gets the time data was read in.

Parameters:

index looks like this is the index back in the number of bytes last read in

Returns:

the time the last read data was read in

Reimplemented in **ArLogFileConnection** (p. 235), **ArSerialConnection** (p. 427), and **ArTcpConnection** (p. 484).

4.36.3.6 virtual bool ArDeviceConnection::isTimeStamping (void) `[pure virtual]`

sees if timestamping is really going on or not.

Returns:

true if real timestamping is happening, false otherwise

Reimplemented in **ArLogFileConnection** (p. 236), **ArSerialConnection** (p. 428), and **ArTcpConnection** (p. 484).

4.36.3.7 virtual int ArDeviceConnection::read (const char * *data*, unsigned int *size*, unsigned int *msWait* = 0) `[pure virtual]`

Reads data from connection.

Reads data from connection

Parameters:

data pointer to a character array to read the data into

size maximum number of bytes to read

msWait read blocks for this many milliseconds (not at all for < 0)

Returns:

number of bytes read, or -1 for failure

See also:

write (p. 128), **writePacket** (p. 129)

Reimplemented in **ArLogFileConnection** (p. 236), **ArSerialConnection** (p. 428), and **ArTcpConnection** (p. 485).

4.36.3.8 virtual int ArDeviceConnection::write (const char * *data*, unsigned int *size*) `[pure virtual]`

Writes data to connection.

Writes data to connection

Parameters:

data pointer to a character array to write the data from

size number of bytes to write

Returns:

number of bytes read, or -1 for failure

See also:

read (p. 128), **writePacket** (p. 129)

Reimplemented in **ArLogFileConnection** (p. 237), **ArSerialConnection** (p. 430), and **ArTcpConnection** (p. 486).

4.36.3.9 virtual int ArDeviceConnection::writePacket (ArBasePacket * *packet*) [inline, virtual]

Writes data to connection.

Writes data to connection from a packet

Parameters:

packet pointer to a packet to write the data from

Returns:

number of bytes written, or -1 for failure

See also:

read (p. 128), **write** (p. 128)

The documentation for this class was generated from the following files:

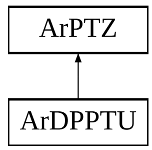
- ArDeviceConnection.h
- ArDeviceConnection.cpp

4.37 ArDPPTU Class Reference

Driver for the DPPTU.

#include <ArDPPTU.h>

Inheritance diagram for ArDPPTU::



Public Types

- enum { , **MIN_PAN** = -158, **MAX_TILT** = 30, **MIN_TILT** = -46, **MAX_PAN_SLEW** = 149, **MIN_PAN_SLEW** = 2, **MAX_TILT_-SLEW** = 149, **MIN_TILT_SLEW** = 2, **MAX_PAN_ACCEL** = 102, **MIN_PAN_ACCEL** = 2, **MAX_TILT_ACCEL** = 102, **MIN_TILT_-ACCEL** = 2 }

Public Methods

- **ArDPPTU** (**ArRobot** ∗robot)

  Constructor.

- virtual ∼**ArDPPTU** ()

  Destructor.

- bool **init** (void)

  Initializes the camera.

- bool **canZoom** (void) const

  Returns true if camera can zoom (or rather, if it is controlled by this).

- bool **blank** (void)

  Sends a delimiter only.

- bool **resetCalib** (void)

  Perform reset calibration.

- bool **disableReset** (void)

Disable power-on reset.

- bool **resetTilt** (void)

  Reset tilt axis.

- bool **resetPan** (void)

  Reset pan axis only.

- bool **resetAll** (void)

  Reset pan and tilt axes on power-on.

- bool **saveSet** (void)

  Save current settings as defaults.

- bool **restoreSet** (void)

  Restore stored defaults.

- bool **factorySet** (void)

  Restore factory defaults.

- bool **panTilt** (int pdeg, int tdeg)

  Pans and tilts to the given degrees.

- bool **pan** (int deg)

  Pans to the given degrees.

- bool **panRel** (int deg)

  Pans relative to current position by given degrees.

- bool **tilt** (int deg)

  Tilts to the given degrees.

- bool **tiltRel** (int deg)

  Tilts relative to the current position by given degrees.

- bool **panTiltRel** (int pdeg, int tdeg)

  Pans and tilts relatives to the current position by the given degrees.

- bool **limitEnforce** (bool val)

  Enables or disables the position limit enforcement.

- bool **immedExec** (void)

Sets unit to immediate-execution mode for positional commands.

- bool **slaveExec** (void)

  Sets unit to slaved-execution mode for positional commands.

- bool **awaitExec** (void)

  Instructs unit to await completion of the last issued command.

- bool **haltAll** (void)

  Halts all pan-tilt movement.

- bool **haltPan** (void)

  Halts pan axis movement.

- bool **haltTilt** (void)

  Halts tilt axis movement.

- virtual int **getMaxPosPan** (void) const

  Gets the highest positive degree the camera can pan to.

- virtual int **getMaxNegPan** (void) const

  Gets the lowest negative degree the camera can pan to.

- virtual int **getMaxPosTilt** (void) const

  Gets the highest positive degree the camera can tilt to.

- virtual int **getMaxNegTilt** (void) const

  Gets the lowest negative degree the camera can tilt to.

- bool **initMon** (int deg1, int deg2, int deg3, int deg4)

  Sets monitor mode - pan pos1/pos2, tilt pos1/pos2.

- bool **enMon** (void)

  Enables monitor mode at power up.

- bool **disMon** (void)

  Disables monitor mode at power up.

- bool **offStatPower** (void)

  Sets stationary power mode to off.

- bool **regStatPower** (void)

Sets regular stationary power mode.

- bool **lowStatPower** (void)

  Sets low stationary power mode.

- bool **highMotPower** (void)

  Sets high in-motion power mode.

- bool **regMotPower** (void)

  Sets regular in-motion power mode.

- bool **lowMotPower** (void)

  Sets low in-motion power mode.

- bool **panAccel** (int deg)

  Sets acceleration for pan axis.

- bool **tiltAccel** (int deg)

  Sets acceleration for tilt axis.

- bool **basePanSlew** (int deg)

  Sets the start-up pan slew.

- bool **baseTiltSlew** (int deg)

  Sets the start-up tilt slew.

- bool **upperPanSlew** (int deg)

  Sets the upper pan slew.

- bool **lowerPanSlew** (int deg)

  Sets the lower pan slew.

- bool **upperTiltSlew** (int deg)

  Sets the upper tilt slew.

- bool **lowerTiltSlew** (int deg)

  Sets the lower pan slew.

- bool **indepMove** (void)

  Sets motion to indenpendent control mode.

- bool **velMove** (void)

Sets motion to pure velocity control mode.

- bool **panSlew** (int deg)
  Sets the rate that the unit pans at.
- bool **tiltSlew** (int deg)
  Sets the rate the unit tilts at.
- bool **panSlewRel** (int deg)
  Sets the rate that the unit pans at, relative to current slew.
- bool **tiltSlewRel** (int deg)
  Sets the rate the unit tilts at, relative to current slew.
- virtual int **getPan** (void) const
  The angle the camera was last told to pan to.
- virtual int **getTilt** (void) const
  The angle the camera was last told to tilt to.
- int **getPanSlew** (void)
  Gets the current pan slew.
- int **getTiltSlew** (void)
  Gets the current tilt slew.
- int **getBasePanSlew** (void)
  Gets the base pan slew.
- int **getBaseTiltSlew** (void)
  Gets the base tilt slew.
- int **getPanAccel** (void)
  Gets the current pan acceleration rate.
- int **getTiltAccel** (void)
  Gets the current tilt acceleration rate.

Protected Attributes

- int **myPan**
  adds on extra delim in front to work on H8.

4.37.1 Detailed Description

Driver for the DPPTU.

4.37.2 Member Enumeration Documentation

4.37.2.1 anonymous enum

Enumeration values:

- **MIN_PAN** Maximum pan range of 3090 positions.
- **MAX_TILT** Minimum pan range of -3090 positions.
- **MIN_TILT** Maximum tilt range of 600 positions.
- **MAX_PAN_SLEW** Minimum tilt range of -900 positions.
- **MIN_PAN_SLEW** Maximum pan slew of 2902 positions/sec.
- **MAX_TILT_SLEW** Minimum tilt slew of 31 positions/sec.
- **MIN_TILT_SLEW** Maximum tilt slew of 2902 positions/sec.
- **MAX_PAN_ACCEL** Minimum tilt slew of 31 positions/sec.
- **MIN_PAN_ACCEL** Maximum pan acceleration of 2000 positions/sec^2.
- **MAX_TILT_ACCEL** Minimum pan acceleration of 0 positions/sec^2.
- **MIN_TILT_ACCEL** Maximum tilt acceleration of 2000 positions/sec^2.

4.37.3 Member Function Documentation

4.37.3.1 bool ArDPPTU::blank (void)

Sends a delimiter only.

A blank packet can be sent to exit monitor mode *

The documentation for this class was generated from the following files:

- ArDPPTU.h
- ArDPPTU.cpp

4.38 ArDPPTUCommands Class Reference

A class with the commands for the DPPTU.

`#include <ArDPPTU.h>`

Public Types

- enum { **DELIM** = 0x20, **INIT** = 0x40, **ACCEL** = 0x61, **BASE** = 0x62, **CONTROL** = 0x63, **DISABLE** = 0x64, **ENABLE** = 0x65, **FACTORY** = 0x66, **HALT** = 0x68, **IMMED** = 0x69, **LIMIT** = 0x6C, **MONITOR** = 0x6D, **OFFSET** = 0x6F, **PAN** = 0x70, **RESET** = 0x72, **SPEED** = 0x73, **TILT** = 0x74, **UPPER** = 0x75, **VELOCITY** = 0x76 }

4.38.1 Detailed Description

A class with the commands for the DPPTU.

This class is for controlling the Directed Perceptions Pan-Tilt Unit

Note that there are far too many functions enabled in here, most of which are extraneous. The important ones are defined in the **ArPTZ** (p. 298) class and include the basic pan, tilt commands.

The DPPTU's pan and tilt commands work on a number of units equal to (degrees / 0.514). The panTilt function always rounds the conversion closer to zero, so that a magnitude greater than the allowable range of movement is not sent to the camera.

4.38.2 Member Enumeration Documentation

4.38.2.1 anonymous enum

Enumeration values:

DELIM Space - Carriage return delimeter.

INIT Init character.

ACCEL Acceleration, Await position-command completion.

BASE Base speed.

CONTROL Speed control.

DISABLE Disable character, Delta, Default.

ENABLE Enable character, Echoing.

FACTORY Restore factory defaults.

HALT Halt, Hold, High.

IMMED Immediate position-command execution mode, Independent control mode.

LIMIT Position limit character, Low.

MONITOR Monitor, In-motion power mode.

OFFSET Offset position, Off.

PAN Pan.

RESET Reset calibration, Restore stored defaults, Regular.

SPEED Speed, Slave.

TILT Tilt.

UPPER Upper speed limit.

VELOCITY Velocity control mode.

The documentation for this class was generated from the following file:

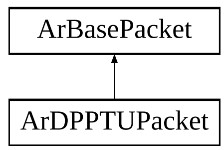
- ArDPPTU.h

4.39 ArDPPTUPacket Class Reference

A class for for making commands to send to the DPPTU.

`#include <ArDPPTU.h>`

Inheritance diagram for ArDPPTUPacket::



Public Methods

- **ArDPPTUPacket** (**ArTypes::UByte2** bufferSize=30)

  Constructor.

- virtual ~**ArDPPTUPacket** ()

  Destructor.

- virtual void **finalizePacket** (void)

  MakeFinals the packet in preparation for sending, must be done.

4.39.1 Detailed Description

A class for for making commands to send to the DPPTU.

There are only a few functioning ways to put things into this packet, you MUST use these, if you use anything else your commands won't work. You must use byteToBuf and byte2ToBuf.

The documentation for this class was generated from the following files:

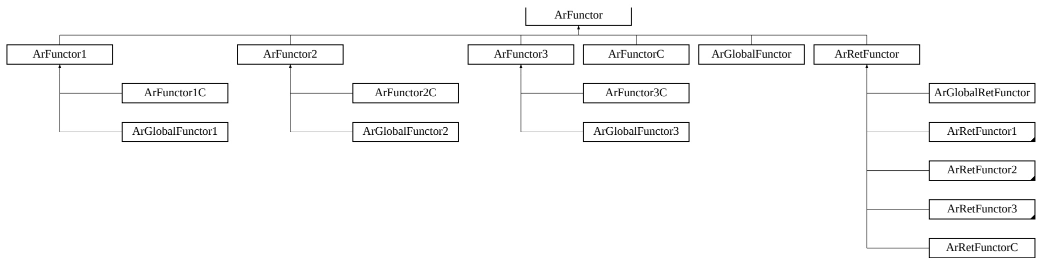
- ArDPPTU.h
- ArDPPTU.cpp

4.40 ArFunctor Class Reference

Base class for functors.

`#include <ArFunctor.h>`

Inheritance diagram for ArFunctor::



Public Methods

- virtual ~**ArFunctor** ()

  Destructor.

- virtual void **invoke** (void)=0

  Invokes the functor.

4.40.1 Detailed Description

Base class for functors.

Functors are meant to encapsulate the idea of a pointer to a function which is a member of a class. To use a pointer to a member function, you must have a C style function pointer, 'void(Class::*)()', and a pointer to an instance of the class in which the function is a member of. This is because all non-static member functions must have a 'this' pointer. If they dont and if the member function uses any member data or even other member functions it will not work right and most likely crash. This is because the 'this' pointer is not the correct value and is most likely a random uninitialized value. The virtue of static member functions is that they do not require a 'this' pointer to be run. But the compiler will never let you access any member data or functions from within a static member function.

Because of the design of C++ never allowed for encapsulating these two pointers together into one language supported construct, this has to be done by hand. For conviences sake, there are functors (**ArGlobalFunctor** (p. 168), **ArGlobalRetFunctor** (p. 182)) which take a pure C style function pointer (a non-member function). This is in case you want to use a functor that refers to a global C style function.

Aria (p. 205) makes use of functors by using them as callback functions. Since **Aria** (p. 205) is programmed using the object oriented programming paradigm, all the callback functions need to be tied to an object and a particular instance. Thus the need for functors. Most of the use of callbacks simply take an ArFunctor, which is the base class for all the functors. This class only has the ability to invoke a functor. All the derivitave functors have the ability to invoke the correct function on the correct object.

Because functions have different signatures because they take different types of parameters and have different number of parameters, templates were used to create the functors. These are the base classes for the functors. These classes encapsulate everything except for the class type that the member function is a member of. This allows someone to accept a functor of type **ArFunctor1** (p. 142)<int> which has one parameter of type 'int'. But they never have to know that the function is a member function of class 'SomeUnknownType'. These classes are:

ArFunctor, **ArFunctor1** (p. 142), **ArFunctor2** (p. 148), **ArFunctor3** (p. 155) **ArRetFunctor** (p. 327), **ArRetFunctor1** (p. 328), **ArRetFunctor2** (p. 334), **ArRetFunctor3** (p. 342)

These 8 functors are the only thing a piece of code that wants a functor will ever need. But these classes are abstract classes and can not be instantiated. On the other side, the piece of code that wants to be called back will need the functor classes that know about the class type. These functors are:

ArFunctorC (p. 165), **ArFunctor1C** (p. 144), **ArFunctor2C** (p. 150), **ArFunctor3C** (p. 157) **ArRetFunctorC** (p. 352), **ArRetFunctor1C** (p. 330), **ArRetFunctor2C** (p. 336), **ArRetFunctor3C** (p. 345)

These functors are meant to be instantiated and passed of to a piece of code that wants to use them. That piece of code should only know the functor as one of the functor classes without the 'C' in it.

Note that you can create these FunctorC instances with default arguments that are then used when the invoke is called without those arguments... These are quite useful since if you have a class that expects an ArFunctor you can make an **ArFunctor1C** (p. 144) with default arguments and pass it as an ArFunctor... and it will get called with that default argument, this is useful for having multiple functors use the same function with different arguments and results (just takes one functor each). You can see an example of this in the tests/functorTest.cpp example (in testBase for example).

See the example functor.cpp for a simple example of using functors.

See the test program functortest.cpp for the full use of all the functors.

The documentation for this class was generated from the following file:

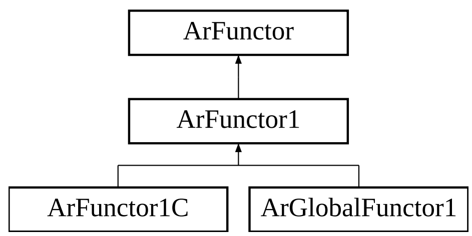
- ArFunctor.h

4.41 ArFunctor1 Class Template Reference

Base class for functors with 1 parameter.

`#include <ArFunctor.h>`

Inheritance diagram for ArFunctor1::



Public Methods

- virtual ~**ArFunctor1** ()

  Destructor.

- virtual void **invoke** (void)=0

  Invokes the functor.

- virtual void **invoke** (P1 p1)=0

  Invokes the functor.

4.41.1 Detailed Description

template<class P1> class ArFunctor1< P1 >

Base class for functors with 1 parameter.

This is the base class for functors with 1 parameter. Code that has a reference to a functor that takes 1 parameter should use this class name. This allows the code to know how to invoke the functor without knowing which class the member function is in.

For an overall description of functors, see **ArFunctor** (p. 139).

4.41.2 Member Function Documentation

4.41.2.1 template<class P1> virtual void ArFunctor1< P1 >::invoke (P1 *p1*) `[pure virtual]`

Invokes the functor.

Parameters:
p1 first parameter

Reimplemented in **ArGlobalFunctor1** (p. 171), and **ArFunctor1C** (p. 146).

The documentation for this class was generated from the following file:

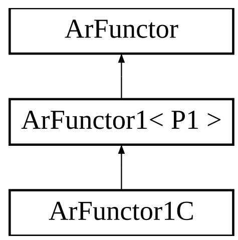
- ArFunctor.h

4.42 ArFunctor1C Class Template Reference

Functor for a member function with 1 parameter.

#include <ArFunctor.h>

Inheritance diagram for ArFunctor1C::



Public Methods

- **ArFunctor1C** ()

  Constructor.

- **ArFunctor1C** (T &obj, void(T::*func)(P1))

  Constructor - supply function pointer.

- **ArFunctor1C** (T &obj, void(T::*func)(P1), P1 p1)

  Constructor - supply function pointer, default parameters.

- **ArFunctor1C** (T *obj, void(T::*func)(P1))

  Constructor - supply function pointer.

- **ArFunctor1C** (T *obj, void(T::*func)(P1), P1 p1)

  Constructor - supply function pointer, default parameters.

- virtual ~**ArFunctor1C** ()

  Destructor.

- virtual void **invoke** (void)

  Invokes the functor.

- virtual void **invoke** (P1 p1)

  Invokes the functor.

- virtual void **setThis** (T *obj)

Set the 'this' pointer.

- virtual void **setThis** (T &obj)

  Set the 'this' pointer.

- virtual void **setP1** (P1 p1)

  Set the default parameter.

4.42.1 Detailed Description

template<class T, class P1> class ArFunctor1C< T, P1 >

Functor for a member function with 1 parameter.

This is a class for member functions which take 1 parameter. This class contains the knowledge on how to call a member function on a particular instance of a class. This class should be instantiated by code that wishes to pass off a functor to another piece of code.

For an overall description of functors, see **ArFunctor** (p. 139).

4.42.2 Constructor & Destructor Documentation

4.42.2.1 template<class T, class P1> ArFunctor1C< T, P1 >::ArFunctor1C (T & *obj*, void(T::∗ *func*)(P1)) `[inline]`

Constructor - supply function pointer.

Parameters:

func member function pointer

4.42.2.2 template<class T, class P1> ArFunctor1C< T, P1 >::ArFunctor1C (T & *obj*, void(T::∗ *func*)(P1), P1 *p1*) `[inline]`

Constructor - supply function pointer, default parameters.

Parameters:

func member function pointer

p1 default first parameter

4.42.2.3 template<class T, class P1> ArFunctor1C< T, P1 >::ArFunctor1C (T * *obj*, void(T::* *func*)(P1)) [inline]

Constructor - supply function pointer.

Parameters:

func member function pointer

4.42.2.4 template<class T, class P1> ArFunctor1C< T, P1 >::ArFunctor1C (T * *obj*, void(T::* *func*)(P1), P1 *p1*) [inline]

Constructor - supply function pointer, default parameters.

Parameters:

func member function pointer

p1 default first parameter

4.42.3 Member Function Documentation

4.42.3.1 template<class T, class P1> virtual void ArFunctor1C< T, P1 >::invoke (P1 *p1*) [inline, virtual]

Invokes the functor.

Parameters:

p1 first parameter

Reimplemented from **ArFunctor1** (p. 143).

4.42.3.2 template<class T, class P1> virtual void ArFunctor1C< T, P1 >::setP1 (P1 *p1*) [inline, virtual]

Set the default parameter.

Parameters:

p1 default first parameter

4.42.3.3 template<class T, class P1> virtual void ArFunctor1C< T, P1 >::setThis (T & *obj*) [inline, virtual]

Set the 'this' pointer.

Parameters:

obj the 'this' pointer

4.42.3.4 template<class T, class P1> virtual void ArFunctor1C< T, P1 >::setThis (T * *obj*) [inline, virtual]

Set the 'this' pointer.

Parameters:

obj the 'this' pointer

The documentation for this class was generated from the following file:

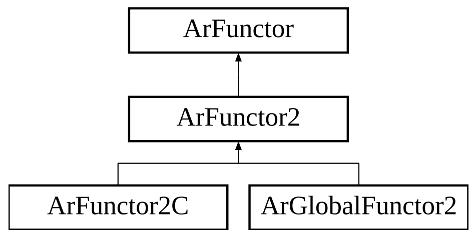
- ArFunctor.h

4.43 ArFunctor2 Class Template Reference

Base class for functors with 2 parameters.

`#include <ArFunctor.h>`

Inheritance diagram for ArFunctor2::



Public Methods

- virtual ~**ArFunctor2** ()

  Destructor.

- virtual void **invoke** (void)=0

  Invokes the functor.

- virtual void **invoke** (P1 p1)=0

  Invokes the functor.

- virtual void **invoke** (P1 p1, P2 p2)=0

  Invokes the functor.

4.43.1 Detailed Description

template<class P1, class P2> class ArFunctor2< P1, P2 >

Base class for functors with 2 parameters.

This is the base class for functors with 2 parameters. Code that has a reference to a functor that takes 2 parameters should use this class name. This allows the code to know how to invoke the functor without knowing which class the member function is in.

For an overall description of functors, see **ArFunctor** (p. 139).

4.43.2 Member Function Documentation

4.43.2.1 template<class P1, class P2> virtual void ArFunctor2< P1, P2 >::invoke (P1 *p1*, P2 *p2*) `[pure virtual]`

Invokes the functor.

Parameters:

p1 first parameter

p2 second parameter

Reimplemented in **ArGlobalFunctor2** (p. 175), and **ArFunctor2C** (p. 153).

4.43.2.2 template<class P1, class P2> virtual void ArFunctor2< P1, P2 >::invoke (P1 *p1*) `[pure virtual]`

Invokes the functor.

Parameters:

p1 first parameter

Reimplemented in **ArGlobalFunctor2** (p. 175), and **ArFunctor2C** (p. 153).

The documentation for this class was generated from the following file:

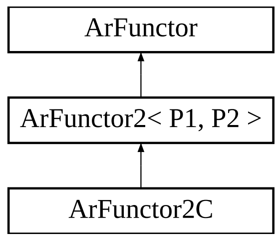
- ArFunctor.h

4.44 ArFunctor2C Class Template Reference

Functor for a member function with 2 parameters.

```
#include <ArFunctor.h>
```

Inheritance diagram for ArFunctor2C::



Public Methods

- **ArFunctor2C** ()

  Constructor.

- **ArFunctor2C** (T &obj, void(T::∗func)(P1, P2))

  Constructor - supply function pointer.

- **ArFunctor2C** (T &obj, void(T::∗func)(P1, P2), P1 p1)

  Constructor - supply function pointer, default parameters.

- **ArFunctor2C** (T &obj, void(T::∗func)(P1, P2), P1 p1, P2 p2)

  Constructor - supply function pointer, default parameters.

- **ArFunctor2C** (T ∗obj, void(T::∗func)(P1, P2))

  Constructor - supply function pointer.

- **ArFunctor2C** (T ∗obj, void(T::∗func)(P1, P2), P1 p1)

  Constructor - supply function pointer, default parameters.

- **ArFunctor2C** (T ∗obj, void(T::∗func)(P1, P2), P1 p1, P2 p2)

  Constructor - supply function pointer, default parameters.

- virtual ∼**ArFunctor2C** ()

  Destructor.

- virtual void **invoke** (void)

Invokes the functor.

- virtual void **invoke** (P1 p1)

  Invokes the functor.

- virtual void **invoke** (P1 p1, P2 p2)

  Invokes the functor.

- virtual void **setThis** (T *obj)

  Set the 'this' pointer.

- virtual void **setThis** (T &obj)

  Set the 'this' pointer.

- virtual void **setP1** (P1 p1)

  Set the default parameter.

- virtual void **setP2** (P2 p2)

  Set the default 2nd parameter.

4.44.1 Detailed Description

template<class T, class P1, class P2> class ArFunctor2C< T, P1, P2 >

Functor for a member function with 2 parameters.

This is a class for member functions which take 2 parameters. This class contains the knowledge on how to call a member function on a particular instance of a class. This class should be instantiated by code that wishes to pass off a functor to another piece of code.

For an overall description of functors, see **ArFunctor** (p. 139).

4.44.2 Constructor & Destructor Documentation

4.44.2.1 template<class T, class P1, class P2> ArFunctor2C< T, P1, P2 >::ArFunctor2C (T & *obj*, void(T::* *func*)(P1, P2)) `[inline]`

Constructor - supply function pointer.

Parameters:

func member function pointer

4.44.2.2 template<class T, class P1, class P2> ArFunctor2C< T, P1, P2 >::ArFunctor2C (T & *obj*, void(T::* *func*)(P1, P2), P1 *p1*) `[inline]`

Constructor - supply function pointer, default parameters.

Parameters:

func member function pointer

p1 default first parameter

4.44.2.3 template<class T, class P1, class P2> ArFunctor2C< T, P1, P2 >::ArFunctor2C (T & *obj*, void(T::* *func*)(P1, P2), P1 *p1*, P2 *p2*) `[inline]`

Constructor - supply function pointer, default parameters.

Parameters:

func member function pointer

p1 default first parameter

p2 default second parameter

4.44.2.4 template<class T, class P1, class P2> ArFunctor2C< T, P1, P2 >::ArFunctor2C (T * *obj*, void(T::* *func*)(P1, P2)) `[inline]`

Constructor - supply function pointer.

Parameters:

func member function pointer

4.44.2.5 template<class T, class P1, class P2> ArFunctor2C< T, P1, P2 >::ArFunctor2C (T * *obj*, void(T::* *func*)(P1, P2), P1 *p1*) `[inline]`

Constructor - supply function pointer, default parameters.

Parameters:

func member function pointer

p1 default first parameter

4.44.2.6 template<class T, class P1, class P2> ArFunctor2C< T, P1, P2 >::ArFunctor2C (T * *obj*, void(T::* *func*)(P1, P2), P1 *p1*, P2 *p2*) `[inline]`

Constructor - supply function pointer, default parameters.

Parameters:
- ***func*** member function pointer
- ***p1*** default first parameter
- ***p2*** default second parameter

4.44.3 Member Function Documentation

4.44.3.1 template<class T, class P1, class P2> virtual void ArFunctor2C< T, P1, P2 >::invoke (P1 *p1*, P2 *p2*) `[inline, virtual]`

Invokes the functor.

Parameters:
- ***p1*** first parameter
- ***p2*** second parameter

Reimplemented from **ArFunctor2** (p. 149).

4.44.3.2 template<class T, class P1, class P2> virtual void ArFunctor2C< T, P1, P2 >::invoke (P1 *p1*) `[inline, virtual]`

Invokes the functor.

Parameters:
- ***p1*** first parameter

Reimplemented from **ArFunctor2** (p. 149).

4.44.3.3 template<class T, class P1, class P2> virtual void ArFunctor2C< T, P1, P2 >::setP1 (P1 *p1*) `[inline, virtual]`

Set the default parameter.

Parameters:
- ***p1*** default first parameter

4.44.3.4 template<class T, class P1, class P2> virtual void ArFunctor2C< T, P1, P2 >::setP2 (P2 *p2*) `[inline, virtual]`

Set the default 2nd parameter.

Parameters:

p2 default second parameter

4.44.3.5 template<class T, class P1, class P2> virtual void ArFunctor2C< T, P1, P2 >::setThis (T & *obj*) `[inline, virtual]`

Set the 'this' pointer.

Parameters:

obj the 'this' pointer

4.44.3.6 template<class T, class P1, class P2> virtual void ArFunctor2C< T, P1, P2 >::setThis (T * *obj*) `[inline, virtual]`

Set the 'this' pointer.

Parameters:

obj the 'this' pointer

The documentation for this class was generated from the following file:

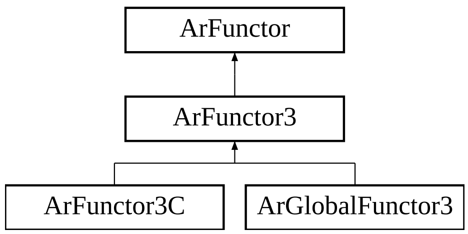
- ArFunctor.h

4.45 ArFunctor3 Class Template Reference

Base class for functors with 3 parameters.

#include <ArFunctor.h>

Inheritance diagram for ArFunctor3::



Public Methods

- virtual ~**ArFunctor3** ()

  Destructor.

- virtual void **invoke** (void)=0

  Invokes the functor.

- virtual void **invoke** (P1 p1)=0

  Invokes the functor.

- virtual void **invoke** (P1 p1, P2 p2)=0

  Invokes the functor.

- virtual void **invoke** (P1 p1, P2 p2, P3 p3)=0

  Invokes the functor.

4.45.1 Detailed Description

template<class P1, class P2, class P3> class ArFunctor3< P1, P2, P3 >

Base class for functors with 3 parameters.

This is the base class for functors with 3 parameters. Code that has a reference to a functor that takes 3 parameters should use this class name. This allows the code to know how to invoke the functor without knowing which class the member function is in.

For an overall description of functors, see **ArFunctor** (p. 139).

4.45.2 Member Function Documentation

4.45.2.1 template<class P1, class P2, class P3> virtual void ArFunctor3< P1, P2, P3 >::invoke (P1 *p1*, P2 *p2*, P3 *p3*) `[pure virtual]`

Invokes the functor.

Parameters:

p1 first parameter

p2 second parameter

p3 third parameter

Reimplemented in **ArGlobalFunctor3** (p. 179), and **ArFunctor3C** (p. 161).

4.45.2.2 template<class P1, class P2, class P3> virtual void ArFunctor3< P1, P2, P3 >::invoke (P1 *p1*, P2 *p2*) `[pure virtual]`

Invokes the functor.

Parameters:

p1 first parameter

p2 second parameter

Reimplemented in **ArGlobalFunctor3** (p. 180), and **ArFunctor3C** (p. 161).

4.45.2.3 template<class P1, class P2, class P3> virtual void ArFunctor3< P1, P2, P3 >::invoke (P1 *p1*) `[pure virtual]`

Invokes the functor.

Parameters:

p1 first parameter

Reimplemented in **ArGlobalFunctor3** (p. 180), and **ArFunctor3C** (p. 162).

The documentation for this class was generated from the following file:

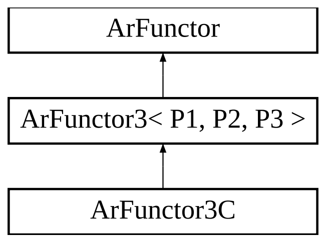
- ArFunctor.h

4.46 ArFunctor3C Class Template Reference

Functor for a member function with 3 parameters.

#include <ArFunctor.h>

Inheritance diagram for ArFunctor3C::



Public Methods

- **ArFunctor3C** ()

  Constructor.

- **ArFunctor3C** (T &obj, void(T::∗func)(P1, P2, P3))

  Constructor - supply function pointer.

- **ArFunctor3C** (T &obj, void(T::∗func)(P1, P2, P3), P1 p1)

  Constructor - supply function pointer, default parameters.

- **ArFunctor3C** (T &obj, void(T::∗func)(P1, P2, P3), P1 p1, P2 p2)

  Constructor - supply function pointer, default parameters.

- **ArFunctor3C** (T &obj, void(T::∗func)(P1, P2, P3), P1 p1, P2 p2, P3 p3)

  Constructor - supply function pointer, default parameters.

- **ArFunctor3C** (T ∗obj, void(T::∗func)(P1, P2, P3))

  Constructor - supply function pointer.

- **ArFunctor3C** (T ∗obj, void(T::∗func)(P1, P2, P3), P1 p1)

  Constructor - supply function pointer, default parameters.

- **ArFunctor3C** (T ∗obj, void(T::∗func)(P1, P2, P3), P1 p1, P2 p2)

  Constructor - supply function pointer, default parameters.

- **ArFunctor3C** (T ∗obj, void(T::∗func)(P1, P2, P3), P1 p1, P2 p2, P3 p3)

  Constructor - supply function pointer, default parameters.

- virtual ∼**ArFunctor3C** ()

  Destructor.

- virtual void **invoke** (void)

  Invokes the functor.

- virtual void **invoke** (P1 p1)

  Invokes the functor.

- virtual void **invoke** (P1 p1, P2 p2)

  Invokes the functor.

- virtual void **invoke** (P1 p1, P2 p2, P3 p3)

  Invokes the functor.

- virtual void **setThis** (T ∗obj)

  Set the 'this' pointer.

- virtual void **setThis** (T &obj)

  Set the 'this' pointer.

- virtual void **setP1** (P1 p1)

  Set the default parameter.

- virtual void **setP2** (P2 p2)

  Set the default 2nd parameter.

- virtual void **setP3** (P3 p3)

  Set the default third parameter.

4.46.1 Detailed Description

template<class T, class P1, class P2, class P3> class ArFunctor3C< T, P1, P2, P3 >

Functor for a member function with 3 parameters.

This is a class for member functions which take 3 parameters. This class contains the knowledge on how to call a member function on a particular instance of a class. This class should be instantiated by code that wishes to pass off a functor to another piece of code.

For an overall description of functors, see **ArFunctor** (p. 139).

4.46.2 Constructor & Destructor Documentation

4.46.2.1 template<class T, class P1, class P2, class P3> ArFunctor3C< T, P1, P2, P3 >::ArFunctor3C (T & *obj*, void(T::* *func*)(P1, P2, P3)) `[inline]`

Constructor - supply function pointer.

Parameters:

func member function pointer

4.46.2.2 template<class T, class P1, class P2, class P3> ArFunctor3C< T, P1, P2, P3 >::ArFunctor3C (T & *obj*, void(T::* *func*)(P1, P2, P3), P1 *p1*) `[inline]`

Constructor - supply function pointer, default parameters.

Parameters:

func member function pointer

p1 default first parameter

4.46.2.3 template<class T, class P1, class P2, class P3> ArFunctor3C< T, P1, P2, P3 >::ArFunctor3C (T & *obj*, void(T::* *func*)(P1, P2, P3), P1 *p1*, P2 *p2*) `[inline]`

Constructor - supply function pointer, default parameters.

Parameters:

func member function pointer

p1 default first parameter

p2 default second parameter

4.46.2.4 template<class T, class P1, class P2, class P3> ArFunctor3C< T, P1, P2, P3 >::ArFunctor3C (T & *obj*, void(T::* *func*)(P1, P2, P3), P1 *p1*, P2 *p2*, P3 *p3*) [inline]

Constructor - supply function pointer, default parameters.

Parameters:

func member function pointer

p1 default first parameter

p2 default second parameter

p3 default third parameter

4.46.2.5 template<class T, class P1, class P2, class P3> ArFunctor3C< T, P1, P2, P3 >::ArFunctor3C (T * *obj*, void(T::* *func*)(P1, P2, P3)) [inline]

Constructor - supply function pointer.

Parameters:

func member function pointer

4.46.2.6 template<class T, class P1, class P2, class P3> ArFunctor3C< T, P1, P2, P3 >::ArFunctor3C (T * *obj*, void(T::* *func*)(P1, P2, P3), P1 *p1*) [inline]

Constructor - supply function pointer, default parameters.

Parameters:

func member function pointer

p1 default first parameter

4.46.2.7 template<class T, class P1, class P2, class P3> ArFunctor3C< T, P1, P2, P3 >::ArFunctor3C (T * *obj*, void(T::* *func*)(P1, P2, P3), P1 *p1*, P2 *p2*) [inline]

Constructor - supply function pointer, default parameters.

Parameters:

func member function pointer

p1 default first parameter

p2 default second parameter

4.46.2.8 template<class T, class P1, class P2, class P3> ArFunctor3C< T, P1, P2, P3 >::ArFunctor3C (T ∗ *obj*, void(T::∗ *func*)(P1, P2, P3), P1 *p1*, P2 *p2*, P3 *p3*) `[inline]`

Constructor - supply function pointer, default parameters.

Parameters:

func member function pointer

p1 default first parameter

p2 default second parameter

p3 default third parameter

4.46.3 Member Function Documentation

4.46.3.1 template<class T, class P1, class P2, class P3> virtual void ArFunctor3C< T, P1, P2, P3 >::invoke (P1 *p1*, P2 *p2*, P3 *p3*) `[inline, virtual]`

Invokes the functor.

Parameters:

p1 first parameter

p2 second parameter

p3 third parameter

Reimplemented from **ArFunctor3** (p. 156).

4.46.3.2 template<class T, class P1, class P2, class P3> virtual void ArFunctor3C< T, P1, P2, P3 >::invoke (P1 *p1*, P2 *p2*) `[inline, virtual]`

Invokes the functor.

Parameters:

p1 first parameter

p2 second parameter

Reimplemented from **ArFunctor3** (p. 156).

4.46.3.3 template<class T, class P1, class P2, class P3> virtual void ArFunctor3C< T, P1, P2, P3 >::invoke (P1 *p1*) `[inline, virtual]`

Invokes the functor.

Parameters:

p1 first parameter

Reimplemented from **ArFunctor3** (p. 156).

4.46.3.4 template<class T, class P1, class P2, class P3> virtual void ArFunctor3C< T, P1, P2, P3 >::setP1 (P1 *p1*) `[inline, virtual]`

Set the default parameter.

Parameters:

p1 default first parameter

4.46.3.5 template<class T, class P1, class P2, class P3> virtual void ArFunctor3C< T, P1, P2, P3 >::setP2 (P2 *p2*) `[inline, virtual]`

Set the default 2nd parameter.

Parameters:

p2 default second parameter

4.46.3.6 template<class T, class P1, class P2, class P3> virtual void ArFunctor3C< T, P1, P2, P3 >::setP3 (P3 *p3*) `[inline, virtual]`

Set the default third parameter.

Parameters:

p3 default third parameter

4.46.3.7 template<class T, class P1, class P2, class P3> virtual void ArFunctor3C< T, P1, P2, P3 >::setThis (T & *obj*) [inline, virtual]

Set the 'this' pointer.

Parameters:

obj the 'this' pointer

4.46.3.8 template<class T, class P1, class P2, class P3> virtual void ArFunctor3C< T, P1, P2, P3 >::setThis (T * *obj*) [inline, virtual]

Set the 'this' pointer.

Parameters:

obj the 'this' pointer

The documentation for this class was generated from the following file:

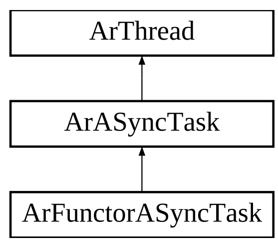
- ArFunctor.h

4.47 ArFunctorASyncTask Class Reference

This is like **ArASyncTask** (p. 110), but instead of runThread it uses a functor to run.

`#include <ArFunctorASyncTask.h>`

Inheritance diagram for ArFunctorASyncTask::



Public Methods

- **ArFunctorASyncTask** (**ArRetFunctor1**< void *, void *> *functor)

  Constructor.

- virtual ~**ArFunctorASyncTask** ()

  Destructor.

- virtual void * **runThread** (void *arg)

  Our reimplementation of runThread.

4.47.1 Detailed Description

This is like **ArASyncTask** (p. 110), but instead of runThread it uses a functor to run.

The documentation for this class was generated from the following files:

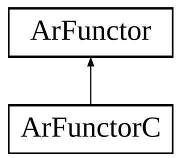
- ArFunctorASyncTask.h
- ArFunctorASyncTask.cpp

4.48 ArFunctorC Class Template Reference

Functor for a member function.

`#include <ArFunctor.h>`

Inheritance diagram for ArFunctorC::



Public Methods

- **ArFunctorC** ()
  Constructor.
- **ArFunctorC** (T &obj, void(T::∗func)(void))
  Constructor - supply function pointer.
- **ArFunctorC** (T ∗obj, void(T::∗func)(void))
  Constructor - supply function pointer.
- virtual ∼**ArFunctorC** ()
  Destructor.
- virtual void **invoke** (void)
  Invokes the functor.
- virtual void **setThis** (T ∗obj)
  Set the 'this' pointer.
- virtual void **setThis** (T &obj)
  Set the 'this' pointer.

4.48.1 Detailed Description

template<class T> class ArFunctorC< T >

Functor for a member function.

This is a class for member functions. This class contains the knowledge on how to call a member function on a particular instance of a class. This class should be instantiated by code that wishes to pass off a functor to another piece of code.

For an overall description of functors, see **ArFunctor** (p. 139).

4.48.2 Constructor & Destructor Documentation

4.48.2.1 template<class T> ArFunctorC< T >::ArFunctorC (T & *obj*, void(T::* *func*)(void)) `[inline]`

Constructor - supply function pointer.

Parameters:

func member function pointer

4.48.2.2 template<class T> ArFunctorC< T >::ArFunctorC (T * *obj*, void(T::* *func*)(void)) `[inline]`

Constructor - supply function pointer.

Parameters:

func member function pointer

4.48.3 Member Function Documentation

4.48.3.1 template<class T> virtual void ArFunctorC< T >::setThis (T & *obj*) `[inline, virtual]`

Set the 'this' pointer.

Parameters:

obj the 'this' pointer

4.48.3.2 template<class T> virtual void ArFunctorC< T >::setThis (T * *obj*) `[inline, virtual]`

Set the 'this' pointer.

Parameters:

obj the 'this' pointer

The documentation for this class was generated from the following file:

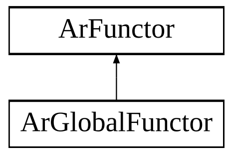
- ArFunctor.h

4.49 ArGlobalFunctor Class Reference

Functor for a global function with no parameters.

`#include <ArFunctor.h>`

Inheritance diagram for ArGlobalFunctor::



Public Methods

- **ArGlobalFunctor** ()

  Constructor.

- **ArGlobalFunctor** (void(∗func)(void))

  Constructor - supply function pointer.

- virtual ∼**ArGlobalFunctor** ()

  Destructor.

- virtual void **invoke** (void)

  Invokes the functor.

4.49.1 Detailed Description

Functor for a global function with no parameters.

This is a class for global functions. This ties a C style function pointer into the functor class hierarchy as a convience. Code that has a reference to this class and treat it as an **ArFunctor** (p. 139) can use it like any other functor.

For an overall description of functors, see **ArFunctor** (p. 139).

4.49.2 Constructor & Destructor Documentation

4.49.2.1 ArGlobalFunctor::ArGlobalFunctor (void(* *func*)(void)) [inline]

Constructor - supply function pointer.

Parameters:

func global function pointer

The documentation for this class was generated from the following file:

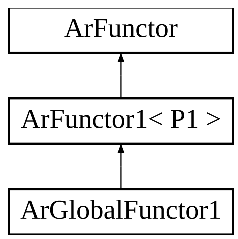
- ArFunctor.h

4.50 ArGlobalFunctor1 Class Template Reference

Functor for a global function with 1 parameter.

#include <ArFunctor.h>

Inheritance diagram for ArGlobalFunctor1::



Public Methods

- **ArGlobalFunctor1** ()

  Constructor.

- **ArGlobalFunctor1** (void(∗func)(P1))

  Constructor - supply function pointer.

- **ArGlobalFunctor1** (void(∗func)(P1), P1 p1)

  Constructor - supply function pointer, default parameters.

- virtual ∼**ArGlobalFunctor1** ()

  Destructor.

- virtual void **invoke** (void)

  Invokes the functor.

- virtual void **invoke** (P1 p1)

  Invokes the functor.

- virtual void **setP1** (P1 p1)

  Set the default parameter.

4.50.1 Detailed Description

template<class P1> class ArGlobalFunctor1< P1 >

Functor for a global function with 1 parameter.

This is a class for global functions which take 1 parameter. This ties a C style function pointer into the functor class hierarchy as a convience. Code that has a reference to this class and treat it as an **ArFunctor** (p. 139) can use it like any other functor.

For an overall description of functors, see **ArFunctor** (p. 139).

4.50.2 Constructor & Destructor Documentation

4.50.2.1 template<class P1> ArGlobalFunctor1< P1 >::ArGlobalFunctor1 (void(* *func*)(P1)) `[inline]`

Constructor - supply function pointer.

Parameters:

func global function pointer

4.50.2.2 template<class P1> ArGlobalFunctor1< P1 >::ArGlobalFunctor1 (void(* *func*)(P1), P1 *p1*) `[inline]`

Constructor - supply function pointer, default parameters.

Parameters:

func global function pointer

p1 default first parameter

4.50.3 Member Function Documentation

4.50.3.1 template<class P1> virtual void ArGlobalFunctor1< P1 >::invoke (P1 *p1*) `[inline, virtual]`

Invokes the functor.

Parameters:

p1 first parameter

Reimplemented from **ArFunctor1** (p. 143).

4.50.3.2 template<class P1> virtual void ArGlobalFunctor1< P1 >::setP1 (P1 *p1*) [inline, virtual]

Set the default parameter.

Parameters:

p1 default first parameter

The documentation for this class was generated from the following file:

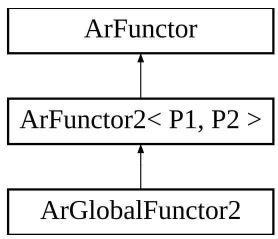
- ArFunctor.h

4.51 ArGlobalFunctor2 Class Template Reference

Functor for a global function with 2 parameters.

`#include <ArFunctor.h>`

Inheritance diagram for ArGlobalFunctor2::



Public Methods

- **ArGlobalFunctor2** ()

  Constructor.

- **ArGlobalFunctor2** (void(∗func)(P1, P2))

  Constructor - supply function pointer.

- **ArGlobalFunctor2** (void(∗func)(P1, P2), P1 p1)

  Constructor - supply function pointer, default parameters.

- **ArGlobalFunctor2** (void(∗func)(P1, P2), P1 p1, P2 p2)

  Constructor - supply function pointer, default parameters.

- virtual ∼**ArGlobalFunctor2** ()

  Destructor.

- virtual void **invoke** (void)

  Invokes the functor.

- virtual void **invoke** (P1 p1)

  Invokes the functor.

- virtual void **invoke** (P1 p1, P2 p2)

  Invokes the functor.

- virtual void **setP1** (P1 p1)

  Set the default parameter.

- virtual void **setP2** (P2 p2)

  Set the default 2nd parameter.

4.51.1 Detailed Description

template<class P1, class P2> class ArGlobalFunctor2< P1, P2 >

Functor for a global function with 2 parameters.

This is a class for global functions which take 2 parameters. This ties a C style function pointer into the functor class hierarchy as a convience. Code that has a reference to this class and treat it as an **ArFunctor** (p. 139) can use it like any other functor.

For an overall description of functors, see **ArFunctor** (p. 139).

4.51.2 Constructor & Destructor Documentation

4.51.2.1 template<class P1, class P2> ArGlobalFunctor2< P1, P2 >::ArGlobalFunctor2 (void(* *func*)(P1, P2)) `[inline]`

Constructor - supply function pointer.

Parameters:

func global function pointer

4.51.2.2 template<class P1, class P2> ArGlobalFunctor2< P1, P2 >::ArGlobalFunctor2 (void(* *func*)(P1, P2), P1 *p1*) `[inline]`

Constructor - supply function pointer, default parameters.

Parameters:

func global function pointer

p1 default first parameter

4.51.2.3 template<class P1, class P2> ArGlobalFunctor2< P1, P2 >::ArGlobalFunctor2 (void(* *func*)(P1, P2), P1 *p1*, P2 *p2*) [inline]

Constructor - supply function pointer, default parameters.

Parameters:

func global function pointer

p1 default first parameter

p2 default second parameter

4.51.3 Member Function Documentation

4.51.3.1 template<class P1, class P2> virtual void ArGlobalFunctor2< P1, P2 >::invoke (P1 *p1*, P2 *p2*) [inline, virtual]

Invokes the functor.

Parameters:

p1 first parameter

p2 second parameter

Reimplemented from **ArFunctor2** (p. 149).

4.51.3.2 template<class P1, class P2> virtual void ArGlobalFunctor2< P1, P2 >::invoke (P1 *p1*) [inline, virtual]

Invokes the functor.

Parameters:

p1 first parameter

Reimplemented from **ArFunctor2** (p. 149).

4.51.3.3 template<class P1, class P2> virtual void ArGlobalFunctor2< P1, P2 >::setP1 (P1 *p1*) [inline, virtual]

Set the default parameter.

Parameters:

p1 default first parameter

4.51.3.4 template<class P1, class P2> virtual void ArGlobalFunctor2< P1, P2 >::setP2 (P2 *p2*) [inline, virtual]

Set the default 2nd parameter.

Parameters:

p2 default second parameter

The documentation for this class was generated from the following file:

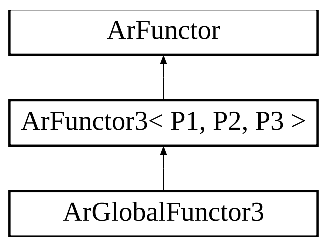
- ArFunctor.h

4.52 ArGlobalFunctor3 Class Template Reference

Functor for a global function with 3 parameters.

`#include <ArFunctor.h>`

Inheritance diagram for ArGlobalFunctor3::



Public Methods

- **ArGlobalFunctor3** ()

  Constructor.

- **ArGlobalFunctor3** (void(∗func)(P1, P2, P3))

  Constructor - supply function pointer.

- **ArGlobalFunctor3** (void(∗func)(P1, P2, P3), P1 p1)

  Constructor - supply function pointer, default parameters.

- **ArGlobalFunctor3** (void(∗func)(P1, P2, P3), P1 p1, P2 p2)

  Constructor - supply function pointer, default parameters.

- **ArGlobalFunctor3** (void(∗func)(P1, P2, P3), P1 p1, P2 p2, P3 p3)

  Constructor - supply function pointer, default parameters.

- virtual ∼**ArGlobalFunctor3** ()

  Destructor.

- virtual void **invoke** (void)

  Invokes the functor.

- virtual void **invoke** (P1 p1)

  Invokes the functor.

- virtual void **invoke** (P1 p1, P2 p2)

  Invokes the functor.

- virtual void **invoke** (P1 p1, P2 p2, P3 p3)

  Invokes the functor.

- virtual void **setP1** (P1 p1)

  Set the default parameter.

- virtual void **setP2** (P2 p2)

  Set the default 2nd parameter.

- virtual void **setP3** (P3 p3)

  Set the default third parameter.

4.52.1 Detailed Description

template<class P1, class P2, class P3> class ArGlobalFunctor3< P1, P2, P3 >

Functor for a global function with 3 parameters.

This is a class for global functions which take 3 parameters. This ties a C style function pointer into the functor class hierarchy as a convience. Code that has a reference to this class and treat it as an **ArFunctor** (p. 139) can use it like any other functor.

For an overall description of functors, see **ArFunctor** (p. 139).

4.52.2 Constructor & Destructor Documentation

4.52.2.1 template<class P1, class P2, class P3> ArGlobalFunctor3< P1, P2, P3 >::ArGlobalFunctor3 (void(* *func*)(P1, P2, P3)) `[inline]`

Constructor - supply function pointer.

Parameters:

func global function pointer

4.52.2.2 template<class P1, class P2, class P3> ArGlobalFunctor3< P1, P2, P3 >::ArGlobalFunctor3 (void(* *func*)(P1, P2, P3), P1 *p1*) [inline]

Constructor - supply function pointer, default parameters.

Parameters:

func global function pointer

p1 default first parameter

4.52.2.3 template<class P1, class P2, class P3> ArGlobalFunctor3< P1, P2, P3 >::ArGlobalFunctor3 (void(* *func*)(P1, P2, P3), P1 *p1*, P2 *p2*) [inline]

Constructor - supply function pointer, default parameters.

Parameters:

func global function pointer

p1 default first parameter

p2 default second parameter

4.52.2.4 template<class P1, class P2, class P3> ArGlobalFunctor3< P1, P2, P3 >::ArGlobalFunctor3 (void(* *func*)(P1, P2, P3), P1 *p1*, P2 *p2*, P3 *p3*) [inline]

Constructor - supply function pointer, default parameters.

Parameters:

func global function pointer

p1 default first parameter

p2 default second parameter

p3 default third parameter

4.52.3 Member Function Documentation

4.52.3.1 template<class P1, class P2, class P3> virtual void ArGlobalFunctor3< P1, P2, P3 >::invoke (P1 *p1*, P2 *p2*, P3 *p3*) [inline, virtual]

Invokes the functor.

Parameters:

p1 first parameter

p2 second parameter

p3 third parameter

Reimplemented from **ArFunctor3** (p. 156).

4.52.3.2 template<class P1, class P2, class P3> virtual void ArGlobalFunctor3< P1, P2, P3 >::invoke (P1 *p1*, P2 *p2*) `[inline, virtual]`

Invokes the functor.

Parameters:

p1 first parameter

p2 second parameter

Reimplemented from **ArFunctor3** (p. 156).

4.52.3.3 template<class P1, class P2, class P3> virtual void ArGlobalFunctor3< P1, P2, P3 >::invoke (P1 *p1*) `[inline, virtual]`

Invokes the functor.

Parameters:

p1 first parameter

Reimplemented from **ArFunctor3** (p. 156).

4.52.3.4 template<class P1, class P2, class P3> virtual void ArGlobalFunctor3< P1, P2, P3 >::setP1 (P1 *p1*) `[inline, virtual]`

Set the default parameter.

Parameters:

p1 default first parameter

4.52.3.5 template<class P1, class P2, class P3> virtual void ArGlobalFunctor3< P1, P2, P3 >::setP2 (P2 *p2*) [inline, virtual]

Set the default 2nd parameter.

Parameters:

p2 default second parameter

4.52.3.6 template<class P1, class P2, class P3> virtual void ArGlobalFunctor3< P1, P2, P3 >::setP3 (P3 *p3*) [inline, virtual]

Set the default third parameter.

Parameters:

p3 default third parameter

The documentation for this class was generated from the following file:

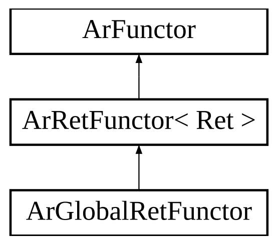
- ArFunctor.h

4.53 ArGlobalRetFunctor Class Template Reference

Functor for a global function with return value.

`#include <ArFunctor.h>`

Inheritance diagram for ArGlobalRetFunctor::



Public Methods

- **ArGlobalRetFunctor** ()
  Constructor.
- **ArGlobalRetFunctor** (Ret(∗func)(void))
  Constructor - supply function pointer.
- virtual ∼**ArGlobalRetFunctor** ()
  Destructor.
- virtual Ret **invokeR** (void)
  Invokes the functor with return value.

4.53.1 Detailed Description

template<class Ret> class ArGlobalRetFunctor< Ret >

Functor for a global function with return value.

This is a class for global functions which return a value. This ties a C style function pointer into the functor class hierarchy as a convience. Code that has a reference to this class and treat it as an **ArFunctor** (p. 139) can use it like any other functor.

For an overall description of functors, see **ArFunctor** (p. 139).

4.53.2 Constructor & Destructor Documentation

4.53.2.1 template<class Ret> ArGlobalRetFunctor< Ret >::ArGlobalRetFunctor (Ret(* *func*)(void)) [inline]

Constructor - supply function pointer.

Parameters:

func global function pointer

The documentation for this class was generated from the following file:

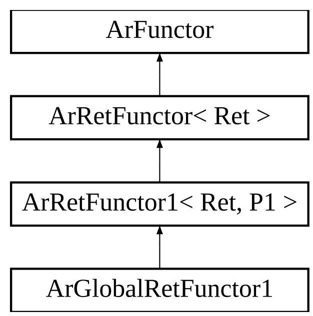
- ArFunctor.h

4.54 ArGlobalRetFunctor1 Class Template Reference

Functor for a global function with 1 parameter and return value.

`#include <ArFunctor.h>`

Inheritance diagram for ArGlobalRetFunctor1::



Public Methods

- **ArGlobalRetFunctor1** ()

  Constructor.

- **ArGlobalRetFunctor1** (Ret(∗func)(P1))

  Constructor - supply function pointer.

- **ArGlobalRetFunctor1** (Ret(∗func)(P1), P1 p1)

  Constructor - supply function pointer, default parameters.

- virtual ∼**ArGlobalRetFunctor1** ()

  Destructor.

- virtual Ret **invokeR** (void)

  Invokes the functor with return value.

- virtual Ret **invokeR** (P1 p1)

  Invokes the functor with return value.

- virtual void **setP1** (P1 p1)

  Set the default parameter.

4.54.1 Detailed Description

template<class Ret, class P1> class ArGlobalRetFunctor1< Ret, P1 >

Functor for a global function with 1 parameter and return value.

This is a class for global functions which take 1 parameter and return a value. This ties a C style function pointer into the functor class hierarchy as a convience. Code that has a reference to this class and treat it as an **ArFunctor** (p. 139) can use it like any other functor.

For an overall description of functors, see **ArFunctor** (p. 139).

4.54.2 Constructor & Destructor Documentation

4.54.2.1 template<class Ret, class P1> ArGlobalRetFunctor1< Ret, P1 >::ArGlobalRetFunctor1 (Ret(* *func*)(P1)) `[inline]`

Constructor - supply function pointer.

Parameters:

func global function pointer

4.54.2.2 template<class Ret, class P1> ArGlobalRetFunctor1< Ret, P1 >::ArGlobalRetFunctor1 (Ret(* *func*)(P1), P1 *p1*) `[inline]`

Constructor - supply function pointer, default parameters.

Parameters:

func global function pointer

p1 default first parameter

4.54.3 Member Function Documentation

4.54.3.1 template<class Ret, class P1> virtual Ret ArGlobalRetFunctor1< Ret, P1 >::invokeR (P1 *p1*) `[inline, virtual]`

Invokes the functor with return value.

Parameters:

p1 first parameter

Reimplemented from **ArRetFunctor1** (p. 329).

4.54.3.2 template<class Ret, class P1> virtual void ArGlobalRetFunctor1< Ret, P1 >::setP1 (P1 *p1*) [inline, virtual]

Set the default parameter.

Parameters:

p1 default first parameter

The documentation for this class was generated from the following file:

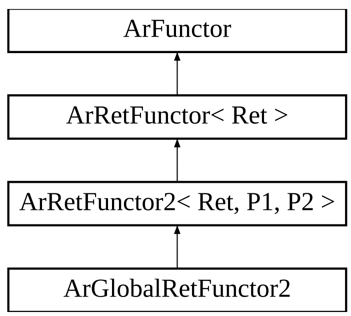
- ArFunctor.h

4.55 ArGlobalRetFunctor2 Class Template Reference

Functor for a global function with 2 parameters and return value.

#include <ArFunctor.h>

Inheritance diagram for ArGlobalRetFunctor2::



Public Methods

- **ArGlobalRetFunctor2** ()

  Constructor.

- **ArGlobalRetFunctor2** (Ret(∗func)(P1, P2))

  Constructor - supply function pointer.

- **ArGlobalRetFunctor2** (Ret(∗func)(P1, P2), P1 p1)

  Constructor - supply function pointer, default parameters.

- **ArGlobalRetFunctor2** (Ret(∗func)(P1, P2), P1 p1, P2 p2)

  Constructor - supply function pointer, default parameters.

- virtual ∼**ArGlobalRetFunctor2** ()

  Destructor.

- virtual Ret **invokeR** (void)

  Invokes the functor with return value.

- virtual Ret **invokeR** (P1 p1)

  Invokes the functor with return value.

- virtual Ret **invokeR** (P1 p1, P2 p2)
  Invokes the functor with return value.
- virtual void **setP1** (P1 p1)
  Set the default parameter.
- virtual void **setP2** (P2 p2)
  Set the default 2nd parameter.

4.55.1 Detailed Description

template<class Ret, class P1, class P2> class ArGlobalRetFunctor2< Ret, P1, P2 >

Functor for a global function with 2 parameters and return value.

This is a class for global functions which take 2 parameters and return a value. This ties a C style function pointer into the functor class hierarchy as a convience. Code that has a reference to this class and treat it as an **ArFunctor** (p. 139) can use it like any other functor.

For an overall description of functors, see **ArFunctor** (p. 139).

4.55.2 Constructor & Destructor Documentation

4.55.2.1 template<class Ret, class P1, class P2> ArGlobalRetFunctor2< Ret, P1, P2 >::ArGlobalRetFunctor2 (Ret(* *func*)(P1, P2)) `[inline]`

Constructor - supply function pointer.

Parameters:
  func global function pointer

4.55.2.2 template<class Ret, class P1, class P2> ArGlobalRetFunctor2< Ret, P1, P2 >::ArGlobalRetFunctor2 (Ret(* *func*)(P1, P2), P1 *p1*) `[inline]`

Constructor - supply function pointer, default parameters.

Parameters:
  func global function pointer
  p1 default first parameter

4.55.2.3 template<class Ret, class P1, class P2> ArGlobalRetFunctor2< Ret, P1, P2 >::ArGlobalRetFunctor2 (Ret(* *func*)(P1, P2), P1 *p1*, P2 *p2*) `[inline]`

Constructor - supply function pointer, default parameters.

Parameters:

func global function pointer

p2 default second parameter

4.55.3 Member Function Documentation

4.55.3.1 template<class Ret, class P1, class P2> virtual Ret ArGlobalRetFunctor2< Ret, P1, P2 >::invokeR (P1 *p1*, P2 *p2*) `[inline, virtual]`

Invokes the functor with return value.

Parameters:

p1 first parameter

p2 second parameter

Reimplemented from **ArRetFunctor2** (p. 335).

4.55.3.2 template<class Ret, class P1, class P2> virtual Ret ArGlobalRetFunctor2< Ret, P1, P2 >::invokeR (P1 *p1*) `[inline, virtual]`

Invokes the functor with return value.

Parameters:

p1 first parameter

Reimplemented from **ArRetFunctor2** (p. 335).

4.55.3.3 template<class Ret, class P1, class P2> virtual void ArGlobalRetFunctor2< Ret, P1, P2 >::setP1 (P1 *p1*) `[inline, virtual]`

Set the default parameter.

Parameters:

p1 default first parameter

4.55.3.4 template<class Ret, class P1, class P2> virtual void ArGlobalRetFunctor2< Ret, P1, P2 >::setP2 (P2 *p2*) [inline, virtual]

Set the default 2nd parameter.

Parameters:

p2 default second parameter

The documentation for this class was generated from the following file:

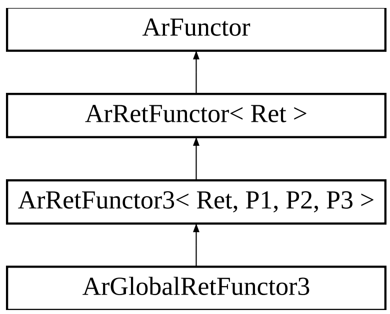
- ArFunctor.h

4.56 ArGlobalRetFunctor3 Class Template Reference

Functor for a global function with 2 parameters and return value.

`#include <ArFunctor.h>`

Inheritance diagram for ArGlobalRetFunctor3::



Public Methods

- **ArGlobalRetFunctor3** ()

  Constructor.

- **ArGlobalRetFunctor3** (Ret(∗func)(P1, P2, P3))

  Constructor - supply function pointer.

- **ArGlobalRetFunctor3** (Ret(∗func)(P1, P2, P3), P1 p1)

  Constructor - supply function pointer, default parameters.

- **ArGlobalRetFunctor3** (Ret(∗func)(P1, P2, P3), P1 p1, P2 p2)

  Constructor - supply function pointer, default parameters.

- **ArGlobalRetFunctor3** (Ret(∗func)(P1, P2, P3), P1 p1, P2 p2, P3 p3)

  Constructor - supply function pointer, default parameters.

- virtual ∼**ArGlobalRetFunctor3** ()

  Destructor.

- virtual Ret **invokeR** (void)

  Invokes the functor with return value.

- virtual Ret **invokeR** (P1 p1)
  Invokes the functor with return value.
- virtual Ret **invokeR** (P1 p1, P2 p2)
  Invokes the functor with return value.
- virtual Ret **invokeR** (P1 p1, P2 p2, P3 p3)
  Invokes the functor with return value.
- virtual void **setP1** (P1 p1)
  Set the default parameter.
- virtual void **setP2** (P2 p2)
  Set the default 2nd parameter.
- virtual void **setP3** (P2 p3)
  Set the default third parameter.

4.56.1 Detailed Description

template<class Ret, class P1, class P2, class P3> class ArGlobalRetFunctor3< Ret, P1, P2, P3 >

Functor for a global function with 2 parameters and return value.

This is a class for global functions which take 2 parameters and return a value. This ties a C style function pointer into the functor class hierarchy as a convience. Code that has a reference to this class and treat it as an **ArFunctor** (p. 139) can use it like any other functor.

For an overall description of functors, see **ArFunctor** (p. 139).

4.56.2 Constructor & Destructor Documentation

4.56.2.1 template<class Ret, class P1, class P2, class P3> ArGlobalRetFunctor3< Ret, P1, P2, P3 >::ArGlobalRetFunctor3 (Ret(* *func*)(P1, P2, P3)) `[inline]`

Constructor - supply function pointer.

Parameters:
func global function pointer

4.56.2.2 template<class Ret, class P1, class P2, class P3> ArGlobalRetFunctor3< Ret, P1, P2, P3 >::ArGlobalRetFunctor3 (Ret(* *func*)(P1, P2, P3), P1 *p1*) [inline]

Constructor - supply function pointer, default parameters.

Parameters:

func global function pointer

p1 default first parameter

4.56.2.3 template<class Ret, class P1, class P2, class P3> ArGlobalRetFunctor3< Ret, P1, P2, P3 >::ArGlobalRetFunctor3 (Ret(* *func*)(P1, P2, P3), P1 *p1*, P2 *p2*) [inline]

Constructor - supply function pointer, default parameters.

Parameters:

func global function pointer

p1 default first parameter

p2 default second parameter

4.56.2.4 template<class Ret, class P1, class P2, class P3> ArGlobalRetFunctor3< Ret, P1, P2, P3 >::ArGlobalRetFunctor3 (Ret(* *func*)(P1, P2, P3), P1 *p1*, P2 *p2*, P3 *p3*) [inline]

Constructor - supply function pointer, default parameters.

Parameters:

func global function pointer

p1 default first parameter

p2 default second parameter

4.56.3 Member Function Documentation

4.56.3.1 template<class Ret, class P1, class P2, class P3> virtual Ret ArGlobalRetFunctor3< Ret, P1, P2, P3 >::invokeR (P1 *p1*, P2 *p2*, P3 *p3*) [inline, virtual]

Invokes the functor with return value.

Parameters:

p1 first parameter

p2 second parameter

p3 third parameter

Reimplemented from **ArRetFunctor3** (p. 343).

4.56.3.2 template<class Ret, class P1, class P2, class P3> virtual Ret ArGlobalRetFunctor3< Ret, P1, P2, P3 >::invokeR (P1 *p1*, P2 *p2*) `[inline, virtual]`

Invokes the functor with return value.

Parameters:

p1 first parameter

p2 second parameter

Reimplemented from **ArRetFunctor3** (p. 343).

4.56.3.3 template<class Ret, class P1, class P2, class P3> virtual Ret ArGlobalRetFunctor3< Ret, P1, P2, P3 >::invokeR (P1 *p1*) `[inline, virtual]`

Invokes the functor with return value.

Parameters:

p1 first parameter

Reimplemented from **ArRetFunctor3** (p. 343).

4.56.3.4 template<class Ret, class P1, class P2, class P3> virtual void ArGlobalRetFunctor3< Ret, P1, P2, P3 >::setP1 (P1 *p1*) `[inline, virtual]`

Set the default parameter.

Parameters:

p1 default first parameter

4.56.3.5 template<class Ret, class P1, class P2, class P3> virtual void ArGlobalRetFunctor3< Ret, P1, P2, P3 >::setP2 (P2 *p2*) [inline, virtual]

Set the default 2nd parameter.

Parameters:

p2 default second parameter

4.56.3.6 template<class Ret, class P1, class P2, class P3> virtual void ArGlobalRetFunctor3< Ret, P1, P2, P3 >::setP3 (P2 *p3*) [inline, virtual]

Set the default third parameter.

Parameters:

p3 default third parameter

The documentation for this class was generated from the following file:

- ArFunctor.h

4.57 ArGripper Class Reference

A class of convenience functions for using the gripper.

`#include <ArGripper.h>`

Public Types

- enum **Type** { **QUERYTYPE**, **GENIO**, **USERIO**, **GRIPPAC**, **NO-GRIPPER** }

  These are the types for the gripper.

Public Methods

- **ArGripper** (**ArRobot** *robot, int gripperType=QUERYTYPE)

  Constructor.

- virtual ~**ArGripper** ()

  Destructor.

- bool **gripOpen** (void)

  Opens the gripper paddles.

- bool **gripClose** (void)

  Closes the gripper paddles.

- bool **gripStop** (void)

  Stops the gripper paddles.

- bool **liftUp** (void)

  Raises the lift to the top.

- bool **liftDown** (void)

  Lowers the lift to the bottom.

- bool **liftStop** (void)

  Stops the lift.

- bool **gripperStore** (void)

  Puts the gripper in a storage position.

- bool **gripperDeploy** (void)
  Puts the gripper in a deployed position, ready for use.
- bool **gripperHalt** (void)
  Halts the lift and the gripper paddles.
- bool **gripPressure** (int mSecIntervals)
  Sets the amount of pressure the gripper applies.
- bool **liftCarry** (int mSecIntervals)
  Raises the lift by a given amount of time.
- bool **isGripMoving** (void) const
  Returns true if the gripper paddles are moving.
- bool **isLiftMoving** (void) const
  Returns true if the lift is moving.
- int **getGripState** (void) const
  Returns the state of the gripper paddles.
- int **getPaddleState** (void) const
  Returns the state of each gripper paddle.
- int **getBreakBeamState** (void) const
  Returns the state of the gripper's breakbeams.
- bool **isLiftMaxed** (void) const
  Returns the state of the lift.
- int **getType** (void) const
  Gets the type of the gripper.
- void **setType** (int type)
  Sets the type of the gripper.
- long **getMSecSinceLastPacket** (void) const
  Gets the number of mSec since the last gripper packet.
- int **getGraspTime** (void) const
  Gets the grasp time.

- void **logState** (void) const
  logs the gripper state.
- bool **packetHandler** (**ArRobotPacket** *packet)
  Parses the gripper packet.
- void **connectHandler** (void)
  The handler for when the robot connects.

4.57.1 Detailed Description

A class of convenience functions for using the gripper.

The commands which start with grip are for the gripper paddles, the ones which start with lift are the for the lift, and the ones which start with gripper are for the entire unit.

4.57.2 Member Enumeration Documentation

4.57.2.1 enum ArGripper::Type

These are the types for the gripper.

Enumeration values:

QUERYTYPE Finds out what type from the robot, default.

GENIO Uses general IO.

USERIO Uses the user IO.

GRIPPAC Uses a packet requested from the robot.

NOGRIPPER There isn't a gripper.

4.57.3 Constructor & Destructor Documentation

4.57.3.1 ArGripper::ArGripper (ArRobot * *robot*, int *gripperType* = QUERYTYPE)

Constructor.

Parameters:

robot The robot this gripper is attached to

useGenIO Whether the gripper on this robot is using GenIO or not

4.57.4 Member Function Documentation

4.57.4.1 int ArGripper::getBreakBeamState (void) const

Returns the state of the gripper's breakbeams.

Returns:
0 if no breakbeams broken, 1 if inner breakbeam broken, 2 if outter breakbeam broken, 3 if both breakbeams broken

4.57.4.2 int ArGripper::getGraspTime (void) const

Gets the grasp time.

If you are using this as anything other than GRIPPAC and you want to find out the grasp time again, just do a setType with QUERYTYPE and it will query the robot again and get the grasp time from the robot.

Returns:
the number of 20 MSec intervals the gripper will continue grasping for after both paddles are triggered

4.57.4.3 int ArGripper::getGripState (void) const

Returns the state of the gripper paddles.

Returns:
0 if gripper paddles between open and closed, 1 if gripper paddles are open, 2 if gripper paddles are closed

4.57.4.4 long ArGripper::getMSecSinceLastPacket (void) const

Gets the number of mSec since the last gripper packet.

Returns:
the number of milliseconds since the last packet

4.57.4.5 int ArGripper::getPaddleState (void) const

Returns the state of each gripper paddle.

Returns:
0 if no gripper paddles are triggered, 1 if the left paddle is triggered, 2 if the right paddle is triggered, 3 if both are triggered

4.57.4.6 int ArGripper::getType (void) const

Gets the type of the gripper.

Returns:
the gripper type

See also:
Type (p. 198)

4.57.4.7 bool ArGripper::gripClose (void)

Closes the gripper paddles.

Returns:
whether the command was sent to the robot or not

4.57.4.8 bool ArGripper::gripOpen (void)

Opens the gripper paddles.

Returns:
whether the command was sent to the robot or not

4.57.4.9 bool ArGripper::gripPressure (int *mSecIntervals*)

Sets the amount of pressure the gripper applies.

Returns:
whether the command was sent to the robot or not

4.57.4.10 bool ArGripper::gripStop (void)

Stops the gripper paddles.

Returns:
whether the command was sent to the robot or not

4.57.4.11 bool ArGripper::gripperDeploy (void)

Puts the gripper in a deployed position, ready for use.

Returns:
whether the command was sent to the robot or not

4.57.4.12 bool ArGripper::gripperHalt (void)

Halts the lift and the gripper paddles.

Returns:
whether the command was sent to the robot or not

4.57.4.13 bool ArGripper::gripperStore (void)

Puts the gripper in a storage position.

Returns:
whether the command was sent to the robot or not

4.57.4.14 bool ArGripper::isGripMoving (void) const

Returns true if the gripper paddles are moving.

Returns:
true if the gripper paddles are moving

4.57.4.15 bool ArGripper::isLiftMaxed (void) const

Returns the state of the lift.

Returns:
false if lift is between up and down, true is either all the way up or down

4.57.4.16 bool ArGripper::isLiftMoving (void) const

Returns true if the lift is moving.

Returns:
true if the lift is moving

4.57.4.17 bool ArGripper::liftCarry (int *mSecIntervals*)

Raises the lift by a given amount of time.

Returns:
whether the command was sent to the robot or not

4.57.4.18 bool ArGripper::liftDown (void)

Lowers the lift to the bottom.

Returns:
whether the command was sent to the robot or not

4.57.4.19 bool ArGripper::liftStop (void)

Stops the lift.

Returns:
whether the command was sent to the robot or not

4.57.4.20 bool ArGripper::liftUp (void)

Raises the lift to the top.

Returns:
whether the command was sent to the robot or not

4.57.4.21 void ArGripper::setType (int *type*)

Sets the type of the gripper.

Parameters:
type the type of gripper to set it to

The documentation for this class was generated from the following files:

- ArGripper.h
- ArGripper.cpp

4.58 ArGripperCommands Class Reference

A class with an enum of the commands for the gripper.

`#include <ArGripper.h>`

Public Types

- enum **Commands** { **GRIP_OPEN** = 1, **GRIP_CLOSE** = 2, **GRIP_STOP** = 3, **LIFT_UP** = 4, **LIFT_DOWN** = 5, **LIFT_STOP** = 6, **GRIPPER_STORE** = 7, **GRIPPER_DEPLOY** = 8, **GRIPPER_HALT** = 15, **GRIP_PRESSURE** = 16, **LIFT_CARRY** }

4.58.1 Detailed Description

A class with an enum of the commands for the gripper.

A class with an enum of the commands for the gripper, see the p2 operations manual and the gripper guide for more detailed descriptions. The enum values which start with GRIP are for the gripper paddles, the ones which start with LIFT are the for the lift, and the ones which start with GRIPPER are for the entire unit.

4.58.2 Member Enumeration Documentation

4.58.2.1 enum ArGripperCommands::Commands

Enumeration values:

GRIP_OPEN open the gripper paddles fully.

GRIP_CLOSE close the gripper paddles all the way.

GRIP_STOP stop the gripper paddles where they are.

LIFT_UP raises the lift to the top of its range.

LIFT_DOWN lowers the lift to the bottom of its range.

LIFT_STOP stops the lift where it is.

GRIPPER_STORE closes the paddles and raises the lift simultaneously, this is for storage not for grasping/carrying an object

GRIPPER_DEPLOY opens the paddles and lowers the lieft simultaneously, this is for getting ready to grasp an object, not for object drops

GRIPPER_HALT stops the gripper paddles and lift from moving.

GRIP_PRESSURE sets the time delay in 20 msec increments after the gripper paddles first grasp an object before they stop moving, regulates grasp pressure

LIFT_CARRY raises or lowers the lieft, the argument is the number of 20 msec increments to raise or lower the lift, poseitive arguments for raise, negative for lower

The documentation for this class was generated from the following file:

- ArGripper.h

4.59 Aria Class Reference

This class performs global initialization and deinitialization.

`#include <ariaInternal.h>`

Public Types

- enum **SigHandleMethod** { **SIGHANDLE_SINGLE**, **SIGHANDLE_THREAD**, **SIGHANDLE_NONE** }

Static Public Methods

- void **init** (**SigHandleMethod** method=SIGHANDLE_SINGLE, bool initSockets=true)

  Performs OS-specific initialization.

- void **uninit** ()

  Performs OS-specific deinitialization.

- void **addInitCallBack** (**ArFunctor** *cb, **ArListPos::Pos** position)

  Adds a callback to call when Aria is inited.

- void **addUninitCallBack** (**ArFunctor** *cb, **ArListPos::Pos** position)

  Adds a callback to call when Aria is uninited.

- void **shutdown** ()

  Shutdown all Aria processes/threads.

- void **exit** ()

  Force an exit of all Aria processes/threads.

- bool **getRunning** (void)

  Sees if Aria is still running (mostly for the thread in main).

- void **addRobot** (**ArRobot** *robot)

  Add a robot to the global list of robots.

- void **delRobot** (**ArRobot** *robot)

  Remove a robot from the global list of robots.

- **ArRobot** ∗ **findRobot** (char ∗name)
  Finds a robot in the global list of robots, by name.
- std::list< **ArRobot** ∗> ∗ **getRobotList** ()
  Get a copy of the global robot list.
- void **setDirectory** (const char ∗directory)
  Sets the directory that ARIA resides in.
- std::string **getDirectory** (void)
  Gets the directory that ARIA resides in.
- void **setKeyHandler** (**ArKeyHandler** ∗keyHandler)
  Sets the key handler, so that other classes can find it.
- **ArKeyHandler** ∗ **getKeyHandler** (void)
  Gets the key handler if one has been set.
- void **signalHandlerCB** (int sig)
  Internal, the callback for the signal handling.

4.59.1 Detailed Description

This class performs global initialization and deinitialization.

4.59.2 Member Enumeration Documentation

4.59.2.1 enum Aria::SigHandleMethod

Enumeration values:

SIGHANDLE_SINGLE Setup signal handlers in a global, non-thread way.

SIGHANDLE_THREAD Setup a dedicated signal handling thread.

SIGHANDLE_NONE Do no signal handling.

4.59.3 Member Function Documentation

4.59.3.1 void Aria::addInitCallBack (ArFunctor ∗ *cb*, ArListPos::Pos *position*) `[static]`

Adds a callback to call when Aria is inited.

This will add a callback to the list of callbacks to call when Aria has been initialized. It can be called before anything else.

4.59.3.2 void Aria::addUninitCallBack (ArFunctor * *cb*, ArListPos::Pos *position*) [static]

Adds a callback to call when Aria is uninited.

This will add a callback to the list of callbacks to call right before Aria is un-initialized. It can be called before anything else. This facilitates code that in operating system signal handlers simply calls **Aria::uninit**() (p. 209) and packages that are based on Aria are unitited as well. It simplifies the entire uninit process.

4.59.3.3 void Aria::exit () [static]

Force an exit of all Aria processes/threads.

This calls cancel() on all AtThread's and **ArASyncTask** (p. 110)'s. It forces each thread to exit and should only be used in the case of a thread hanging or getting stuck in an infinite loop. This works fine in Linux. In Windows it is not recommended at all that this function be called. Windows can not handle cleanly killing off a thread. See the help in the VC++ compiler on the WIN32 function TerminateThread. The biggest problem is that the state of DLL's can be destroyed.

4.59.3.4 ArRobot * Aria::findRobot (char * *name*) [static]

Finds a robot in the global list of robots, by name.

Parameters:
name the name of the robot you want to find

Returns:
NULL if there is no robot of that name, otherwise the robot with that name

4.59.3.5 std::string Aria::getDirectory (void) [static]

Gets the directory that ARIA resides in.

This gets the directory that ARIA is located in, this is so ARIA can find param files and the like.

Returns:
the directory ARIA is located in

See also:
setDirectory (p. 208)

4.59.3.6 bool Aria::getRunning (void) `[static]`

Sees if Aria is still running (mostly for the thread in main).

This returns if the ARIA stuff is running, which is defined as the time between **Aria::init** (p. 208) and any of **Aria::shutdown** (p. 209), **Aria::exit** (p. 207), or the signal handler kicking off.

4.59.3.7 void Aria::init (SigHandleMethod *method* = SIGHANDLE_SINGLE, bool *initSockets* = true) `[static]`

Performs OS-specific initialization.

This must be called first before any other Aria functions. It initializes the thread layer and the signal handling method. For Windows it iniatializes the socket layer as well. This also sets the directory Aria is located in from the ARIA environmental variable, for a description of this see getDirectory and setDirectory.

For Linux the default signal handling method is to cleanly close down the program, cause all the instances of **ArRobot** (p. 355) to stop their run loop and disconnect from their robot. The program will exit on the following signals: SigHUP, SigINT, SigQUIT, and SigTERM.

For Windows, there is no signal handling.

Parameters:

method the method in which to handle signals. Defaulted to SIGHANDLE_SINGLE.

initSockets specify whether or not to initialize the socket layer. This is only meaningfull for Windows. Defaulted to true.

See also:
ArSignalHandler (p. 453) , **ArSocket** (p. 461)

4.59.3.8 void Aria::setDirectory (const char * *directory*) `[static]`

Sets the directory that ARIA resides in.

This sets the directory that ARIA is located in, so ARIA can find param files and the like. This can also be controlled by the environment variable ARIA, which this is set to (if it exists) when **Aria::init** (p. 208) is done. So for setDirectory to be effective, it must be done after the **Aria::init** (p. 208).

Parameters:
directory the directory Aria is located in

See also:
getDirectory (p. 207)

4.59.3.9 void Aria::shutdown () [static]

Shutdown all Aria processes/threads.

This calls stop() on all **ArThread** (p. 487)'s and **ArASyncTask** (p. 110)'s. It will block until all **ArThread** (p. 487)'s and **ArASyncTask** (p. 110)'s exit. It is expected that all the tasks will obey the **ArThread::myRunning** (p. 489) variable and exit when it is false.

4.59.3.10 void Aria::uninit () [static]

Performs OS-specific deinitialization.

This must be called last, after all other Aria functions. For both Linux and Windows, it closes all the open ArModules. For Windows it deinitializes the socket layer as well.

The documentation for this class was generated from the following files:

- ariaInternal.h
- Aria.cpp

4.60 ArInterpolation Class Reference

`#include <ArInterpolation.h>`

Public Methods

- **ArInterpolation** (size_t numberOfReadings=100)

  Constructor.

- virtual ~**ArInterpolation** ()

  Destructor.

- bool **addReading** (**ArTime** timeOfReading, **ArPose** position)

  Adds a new reading.

- int **getPose** (**ArTime** timeStamp, **ArPose** *position)

  Finds a position.

- void **setNumberOfReadings** (size_t numberOfReadings)

  Sets the number of readings this instance holds back in time.

- size_t **getNumberOfReadings** (void) const

  Gets the number of readings this instance holds back in time.

- void **reset** (void)

  Empties the interpolated positions.

4.60.1 Detailed Description

This class takes care of storing in readings of position vs time, and then interpolating between them to find where the robot was at a particular point in time. It has two lists, one containing the times, and one containing the positions at those same times (per position), they must be walked through jointly to maintain cohesion. The new entries are at the front of the list, while the old ones are at the back. numberOfReadings and the setNumberOfReadings control the number of entries in the list. If a size is set that is smaller than the current size, then the old ones are chopped off.

4.60.2 Member Function Documentation

4.60.2.1 int ArInterpolation::getPose (ArTime *timeStamp*, ArPose * *position*)

Finds a position.

Parameters:

timeStamp the time we are interested in

position the pose to set to the given position

Returns:

1 its good interpolation, 0 its predicting, -1 its too far to predict, -2 its too old, -3 there's not enough data to predict

The documentation for this class was generated from the following files:

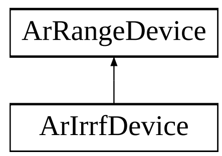
- ArInterpolation.h
- ArInterpolation.cpp

4.61 ArIrrfDevice Class Reference

A class for connecting to a PB-9 and managing the resulting data.

```
#include <ArIrrfDevice.h>
```

Inheritance diagram for ArIrrfDevice::



Public Methods

- **ArIrrfDevice** (size_t currentBufferSize=91, size_t cumulativeBufferSize=273, const char *name="irrf")

  Constructor.

- ~**ArIrrfDevice** ()

  Destructor.

- bool **packetHandler** (**ArRobotPacket** *packet)

  The packet handler for use when connecting to an H8 micro-controller.

- void **setCumulativeMaxRange** (double r)

  Maximum range for a reading to be added to the cumulative buffer (mm).

- virtual void **setRobot** (**ArRobot** *)

  Sets the robot this device is attached to.

4.61.1 Detailed Description

A class for connecting to a PB-9 and managing the resulting data.

This class is for use with a PB9 IR rangefinder. It has the packethandler necessary to process the packets, and will put the data into ArRangeBuffers for use with obstacle avoidance, etc.

The PB9 is still under development, and only works on an H8 controller running AROS.

4.61.2 Member Function Documentation

4.61.2.1 bool ArIrrfDevice::packetHandler (ArRobotPacket * *packet*)

The packet handler for use when connecting to an H8 micro-controller.

This is the packet handler for the PB9 data, which is sent via the micro controller, to the client. This will read the data from the packets, and then call processReadings to filter add the data to the current and cumulative buffers.

The documentation for this class was generated from the following files:

- ArIrrfDevice.h
- ArIrrfDevice.cpp

4.62 ArJoyHandler Class Reference

Interfaces to a joystick.

`#include <ArJoyHandler.h>`

Public Methods

- **ArJoyHandler** (bool useOSCal=true, bool useOldJoystick=false)

  Constructor.

- ~**ArJoyHandler** ()

  Destructor.

- bool **init** (void)

  Intializes the joystick, returns true if successful.

- bool **haveJoystick** (void)

  Returns if the joystick was successfully initialized or not.

- void **getDoubles** (double ∗x, double ∗y, double ∗z=NULL)

  Gets the adjusted reading, as floats, between -1.0 and 1.0.

- bool **getButton** (unsigned int button)

  Gets the button.

- bool **haveZAxis** (void)

  Returns true if we definitely have a Z axis (we don't know in windows unless it moves).

- void **setSpeeds** (int x, int y, int z=0)

  Sets the max that X or Y will return.

- void **getAdjusted** (int ∗x, int ∗y, int ∗z=NULL)

  Gets the adjusted reading, as integers, based on the setSpeed.

- unsigned int **getNumAxes** (void)

  Gets the number of axes the joystick has.

- double **getAxis** (unsigned int axis)

  Gets the floating (-1 to 1) location of the given joystick axis.

- unsigned int **getNumButtons** (void)

Gets the number of buttons the joystick has.

- void **setUseOSCal** (bool useOSCal)

  Sets whether to just use OS calibration or not.

- bool **getUseOSCal** (void)

  Gets whether to just use OS calibration or not.

- void **startCal** (void)

  Starts the calibration process.

- void **endCal** (void)

  Ends the calibration process.

- void **getUnfiltered** (int ∗x, int ∗y, int ∗z=NULL)

  Gets the unfilitered reading, mostly for internal use, maybe useful for Calibration.

- void **getStats** (int ∗maxX, int ∗minX, int ∗maxY, int ∗minY, int ∗cenX, int ∗cenY)

  Gets the stats for the joystick, useful after calibrating to save values.

- void **setStats** (int maxX, int minX, int maxY, int minY, int cenX, int cenY)

  Sets the stats for the joystick, useful for restoring calibrated settings.

- void **getSpeeds** (int ∗x, int ∗y, int ∗z)

  Gets the speeds that X and Y are set to.

4.62.1 Detailed Description

Interfaces to a joystick.

The joystick handler keeps track of the minimum and maximums for both axes, updating them to constantly be better calibrated. The speeds set influence what is returned by getAdjusted...

The joystick is not opened until init is called. What should basically be done to use this class is to 'init' a joystick, do a 'setSpeed' so you can use 'getAdusted', then at some point do a 'getButton' to see if a button is pressed, and then do a 'getAdjusted' to get the values to act on.

Also note that x is usually rotational velocity (since it right/left), whereas Y is translational (since it is up/down).

You can also use this to do multiple uses with the joystick, for example to have button 1 drive the robot while to have button 2 move the camera, you can get the different values you want (don't want to move the camera as quickly or as far as the robot) by using setSpeed before doing getAdjusted since setSpeed is fast and won't take any time.

4.62.2 Constructor & Destructor Documentation

4.62.2.1 ArJoyHandler::ArJoyHandler (bool *useOSCal* = true, bool *useOld* = false)

Constructor.

Parameters:

useOSCal if this is set then the joystick will just rely on the OS to calibrate, otherwise it will keep track of center min and max and use those values for calibration

useOld use the old linux interface to the joystick

4.62.3 Member Function Documentation

4.62.3.1 void ArJoyHandler::endCal (void)

Ends the calibration process.

Ends the calibration, which also sets the center to where the joystick is when the function is called... the center is never reset except in this function, whereas the min and maxes are constantly checked

See also:

startCal (p. 219)

4.62.3.2 void ArJoyHandler::getAdjusted (int ∗ *x*, int ∗ *y*, int ∗ *z* = NULL)

Gets the adjusted reading, as integers, based on the setSpeed.

if useOSCal is true then this returns the readings as calibrated from the OS. If useOSCal is false this finds the percentage of the distance between center and max (or min) then takes this percentage and multiplies it by the speeds given the class, and returns the values computed from this.

Parameters:

x pointer to an integer in which to store the x value, which is between - x given in set speeds and x given in set speeds

y pointer to an integer in which to store the y value, which is between - y given in set speeds and y given in set speeds

4.62.3.3 double ArJoyHandler::getAxis (unsigned int *axis*)

Gets the floating (-1 to 1) location of the given joystick axis.

Parameters:

axis axis to get the value of axes are 1 through **getNumAxes**() (p. 218)

Returns:

true if the button is pressed, false otherwise

4.62.3.4 bool ArJoyHandler::getButton (unsigned int *button*)

Gets the button.

Parameters:

button button to test for pressed, buttons are 1 through **getNumButtons**() (p. 218)

Returns:

true if the button is pressed, false otherwise

4.62.3.5 void ArJoyHandler::getDoubles (double ∗ *x*, double ∗ *y*, double ∗ *z* = NULL)

Gets the adjusted reading, as floats, between -1.0 and 1.0.

If useOSCal is true then this returns the readings as calibrated from the OS. If useOSCal is false this finds the percentage of the distance between center and max (or min) then takes this percentage and multiplies it by the speeds given the class, and returns the values computed from this.

Parameters:

x pointer to a double in which to store the x value, this value is a value between -1.0 and 1.0, for where the stick is on that axis

y pointer to a double in which to store the y value, this value is a value between -1.0 and 1.0, for where the stick is on that axis

4.62.3.6 unsigned int ArJoyHandler::getNumAxes (void)

Gets the number of axes the joystick has.

Returns:

the number of axes (1 through this number)

4.62.3.7 unsigned int ArJoyHandler::getNumButtons (void)

Gets the number of buttons the joystick has.

Returns:

the number of buttons (1 through this number)

4.62.3.8 void ArJoyHandler::getUnfiltered (int ∗ *x*, int ∗ *y*, int ∗ *z* = NULL)

Gets the unfilitered reading, mostly for internal use, maybe useful for Calibration.

This returns the raw value from the joystick... with X and Y varying between -128 and poseitive 128... this shouldn't be used except in calibration since it'll give very strange readings. For example its not uncommon for a joystick to move 10 to the right but 50 or 100 to the left, so if you aren't adjusting for this you get a robot (or whatever) that goes left really fast, but will hardly go right, hence you should use getAdjusted exclusively except for display in calibration.

Parameters:

x pointer to an integer in which to store x value

y pointer to an integer in which to store y value

4.62.3.9 bool ArJoyHandler::getUseOSCal (void)

Gets whether to just use OS calibration or not.

Returns:

if useOSCal is set then the joystick will just rely on the OS to calibrate, otherwise it will keep track of center min and max and use those values for calibration

4.62.3.10 void ArJoyHandler::setUseOSCal (bool *useOSCal*)

Sets whether to just use OS calibration or not.

Parameters:

useOSCal if this is set then the joystick will just rely on the OS to calibrate, otherwise it will keep track of center min and max and use those values for calibration

4.62.3.11 void ArJoyHandler::startCal (void)

Starts the calibration process.

Starts the calibration, which resets all the min and max variables as well as the center variables.

See also:

endCal (p. 216)

The documentation for this class was generated from the following files:

- ArJoyHandler.h
- ArJoyHandler.cpp
- ArJoyHandler_LIN.cpp
- ArJoyHandler_WIN.cpp

4.63 ArKeyHandler Class Reference

This class will read input from the keyboard.

`#include <ArKeyHandler.h>`

Public Types

- enum **KEY** { **UP** = 256, **DOWN**, **LEFT**, **RIGHT**, **ESCAPE**, **SPACE**, **TAB**, **ENTER**, **BACKSPACE**, **F1**, **F2**, **F3**, **F4** }

  These are enums for the non-ascii keys.

Public Methods

- **ArKeyHandler** (bool blocking=false)

  Constructor.

- ~**ArKeyHandler** ()

  Destructor.

- bool **addKeyHandler** (int keyToHandle, **ArFunctor** *functor)

  This adds a keyhandler, when the keyToHandle is hit, functor will fire.

- bool **remKeyHandler** (int keyToHandler)

  This removes a key handler, by key.

- bool **remKeyHandler** (**ArFunctor** *functor)

  This removes a key handler, by key.

- void **restore** (void)

  Sets stdin back to its original settings, if its been restored it won't read anymore.

- void **checkKeys** (void)

  intnernal, use addKeyHandler, Checks for keys and handles them.

- int **getKey** (void)

  internal, use addKeyHandler instead... Gets a key from the stdin if ones available, -1 if there aren't any available.

4.63.1 Detailed Description

This class will read input from the keyboard.

This class is for handling input from the keyboard, you just addKeyHandler the keys you want to deal with.

You should also register the keyhandler with **Aria::setKeyHandler** (p. 206), and before you create a key handler you should see if one is already there with **Aria::getKeyHandler** (p. 206).

You can attach a key handler to a robot with **ArRobot::attachKeyHandler** (p. 377) which will put a task into the robots list of tasks so that it'll get checked every cycle or you can just call checkKeys yourself (like in its own thread or in the main thread). You should only attach a key handler to one robot, even if you're using multiple robots.

4.63.2 Member Enumeration Documentation

4.63.2.1 enum ArKeyHandler::KEY

These are enums for the non-ascii keys.

Enumeration values:

- **UP** Up arrow (keypad or 4 key dirs).
- **DOWN** Down arrow (keypad or 4 key dirs).
- **LEFT** Left arrow (keypad or 4 key dirs).
- **RIGHT** Right arrow (keypad or 4 key dirs).
- **ESCAPE** Escape key.
- **SPACE** Space key.
- **TAB** Tab key.
- **ENTER** Enter key.
- **BACKSPACE** Backspace key.
- **F1** F1.
- **F2** F2.
- **F3** F3.
- **F4** F4.

4.63.3 Constructor & Destructor Documentation

4.63.3.1 ArKeyHandler::ArKeyHandler (bool *blocking* = false)

Constructor.

Parameters:

blocking whether or not to block waiting on keys, default is false, ie not to wait... you probably only want to block if you are using checkKeys yourself like after you start a robot run or in its own thread or something along those lines

4.63.4 Member Function Documentation

4.63.4.1 bool ArKeyHandler::addKeyHandler (int *keyToHandle*, ArFunctor ∗ *functor*)

This adds a keyhandler, when the keyToHandle is hit, functor will fire.

Parameters:

keyToHandle this is an ascii character, such as 'a' or '1' or '[', or a member of the KEY enum.

functor a functor to call when the given key is pressed

Returns:

true if the addKeyHandler succeeded, which means that the key added was unique and it will be handled... false means that the add failed, because there was already a keyHandler in place for that key

4.63.4.2 bool ArKeyHandler::remKeyHandler (ArFunctor ∗ *functor*)

This removes a key handler, by key.

Parameters:

keyToHandle the functor to remove

Returns:

true if the remKeyHandler succeeded, which means that the key wad found and rmeoved... false means that the remove failed because there was no key for that

4.63.4.3 bool ArKeyHandler::remKeyHandler (int *keyToHandle*)

This removes a key handler, by key.

Parameters:

keyToHandle this is an ascii character, such as 'a' or '1' or '[', or a member of the KEY enum.

Returns:

true if the remKeyHandler succeeded, which means that the key wad found and rmeoved... false means that the remove failed because there was no key for that

The documentation for this class was generated from the following files:

- ArKeyHandler.h
- ArKeyHandler.cpp

4.64 ArLine Class Reference

This is the class for a line to do some geometric manipulation.

`#include <ariaUtil.h>`

Public Methods

- **ArLine** (double a, double b, double c)

  Constructor with parameters.

- **ArLine** (double x1, double y1, double x2, double y2)

  Constructor with endpoints.

- virtual ∼**ArLine** ()

  Destructor.

- void **newParameters** (double a, double b, double c)

  Sets the line parameters (make it not a segment).

- void **newParametersFromEndpoints** (double x1, double y1, double x2, double y2)

  Sets the line parameters from endpoints, but makes it not a segment.

- const double **getA** (void) const

  Gets the A line parameter.

- const double **getB** (void) const

  Gets the B line parameter.

- const double **getC** (void) const

  Gets the C line parameter.

- bool **intersects** (const ArLine ∗line, **ArPose** ∗pose)

  finds the intersection of this line with another line.

- void **makeLinePerp** (const **ArPose** ∗pose, ArLine ∗line)

  Makes the given line perpendicular to this one though the given pose.

4.64.1 Detailed Description

This is the class for a line to do some geometric manipulation.

Note this the theoretical line, ie it goes infinitely, if you want what most people think of as a line (ie with endpoints) use **ArLineSegment** (p. 226)

4.64.2 Member Function Documentation

4.64.2.1 bool ArLine::intersects (const ArLine ∗ *line*, ArPose ∗ *pose*) `[inline]`

finds the intersection of this line with another line.

Parameters:

line the line to check if it intersects with this line

pose if the lines intersect, the pose is set to the location

Returns:

true if they intersect, false if they do not

The documentation for this class was generated from the following file:

- ariaUtil.h

4.65 ArLineSegment Class Reference

This is the class for a line segment to do some geometric manipulation.

`#include <ariaUtil.h>`

Public Methods

- **ArLineSegment** (double x1, double y1, double x2, double y2)
  Constructor with endpoints.
- virtual ~**ArLineSegment** ()
  Destructor.
- void **newEndPoints** (double x1, double y1, double x2, double y2)
  Gives the line some new end points (makes it a segment).
- bool **intersects** (const **ArLine** *line, **ArPose** *pose)
  Sees if a line intersects with this segment.
- bool **intersects** (ArLineSegment *line, **ArPose** *pose)
  Sees if a line segment intersects with this segment.
- bool **getPerpPoint** (**ArPose** pose, **ArPose** *perpPoint)
  Gets the point at which the given pose is perpindicular to the line.
- bool **getPerpPoint** (const **ArPose** *pose, **ArPose** *perpPoint)
  Gets the point at which the given pose is perpindicular to the line.
- const double **getX1** (void) const
  Gets the x coordinate of the first endpoint (only use on segments).
- const double **getY1** (void) const
  Gets the y coordinate of the first endpoint (only use on segments).
- const double **getX2** (void) const
  Gets the x coordinate of the second endpoint (only use on segments).
- const double **getY2** (void) const
  Gets the y coordinate of the second endpoint (only use on segments).
- const double **getA** (void) const
  Gets the A line parameter.

- const double **getB** (void) const
  Gets the B line parameter.
- const double **getC** (void) const
  Gets the C line parameter.
- const bool **linePointIsInSegment** (**ArPose** *pose) const
  Internal function for seeing if a point on our line is within our segment.

Protected Attributes

- double **myX1**
  Internal function to set the parameters of the line from endpoitns.
- double **myY1**
  Internal function to set the parameters of the line from endpoitns.
- double **myX2**
  Internal function to set the parameters of the line from endpoitns.
- double **myY2**
  Internal function to set the parameters of the line from endpoitns.

4.65.1 Detailed Description

This is the class for a line segment to do some geometric manipulation.

4.65.2 Member Function Documentation

4.65.2.1 bool ArLineSegment::getPerpPoint (const ArPose * *pose*, ArPose * *perpPoint*) `[inline]`

Gets the point at which the given pose is perpindicular to the line.

This is just a faster version for certain critical spots than the above one... use the above one if you can... If the point is beyond either segment end this will return false

Parameters:

pose the pointer of the pose to find the perp point of

pose the pointer of the pose to set to the found point

Returns:

true if the pose is within the bounds of the line segment

4.65.2.2 bool ArLineSegment::getPerpPoint (ArPose *pose*, ArPose * *perpPoint*) [inline]

Gets the point at which the given pose is perpindicular to the line.

If the point is beyond either segment end this will return false

Parameters:

pose the pointer of the pose to find the perp point of

pose the pointer of the pose to set to the found point

Returns:

true if the pose is within the bounds of the line segment

4.65.2.3 bool ArLineSegment::intersects (ArLineSegment * *line*, ArPose * *pose*) [inline]

Sees if a line segment intersects with this segment.

Parameters:

line the line segment to check if it intersects with this line

pose if the lines intersect, the pose is set to the location

Returns:

true if they intersect, false if they do not

4.65.2.4 bool ArLineSegment::intersects (const ArLine * *line*, ArPose * *pose*) [inline]

Sees if a line intersects with this segment.

Parameters:

line the line to check if it intersects with this line

pose if the lines intersect, the pose is set to the location

Returns:

true if they intersect, false if they do not

The documentation for this class was generated from the following file:

- ariaUtil.h

4.66 ArListPos Class Reference

has enum for position in list.

`#include <ariaTypedefs.h>`

Public Types

- enum **Pos** { **FIRST** = 1, **LAST** = 2 }

4.66.1 Detailed Description

has enum for position in list.

4.66.2 Member Enumeration Documentation

4.66.2.1 enum ArListPos::Pos

Enumeration values:

FIRST place item first in the list.

LAST place item last in the list.

The documentation for this class was generated from the following file:

- ariaTypedefs.h

4.67 ArLog Class Reference

Logging utility class.

`#include <ArLog.h>`

Public Types

- enum **LogType** { **StdOut**, **StdErr**, **File**, **Colbert**, **None** }
- enum **LogLevel** { **Terse**, **Normal**, **Verbose** }

Static Public Methods

- void **log** (**LogLevel** level, char ∗str,...)

  Log a message.

- void **logPlain** (**LogLevel** level, char ∗str)

  Log a message without varargs (wrapper for java) Log a message.

- bool **init** (**LogType** type, **LogLevel** level, const char ∗fileName="")

  Initialize the logging utility.

- void **close** ()

  Close the logging utility.

4.67.1 Detailed Description

Logging utility class.

ArLog is a utility class to log all messages from **Aria** (p. 205) to a choosen destintation. Messages can be logged to stdout, stderr, a file, and turned off completely. Logging by default is set to stdout. The level of logging can be changed as well. Allowed levels are Terse, Normal, and Verbose. By default the level is set to Normal.

4.67.2 Member Enumeration Documentation

4.67.2.1 enum ArLog::LogLevel

Enumeration values:

Terse Use terse logging.

Normal Use normal logging.

Verbose Use verbose logging.

4.67.2.2 enum ArLog::LogType

Enumeration values:

StdOut Use stdout for logging.

StdErr Use stderr for logging.

File Use a file for logging.

Colbert Use a Colbert stream for logging.

None Disable logging.

4.67.3 Member Function Documentation

4.67.3.1 bool ArLog::init (LogType *type*, LogLevel *level*, const char * *fileName* = "") `[static]`

Initialize the logging utility.

Initialize the logging utility by supplying the type of logging and the level of logging. If the type is File, the fileName needs to be supplied.

Parameters:

type type of Logging

level level of logging

fileName the name of the file for File type of logging

4.67.3.2 void ArLog::log (LogLevel *level*, char * *str*, ...) `[static]`

Log a message.

This function is used like printf(). If the supplied level is less than or equal to the set level, it will be printed.

Parameters:

level level of logging

str printf() like formating string

The documentation for this class was generated from the following files:

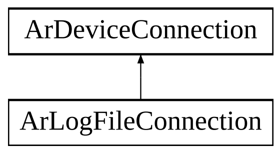
- ArLog.h
- ArLog.cpp

4.68 ArLogFileConnection Class Reference

For connecting through a log file.

```
#include <ArLogFileConnection.h>
```

Inheritance diagram for ArLogFileConnection::



Public Types

- enum **Open** { **OPEN_FILE_NOT_FOUND** = 1, **OPEN_NOT_A_LOG_FILE** }

Public Methods

- **ArLogFileConnection** ()

  Constructor.

- virtual ~**ArLogFileConnection** ()

  Destructor also closes connection.

- int **open** (const char ∗fname=NULL)

  Opens a connection to the given host and port.

- virtual bool **openSimple** (void)

  Opens the connection again, using the values from setLocation or.

- virtual int **getStatus** (void)

  Gets the status of the connection, which is one of the enum status.

- virtual bool **close** (void)

  Closes the connection.

- virtual int **read** (const char ∗data, unsigned int size, unsigned int msWait=0)

  Reads data from connection.

- virtual int **write** (const char ∗data, unsigned int size)
  Writes data to connection.
- virtual const char ∗ **getOpenMessage** (int messageNumber)
  Gets the string of the message associated with opening the device.
- virtual **ArTime getTimeRead** (int index)
  Gets the time data was read in.
- virtual bool **isTimeStamping** (void)
  sees if timestamping is really going on or not.
- const char ∗ **getLogFile** (void)
  Gets the name of the host connected to.
- int **internalOpen** (void)
  Internal function used by open and openSimple.

4.68.1 Detailed Description

For connecting through a log file.

4.68.2 Member Enumeration Documentation

4.68.2.1 enum ArLogFileConnection::Open

Enumeration values:
OPEN_FILE_NOT_FOUND Can't find the file.
OPEN_NOT_A_LOG_FILE Doesn't look like a log file.

4.68.3 Member Function Documentation

4.68.3.1 bool ArLogFileConnection::close (void) `[virtual]`

Closes the connection.

Returns:
whether the close succeeded or not

Reimplemented from **ArDeviceConnection** (p. 126).

4.68.3.2 const char * ArLogFileConnection::getLogFile (void)

Gets the name of the host connected to.

Returns:
the name of the log file

4.68.3.3 const char * ArLogFileConnection::getOpenMessage (int *messageNumber*) [virtual]

Gets the string of the message associated with opening the device.

Each class inherited from this one has an open method which returns 0 for success or an integer which can be passed into this function to obtain a string describing the reason for failure

Parameters:
messageNumber the number returned from the open

Returns:
the error description associated with the messageNumber

Reimplemented from **ArDeviceConnection** (p. 126).

4.68.3.4 int ArLogFileConnection::getStatus (void) [virtual]

Gets the status of the connection, which is one of the enum status.

Gets the status of the connection, which is one of the enum status. If you want to get a string to go along with the number, use getStatusMessage

Returns:
the status of the connection

See also:
getStatusMessage (p. 127)

Reimplemented from **ArDeviceConnection** (p. 126).

4.68.3.5 ArTime ArLogFileConnection::getTimeRead (int *index*) [virtual]

Gets the time data was read in.

Parameters:

index looks like this is the index back in the number of bytes last read in

Returns:

the time the last read data was read in

Reimplemented from **ArDeviceConnection** (p. 127).

4.68.3.6 bool ArLogFileConnection::isTimeStamping (void) [virtual]

sees if timestamping is really going on or not.

Returns:

true if real timestamping is happening, false otherwise

Reimplemented from **ArDeviceConnection** (p. 127).

4.68.3.7 int ArLogFileConnection::open (const char ∗ *fname* = NULL)

Opens a connection to the given host and port.

Parameters:

fname the file to connect to, if NULL (default) then robot.log

Returns:

0 for success, otherwise one of the open enums

See also:

getOpenMessage (p. 235)

4.68.3.8 int ArLogFileConnection::read (const char ∗ *data*, unsigned int *size*, unsigned int *msWait* = 0) [virtual]

Reads data from connection.

Reads data from connection

Parameters:

data pointer to a character array to read the data into

size maximum number of bytes to read

msWait read blocks for this many milliseconds (not at all for < 0)

Returns:
number of bytes read, or -1 for failure

See also:
write (p. 237), **writePacket** (p. 129)

Reimplemented from **ArDeviceConnection** (p. 128).

4.68.3.9 int ArLogFileConnection::write (const char * *data*, unsigned int *size*) `[virtual]`

Writes data to connection.

Writes data to connection

Parameters:
data pointer to a character array to write the data from

size number of bytes to write

Returns:
number of bytes read, or -1 for failure

See also:
read (p. 236), **writePacket** (p. 129)

Reimplemented from **ArDeviceConnection** (p. 128).

The documentation for this class was generated from the following files:

- ArLogFileConnection.h
- ArLogFileConnection.cpp

4.69 ArMath Class Reference

This class has static members to do common math operations.

`#include <ariaUtil.h>`

Static Public Methods

- double **addAngle** (double ang1, double ang2)

  This adds two angles together and fixes the result to [-180, 180].

- double **subAngle** (double ang1, double ang2)

  This subtracts one angle from another and fixes the result to [-180,180].

- double **fixAngle** (double angle)

  Takes an angle and returns the angle in range (-180,180].

- double **degToRad** (double deg)

  Converts an angle in degrees to an angle in radians.

- double **radToDeg** (double rad)

  Converts an angle in radians to an angle in degrees.

- double **cos** (double angle)

  Finds the cos, from angles in degrees.

- double **sin** (double angle)

  Finds the sin, from angles in degrees.

- double **atan2** (double y, double x)

  Finds the arctan of the given y/x pair.

- bool **angleBetween** (double angle, double startAngle, double endAngle)

  Finds if one angle is between two other angles.

- double **fabs** (double val)

  Finds the absolute value of a double.

- int **roundInt** (double val)

  Finds the closest integer to double given.

- void **pointRotate** (double ∗x, double ∗y, double th)

  Rotates a point around 0 by degrees given.

- long **random** (void)

  Returns a long between 0 and some arbitrary huge number.

- double **distanceBetween** (double x1, double y1, double x2, double y2)

  Finds the distance between two coordinates.

- double **squaredDistanceBetween** (double x1, double y1, double x2, double y2)

  Finds the squared distance between two coordinates.

4.69.1 Detailed Description

This class has static members to do common math operations.

4.69.2 Member Function Documentation

4.69.2.1 double ArMath::addAngle (double *ang1*, double *ang2*) `[inline, static]`

This adds two angles together and fixes the result to [-180, 180].

Parameters:

ang1 first angle

ang2 second angle, added to first

Returns:

sum of the angles, in range [-180,180]

See also:

subAngle (p. 242) , **fixAngle** (p. 241)

4.69.2.2 double ArMath::atan2 (double *y*, double *x*) `[inline, static]`

Finds the arctan of the given y/x pair.

Parameters:

y the y distance

x the x distance

Returns:
the angle y and x form

4.69.2.3 double ArMath::cos (double *angle*) `[inline, static]`

Finds the cos, from angles in degrees.

Parameters:
angle angle to find the cos of, in degrees

Returns:
the cos of the angle

See also:
sin (p. 242)

4.69.2.4 double ArMath::degToRad (double *deg*) `[inline, static]`

Converts an angle in degrees to an angle in radians.

Parameters:
deg the angle in degrees

Returns:
the angle in radians

See also:
radToDeg (p. 241)

4.69.2.5 double ArMath::distanceBetween (double *x1*, double *y1*, double *x2*, double *y2*) `[inline, static]`

Finds the distance between two coordinates.

Parameters:
x1 the first coords x position
y1 the first coords y position
x2 the second coords x position
y2 the second coords y position

Returns:
the distance between (x1, y1) and (x2, y2)

4.69.2.6 double ArMath::fabs (double *val*) `[inline, static]`

Finds the absolute value of a double.

Parameters:
val the number to find the absolute value of

Returns:
the absolute value of the number

4.69.2.7 double ArMath::fixAngle (double *angle*) `[inline, static]`

Takes an angle and returns the angle in range (-180,180].

Parameters:
angle the angle to fix

Returns:
the angle in range (-180,180]

See also:
addAngle (p. 239) , **subAngle** (p. 242)

4.69.2.8 double ArMath::radToDeg (double *rad*) `[inline, static]`

Converts an angle in radians to an angle in degrees.

Parameters:
rad the angle in radians

Returns:
the angle in degrees

See also:
degToRad (p. 240)

4.69.2.9 int ArMath::roundInt (double *val*) `[inline, static]`

Finds the closest integer to double given.

Parameters:
val the double to find the nearest integer to

Returns:
the integer the value is nearest to

4.69.2.10 double ArMath::sin (double *angle*) [inline, static]

Finds the sin, from angles in degrees.

Parameters:

angle angle to find the sin of, in degrees

Returns:

the sin of the angle

See also:

cos (p. 240)

4.69.2.11 double ArMath::squaredDistanceBetween (double *x1*, double *y1*, double *x2*, double *y2*) [inline, static]

Finds the squared distance between two coordinates.

use this only where speed really matters

Parameters:

x1 the first coords x position

y1 the first coords y position

x2 the second coords x position

y2 the second coords y position

Returns:

the distance between (x1, y1) and (x2, y2)

4.69.2.12 double ArMath::subAngle (double *ang1*, double *ang2*) [inline, static]

This subtracts one angle from another and fixes the result to [-180,180].

Parameters:

ang1 first angle

ang2 second angle, subtracted from first angle

Returns:

resulting angle, in range [-180,180]

See also:
addAngle (p. 239) , **fixAngle** (p. 241)

The documentation for this class was generated from the following file:

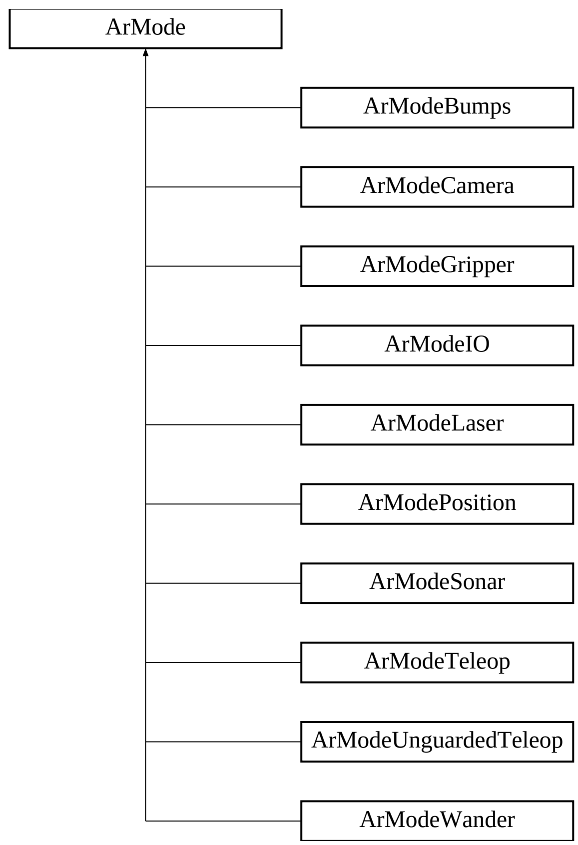
- ariaUtil.h

4.70 ArMode Class Reference

A class for different modes, mostly as related to keyboard input.

`#include <ArMode.h>`

Inheritance diagram for ArMode::



Public Methods

- **ArMode** (**ArRobot** ∗robot, const char ∗name, char key, char key2)

  Constructor.

- virtual ∼**ArMode** ()

  Destructor.

- const char ∗ **getName** (void)

Gets the name of the mode.

- virtual void **activate** (void)=0

  The function called when the mode is activated, subclass must provide.

- virtual void **deactivate** (void)=0

  The function called when the mode is deactivated, subclass must provide.

- virtual void **userTask** (void)

  The ArMode's user task, don't need one, subclass must provide if needed.

- virtual void **help** (void)

  The mode's help print out... subclass must provide if needed.

- bool **baseActivate** (void)

  The base activation, it MUST be called by inheriting classes, and inheriting classes MUST return if this returns false.

- bool **baseDeactivate** (void)

  The base deactivation, it MUST be called by inheriting classes, and inheriting classes MUST return if this returns false.

- char **getKey** (void)

  An internal function to get the first key this is bound to.

- char **getKey2** (void)

  An internal function to get the second key this is bound to.

Static Public Methods

- void **baseHelp** (void)

  This is the base help function, its internal, bound to ? and h and H.

4.70.1 Detailed Description

A class for different modes, mostly as related to keyboard input.

Each mode is going to need to add its keys to the keyHandler... each mode should only use the keys 1-0, the arrow keys (movement), the space bar (stop), z (zoom in), x (zoom out), and e (exercise)... then when its activate is called by that key handler it needs to first deactivate the ourActiveMode (if its not itself, in which case its done) then add its key handling stuff... activate and deactivate will need to add and remove their user tasks (or call the base class activate/deactivate to do it) as well as the key handling things for their other part of modes. This mode will ALWAYS bind help to /, ?, h, and H when the first instance of an ArMode is made.

4.70.2 Constructor & Destructor Documentation

4.70.2.1 ArMode::ArMode (ArRobot * *robot*, const char * *name*, char *key*, char *key2*)

Constructor.

Parameters:

robot the robot we're attaching to

name the name of this mode

key the first key to switch to this mode on... it can be '\0' if you don't want to use this

key the first key to switch to this mode on... it can be '\0' if you don't want to use this

4.70.3 Member Function Documentation

4.70.3.1 bool ArMode::baseActivate (void)

The base activation, it MUST be called by inheriting classes, and inheriting classes MUST return if this returns false.

Inheriting modes must first call this to get their user task called and to deactivate the active mode.... if it returns false then the inheriting class must return, as it means that his mode is already active

4.70.3.2 bool ArMode::baseDeactivate (void)

The base deactivation, it MUST be called by inheriting classes, and inheriting classes MUST return if this returns false.

This gets called when the mode is deactivated, it removes the user task from the robot

4.70.3.3 virtual void ArMode::help (void) `[inline, virtual]`

The mode's help print out... subclass must provide if needed.

This is called as soon as a mode is activated, and should give directions on to what keys do what and what this mode will do

Reimplemented in **ArModeTeleop** (p. 254), **ArModeUnguardedTeleop** (p. 256), **ArModeWander** (p. 258), **ArModeGripper** (p. 251), **ArModeCamera** (p. 249), and **ArModeSonar** (p. 253).

The documentation for this class was generated from the following files:

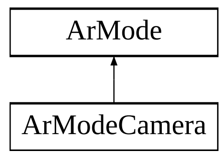
- ArMode.h
- ArMode.cpp

4.71 ArModeCamera Class Reference

Mode for controlling the gripper.

#include <ArModes.h>

Inheritance diagram for ArModeCamera::



Public Methods

- **ArModeCamera** (**ArRobot** *robot, const char *name, char key, char key2)

  Constructor.

- virtual ~**ArModeCamera** ()

  Destructor.

- virtual void **activate** (void)

  The function called when the mode is activated, subclass must provide.

- virtual void **deactivate** (void)

  The function called when the mode is deactivated, subclass must provide.

- virtual void **userTask** (void)

  The **ArMode** (p. 244)*'s user task, don't need one, subclass must provide if needed.*

- virtual void **help** (void)

  The mode's help print out... subclass must provide if needed.

4.71.1 Detailed Description

Mode for controlling the gripper.

4.71.2 Member Function Documentation

4.71.2.1 void ArModeCamera::help (void) [virtual]

The mode's help print out... subclass must provide if needed.

This is called as soon as a mode is activated, and should give directions on to what keys do what and what this mode will do

Reimplemented from **ArMode** (p. 246).

The documentation for this class was generated from the following files:

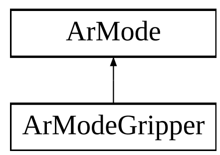
- ArModes.h
- ArModes.cpp

4.72 ArModeGripper Class Reference

Mode for controlling the gripper.

#include <ArModes.h>

Inheritance diagram for ArModeGripper::



Public Methods

- **ArModeGripper** (**ArRobot** ∗robot, const char ∗name, char key, char key2)

  Constructor.

- virtual ∼**ArModeGripper** ()

  Destructor.

- virtual void **activate** (void)

  The function called when the mode is activated, subclass must provide.

- virtual void **deactivate** (void)

  The function called when the mode is deactivated, subclass must provide.

- virtual void **userTask** (void)

  The **ArMode** (p. 244)*'s user task, don't need one, subclass must provide if needed.*

- virtual void **help** (void)

  The mode's help print out... subclass must provide if needed.

4.72.1 Detailed Description

Mode for controlling the gripper.

4.72.2 Member Function Documentation

4.72.2.1 void ArModeGripper::help (void) [virtual]

The mode's help print out... subclass must provide if needed.

This is called as soon as a mode is activated, and should give directions on to what keys do what and what this mode will do

Reimplemented from **ArMode** (p. 246).

The documentation for this class was generated from the following files:

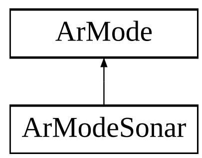
- ArModes.h
- ArModes.cpp

4.73 ArModeSonar Class Reference

Mode for displaying the sonar.

#include <ArModes.h>

Inheritance diagram for ArModeSonar::



Public Methods

- **ArModeSonar** (**ArRobot** ∗robot, const char ∗name, char key, char key2)

  Constructor.

- virtual ∼**ArModeSonar** ()

  Destructor.

- virtual void **activate** (void)

  The function called when the mode is activated, subclass must provide.

- virtual void **deactivate** (void)

  The function called when the mode is deactivated, subclass must provide.

- virtual void **userTask** (void)

  The **ArMode** (p. 244)*'s user task, don't need one, subclass must provide if needed.*

- virtual void **help** (void)

  The mode's help print out... subclass must provide if needed.

4.73.1 Detailed Description

Mode for displaying the sonar.

4.73.2 Member Function Documentation

4.73.2.1 void ArModeSonar::help (void) [virtual]

The mode's help print out... subclass must provide if needed.

This is called as soon as a mode is activated, and should give directions on to what keys do what and what this mode will do

Reimplemented from **ArMode** (p. 246).

The documentation for this class was generated from the following files:

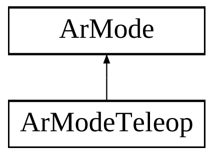
- ArModes.h
- ArModes.cpp

4.74 ArModeTeleop Class Reference

Mode for teleoping the robot with joystick + keyboard.

#include <ArModes.h>

Inheritance diagram for ArModeTeleop::



Public Methods

- **ArModeTeleop** (**ArRobot** ∗robot, const char ∗name, char key, char key2)

  Constructor.

- virtual ∼**ArModeTeleop** ()

  Destructor.

- virtual void **activate** (void)

  The function called when the mode is activated, subclass must provide.

- virtual void **deactivate** (void)

  The function called when the mode is deactivated, subclass must provide.

- virtual void **help** (void)

  The mode's help print out... subclass must provide if needed.

4.74.1 Detailed Description

Mode for teleoping the robot with joystick + keyboard.

4.74.2 Member Function Documentation

4.74.2.1 void ArModeTeleop::help (void) [virtual]

The mode's help print out... subclass must provide if needed.

This is called as soon as a mode is activated, and should give directions on to what keys do what and what this mode will do

Reimplemented from **ArMode** (p. 246).

The documentation for this class was generated from the following files:

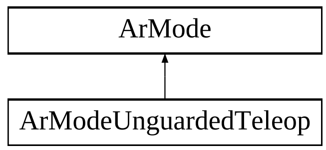
- ArModes.h
- ArModes.cpp

4.75 ArModeUnguardedTeleop Class Reference

Mode for teleoping the robot with joystick + keyboard.

`#include <ArModes.h>`

Inheritance diagram for ArModeUnguardedTeleop::



Public Methods

- **ArModeUnguardedTeleop** (**ArRobot** ∗robot, const char ∗name, char key, char key2)

  Constructor.

- virtual ∼**ArModeUnguardedTeleop** ()

  Destructor.

- virtual void **activate** (void)

  The function called when the mode is activated, subclass must provide.

- virtual void **deactivate** (void)

  The function called when the mode is deactivated, subclass must provide.

- virtual void **help** (void)

  The mode's help print out... subclass must provide if needed.

4.75.1 Detailed Description

Mode for teleoping the robot with joystick + keyboard.

4.75.2 Member Function Documentation

4.75.2.1 void ArModeUnguardedTeleop::help (void) `[virtual]`

The mode's help print out... subclass must provide if needed.

This is called as soon as a mode is activated, and should give directions on to what keys do what and what this mode will do

Reimplemented from **ArMode** (p. 246).

The documentation for this class was generated from the following files:

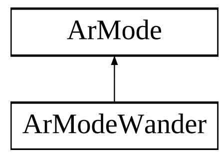
- ArModes.h
- ArModes.cpp

4.76 ArModeWander Class Reference

Mode for wandering around.

#include <ArModes.h>

Inheritance diagram for ArModeWander::



Public Methods

- **ArModeWander** (**ArRobot** ∗robot, const char ∗name, char key, char key2)

  Constructor.

- virtual ∼**ArModeWander** ()

  Destructor.

- virtual void **activate** (void)

  The function called when the mode is activated, subclass must provide.

- virtual void **deactivate** (void)

  The function called when the mode is deactivated, subclass must provide.

- virtual void **help** (void)

  The mode's help print out... subclass must provide if needed.

4.76.1 Detailed Description

Mode for wandering around.

4.76.2 Member Function Documentation

4.76.2.1 void ArModeWander::help (void) [virtual]

The mode's help print out... subclass must provide if needed.

This is called as soon as a mode is activated, and should give directions on to what keys do what and what this mode will do

Reimplemented from **ArMode** (p. 246).

The documentation for this class was generated from the following files:

- ArModes.h
- ArModes.cpp

4.77 ArModule Class Reference

Dynamicly loaded module base class, read warning in more.

`#include <ArModule.h>`

Public Methods

- **ArModule** ()

  Constructor.

- virtual ~**ArModule** ()

  Destructor.

- virtual bool **init** (**ArRobot** *robot, void *argument=NULL)=0

  Initialize the module. The module should use the supplied **ArRobot** (p. 355) *pointer.*

- virtual bool **exit** ()=0

  Close down the module and have it exit.

- **ArRobot** * **getRobot** ()

  Get the **ArRobot** (p. 355) *pointer the module should be using.*

- void **setRobot** (**ArRobot** *robot)

  Set the **ArRobot** (p. 355) *pointer.*

Protected Attributes

- **ArRobot** * **myRobot**

  Stored **ArRobot** (p. 355) *pointer that the module should use.*

4.77.1 Detailed Description

Dynamicly loaded module base class, read warning in more.

Right now only one module's init will be called, that is the first one, its a bug that I just don't have time to fix at the moment. I'll get to it when I have time or if someone needs it... someone else wrote this code so it'll take me a little longer to fix it.

This class defines a dyanicmly loaded module of code. This is usefull for an application to load piece of code that it does not know about. The ArModule defines and interface in which to invoke that piece of code that the program does not know about. For instance, a module could contain an **ArAction** (p. 39) and the modules **init**() (p. 261) could instantiate the **ArAction** (p. 39) and add it to the supplied **ArRobot** (p. 355). The **init**() (p. 261) takes a reference to an **ArRobot** (p. 355). The module should use that robot for its purposes. If the module wants to use more robots, assuming there are multiple robots, it can use **Aria::getRobotList**() (p. 206) to find all the **ArRobot** (p. 355) instantiated. The module should do all its clean up in **exit**() (p. 260).

The user should derive their own class from ArModule and implement the **init**() (p. 261) and **exit**() (p. 260) functions. The users code should always clean up when **exit**() (p. 260) is called. **exit**() (p. 260) is called right before the module (dynamic library .dll/.so) is closed and removed from the program.

The macro ARDEF_MODULE() must be called within the .cpp file of the users module. A global instance of the users module must be defined and a reference to that instance must be passed to ARDEF_MODULE(). This allows the **ArModuleLoader** (p. 263) to find the users module class and invoke it.

One thing to note about the use of code wrapped in ArModules and staticly linking in that code. To be able to staticly link .cpp files which contain an ArModule, the define of ARIA_STATIC should be defined. This will cause the ARDEF_MODULE() to do nothing. If it defined its normal functions and variables, the linker would fail to staticly link in multiple modules since they all have symbols with the same name.

See also **ArModuleLoader** (p. 263) to see how to load an ArModule into a program.

See also the example programs simpleMod.cpp and simpleModule.cpp. For a more complete example, see the example programs joydriveActionMod.cpp and joydriveActionModule.cpp.

4.77.2 Member Function Documentation

4.77.2.1 virtual bool ArModule::init (ArRobot * *robot*, void * *argument* = NULL) `[pure virtual]`

Initialize the module. The module should use the supplied **ArRobot** (p. 355) pointer.

Parameters:

robot Robot this module should attach to, can be NULL for none, so make sure you handle that case

modArgument an optional string argument to the module, this defaults to NULL, you'll need to cast this to whatever you want it to be... you'll want to document this clearly with the module

The documentation for this class was generated from the following files:

- ArModule.h
- ArModule.cpp

4.78 ArModuleLoader Class Reference

Dynamic **ArModule** (p. 260) loader.

`#include <ArModuleLoader.h>`

Public Types

- enum **Status** { **STATUS_SUCCESS** = 0, **STATUS_ALREADY_LOADED**, **STATUS_FAILED_OPEN**, **STATUS_INVALID**, **STATUS_INIT_FAILED**, **STATUS_EXIT_FAILED**, **STATUS_NOT_FOUND** }

Static Public Methods

- **Status load** (const char ∗modName, **ArRobot** ∗robot, void ∗modArgument=NULL, bool quiet=false)

  Load an **ArModule** (p. 260).

- **Status reload** (const char ∗modName, **ArRobot** ∗robot, void ∗modArgument=NULL, bool quiet=false)

  Close and then reload an **ArModule** (p. 260).

- **Status close** (const char ∗modName, bool quiet=false)

  Close an **ArModule** (p. 260).

- void **closeAll** ()

  Close all open **ArModule** (p. 260).

4.78.1 Detailed Description

Dynamic **ArModule** (p. 260) loader.

The ArModuleLoader is used to load ArModules into a program and invoke them.

See also **ArModule** (p. 260) to see how to define an **ArModule** (p. 260).

See also the example programs simpleMod.cpp and simpleModule.cpp. For a more complete example, see the example programs joydriveActionMod.cpp and joydriveActionModule.cpp.

4.78.2 Member Enumeration Documentation

4.78.2.1 enum ArModuleLoader::Status

Enumeration values:

- **STATUS_SUCCESS** Load succeded.
- **STATUS_ALREADY_LOADED** Module already loaded.
- **STATUS_FAILED_OPEN** Could not find or open the module.
- **STATUS_INVALID** Invalid module file format.
- **STATUS_INIT_FAILED** The module failed its init stage.
- **STATUS_EXIT_FAILED** The module failed its exit stage.
- **STATUS_NOT_FOUND** The module was not found.

4.78.3 Member Function Documentation

4.78.3.1 ArModuleLoader::Status ArModuleLoader::close (const char * *modName*, bool *quiet* = false) `[static]`

Close an **ArModule** (p. 260).

Calls **ArModule::exit**() (p. 260) on the module, then closes the library.

Parameters:

- ***modName*** filename of the module without the extension (.dll or .so)
- ***quiet*** whether to print out a message if this fails or not, defaults to false

4.78.3.2 ArModuleLoader::Status ArModuleLoader::load (const char * *modName*, ArRobot * *robot*, void * *modArgument* = NULL, bool *quiet* = false) `[static]`

Load an **ArModule** (p. 260).

THIS ONLY LOADS one init on the module right now, if its called again it'll load the same init over. I'll fix it later... read the more verbose description in ArModule.h.

Takes a string name of the module which is just the file name of the module without the extension (.dll or .so). It will figure out the correct extension based on wheter its a Linux or Windows build. It will also uses the standard operating systems ability to find the library. So the library must be located within the PATH variable for Windows and the LD_LIBRARY_PATH for Linux. You can also just give the absolute path to the library, or the relative path from the directory the program was started in (ie ./simpleMod). The **ArModule**

(p. 260) will be passed the **ArRobot** (p. 355) reference that **load**() (p. 264) takes. This is the **ArRobot** (p. 355) that the **ArModule** (p. 260) will use for its processing.

Parameters:

modName filename of the module without the extension (.dll or .so)

robot **ArRobot** (p. 355) reference which the module is to use, this can be NULL

modArgument A void pointer argument to pass to the module, if its a const value you'll need to cast it to a non-const value to get it to work (for example if you were using a constant string). This value defaults to NULL.

quiet whether to print out a message if this fails or not, defaults to false

4.78.3.3 ArModuleLoader::Status ArModuleLoader::reload (const char ∗ *modName*, ArRobot ∗ *robot*, void ∗ *modArgument* = NULL, bool *quiet* = false) `[static]`

Close and then reload an **ArModule** (p. 260).

reload() (p. 265) is similiar to **load**() (p. 264), except that it will call **close**() (p. 264) on the module and then call **load**() (p. 264).

Parameters:

modName filename of the module without the extension (.dll or .so)

The documentation for this class was generated from the following files:

- ArModuleLoader.h
- ArModuleLoader.cpp

4.79 ArMutex Class Reference

Mutex wrapper class.

`#include <ArMutex.h>`

Public Types

- enum **Status** { **STATUS_FAILED_INIT** = 1, **STATUS_FAILED**, **STATUS_ALREADY_LOCKED** }

Public Methods

- **ArMutex** ()
  Constructor.
- virtual ~**ArMutex** ()
  Destructor.
- virtual int **lock** ()
  Lock the mutex.
- virtual int **tryLock** ()
  Try to lock the mutex, but do not block.
- virtual int **unlock** ()
  Unlock the mutex, allowing another thread to obtain the lock.
- virtual const char * **getError** (int messageNumber) const
  Get a human readable error message from an error code.
- virtual MutexType & **getMutex** ()
  Get a reference to the underlying mutex variable.

4.79.1 Detailed Description

Mutex wrapper class.

This class wraps the operating systems mutex functions. It allows mutualy exclusive access to a critical section. This is extremely usefull for multiple threads which want to use the same variable. ArMutex simply uses the POSIX pthread interface in an object oriented manner. It also applies the same concept to Windows using Windows own abilities to restrict access to critical sections.

4.79.2 Member Enumeration Documentation

4.79.2.1 enum ArMutex::Status

Enumeration values:

- **STATUS_FAILED_INIT** Failed to initialize.
- **STATUS_FAILED** General failure.
- **STATUS_ALREADY_LOCKED** Mutex already locked.

4.79.3 Member Function Documentation

4.79.3.1 int ArMutex::lock () `[virtual]`

Lock the mutex.

Lock the mutex. This function will block until no other thread has this mutex locked. If it returns 0, then it obtained the lock and the thread is free to use the critical section that this mutex protects. Else it returns an error code. See **getError**() (p. 266).

4.79.3.2 int ArMutex::tryLock () `[virtual]`

Try to lock the mutex, but do not block.

Try to lock the mutex. This function will not block if another thread has the mutex locked. It will return instantly if that is the case. It will return STATUS_ALREADY_LOCKED if another thread has the mutex locked. If it obtains the lock, it will return 0.

The documentation for this class was generated from the following files:

- ArMutex.h
- ArMutex_LIN.cpp
- ArMutex_WIN.cpp

4.80 ArNetServer Class Reference

Class for running a simple net server to send/recv commands via text.

`#include <ArNetServer.h>`

Public Methods

- **ArNetServer** ()

  Constructor.

- ~**ArNetServer** ()

  Destructor.

- bool **open** (**ArRobot** ∗robot, unsigned int port, const char ∗password, bool multipleClients)

  Initializes the server.

- void **close** (void)

  Closes the server.

- bool **addCommand** (const char ∗command, **ArFunctor3**< char ∗∗, int, **ArSocket** ∗> ∗functor, const char ∗help)

  Adds a new command.

- bool **remCommand** (const char ∗command)

  Removes a command.

- void **sendToAllClients** (const char ∗str,...)

  Sends the given string to all the clients.

- void **sendToAllClientsPlain** (const char ∗str)

  Sends the given string to all the clients, no varargs, wrapper for java.

- bool **isOpen** (void)

  Sees if the server is running and open.

- void **runOnce** (void)

  the internal sync task we use for our loop.

- void **internalGreeting** (**ArSocket** ∗socket)

  the internal function that gives the greeting message.

- void **internalHelp** (**ArSocket** ∗socket)
  The internal function that does the help.
- void **internalHelp** (char ∗∗argv, int argc, **ArSocket** ∗socket)
  The internal function for the help cb.
- void **internalEcho** (char ∗∗argv, int argc, **ArSocket** ∗socket)
  The internal function for echo.
- void **internalQuit** (char ∗∗argv, int argc, **ArSocket** ∗socket)
  The internal function for closing this connection.
- void **internalShutdown** (char ∗∗argv, int argc, **ArSocket** ∗socket)
  The internal function for shutting down.

4.80.1 Detailed Description

Class for running a simple net server to send/recv commands via text.

This class is for running a simple net server which will have a list of commands to use and a fairly simple set of interactions... Start the server with the open function, add commands with the addCommand function and remove commands with remCommand, and close the server with the close function.

4.80.2 Member Function Documentation

4.80.2.1 bool ArNetServer::addCommand (const char ∗ *command*, ArFunctor3< char ∗∗, int, ArSocket ∗> ∗ *functor*, const char ∗ *help*)

Adds a new command.

This adds a command to the list, when the command is given the broken up argv and argc are given along with the socket it came from (so that acks can occur)

4.80.2.2 bool ArNetServer::open (ArRobot ∗ *robot*, unsigned int *port*, const char ∗ *password*, bool *multipleClients*)

Initializes the server.

Open the server, if you supply a robot this will run in the robots attached, if you do not supply a robot then it will be open and you'll have to call runOnce yourself (this is only recommended for advanced users)

Parameters:

robot the robot that this should be attached to and run in the sync task of or NULL not to run in any robot's task

port the port to start up the service on

password the password needed to use the service

multipleClients if false only one client is allowed to connect, if false multiple clients are allowed to connect or just one

Returns:

true if the server could be started, false otherwise

4.80.2.3 bool ArNetServer::remCommand (const char * *command*)

Removes a command.

Parameters:

command the command to remove

Returns:

true if the command was there to remove, false otherwise

4.80.2.4 void ArNetServer::sendToAllClients (const char * *str*, ...)

Sends the given string to all the clients.

This sends the given string to all the clients, this string cannot be more than 2048 number of bytes

The documentation for this class was generated from the following files:

- ArNetServer.h
- ArNetServer.cpp

4.81 ArNetServerConnection Class Reference

this class holds the information related to specific connections.

`#include <ArNetServer.h>`

Public Methods

- **ArNetServerConnection** ()
  Constructor.
- ∼**ArNetServerConnection** ()
  Destructor.
- **ArSocket** ∗ **getSocket** (void)
  Gets the socket it uses.
- char ∗ **readString** (void)
  Reads in a string if there are any to read.
- void **setEcho** (bool on)
  Sets if we're echoing or not.
- bool **getEcho** (void)
  Gets if we're echoing or not.
- void **doEcho** (void)
  Do the echoing (if needed).

4.81.1 Detailed Description

this class holds the information related to specific connections.

4.81.2 Member Function Documentation

4.81.2.1 char ∗ ArNetServerConnection::readString (void)

Reads in a string if there are any to read.

This reads a single string (terminated with

or \r) in from the socket... it also takes care of echoing back to the client if need be

Returns:

if we can't read from the socket anymore we return NULL if we can read but there's no command we return a string thats of 0 length... otherwise we return a string

The documentation for this class was generated from the following files:

- ArNetServer.h
- ArNetServer.cpp

4.82 ArP2Arm Class Reference

Arm Control class.

`#include <ArP2Arm.h>`

Public Types

- enum **State** { **SUCCESS**, **ALREADY_INITED**, **NOT_INITED**, **ROBOT_NOT_SETUP**, **NO_ARM_FOUND**, **COMM_FAILED**, **COULD_NOT_OPEN_PORT**, **COULD_NOT_SET_UP_PORT**, **ALREADY_CONNECTED**, **NOT_CONNECTED**, **INVALID_-JOINT**, **INVALID_POSITION** }

  General error conditions possible from most of the arm related functions.

- enum **PacketType** { **StatusPacket**, **InfoPacket** }

  Type of arm packet identifiers. Used in **ArP2Arm::setPacketCB***()* (p. 275).

- enum **StatusType** { **StatusOff** = 0, **StatusSingle** = 1, **Status-Continuous** = 2 }

  Type of status packets to request for. Used in **ArP2Arm::requestStatus***()* (p. 283).

Public Methods

- **ArP2Arm** ()

  Constructor.

- virtual ~**ArP2Arm** ()

  Destructor.

- void **setRobot** (**ArRobot** ∗robot)

  Set the robot to use to talk to the arm.

- virtual **State init** ()

  Init the arm class.

- virtual **State uninit** ()

  Uninit the arm class.

- virtual **State powerOn** (bool doWait=true)

Power on the arm.

- virtual **State powerOff** ()

  Power off the arm.

- virtual **State requestInfo** ()

  Request the arm info packet.

- virtual **State requestStatus** (**StatusType** status)

  Request the arm status packet.

- virtual **State requestInit** ()

  Request arm initialization.

- virtual **State checkArm** (bool waitForResponse=true)

  Check to see if the arm is still connected.

- virtual **State home** (int joint=-1)

  Home the arm.

- virtual **State park** ()

  Home the arm and power if off.

- virtual **State moveTo** (int joint, float pos, unsigned char vel=0)

  Move a joint to a position in degrees.

- virtual **State moveToTicks** (int joint, unsigned char pos)

  Move a joint to a position in low level arm controller ticks.

- virtual **State moveStep** (int joint, float pos, unsigned char vel=0)

  Move a joint step degrees.

- virtual **State moveStepTicks** (int joint, signed char pos)

  Move a joint step ticks.

- virtual **State moveVel** (int joint, int vel)

  Set the joint to move at the given velocity.

- virtual **State stop** ()

  Stop the arm.

- virtual **State setAutoParkTimer** (int waitSecs)

Set the auto park timer value.

- virtual **State setGripperParkTimer** (int waitSecs)

  Set the gripper park timer value.

- virtual void **setStoppedCB** (**ArFunctor** ∗func)

  Set the arm stopped callback.

- virtual void **setPacketCB** (**ArFunctor1**< **PacketType** > ∗func)

  set the arm packet callback.

- virtual std::string **getArmVersion** ()

  Get the arm version.

- virtual float **getJointPos** (int joint)

  Get the joints position in degrees.

- virtual unsigned char **getJointPosTicks** (int joint)

  Get the joints position in ticks.

- virtual bool **getMoving** (int joint=-1)

  Check to see if the arm is moving.

- virtual bool **isPowered** ()

  Check to see if the arm is powered.

- virtual bool **isGood** ()

  Check to see if the arm is communicating.

- virtual int **getStatus** ()

  Get the two byts of status info from P2OS.

- virtual **ArTime getLastStatusTime** ()

  Get when the last arm status packet came in.

- virtual **ArRobot** ∗ **getRobot** ()

  Get the robot that the arm is on.

- virtual **P2ArmJoint** ∗ **getJoint** (int joint)

  Get the joints data structure.

- virtual bool **convertDegToTicks** (int joint, float pos, unsigned char ∗ticks)

Converts degrees to low level arm controller ticks.

- virtual bool **convertTicksToDeg** (int joint, unsigned char pos, float *degrees)

  Converts low level arm controller ticks to degrees.

Static Public Attributes

- const int **ArmJoint1** = 0x1

  Bit for joint 1 in arm status byte.

- const int **ArmJoint2** = 0x2

  Bit for joint 2 in arm status byte.

- const int **ArmJoint3** = 0x4

  Bit for joint 3 in arm status byte.

- const int **ArmJoint4** = 0x8

  Bit for joint 4 in arm status byte.

- const int **ArmJoint5** = 0x10

  Bit for joint 5 in arm status byte.

- const int **ArmJoint6** = 0x20

  Bit for joint 6 in arm status byte.

- const int **ArmGood** = 0x100

  Bit for arm good state in arm status byte.

- const int **ArmInited** = 0x200

  Bit for arm initialized in arm status byte.

- const int **ArmPower** = 0x400

  Bit for arm powered on in arm status byte.

- const int **ArmHoming** = 0x800

  Bit for arm homing in arm status byte.

- int **NumJoints** = 6

  Number of joints that the arm has.

4.82.1 Detailed Description

Arm Control class.

ArP2Arm is the interface to the AROS/P2OS-based Pioneer 2 Arm servers. The P2 Arm is attached to the robot's microcontroller via an auxiliary serial port.

To use ArmP2, you must first set up an **ArRobot** (p. 355) and have it connect with the robot. The **ArRobot** (p. 355) needs to be run so that it reads and writes packets to and from server. The easiest way is **ArRobot::runAsync**() (p. 397) which runs the **ArRobot** (p. 355) in its own thread.

Then call **ArP2Arm::setRobot**() (p. 273) with **ArRobot** (p. 355), and finally initialized with ArmP2::init(). Once initialized, use the various ArP2Arm methods to power the P2 Arm servos, move joints, and so on.

For simple examples on how to use ArP2Arm, look in the **Aria** (p. 205)/examples directory for P2ArmSimple.cpp and P2ArmJoydrive.cpp.

See the **Aria** (p. 205) documentation on how to use **Aria** (p. 205).

4.82.2 Member Enumeration Documentation

4.82.2.1 enum ArP2Arm::PacketType

Type of arm packet identifiers. Used in **ArP2Arm::setPacketCB**() (p. 275).

Enumeration values:

StatusPacket The status packet type.

InfoPacket The info packet type.

4.82.2.2 enum ArP2Arm::State

General error conditions possible from most of the arm related functions.

Enumeration values:

SUCCESS Succeded.

ALREADY_INITED The class is already initialized.

NOT_INITED The class is not initialized.

ROBOT_NOT_SETUP The **ArRobot** (p. 355) class is not setup properly.

NO_ARM_FOUND The arm can not be found.

COMM_FAILED Communications has failed.

COULD_NOT_OPEN_PORT Could not open the communications port.

COULD_NOT_SET_UP_PORT Could not setup the communications port.

ALREADY_CONNECTED Already connected to the arm.

NOT_CONNECTED Not connected with the arm, connect first.

INVALID_JOINT Invalid joint specified.

INVALID_POSITION Invalid position specified.

4.82.2.3 enum ArP2Arm::StatusType

Type of status packets to request for. Used in **ArP2Arm::requestStatus**() (p. 283).

Enumeration values:

StatusOff Stop sending status packets.

StatusSingle Send a single status packets.

StatusContinuous Send continous packets. Once every 100ms.

4.82.3 Member Function Documentation

4.82.3.1 ArP2Arm::State ArP2Arm::checkArm (bool *waitForResponse* = true) [virtual]

Check to see if the arm is still connected.

Requests that P2OS checks to see if the arm is still alive and immediately exits. This is not a full init and differs that P2OS will still accept arm commands and the arm will not be parked. If P2OS fails to find the arm it will change the status byte accordingly and stop accepting arm related commands except for init commands. If the parameter waitForResponse is true then **checkArm**() (p. 278) will wait the appropriate amoutn of time and check the status of the arm. If you wish to do the waiting else where the arm check sequence takes about 200ms, so the user should wait 300ms then send a **ArP2Arm::requestStatus**() (p. 283) to get the results of the check arm request. Since there is a very noticable time delay, the user should use the **ArP2Arm::setPacketCB**() (p. 275) to set a callback so the user knows when the packet has been recieved.

This can be usefull for telling if the arm is still alive. The arm controller can be powered on/off seperately from the robot.

Parameters:

waitForResponse cause the function to block until their is a response

See also:
requestInit (p. 282) , **setPacketCB** (p. 275)

4.82.3.2 ArP2Arm::State ArP2Arm::home (int *joint* = -1) [virtual]

Home the arm.

Tells the arm to go to the home position. While the arm is homing, the status byte will reflect it with the **ArP2Arm::ArmHoming** (p. 276) flag. If joint is set to -1, then all the joints will be homed at a safe speed. If a single joint is specified, that joint will be told to go to its home position at the current speed its set at.

Parameters:
joint home only that joint

4.82.3.3 ArP2Arm::State ArP2Arm::init (void) [virtual]

Init the arm class.

Initialize the P2 Arm class. This must be called before anything else. The **setRobot**() (p. 273) must be called to let ArP2Arm know what instance of an **ArRobot** (p. 355) to use. It talks to the robot and makes sure that there is an arm on it and it is in a good condition. The AROS/P2OS arm servers take care of AUX port serial communications with the P2 Arm controller.

4.82.3.4 ArP2Arm::State ArP2Arm::moveStep (int *joint*, float *pos*, unsigned char *vel* = 0) [virtual]

Move a joint step degrees.

Step the joint pos degrees from its current position at the given speed. If vel is 0, then the currently set speed will be used.

See **ArP2Arm::moveToTicks**() (p. 281) for a description of how positions are defined. See **ArP2Arm::moveVel**() (p. 281) for a description of how speeds are defined.

Parameters:
joint the joint to move
pos the position in degrees to step
vel the speed at which to move. 0 will use the currently set speed

See also:
moveTo (p. 280) , **moveVel** (p. 281)

4.82.3.5 ArP2Arm::State ArP2Arm::moveStepTicks (int *joint*, signed char *pos*) [virtual]

Move a joint step ticks.

Move the joint pos ticks from its current position. A tick is the arbitrary position value that the arm controller uses. The arm controller uses a single unsigned byte to represent all the possible positions in the range of the servo for each joint. So the range of ticks is 0-255 which is mapped to the physical range of the servo. Due to the design of the arm, certain joints range are limited by the arm itself. P2OS will bound the position to physical range of each joint. This is a lower level of controlling the arm position than using **ArP2Arm::moveTo**() (p. 280). **ArP2Arm::moveStep**() (p. 279) uses a conversion factor which converts degrees to ticks.

Parameters:

joint the joint to move

pos the position, in ticks, to move to

See also:

moveStep (p. 279)

4.82.3.6 ArP2Arm::State ArP2Arm::moveTo (int *joint*, float *pos*, unsigned char *vel* = 0) [virtual]

Move a joint to a position in degrees.

Move the joint to the position at the given speed. If vel is 0, then the currently set speed will be used. The position is in degrees. Each joint has about a +-90 degree range, but they all differ due to the design.

See **ArP2Arm::moveToTicks**() (p. 281) for a description of how positions are defined. See **ArP2Arm::moveVel**() (p. 281) for a description of how speeds are defined.

Parameters:

joint the joint to move

pos the position in degrees to move to

vel the speed at which to move. 0 will use the currently set speed

See also:

moveToTicks (p. 281) , **moveVel** (p. 281)

4.82.3.7 ArP2Arm::State ArP2Arm::moveToTicks (int *joint*, unsigned char *pos*) [virtual]

Move a joint to a position in low level arm controller ticks.

Move the joint to the given position in ticks. A tick is the arbitrary position value that the arm controller uses. The arm controller uses a single unsigned byte to represent all the possible positions in the range of the servo for each joint. So the range of ticks is 0-255 which is mapped to the physical range of the servo. Due to the design of the arm, certain joints range are limited by the arm itself. P2OS will bound the position to physical range of each joint. This is a lower level of controlling the arm position than using **ArP2Arm::moveTo**() (p. 280). **ArP2Arm::moveTo**() (p. 280) uses a conversion factor which converts degrees to ticks.

Parameters:

joint the joint to move

pos the position, in ticks, to move to

See also:

moveTo (p. 280)

4.82.3.8 ArP2Arm::State ArP2Arm::moveVel (int *joint*, int *vel*) [virtual]

Set the joint to move at the given velocity.

Set the joints velocity. The arm controller has no way of controlling the speed of the servos in the arm. So to control the speed of the arm, P2OS will incrementaly send a string of position commands to the arm controller to get the joint to move to its destination. To vary the speed, the amount of time to wait between each point in the path is varied. The velocity parameter is simply the number of milliseconds to wait between each point in the path. 0 is the fastest and 255 is the slowest. A reasonable range is around 10-40.

Parameters:

joint the joint to move

vel the velocity to move at

4.82.3.9 ArP2Arm::State ArP2Arm::powerOff () [virtual]

Power off the arm.

Powers off the arm. This should only be called when the arm is in a good position to power off. Due to the design, it will go limp when the power is turned off.

A more safe way to power off the arm is to use the **ArP2Arm::park**() (p. 274) function. Which will home the arm, then power if off.

See also:
park (p. 274)

4.82.3.10 ArP2Arm::State ArP2Arm::powerOn (bool *doSleep* = true) [virtual]

Power on the arm.

Powers on the arm. The arm will shake for up to 2 seconds after powering on. If the arm is told to move before it stops shaking, that vibration can be amplified by moving. The default is to wait the 2 seconds for the arm to settle down.

Parameters:
doSleep if true, sleeps 2 seconds to wait for the arm to stop shaking

4.82.3.11 ArP2Arm::State ArP2Arm::requestInfo () [virtual]

Request the arm info packet.

Requests the arm info packet from P2OS and immediately returns. This packet will be sent during the next 100ms cycle of P2OS. Since there is a very noticable time delay, the user should use the **ArP2Arm::setPacketCB**() (p. 275) to set a callback so the user knows when the packet has been recieved.

See also:
setPacketCB (p. 275)

4.82.3.12 ArP2Arm::State ArP2Arm::requestInit () [virtual]

Request arm initialization.

Requests that P2OS initialize the arm and immediately returns. The arm initialization procedure takes about 700ms to complete and a little more time for the status information to be relayed back to the client. Since there is a very noticable time delay, the user should use the **ArP2Arm::setPacketCB**() (p. 275) to set a callback so the user knows when the arm info packet has been recieved. Then wait about 800ms, and send a **ArP2Arm::requestStatus**() (p. 283) to get the results of the init request. While the init is proceding, P2OS will ignore all arm related commands except requests for arm status and arm info packets.

ArP2Arm::checkArm() (p. 278) can be used to periodicly check to make sure that the arm controller is still alive and responding.

See also:
checkArm (p. 278) , **setPacketCB** (p. 275)

4.82.3.13 ArP2Arm::State ArP2Arm::requestStatus (StatusType *status*) [virtual]

Request the arm status packet.

Requests the arm status packet from P2OS and immediately returns. This packet will be sent during the next 100ms cycle of P2OS. Since there is a very noticable time delay, the user should use the **ArP2Arm::setPacketCB**() (p. 275) to set a callback so the user knows when the packet has been recieved.

See also:
setPacketCB (p. 275)

4.82.3.14 ArP2Arm::State ArP2Arm::setAutoParkTimer (int *waitSecs*) [virtual]

Set the auto park timer value.

P2OS will automaticly park the arm if it gets no arm related packets after waitSecs. This is to help protect the arm when the program looses connection with P2OS. Set the value to 0 to disable this timer. Default wait is 10 minutes.

Parameters:
waitSecs seconds to wait till parking the arm when idle

4.82.3.15 ArP2Arm::State ArP2Arm::setGripperParkTimer (int *waitSecs*) [virtual]

Set the gripper park timer value.

P2OS/AROS automatically park the gripper after its been closed for more than waitSecs. The gripper servo can overheat and burnout if it is holding something for more than 10 minutes. Care must be taken to ensure that this does not happen. If you wish to manage the gripper yourself, you can disable this timer by setting it to 0.

Parameters:
waitSecs seconds to wait till parking the gripper once it has begun to grip something

4.82.3.16 ArP2Arm::State ArP2Arm::stop () [virtual]

Stop the arm.

Stop the arm from moving. This overrides all other actions except for the arms initilization sequence.

4.82.3.17 ArP2Arm::State ArP2Arm::uninit () [virtual]

Uninit the arm class.

Uninitialize the arm class. This simply asks the arm to park itself and cleans up its internal state. To completely uninitialize the P2 Arm itself have the **ArRobot** (p. 355) disconnect from P2OS.

The documentation for this class was generated from the following files:

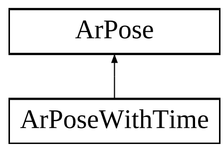
- ArP2Arm.h
- ArP2Arm.cpp

4.83 ArPose Class Reference

The class which represents a position.

#include <ariaUtil.h>

Inheritance diagram for ArPose::



Public Methods

- **ArPose** (double x=0, double y=0, double th=0)

  Constructor, with optional initial values.

- **ArPose** (const ArPose &pose)

  Copy Constructor.

- virtual ~**ArPose** ()

  Destructor.

- virtual void **setPose** (double x, double y, double th=0)

  Sets the position to the given values.

- virtual void **setPose** (ArPose position)

  Sets the position equal to the given position.

- void **setX** (double x)

  Sets the x position.

- void **setY** (double y)

  Sets the y position.

- void **setTh** (double th)

  Sets the heading.

- void **setThRad** (double th)

  Sets the heading, using radians.

- double **getX** (void) const

  Gets the x position.

- double **getY** (void) const

  Gets the y position.

- double **getTh** (void) const

  Gets the heading.

- double **getThRad** (void) const

  Gets the heading, in radians.

- void **getPose** (double *x, double *y, double *th=NULL) const

  Gets the whole position in one function call.

- virtual double **findDistanceTo** (ArPose position) const

  Finds the distance from this position to the given position.

- virtual double **squaredFindDistanceTo** (ArPose position) const

  Finds the square distance from this position to the given position.

- virtual double **findAngleTo** (ArPose position) const

  Finds the angle between this position and the given position.

- virtual void **log** (void) const

  Logs the coordinates using **ArLog** (p. 231).

4.83.1 Detailed Description

The class which represents a position.

This class represents a robot position with heading. The heading defaults to 0, and so does not need to be used (this avoids having 2 types of positions). Everything in the class is inline so it should be fast.

4.83.2 Constructor & Destructor Documentation

4.83.2.1 ArPose::ArPose (double x = 0, double y = 0, double th = 0) `[inline]`

Constructor, with optional initial values.

Sets the position with the given values, can be used with no variables, with just x and y, or with x, y, and th

Parameters:

x the position to set the x position to, default of 0

y the position to set the y position to, default of 0

th the position to set the th position to, default of 0

4.83.3 Member Function Documentation

4.83.3.1 virtual double ArPose::findAngleTo (ArPose *position*) const [inline, virtual]

Finds the angle between this position and the given position.

Parameters:

position the position to find the angle to

Returns:

the angle to the given position from this instance, in degrees

4.83.3.2 virtual double ArPose::findDistanceTo (ArPose *position*) const [inline, virtual]

Finds the distance from this position to the given position.

Parameters:

position the position to find the distance to

Returns:

the distance to the position from this instance

4.83.3.3 void ArPose::getPose (double * *x*, double * *y*, double * *th* = NULL) const [inline]

Gets the whole position in one function call.

Gets the whole position at once, by giving it 2 or 3 pointers to doubles. If you give the function a null pointer for a value it won't try to use the null pointer, so you can pass in a NULL if you don't care about that value. Also note that th defaults to NULL so you can use this with just x and y.

Parameters:

x a pointer to a double to set the x position to

y a pointer to a double to set the y position to

th a pointer to a double to set the heading to, defaults to NULL

4.83.3.4 virtual void ArPose::setPose (ArPose *position*) `[inline, virtual]`

Sets the position equal to the given position.

Parameters:

position the position value this instance should be set to

4.83.3.5 virtual void ArPose::setPose (double *x*, double *y*, double *th* = 0) `[inline, virtual]`

Sets the position to the given values.

Sets the position with the given three values, but the theta does not need to be given as it defaults to 0.

Parameters:

x the position to set the x position to

y the position to set the y position to

th the position to set the th position to, default of 0

4.83.3.6 virtual double ArPose::squaredFindDistanceTo (ArPose *position*) const `[inline, virtual]`

Finds the square distance from this position to the given position.

This is only here for speed, if you aren't doing this thousands of times a second don't use this one use findDistanceTo

Parameters:

position the position to find the distance to

Returns:

the distance to the position from this instance

The documentation for this class was generated from the following file:

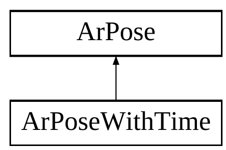
- ariaUtil.h

4.84 ArPoseWithTime Class Reference

A subclass of pose that also has the time the pose was taken.

`#include <ariaUtil.h>`

Inheritance diagram for ArPoseWithTime::



4.84.1 Detailed Description

A subclass of pose that also has the time the pose was taken.

The documentation for this class was generated from the following file:

- ariaUtil.h

4.85 ArPref Class Reference

Preference instance. Used by ArPreferences.

`#include <ArPref.h>`

Public Types

- enum **ValType** { **Integer**, **Double**, **Boolean**, **String** }

Public Methods

- **ArPref** (int section, int pref, const char ∗name, const char ∗val, const char ∗∗validVals, **ValType** valType, const char ∗comment)

  Constructor.

- **ArPref** (const ArPref &pref)

  Copy constructor.

- virtual ∼**ArPref** ()

  Destructor.

- virtual bool **getBool** ()

  Get the value as a boolean.

- virtual int **getInt** ()

  Get the value as an integer.

- virtual double **getDouble** ()

  Get the value as a double.

- virtual std::string **getString** ()

  Get the value as a std::string.

- virtual bool **setBool** (bool val, bool append=false)

  Set the value to be the supplied boolean.

- virtual bool **setInt** (int val, bool append=false)

  Set the value to be the supplied integer.

- virtual bool **setDouble** (double val, bool append=false)

  Set the value to be the supplied doule.

- virtual bool **setString** (const char ∗val, bool append=false)

  Set the value to be the supplied std::string.

- virtual int **getSetCount** ()

  Get the number of values that would be in the set regardless of type.

- virtual int **getBoolSet** (bool ∗boolArray, int size)

  Get the value as multiple booleans.

- virtual int **getIntSet** (int ∗intArray, int size)

  Get the value as multiple integers.

- virtual int **getDoubleSet** (double ∗doubleArray, int size)

  Get the value as multiple doubles.

- virtual int **getStringSet** (std::string ∗stringArray, int size)

  Get the value as multiple std::strings.

- virtual bool **setBoolSet** (bool append, int count,...)

  Set the value to be the supplied booleans.

- virtual bool **setIntSet** (bool append, int count,...)

  Set the value to be the supplied integers.

- virtual bool **setDoubleSet** (bool append, int count,...)

  Set the value to be the supplied doubles.

4.85.1 Detailed Description

Preference instance. Used by ArPreferences.

This represents an individual preference which is loaded from compiled in defaults of from a preferences file. A preference can be one of four different types: Integer, Double, Boolean, String. The preference itself is stored as a string. There are accessors which convert from string to the desired format and vice versa: **getBool**() (p. 292), **getInt**() (p. 293), **getDouble**() (p. 293), **getString**() (p. 294), **setBool**() (p. 294), **setInt**() (p. 295), **setDouble**() (p. 295), **setString**() (p. 296). A preference can also have a set of values of all the same type. In the file would look like:

<key> <int> <int> <int> ...

The 'set' accessors can deal with an abitrary amount of values: **getBoolSet**() (p. 292), **getIntSet**() (p. 293), **getDoubleSet**() (p. 293), **getStringSet**() (p. 294), **setBoolSet**() (p. 295), **setIntSet**() (p. 296), **setDoubleSet**() (p. 295).

A preference can have an array of valid values. When the file is loaded, ArPreferences checks all the values from the file against the supplied valid values. The check is done with a string compare. It is most usefull for string values. So it will apply to numbers as long as they are formated in the correct way.

4.85.2 Member Enumeration Documentation

4.85.2.1 enum ArPref::ValType

Enumeration values:

Integer integer number value.

Double double number value.

Boolean boolean value, expressed as 'true' or 'false' in the file.

String a string value.

4.85.3 Member Function Documentation

4.85.3.1 bool ArPref::getBool (void) `[virtual]`

Get the value as a boolean.

Get the value, formating it correctly. If the preference is not of the boolean type or not found, it will return false.

4.85.3.2 int ArPref::getBoolSet (bool * *boolArray*, int *size*) `[virtual]`

Get the value as multiple booleans.

Get the value, formating it correctly. If the preference is not of the boolean type or not found, it will return false.

Parameters:

boolArray the array to fill out with the values

size the size of the passed in array

Returns:

the number of values put into the array

4.85.3.3 double ArPref::getDouble (void) `[virtual]`

Get the value as a double.

Get the value, formating it correctly. If the preference is not of the double type or not found, it will return 0.0.

4.85.3.4 int ArPref::getDoubleSet (double ∗ *doubleArray*, int *size*) `[virtual]`

Get the value as multiple doubles.

Get the value, formating it correctly. If the preference is not of the double type or not found, it will return an empty list.

Parameters:

doubleArray the array to fill out with the values

size the size of the passed in array

Returns:

the number of values put into the array

4.85.3.5 int ArPref::getInt (void) `[virtual]`

Get the value as an integer.

Get the value, formating it correctly. If the preference is not of the integer type or not found, it will return 0.

4.85.3.6 int ArPref::getIntSet (int ∗ *intArray*, int *size*) `[virtual]`

Get the value as multiple integers.

Get the value, formating it correctly. If the preference is not of the integer type or not found, it will return an empty list.

Parameters:

intArray the array to fill out with the values

size the size of the passed in array

Returns:

the number of values put into the array

4.85.3.7 int ArPref::getSetCount () [virtual]

Get the number of values that would be in the set regardless of type.

Get the number of values that is contained in this preference. This is independent of the type of values. Use this to figure out how big of an array that you need to get a set of values.

4.85.3.8 std::string ArPref::getString (void) [virtual]

Get the value as a std::string.

Get the value, formating it correctly. If the preference is not of the string type or not found, it will return "".

4.85.3.9 int ArPref::getStringSet (std::string * *stringArray*, int *size*) [virtual]

Get the value as multiple std::strings.

Get the value, formating it correctly. If the preference is not of the string type or not found, it will return an empty list.

Parameters:

stringArray the array to fill out with the values

size the size of the passed in array

Returns:

the number of values put into the array

4.85.3.10 bool ArPref::setBool (bool *val*, bool *append* = false) [virtual]

Set the value to be the supplied boolean.

If 'append' is true, a copy of this instance with the supplied value will be created and added to the ArPreferences.

Parameters:

val the value to set the preference to

append create a new instance of this preference

4.85.3.11 bool ArPref::setBoolSet (bool *append*, int *count*, ...) `[virtual]`

Set the value to be the supplied booleans.

If 'append' is true, a copy of this instance with the supplied value will be created and added to the ArPreferences.

Parameters:

append create a new instance of this preference

count the number of values in the parameter list

4.85.3.12 bool ArPref::setDouble (double *val*, bool *append* = false) `[virtual]`

Set the value to be the supplied doule.

If 'append' is true, a copy of this instance with the supplied value will be created and added to the ArPreferences.

Parameters:

val the value to set the preference to

append create a new instance of this preference

4.85.3.13 bool ArPref::setDoubleSet (bool *append*, int *count*, ...) `[virtual]`

Set the value to be the supplied doubles.

If 'append' is true, a copy of this instance with the supplied value will be created and added to the ArPreferences.

Parameters:

append create a new instance of this preference

count the number of values in the parameter list

4.85.3.14 bool ArPref::setInt (int *val*, bool *append* = false) `[virtual]`

Set the value to be the supplied integer.

If 'append' is true, a copy of this instance with the supplied value will be created and added to the ArPreferences.

Parameters:

val the value to set the preference to

append create a new instance of this preference

4.85.3.15 bool ArPref::setIntSet (bool *append*, int *count*, ...) `[virtual]`

Set the value to be the supplied integers.

If 'append' is true, a copy of this instance with the supplied value will be created and added to the ArPreferences.

Parameters:

append create a new instance of this preference

count the number of values in the parameter list

4.85.3.16 bool ArPref::setString (const char $*$ *val*, bool *append* = false) `[virtual]`

Set the value to be the supplied std::string.

If 'append' is true, a copy of this instance with the supplied value will be created and added to the ArPreferences.

Parameters:

val the value to set the preference to

append create a new instance of this preference

The documentation for this class was generated from the following files:

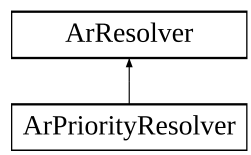
- ArPref.h
- ArPref.cpp

4.86 ArPriorityResolver Class Reference

(Default resolver), takes the action list and uses the priority to resolve.

`#include <ArPriorityResolver.h>`

Inheritance diagram for ArPriorityResolver::



Public Methods

- **ArPriorityResolver** ()

  Constructor.

- virtual ~**ArPriorityResolver** ()

  Destructor.

4.86.1 Detailed Description

(Default resolver), takes the action list and uses the priority to resolve.

This is the default resolver for **ArRobot** (p. 355), meaning if you don't do a non-normal init on the robot, or a setResolver, you'll have one these.

The documentation for this class was generated from the following files:

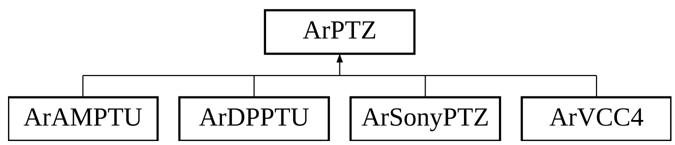
- ArPriorityResolver.h
- ArPriorityResolver.cpp

4.87 ArPTZ Class Reference

Base class which handles the PTZ cameras.

`#include <ArPTZ.h>`

Inheritance diagram for ArPTZ::



Public Methods

- **ArPTZ** (**ArRobot** ∗robot)
- virtual ∼**ArPTZ** ()

  Destructor.
- virtual bool **init** (void)=0

  Initializes the camera.
- virtual bool **pan** (int degrees)=0

  Pans to the given degrees.
- virtual bool **panRel** (int degrees)=0

  Pans relative to current position by given degrees.
- virtual bool **tilt** (int degrees)=0

  Tilts to the given degrees.
- virtual bool **tiltRel** (int degrees)=0

  Tilts relative to the current position by given degrees.
- virtual bool **panTilt** (int degreesPan, int degreesTilt)=0

  Pans and tilts to the given degrees.
- virtual bool **panTiltRel** (int degreesPan, int degreesTilt)=0

  Pans and tilts relatives to the current position by the given degrees.
- virtual bool **canZoom** (void) const=0

  Returns true if camera can zoom (or rather, if it is controlled by this).

- virtual bool **zoom** (int zoomValue)
  Zooms to the given value.
- virtual bool **zoomRel** (int zoomValue)
  Zooms relative to the current value, by the given value.
- virtual int **getPan** (void) const=0
  The angle the camera was last told to pan to.
- virtual int **getTilt** (void) const=0
  The angle the camera was last told to tilt to.
- virtual int **getZoom** (void) const
  The value the camera was last told to zoom to.
- virtual bool **canGetRealPanTilt** (void) const
  If this driver can tell the real pan/tilt angle.
- virtual int **getRealPan** (void) const
  The angle the camera says its at.
- virtual int **getRealTilt** (void) const
  The angle the camera says its at.
- virtual bool **canGetRealZoom** (void) const
  If this driver can tell the real zoom.
- virtual int **getRealZoom** (void) const
  The zoom the camera says its at.
- virtual int **getMaxPosPan** (void) const=0
  Gets the highest positive degree the camera can pan to.
- virtual int **getMaxNegPan** (void) const=0
  Gets the lowest negative degree the camera can pan to.
- virtual int **getMaxPosTilt** (void) const=0
  Gets the highest positive degree the camera can tilt to.
- virtual int **getMaxNegTilt** (void) const=0
  Gets the lowest negative degree the camera can tilt to.

- virtual int **getMaxZoom** (void) const

  Gets the maximum value for the zoom on this camera.

- virtual int **getMinZoom** (void) const

  Gets the lowest value for the zoom on this camera.

- virtual bool **setDeviceConnection** (**ArDeviceConnection** *connection, bool driveFromRobotLoop=true)

  Sets the device connection to be used by this PTZ camera, if set this camera will send commands via this connection, otherwise its via robot.

- virtual **ArDeviceConnection** * **getDeviceConnection** (void)

  Gets the device connection used by this PTZ camera.

- virtual bool **setAuxPort** (int auxPort)

  Sets the aux port on the robot to be used to communicate with this device.

- virtual int **getAuxPort** (void)

  Gets the port the device is set to communicate on.

- virtual **ArBasePacket** * **readPacket** (void)

  Reads a packet from the device connection, MUST NOT BLOCK.

- virtual bool **sendPacket** (**ArBasePacket** *packet)

  Sends a given packet to the camera (via robot or serial port, depending).

- virtual bool **packetHandler** (**ArBasePacket** *packet)

  Handles a packet that was read from the device.

- virtual bool **robotPacketHandler** (**ArRobotPacket** *packet)

  Handles a packet that was read by the robot.

- virtual void **connectHandler** (void)

  Internal, attached to robot, inits the camera when robot connects.

- virtual void **sensorInterpHandler** (void)

  Internal, for attaching to the robots sensor interp to read serial port.

4.87.1 Detailed Description

Base class which handles the PTZ cameras.

This class is mainly concerned with making all the cameras look the same for outgoing data, it is also set up to facilitate the acquisition of incoming data but that is described in the following paragraphs. There are two ways this can be used. The first is the simplest and default behavior and should be used by those whose cameras are attached to their robot's microcontroller, a **ArRobot** (p. 355) pointer is passed in to the contructor, this is where the commands will be sent to the robot via the robot's connection which will then send it along over the second serial port. The second way is to pass an **ArDeviceConnection** (p. 124) to setDeviceConnection, if this is done commands will be sent along the given serial port, this should ONLY be done if the camera is attached straight to a serial port on the computer this program is running on.

The next two paragraphs describe how to get data back from the cameras, but this base class is set up so that by default it won't try to get data back and assumes you're not trying to do that. If you are trying to get data back the important functions are packetHandler, robotPacketHandler and readPacket and you should read the docs on those.

If the camera is attached to the robot (and you are thus using the first method described in the first paragraph) then the only way to get data back is to send an **ArCommands::GETAUX** (p. 120), then set up a robotPacketHandler for the AUX id and have it call the packetHandler you set up in in the class.

If the camera is attached to the serial port on the computer (and thus the second method described in the first paragraph was used) then its more complicated... the default way is to just pass in an **ArDeviceConnection** (p. 124) to setDeviceConnection and implement the readPacket method (which MUST not block), and every time through the robot loop readPacket (with the sensorInterpHandler) will be called and any packets will be given to the packetHandler (which you need to implement in your class) to be processed. The other way to do this method is to pass both an ArDefaultConnection and false to setDeviceConnection, this means the camera will not be read at all by default, and you're on your own for reading the data in (ie like your own thread).

4.87.2 Constructor & Destructor Documentation

4.87.2.1 ArPTZ::ArPTZ (ArRobot ∗ *robot*)

Parameters:

robot The robot this camera is attached to, can be NULL

4.87.3 Member Function Documentation

4.87.3.1 virtual bool ArPTZ::packetHandler (ArBasePacket * *packet*) [inline, virtual]

Handles a packet that was read from the device.

This should work for the robot packet handler or for packets read in from readPacket (the joys of OO), but it can't deal with the need to check the id on robot packets, so you should check the id from robotPacketHandler and then call this one so that your stuff can be used by both robot and serial port connections.

Parameters:
packet the packet to handle

Returns:
true if this packet was handled (ie this knows what it is), false otherwise

Reimplemented in **ArVCC4** (p. 510).

4.87.3.2 virtual ArBasePacket* ArPTZ::readPacket (void) [inline, virtual]

Reads a packet from the device connection, MUST NOT BLOCK.

This should read in a packet from the myConn connection and return a pointer to a packet if there was on to read in, or NULL if there wasn't one... this MUST not block if it is used with the default mode of being driven from the sensorInterpHandler, since that is on the robot loop.

Returns:
packet read in, or NULL if there was no packet read

Reimplemented in **ArVCC4** (p. 511).

4.87.3.3 bool ArPTZ::robotPacketHandler (ArRobotPacket * *packet*) [virtual]

Handles a packet that was read by the robot.

This handles packets read in from the robot, this function should just check the ID of the robot packet and then return what packetHandler thinks of the packet.

Parameters:
packet the packet to handle

Returns:
true if the packet was handled (ie this konws what it is), false otherwise

4.87.3.4 bool ArPTZ::sendPacket (ArBasePacket * *packet*) [virtual]

Sends a given packet to the camera (via robot or serial port, depending).

Parameters:
packet the packet to send

Returns:
true if the packet could be sent, false otherwise

4.87.3.5 bool ArPTZ::setAuxPort (int *auxPort*) [virtual]

Sets the aux port on the robot to be used to communicate with this device.

Parameters:
auxPort The AUX port on the robot's microcontroller that the device is connected to. The C166 controller only has one port. The H8 has two.

Returns:
true if the port was valid (1 or 2). False otherwise.

4.87.3.6 bool ArPTZ::setDeviceConnection (ArDeviceConnection * *connection*, bool *driveFromRobotLoop* = true) [virtual]

Sets the device connection to be used by this PTZ camera, if set this camera will send commands via this connection, otherwise its via robot.

Parameters:
connection the device connection the camera is connected to, normally a serial port

driveFromRobotLoop if this is true then a sensor interp callback wil be set and that callback will read packets and call the packet handler on them

Returns:
true if the serial port is opened or can be opened, false otherwise

The documentation for this class was generated from the following files:

- ArPTZ.h
- ArPTZ.cpp

4.88 ArRangeBuffer Class Reference

This class is a buffer that holds ranging information.

`#include <ArRangeBuffer.h>`

Public Methods

- **ArRangeBuffer** (int size)

  Constructor.

- virtual ~**ArRangeBuffer** ()

  Destructor.

- size_t **getSize** (void) const

  Gets the size of the buffer.

- void **setSize** (size_t size)

  Sets the size of the buffer.

- **ArPose getPoseTaken** () const

  Gets the pose of the robot when readings were taken.

- void **setPoseTaken** (**ArPose** p)

  Sets the pose of the robot when readings were taken.

- void **addReading** (double x, double y)

  Adds a new reading to the buffer.

- void **beginInvalidationSweep** (void)

  Begins a walk through the getBuffer list of readings.

- void **invalidateReading** (std::list< **ArPoseWithTime** *>::iterator readingIt)

  While doing an invalidation sweep a reading to the list to be invalidated.

- void **endInvalidationSweep** (void)

  Ends the invalidation sweep.

- const std::list< **ArPoseWithTime** *> * **getBuffer** (void) const

  Gets a pointer to a list of readings.

- std::list< **ArPoseWithTime** *> * **getBuffer** (void)

Gets a pointer to a list of readings.

- double **getClosestPolar** (double startAngle, double endAngle, **ArPose** position, unsigned int maxRange, double *angle=NULL) const

  Gets the closest reading, on a polar system.

- double **getClosestBox** (double x1, double y1, double x2, double y2, **ArPose** position, unsigned int maxRange, **ArPose** *readingPos=NULL) const

  Gets the closest reading, from a rectangular box, in robot LOCAL coords.

- void **applyTransform** (**ArTransform** trans)

  Applies a transform to the buffer.

- void **clear** (void)

  Clears all the readings in the range buffer.

- void **clearOlderThan** (int milliSeconds)

  Resets the readings older than this many seconds.

- void **clearOlderThanSeconds** (int seconds)

  Resets the readings older than this many seconds.

- void **reset** (void)

  same as clear, but old name.

- void **beginRedoBuffer** (void)

  This begins a redoing of the buffer.

- void **redoReading** (double x, double y)

  Add a reading to the redoing of the buffer.

- void **endRedoBuffer** (void)

  End redoing the buffer.

4.88.1 Detailed Description

This class is a buffer that holds ranging information.

4.88.2 Constructor & Destructor Documentation

4.88.2.1 ArRangeBuffer::ArRangeBuffer (int *size*)

Constructor.

Parameters:
size The size of the buffer, in number of readings

4.88.3 Member Function Documentation

4.88.3.1 void ArRangeBuffer::addReading (double *x*, double *y*)

Adds a new reading to the buffer.

Parameters:
x the x position of the reading
y the y position of the reading

4.88.3.2 void ArRangeBuffer::applyTransform (ArTransform *trans*)

Applies a transform to the buffer.

Applies a transform to the buffers.. this is mostly useful for translating to/from local/global coords, but may have other uses

Parameters:
trans the transform to apply to the data

4.88.3.3 void ArRangeBuffer::beginInvalidationSweep (void)

Begins a walk through the getBuffer list of readings.

This is a set of funkiness used to invalid readings in the buffer. It is fairly complicated. But what you need to do, is set up the invalid sweeping with beginInvalidationSweep, then walk through the list of readings, and pass the iterator to a reading you want to invalidate to invalidateReading, then after you are all through walking the list call endInvalidationSweep. Look at the description of getBuffer for additional warnings.

See also:
invalidateReading (p. 310) , **endInvalidationSweep** (p. 308)

4.88.3.4 void ArRangeBuffer::beginRedoBuffer (void)

This begins a redoing of the buffer.

To redo the buffer means that you're going to want to replace all of the readings in the buffer, and get rid of the ones that you don't replace (invalidate them). The three functions beginRedoBuffer, redoReading, and endRedoBuffer are all made to enable you to do this. What you do, is call **beginRedoBuffer**() (p. 308); then for each reading you want to be in the buffer, call **redoReading**(double x, double y) (p. 310), then when you are done, call **endRedoBuffer**() (p. 308);

4.88.3.5 void ArRangeBuffer::endInvalidationSweep (void)

Ends the invalidation sweep.

See the description of beginInvalidationSweep, it describes how to use this function.

See also:
beginInvalidationSweep (p. 307) , **invalidateReading** (p. 310)

4.88.3.6 void ArRangeBuffer::endRedoBuffer (void)

End redoing the buffer.

For a description of how to use this, see beginRedoBuffer

4.88.3.7 std::list< ArPoseWithTime *> * ArRangeBuffer::getBuffer (void)

Gets a pointer to a list of readings.

This function returns a pointer to a list that has all of the readings in it. This list is mostly for reference, ie for finding some particular value or for using the readings to draw them. Don't do any modification at all to the list unless you really know what you're doing... and if you do you'd better lock the rangeDevice this came from so nothing messes with the list while you are doing so.

Returns:
the list of positions this range buffer has

4.88.3.8 const std::list< ArPoseWithTime *> * ArRangeBuffer::getBuffer (void) const

Gets a pointer to a list of readings.

This function returns a pointer to a list that has all of the readings in it. This list is mostly for reference, ie for finding some particular value or for using the readings to draw them. Don't do any modification at all to the list unless you really know what you're doing... and if you do you'd better lock the rangeDevice this came from so nothing messes with the list while you are doing so.

Returns:
the list of positions this range buffer has

4.88.3.9 double ArRangeBuffer::getClosestBox (double *x1*, double *y1*, double *x2*, double *y2*, ArPose *startPos*, unsigned int *maxRange*, ArPose ∗ *readingPos* = NULL) const

Gets the closest reading, from a rectangular box, in robot LOCAL coords.

Gets the closest reading in a region defined by two points (opposeite points of a rectangle).

Parameters:
- ***x1*** the x coordinate of one of the rectangle points
- ***y1*** the y coordinate of one of the rectangle points
- ***x2*** the x coordinate of the other rectangle point
- ***y2*** the y coordinate of the other rectangle point
- ***startPos*** the position to find the closest reading to (usually the robots position)
- ***maxRange*** the maximum range to return (and what to return if nothing found)
- ***readingPos*** a pointer to a position in which to store the location of the closest position
- ***position*** the origin of the local coords for the definition of the coordinates, normally just ArRobot::getPosition

Returns:
if the return is >= 0 and <= maxRange then this is the distance to the closest reading, if it is >= maxRange, then there was no reading in the given section

4.88.3.10 double ArRangeBuffer::getClosestPolar (double *startAngle*, double *endAngle*, ArPose *startPos*, unsigned int *maxRange*, double ∗ *angle* = NULL) const

Gets the closest reading, on a polar system.

Gets the closest reading in a region defined by startAngle going to endAngle... going counterclockwise (neg degrees to poseitive... with how the robot is set up, thats counterclockwise)... from -180 to 180... this means if you want the slice between 0 and 10 degrees, you must enter it as 0, 10, if you do 10, 0 you'll get the 350 degrees between 10 and 0... be especially careful with negative... for example -30 to -60 is everything from -30, around through 0, 90, and 180 back to -60... since -60 is actually to clockwise of -30

Parameters:

startAngle where to start the slice

endAngle where to end the slice, going clockwise from startAngle

startPos the position to find the closest reading to (usually the robots position)

maxRange the maximum range to return (and what to return if nothing found)

angle a pointer return of the angle to the found reading

position the origin of the local coords for the definition of the coordinates, normally just ArRobot::getPosition

Returns:

if the return is >= 0 and <= maxRange then this is the distance to the closest reading, if it is >= maxRange, then there was no reading in the given section

4.88.3.11 void ArRangeBuffer::invalidateReading (std::list< ArPoseWithTime ∗>::iterator *readingIt*)

While doing an invalidation sweep a reading to the list to be invalidated.

See the description of beginInvalidationSweep, it describes how to use this function.

Parameters:

readingIt the ITERATOR to the reading you want to get rid of

See also:

beginInvaladationSweep , **endInvalidationSweep** (p. 308)

4.88.3.12 void ArRangeBuffer::redoReading (double *x*, double *y*)

Add a reading to the redoing of the buffer.

For a description of how to use this, see beginRedoBuffer

Parameters:

x the x param of the coord to add to the buffer

y the x param of the coord to add to the buffer

4.88.3.13 void ArRangeBuffer::setSize (size_t *size*)

Sets the size of the buffer.

If the new size is smaller than the current buffer it chops off the readings that are excess from the oldest readings... if the new size is larger then it just leaves room for the buffer to grow

Parameters:

size number of readings to set the buffer to

The documentation for this class was generated from the following files:

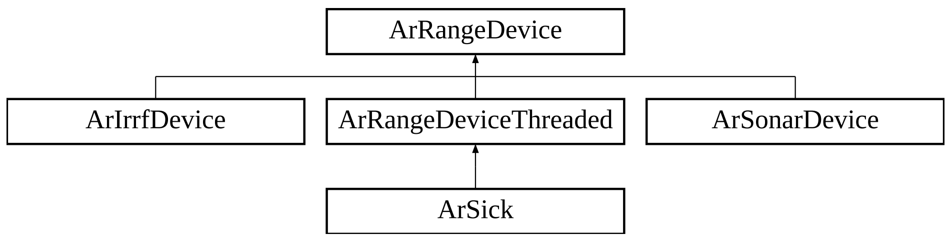
- ArRangeBuffer.h
- ArRangeBuffer.cpp

4.89 ArRangeDevice Class Reference

The class for all devices which return range info (laser, sonar).

`#include <ArRangeDevice.h>`

Inheritance diagram for ArRangeDevice::



Public Methods

- **ArRangeDevice** (size_t currentBufferSize, size_t cumulativeBufferSize, const char ∗name, unsigned int maxRange)

  Constructor.

- virtual ∼**ArRangeDevice** ()

  Destructor.

- virtual const char ∗ **getName** (void) const

  Gets the name of the device.

- virtual void **setRobot** (**ArRobot** ∗robot)

  Sets the robot this device is attached to.

- virtual **ArRobot** ∗ **getRobot** (void)

  Gets the robot this device is attached to.

- virtual void **setCurrentBufferSize** (size_t size)

  Sets the size of the buffer for current readings.

- virtual void **setCumulativeBufferSize** (size_t size)

  Sets the size of the buffer for cumulative readings.

- virtual void **addReading** (double x, double y)

  Adds a reading to the buffer.

- virtual double **currentReadingPolar** (double startAngle, double endAngle, double ∗angle=NULL) const

  Gets the closest current reading in the given polar region.

- virtual double **cumulativeReadingPolar** (double startAngle, double endAngle, double ∗angle=NULL) const

  Gets the closest cumulative reading in the given polar region.

- virtual double **currentReadingBox** (double x1, double y1, double x2, double y2, **ArPose** ∗readingPos=NULL) const

  Gets the closest current reading from the given box region.

- virtual double **cumulativeReadingBox** (double x1, double y1, double x2, double y2, **ArPose** ∗readingPos=NULL) const

  Gets the closest current reading from the given box region.

- virtual const **ArRangeBuffer** ∗ **getCurrentRangeBuffer** (void) const

  Gets the current range buffer.

- virtual const **ArRangeBuffer** ∗ **getCumulativeRangeBuffer** (void) const

  Gets the cumulative range buffer.

- virtual const std::list< **ArPoseWithTime** ∗> ∗ **getCurrentBuffer** (void) const

  Gets the current buffer of readings.

- virtual const std::list< **ArPoseWithTime** ∗> ∗ **getCumulativeBuffer** (void) const

  Gets the current buffer of readings.

- virtual **ArRangeBuffer** ∗ **getCurrentRangeBuffer** (void)

  Gets the current range buffer.

- virtual **ArRangeBuffer** ∗ **getCumulativeRangeBuffer** (void)

  Gets the cumulative range buffer.

- virtual std::list< **ArPoseWithTime** ∗> ∗ **getCurrentBuffer** (void)

  Gets the current buffer of readings.

- virtual std::list< **ArPoseWithTime** ∗> ∗ **getCumulativeBuffer** (void)

  Gets the current buffer of readings.

- virtual const std::list< **ArSensorReading** *> * **getRawReadings** (void) const

    Gets the raw unfiltered readings from the device.

- virtual void **clearCurrentReadings** (void)

    Clears all the current readings.

- virtual void **clearCumulativeReadings** (void)

    Clears all the cumulative readings.

- virtual void **clearCumulativeOlderThan** (int milliSeconds)

    Clears all the cumulative readings older than this number of milliseconds.

- virtual void **clearCumulativeOlderThanSeconds** (int seconds)

    Clears all the cumulative readings older than this number of seconds.

- virtual unsigned int **getMaxRange** (void)

    Gets the maximum range for this device.

- virtual void **setMaxRange** (unsigned int maxRange)

    Sets the maximum range for this device.

- virtual void **applyTransform** (**ArTransform** trans, bool doCumulative=true)

    Applies a transform to the buffers.

- virtual int **lockDevice** ()

    Lock this device.

- virtual int **tryLockDevice** ()

    Try to lock this device.

- virtual int **unlockDevice** ()

    Unlock this device.

4.89.1 Detailed Description

The class for all devices which return range info (laser, sonar).

This class has two buffers, a current buffer for storing just recent (relevant) readings, and a cumulative buffer for a longer history... the sizes of both can be set in the constructor.

This class should be used for all sensors like lasers and sonar, also note that it has the locking functions for such a time when there is a device like a laser that runs in its own thread, so that every device can be locked and unlocked and the users don't have to worry about the detail, because of functions on the **ArRobot** (p. 355) structure which check all of the ArRangeDevice s attached to a robot.

4.89.2 Constructor & Destructor Documentation

4.89.2.1 ArRangeDevice::ArRangeDevice (size_t *currentBufferSize*, size_t *cumulativeBufferSize*, const char * *name*, unsigned int *maxRange*)

Constructor.

Parameters:

currentBufferSize number of readings to store in the current buffer

cumulativeBufferSize number of readings to store in the cumulative buffer

name the name of this device

maxRange the max range of this device, if the device can't find a reading in a specified section, it returns this maxRange

4.89.3 Member Function Documentation

4.89.3.1 void ArRangeDevice::applyTransform (ArTransform *trans*, bool *doCumulative* = true) `[virtual]`

Applies a transform to the buffers.

Applies a transform to the buffers.. this is mostly useful for translating to/from local/global coords, but may have other uses

Parameters:

trans the transform to apply to the data

doCumulative whether to transform the cumulative buffer or not

4.89.3.2 double ArRangeDevice::cumulativeReadingBox (double *x1*, double *y1*, double *x2*, double *y2*, ArPose * *pose* = NULL) const `[virtual]`

Gets the closest current reading from the given box region.

Gets the closest reading in a region defined by two points (opposeite points of a rectangle) out of the cumulative buffer.

Parameters:

x1 the x coordinate of one of the rectangle points

y1 the y coordinate of one of the rectangle points

x2 the x coordinate of the other rectangle point

y2 the y coordinate of the other rectangle point

readingPos a pointer to a position in which to store the location of the closest position

Returns:

if the return is >= 0 and <= maxRange then this is the distance to the closest reading, if it is >= maxRange, then there was no reading in the given section

4.89.3.3 double ArRangeDevice::cumulativeReadingPolar (double *startAngle*, double *endAngle*, double * *angle* = NULL) const [virtual]

Gets the closest cumulative reading in the given polar region.

Gets the closest reading in a region defined by startAngle going to endAngle... going counterclockwise (neg degrees to poseitive... with how the robot is set up, thats counterclockwise)... from -180 to 180... this means if you want the slice between 0 and 10 degrees, you must enter it as 0, 10, if you do 10, 0 you'll get the 350 degrees between 10 and 0... be especially careful with negative... for example -30 to -60 is everything from -30, around through 0, 90, and 180 back to -60... since -60 is actually to clockwise of -30

Parameters:

startAngle where to start the slice

endAngle where to end the slice, going clockwise from startAngle

position the position to find the closest reading to

angle a pointer return of the angle to the found reading

Returns:

if the return is >= 0 and <= maxRange then this is the distance to the closest reading, if it is >= maxRange, then there was no reading in the given section

4.89.3.4 double ArRangeDevice::currentReadingBox (double *x1*, double *y1*, double *x2*, double *y2*, ArPose ∗ *pose* = NULL) const [virtual]

Gets the closest current reading from the given box region.

Gets the closest reading in a region defined by two points (opposeite points of a rectangle) out of the current buffer.

Parameters:

x1 the x coordinate of one of the rectangle points

y1 the y coordinate of one of the rectangle points

x2 the x coordinate of the other rectangle point

y2 the y coordinate of the other rectangle point

readingPos a pointer to a position in which to store the location of the closest position

Returns:

if the return is >= 0 and <= maxRange then this is the distance to the closest reading, if it is >= maxRange, then there was no reading in the given section

4.89.3.5 double ArRangeDevice::currentReadingPolar (double *startAngle*, double *endAngle*, double ∗ *angle* = NULL) const [virtual]

Gets the closest current reading in the given polar region.

Gets the closest reading in a region defined by startAngle going to endAngle... going counterclockwise (neg degrees to poseitive... with how the robot is set up, thats counterclockwise)... from -180 to 180... this means if you want the slice between 0 and 10 degrees, you must enter it as 0, 10, if you do 10, 0 you'll get the 350 degrees between 10 and 0... be especially careful with negative... for example -30 to -60 is everything from -30, around through 0, 90, and 180 back to -60... since -60 is actually to clockwise of -30

Parameters:

startAngle where to start the slice

endAngle where to end the slice, going clockwise from startAngle

position the position to find the closest reading to

angle a pointer return of the angle to the found reading

Returns:
if the return is >= 0 and <= maxRange then this is the distance to the closest reading, if it is >= maxRange, then there was no reading in the given section

4.89.3.6 virtual const std::list<ArSensorReading *>* ArRangeDevice::getRawReadings (void) const `[inline, virtual]`

Gets the raw unfiltered readings from the device.

The raw readings are the full set of unfiltered readings from the device, they are the latest reading, you should manipulate the list you get from this function, the only manipulation of this list should be done by the range device itself. Its only pointers for speed.

4.89.3.7 virtual int ArRangeDevice::lockDevice (void) `[inline, virtual]`

Lock this device.

If you are also inheriting an ASyncTask you MUST override this to use the lock from the **ArASyncTask** (p. 110)

Reimplemented in **ArRangeDeviceThreaded** (p. 321).

4.89.3.8 void ArRangeDevice::setCumulativeBufferSize (size_t *size*) `[virtual]`

Sets the size of the buffer for cumulative readings.

If the new size is smaller than the current buffer it chops off the readings that are excess from the oldest readings... if the new size is larger then it just leaves room for the buffer to grow

Parameters:
size number of readings to set the buffer to

4.89.3.9 void ArRangeDevice::setCurrentBufferSize (size_t *size*) `[virtual]`

Sets the size of the buffer for current readings.

If the new size is smaller than the current buffer it chops off the readings that are excess from the oldest readings... if the new size is larger then it just leaves room for the buffer to grow

Parameters:

size number of readings to set the buffer to

4.89.3.10 virtual int ArRangeDevice::tryLockDevice (void) `[inline, virtual]`

Try to lock this device.

If you are also inheriting an ASyncTask you MUST override this to use the lock from the **ArASyncTask** (p. 110)

Reimplemented in **ArRangeDeviceThreaded** (p. 321).

4.89.3.11 virtual int ArRangeDevice::unlockDevice (void) `[inline, virtual]`

Unlock this device.

If you are also inheriting an ASyncTask you MUST override this to use the lock from the **ArASyncTask** (p. 110)

Reimplemented in **ArRangeDeviceThreaded** (p. 321).

The documentation for this class was generated from the following files:

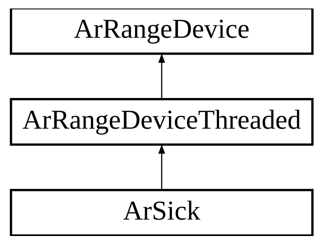
- ArRangeDevice.h
- ArRangeDevice.cpp

4.90 ArRangeDeviceThreaded Class Reference

A range device which can run in its own thread.

#include <ArRangeDeviceThreaded.h>

Inheritance diagram for ArRangeDeviceThreaded::



Public Methods

- **ArRangeDeviceThreaded** (size_t currentBufferSize, size_t cumulativeBufferSize, const char *name, unsigned int maxRange)

  Constructor.

- virtual ~**ArRangeDeviceThreaded** ()

  Destructor.

- virtual void * **runThread** (void *arg)=0

  The functor you need to implement that will be the one executed by the thread.

- virtual void **run** (void)

  Run in this thread.

- virtual void **runAsync** (void)

  Run in its own thread.

- virtual void **stopRunning** (void)

  Stop the thread.

- virtual bool **getRunning** (void)

  Get the running status of the thread.

- virtual bool **getRunningWithLock** (void)

  Get the running status of the thread, locking around the variable.

- virtual int **lockDevice** (void)
  Lock this device.
- virtual int **tryLockDevice** (void)
  Try to lock this device.
- virtual int **unlockDevice** (void)
  Unlock this device.

4.90.1 Detailed Description

A range device which can run in its own thread.

This is a range device thats threaded, it doesn't do multipleInheritance from both **ArASyncTask** (p. 110) and **ArRangeDevice** (p. 312) any more since JAVA doesn't support this and the wrapper software can't deal with it. Its still functionally the same however.

4.90.2 Member Function Documentation

4.90.2.1 virtual int ArRangeDeviceThreaded::lockDevice (void) `[inline, virtual]`

Lock this device.

If you are also inheriting an ASyncTask you MUST override this to use the lock from the **ArASyncTask** (p. 110)

Reimplemented from **ArRangeDevice** (p. 318).

4.90.2.2 virtual int ArRangeDeviceThreaded::tryLockDevice (void) `[inline, virtual]`

Try to lock this device.

If you are also inheriting an ASyncTask you MUST override this to use the lock from the **ArASyncTask** (p. 110)

Reimplemented from **ArRangeDevice** (p. 319).

4.90.2.3 virtual int ArRangeDeviceThreaded::unlockDevice (void) `[inline, virtual]`

Unlock this device.

If you are also inheriting an ASyncTask you MUST override this to use the lock from the **ArASyncTask** (p. 110)

Reimplemented from **ArRangeDevice** (p. 319).

The documentation for this class was generated from the following files:

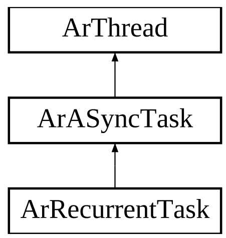
- ArRangeDeviceThreaded.h
- ArRangeDeviceThreaded.cpp

4.91 ArRecurrentTask Class Reference

Recurrent task (runs in its own thread).

`#include <ArRecurrentTask.h>`

Inheritance diagram for ArRecurrentTask::



Public Methods

- **ArRecurrentTask** ()

  Constructor.

- ~**ArRecurrentTask** ()

  Descructor.

- virtual void **task** ()=0

  The main run loop.

- void **go** ()

  Starts up on cycle of the recurrent task.

- int **done** ()

  Check if the task is running or not.

- void **reset** ()

  Cancel the task and reset for the next cycle.

- void * **runThread** (void *ptr)

  The main run loop.

4.91.1 Detailed Description

Recurrent task (runs in its own thread).

The ArRecurrentTask is a task that runs in its own thread. Recurrent tasks are asynchronous tasks that complete in a finite amount of time, and need to be reinvoked recurrently. A typical example is Saphira's localization task: it runs for a few hundred milliseconds, localizes the robot, and returns. Then the cycle starts over. The user simply needs to derive their own class from ArRecurrentTask and define the **task**() (p. 324) function. This is the user code that will be called to execute the task body. Then, create an object of the class, and call the **go**() (p. 323) function to start the task. The status of the task can be checked with the **done**() (p. 324) function, which returns 0 if running, 1 if completed, and 2 if killed. **go**() (p. 323) can be called whenever the task is done to restart it. To stop the task in midstream, call **reset**() (p. 323). kill() kills off the thread, shouldn't be used unless exiting the async task permanently

4.91.2 Member Function Documentation

4.91.2.1 int ArRecurrentTask::done ()

Check if the task is running or not.

0 = running, 1 = finished normally, 2 = canceled

4.91.2.2 void ∗ ArRecurrentTask::runThread (void ∗ *ptr*) `[virtual]`

The main run loop.

Override this function and put your taskes run loop here. Check the value of **getRunning**() (p. 488) or myRunning periodicly in your loop. If the value goes false, the loop should exit and **runThread**() (p. 324) should return.

Reimplemented from **ArASyncTask** (p. 111).

4.91.2.3 virtual void ArRecurrentTask::task () `[pure virtual]`

The main run loop.

Override this function and put your task here.

The documentation for this class was generated from the following files:

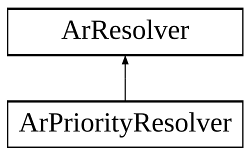
- ArRecurrentTask.h
- ArRecurrentTask.cpp

4.92 ArResolver Class Reference

Resolves a list of actions and returns what to do.

#include <ArResolver.h>

Inheritance diagram for ArResolver::



Public Types

- typedef std::multimap< int, **ArAction** ∗> **ActionMap**

  Constructor.

Public Methods

- virtual ∼**ArResolver** ()

  Desturctor.

- virtual **ArActionDesired** ∗ **resolve** (**ActionMap** ∗actions, **ArRobot** ∗robot)=0

  Figure out a single **ArActionDesired** (p. 51) *from a list of* **ArAction** (p. 39) *s.*

- virtual const char ∗ **getName** (void) const

  Gets the name of the resolver.

- virtual const char ∗ **getDescription** (void) const

  Gets the long description fo the resolver.

4.92.1 Detailed Description

Resolves a list of actions and returns what to do.

This class exists just for resolve, which will always have to be overriden. The class is used to take a list of actions and find out what to do from that...

The documentation for this class was generated from the following file:

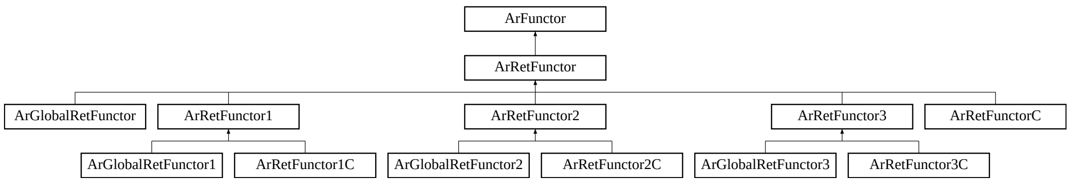
- ArResolver.h

4.93 ArRetFunctor Class Template Reference

Base class for functors with a return value.

`#include <ArFunctor.h>`

Inheritance diagram for ArRetFunctor::



Public Methods

- virtual ~**ArRetFunctor** ()

  Destructor.

- virtual void **invoke** (void)

  Invokes the functor.

- virtual Ret **invokeR** (void)=0

  Invokes the functor with return value.

4.93.1 Detailed Description

template<class Ret> class ArRetFunctor< Ret >

Base class for functors with a return value.

This is the base class for functors with a return value. Code that has a reference to a functor that returns a value should use this class name. This allows the code to know how to invoke the functor without knowing which class the member function is in.

For an overall description of functors, see **ArFunctor** (p. 139).

The documentation for this class was generated from the following file:

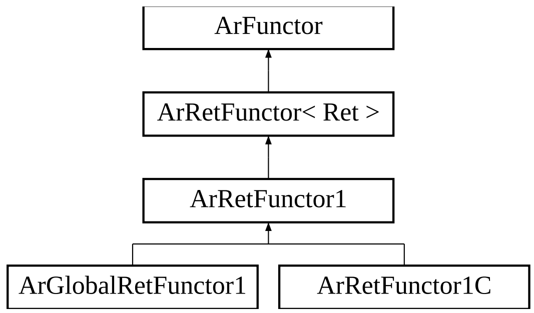
- ArFunctor.h

4.94 ArRetFunctor1 Class Template Reference

Base class for functors with a return value with 1 parameter.

`#include <ArFunctor.h>`

Inheritance diagram for ArRetFunctor1::



Public Methods

- virtual ∼**ArRetFunctor1** ()

  Destructor.

- virtual Ret **invokeR** (void)=0

  Invokes the functor with return value.

- virtual Ret **invokeR** (P1 p1)=0

  Invokes the functor with return value.

4.94.1 Detailed Description

template<class Ret, class P1> class ArRetFunctor1< Ret, P1 >

Base class for functors with a return value with 1 parameter.

This is the base class for functors with a return value and take 1 parameter. Code that has a reference to a functor that returns a value and takes 1 parameter should use this class name. This allows the code to know how to invoke the functor without knowing which class the member function is in.

For an overall description of functors, see **ArFunctor** (p. 139).

4.94.2 Member Function Documentation

4.94.2.1 template<class Ret, class P1> virtual Ret ArRetFunctor1< Ret, P1 >::invokeR (P1 *p1*) `[pure virtual]`

Invokes the functor with return value.

Parameters:
 p1 first parameter

Reimplemented in **ArGlobalRetFunctor1** (p. 185), and **ArRetFunctor1C** (p. 332).

The documentation for this class was generated from the following file:

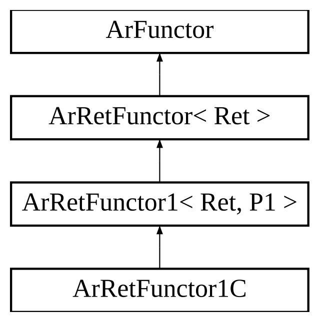
- ArFunctor.h

4.95 ArRetFunctor1C Class Template Reference

Functor for a member function with return value and 1 parameter.

`#include <ArFunctor.h>`

Inheritance diagram for ArRetFunctor1C::



Public Methods

- **ArRetFunctor1C** ()

  Constructor.

- **ArRetFunctor1C** (T &obj, Ret(T::∗func)(P1))

  Constructor - supply function pointer.

- **ArRetFunctor1C** (T &obj, Ret(T::∗func)(P1), P1 p1)

  Constructor - supply function pointer, default parameters.

- **ArRetFunctor1C** (T ∗obj, Ret(T::∗func)(P1))

  Constructor - supply function pointer.

- **ArRetFunctor1C** (T ∗obj, Ret(T::∗func)(P1), P1 p1)

  Constructor - supply function pointer, default parameters.

- virtual ∼**ArRetFunctor1C** ()

  Destructor.

- virtual Ret **invokeR** (void)

  Invokes the functor with return value.

- virtual Ret **invokeR** (P1 p1)

  Invokes the functor with return value.

- virtual void **setThis** (T ∗obj)

  Set the 'this' pointer.

- virtual void **setThis** (T &obj)

  Set the 'this' pointer.

- virtual void **setP1** (P1 p1)

  Set the default parameter.

4.95.1 Detailed Description

template<class Ret, class T, class P1> class ArRetFunctor1C< Ret, T, P1 >

Functor for a member function with return value and 1 parameter.

This is a class for member functions which take 1 parameter and return a value. This class contains the knowledge on how to call a member function on a particular instance of a class. This class should be instantiated by code that wishes to pass off a functor to another piece of code.

For an overall description of functors, see **ArFunctor** (p. 139).

4.95.2 Constructor & Destructor Documentation

4.95.2.1 template<class Ret, class T, class P1> ArRetFunctor1C< Ret, T, P1 >::ArRetFunctor1C (T & *obj*, Ret(T::∗ *func*)(P1)) [inline]

Constructor - supply function pointer.

Parameters:

func member function pointer

4.95.2.2 template<class Ret, class T, class P1> ArRetFunctor1C< Ret, T, P1 >::ArRetFunctor1C (T & *obj*, Ret(T::∗ *func*)(P1), P1 *p1*) [inline]

Constructor - supply function pointer, default parameters.

Parameters:

func member function pointer

p1 default first parameter

4.95.2.3 template<class Ret, class T, class P1> ArRetFunctor1C< Ret, T, P1 >::ArRetFunctor1C (T * *obj*, Ret(T::* *func*)(P1)) `[inline]`

Constructor - supply function pointer.

Parameters:

func member function pointer

4.95.2.4 template<class Ret, class T, class P1> ArRetFunctor1C< Ret, T, P1 >::ArRetFunctor1C (T * *obj*, Ret(T::* *func*)(P1), P1 *p1*) `[inline]`

Constructor - supply function pointer, default parameters.

Parameters:

func member function pointer

p1 default first parameter

4.95.3 Member Function Documentation

4.95.3.1 template<class Ret, class T, class P1> virtual Ret ArRetFunctor1C< Ret, T, P1 >::invokeR (P1 *p1*) `[inline, virtual]`

Invokes the functor with return value.

Parameters:

p1 first parameter

Reimplemented from **ArRetFunctor1** (p. 329).

4.95.3.2 template<class Ret, class T, class P1> virtual void ArRetFunctor1C< Ret, T, P1 >::setP1 (P1 *p1*) `[inline, virtual]`

Set the default parameter.

Parameters:

p1 default first parameter

4.95.3.3 template<class Ret, class T, class P1> virtual void ArRetFunctor1C< Ret, T, P1 >::setThis (T & *obj*) [inline, virtual]

Set the 'this' pointer.

Parameters:

obj the 'this' pointer

4.95.3.4 template<class Ret, class T, class P1> virtual void ArRetFunctor1C< Ret, T, P1 >::setThis (T * *obj*) [inline, virtual]

Set the 'this' pointer.

Parameters:

obj the 'this' pointer

The documentation for this class was generated from the following file:

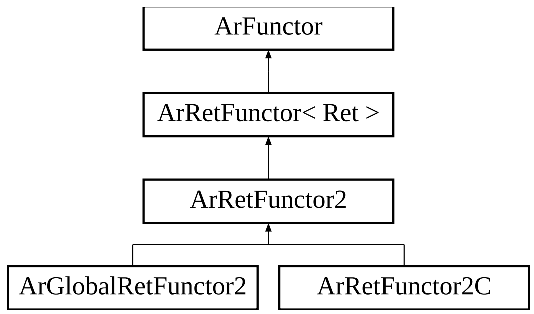
- ArFunctor.h

4.96 ArRetFunctor2 Class Template Reference

Base class for functors with a return value with 2 parameters.

```
#include <ArFunctor.h>
```

Inheritance diagram for ArRetFunctor2::



Public Methods

- virtual ~**ArRetFunctor2** ()
  Destructor.

- virtual Ret **invokeR** (void)=0
  Invokes the functor with return value.

- virtual Ret **invokeR** (P1 p1)=0
  Invokes the functor with return value.

- virtual Ret **invokeR** (P1 p1, P2 p2)=0
  Invokes the functor with return value.

4.96.1 Detailed Description

template<class Ret, class P1, class P2> class ArRetFunctor2< Ret, P1, P2 >

Base class for functors with a return value with 2 parameters.

This is the base class for functors with a return value and take 2 parameters. Code that has a reference to a functor that returns a value and takes 2 parameters should use this class name. This allows the code to know how to invoke the functor without knowing which class the member function is in.

For an overall description of functors, see **ArFunctor** (p. 139).

4.96.2 Member Function Documentation

4.96.2.1 template<class Ret, class P1, class P2> virtual Ret ArRetFunctor2< Ret, P1, P2 >::invokeR (P1 *p1*, P2 *p2*) `[pure virtual]`

Invokes the functor with return value.

Parameters:

p1 first parameter

p2 second parameter

Reimplemented in **ArGlobalRetFunctor2** (p. 189), and **ArRetFunctor2C** (p. 339).

4.96.2.2 template<class Ret, class P1, class P2> virtual Ret ArRetFunctor2< Ret, P1, P2 >::invokeR (P1 *p1*) `[pure virtual]`

Invokes the functor with return value.

Parameters:

p1 first parameter

Reimplemented in **ArGlobalRetFunctor2** (p. 189), and **ArRetFunctor2C** (p. 339).

The documentation for this class was generated from the following file:

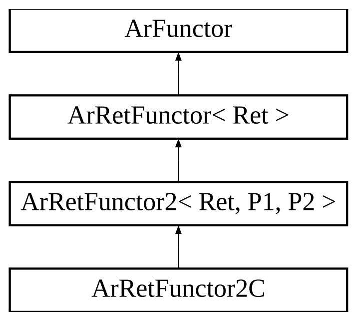
- ArFunctor.h

4.97 ArRetFunctor2C Class Template Reference

Functor for a member function with return value and 2 parameters.

`#include <ArFunctor.h>`

Inheritance diagram for ArRetFunctor2C::



Public Methods

- **ArRetFunctor2C** ()
  Constructor.
- **ArRetFunctor2C** (T &obj, Ret(T::∗func)(P1, P2))
  Constructor - supply function pointer.
- **ArRetFunctor2C** (T &obj, Ret(T::∗func)(P1, P2), P1 p1)
  Constructor - supply function pointer, default parameters.
- **ArRetFunctor2C** (T &obj, Ret(T::∗func)(P1, P2), P1 p1, P2 p2)
  Constructor - supply function pointer, default parameters.
- **ArRetFunctor2C** (T ∗obj, Ret(T::∗func)(P1, P2))
  Constructor - supply function pointer.
- **ArRetFunctor2C** (T ∗obj, Ret(T::∗func)(P1, P2), P1 p1)
  Constructor - supply function pointer, default parameters.
- **ArRetFunctor2C** (T ∗obj, Ret(T::∗func)(P1, P2), P1 p1, P2 p2)
  Constructor - supply function pointer, default parameters.

- virtual ~**ArRetFunctor2C** ()

  Destructor.

- virtual Ret **invokeR** (void)

  Invokes the functor with return value.

- virtual Ret **invokeR** (P1 p1)

  Invokes the functor with return value.

- virtual Ret **invokeR** (P1 p1, P2 p2)

  Invokes the functor with return value.

- virtual void **setThis** (T ∗obj)

  Set the 'this' pointer.

- virtual void **setThis** (T &obj)

  Set the 'this' pointer.

- virtual void **setP1** (P1 p1)

  Set the default parameter.

- virtual void **setP2** (P2 p2)

  Set the default 2nd parameter.

4.97.1 Detailed Description

template<class Ret, class T, class P1, class P2> class ArRetFunctor2C< Ret, T, P1, P2 >

Functor for a member function with return value and 2 parameters.

This is a class for member functions which take 2 parameters and return a value. This class contains the knowledge on how to call a member function on a particular instance of a class. This class should be instantiated by code that wishes to pass off a functor to another piece of code.

For an overall description of functors, see **ArFunctor** (p. 139).

4.97.2 Constructor & Destructor Documentation

4.97.2.1 template<class Ret, class T, class P1, class P2> ArRetFunctor2C< Ret, T, P1, P2 >::ArRetFunctor2C (T & *obj*, Ret(T::∗ *func*)(P1, P2)) [inline]

Constructor - supply function pointer.

Parameters:

func member function pointer

4.97.2.2 template<class Ret, class T, class P1, class P2> ArRetFunctor2C< Ret, T, P1, P2 >::ArRetFunctor2C (T & *obj*, Ret(T::∗ *func*)(P1, P2), P1 *p1*) [inline]

Constructor - supply function pointer, default parameters.

Parameters:

func member function pointer

p1 default first parameter

4.97.2.3 template<class Ret, class T, class P1, class P2> ArRetFunctor2C< Ret, T, P1, P2 >::ArRetFunctor2C (T & *obj*, Ret(T::∗ *func*)(P1, P2), P1 *p1*, P2 *p2*) [inline]

Constructor - supply function pointer, default parameters.

Parameters:

func member function pointer

p1 default first parameter

p2 default second parameter

4.97.2.4 template<class Ret, class T, class P1, class P2> ArRetFunctor2C< Ret, T, P1, P2 >::ArRetFunctor2C (T ∗ *obj*, Ret(T::∗ *func*)(P1, P2)) [inline]

Constructor - supply function pointer.

Parameters:

func member function pointer

4.97.2.5 template<class Ret, class T, class P1, class P2> ArRetFunctor2C< Ret, T, P1, P2 >::ArRetFunctor2C (T * *obj*, Ret(T::* *func*)(P1, P2), P1 *p1*) `[inline]`

Constructor - supply function pointer, default parameters.

Parameters:

func member function pointer

p1 default first parameter

4.97.2.6 template<class Ret, class T, class P1, class P2> ArRetFunctor2C< Ret, T, P1, P2 >::ArRetFunctor2C (T * *obj*, Ret(T::* *func*)(P1, P2), P1 *p1*, P2 *p2*) `[inline]`

Constructor - supply function pointer, default parameters.

Parameters:

func member function pointer

p1 default first parameter

p2 default second parameter

4.97.3 Member Function Documentation

4.97.3.1 template<class Ret, class T, class P1, class P2> virtual Ret ArRetFunctor2C< Ret, T, P1, P2 >::invokeR (P1 *p1*, P2 *p2*) `[inline, virtual]`

Invokes the functor with return value.

Parameters:

p1 first parameter

p2 second parameter

Reimplemented from **ArRetFunctor2** (p. 335).

4.97.3.2 template<class Ret, class T, class P1, class P2> virtual Ret ArRetFunctor2C< Ret, T, P1, P2 >::invokeR (P1 *p1*) `[inline, virtual]`

Invokes the functor with return value.

Parameters:

p1 first parameter

Reimplemented from **ArRetFunctor2** (p. 335).

4.97.3.3 template<class Ret, class T, class P1, class P2> virtual void ArRetFunctor2C< Ret, T, P1, P2 >::setP1 (P1 *p1*) [inline, virtual]

Set the default parameter.

Parameters:

p1 default first parameter

4.97.3.4 template<class Ret, class T, class P1, class P2> virtual void ArRetFunctor2C< Ret, T, P1, P2 >::setP2 (P2 *p2*) [inline, virtual]

Set the default 2nd parameter.

Parameters:

p2 default second parameter

4.97.3.5 template<class Ret, class T, class P1, class P2> virtual void ArRetFunctor2C< Ret, T, P1, P2 >::setThis (T & *obj*) [inline, virtual]

Set the 'this' pointer.

Parameters:

obj the 'this' pointer

4.97.3.6 template<class Ret, class T, class P1, class P2> virtual void ArRetFunctor2C< Ret, T, P1, P2 >::setThis (T * *obj*) [inline, virtual]

Set the 'this' pointer.

Parameters:

obj the 'this' pointer

The documentation for this class was generated from the following file:

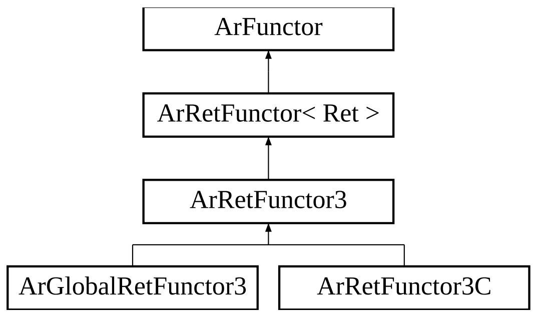
- ArFunctor.h

4.98 ArRetFunctor3 Class Template Reference

Base class for functors with a return value with 3 parameters.

`#include <ArFunctor.h>`

Inheritance diagram for ArRetFunctor3::



Public Methods

- virtual ~**ArRetFunctor3** ()

  Destructor.

- virtual Ret **invokeR** (void)=0

  Invokes the functor with return value.

- virtual Ret **invokeR** (P1 p1)=0

  Invokes the functor with return value.

- virtual Ret **invokeR** (P1 p1, P2 p2)=0

  Invokes the functor with return value.

- virtual Ret **invokeR** (P1 p1, P2 p2, P3 p3)=0

  Invokes the functor with return value.

4.98.1 Detailed Description

template<class Ret, class P1, class P2, class P3> class ArRetFunctor3< Ret, P1, P2, P3 >

Base class for functors with a return value with 3 parameters.

This is the base class for functors with a return value and take 3 parameters. Code that has a reference to a functor that returns a value and takes 3 parameters should use this class name. This allows the code to know how to invoke the functor without knowing which class the member function is in.

For an overall description of functors, see **ArFunctor** (p. 139).

4.98.2 Member Function Documentation

4.98.2.1 template<class Ret, class P1, class P2, class P3> virtual Ret ArRetFunctor3< Ret, P1, P2, P3 >::invokeR (P1 *p1*, P2 *p2*, P3 *p3*) `[pure virtual]`

Invokes the functor with return value.

Parameters:

p1 first parameter

p2 second parameter

p3 third parameter

Reimplemented in **ArGlobalRetFunctor3** (p. 193), and **ArRetFunctor3C** (p. 349).

4.98.2.2 template<class Ret, class P1, class P2, class P3> virtual Ret ArRetFunctor3< Ret, P1, P2, P3 >::invokeR (P1 *p1*, P2 *p2*) `[pure virtual]`

Invokes the functor with return value.

Parameters:

p1 first parameter

p2 second parameter

Reimplemented in **ArGlobalRetFunctor3** (p. 194), and **ArRetFunctor3C** (p. 349).

4.98.2.3 template<class Ret, class P1, class P2, class P3> virtual Ret ArRetFunctor3< Ret, P1, P2, P3 >::invokeR (P1 *p1*) `[pure virtual]`

Invokes the functor with return value.

Parameters:

p1 first parameter

Reimplemented in **ArGlobalRetFunctor3** (p. 194), and **ArRetFunctor3C** (p. 350).

The documentation for this class was generated from the following file:

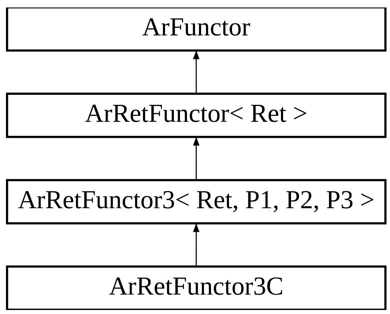
- ArFunctor.h

4.99 ArRetFunctor3C Class Template Reference

Functor for a member function with return value and 3 parameters.

#include <ArFunctor.h>

Inheritance diagram for ArRetFunctor3C::



Public Methods

- **ArRetFunctor3C** ()

  Constructor.

- **ArRetFunctor3C** (T &obj, Ret(T::∗func)(P1, P2, P3))

  Constructor - supply function pointer.

- **ArRetFunctor3C** (T &obj, Ret(T::∗func)(P1, P2, P3), P1 p1)

  Constructor - supply function pointer, default parameters.

- **ArRetFunctor3C** (T &obj, Ret(T::∗func)(P1, P2, P3), P1 p1, P2 p2)

  Constructor - supply function pointer, default parameters.

- **ArRetFunctor3C** (T &obj, Ret(T::∗func)(P1, P2, P3), P1 p1, P2 p2, P3 p3)

  Constructor - supply function pointer, default parameters.

- **ArRetFunctor3C** (T ∗obj, Ret(T::∗func)(P1, P2, P3))

  Constructor - supply function pointer.

- **ArRetFunctor3C** (T ∗obj, Ret(T::∗func)(P1, P2, P3), P1 p1)

  Constructor - supply function pointer, default parameters.

- **ArRetFunctor3C** (T ∗obj, Ret(T::∗func)(P1, P2, P3), P1 p1, P2 p2)

  Constructor - supply function pointer, default parameters.

- **ArRetFunctor3C** (T ∗obj, Ret(T::∗func)(P1, P2, P3), P1 p1, P2 p2, P3 p3)

  Constructor - supply function pointer, default parameters.

- virtual ∼**ArRetFunctor3C** ()

  Destructor.

- virtual Ret **invokeR** (void)

  Invokes the functor with return value.

- virtual Ret **invokeR** (P1 p1)

  Invokes the functor with return value.

- virtual Ret **invokeR** (P1 p1, P2 p2)

  Invokes the functor with return value.

- virtual Ret **invokeR** (P1 p1, P2 p2, P3 p3)

  Invokes the functor with return value.

- virtual void **setThis** (T ∗obj)

  Set the 'this' pointer.

- virtual void **setThis** (T &obj)

  Set the 'this' pointer.

- virtual void **setP1** (P1 p1)

  Set the default parameter.

- virtual void **setP2** (P2 p2)

  Set the default 2nd parameter.

- virtual void **setP3** (P3 p3)

  Set the default third parameter.

4.99.1 Detailed Description

template<class Ret, class T, class P1, class P2, class P3> class ArRetFunctor3C< Ret, T, P1, P2, P3 >

Functor for a member function with return value and 3 parameters.

This is a class for member functions which take 3 parameters and return a value. This class contains the knowledge on how to call a member function on a particular instance of a class. This class should be instantiated by code that wishes to pass off a functor to another piece of code.

For an overall description of functors, see **ArFunctor** (p. 139).

4.99.2 Constructor & Destructor Documentation

4.99.2.1 template<class Ret, class T, class P1, class P2, class P3> ArRetFunctor3C< Ret, T, P1, P2, P3 >::ArRetFunctor3C (T & *obj*, Ret(T::∗ *func*)(P1, P2, P3)) `[inline]`

Constructor - supply function pointer.

Parameters:

func member function pointer

4.99.2.2 template<class Ret, class T, class P1, class P2, class P3> ArRetFunctor3C< Ret, T, P1, P2, P3 >::ArRetFunctor3C (T & *obj*, Ret(T::∗ *func*)(P1, P2, P3), P1 *p1*) `[inline]`

Constructor - supply function pointer, default parameters.

Parameters:

func member function pointer

p1 default first parameter

4.99.2.3 template<class Ret, class T, class P1, class P2, class P3> ArRetFunctor3C< Ret, T, P1, P2, P3 >::ArRetFunctor3C (T & *obj*, Ret(T::∗ *func*)(P1, P2, P3), P1 *p1*, P2 *p2*) `[inline]`

Constructor - supply function pointer, default parameters.

Parameters:

func member function pointer

p1 default first parameter

p2 default second parameter

4.99.2.4 template<class Ret, class T, class P1, class P2, class P3> ArRetFunctor3C< Ret, T, P1, P2, P3 >::ArRetFunctor3C (T & *obj*, Ret(T::∗ *func*)(P1, P2, P3), P1 *p1*, P2 *p2*, P3 *p3*) `[inline]`

Constructor - supply function pointer, default parameters.

Parameters:

func member function pointer

p1 default first parameter

p2 default second parameter

4.99.2.5 template<class Ret, class T, class P1, class P2, class P3> ArRetFunctor3C< Ret, T, P1, P2, P3 >::ArRetFunctor3C (T ∗ *obj*, Ret(T::∗ *func*)(P1, P2, P3)) `[inline]`

Constructor - supply function pointer.

Parameters:

func member function pointer

4.99.2.6 template<class Ret, class T, class P1, class P2, class P3> ArRetFunctor3C< Ret, T, P1, P2, P3 >::ArRetFunctor3C (T ∗ *obj*, Ret(T::∗ *func*)(P1, P2, P3), P1 *p1*) `[inline]`

Constructor - supply function pointer, default parameters.

Parameters:

func member function pointer

p1 default first parameter

4.99.2.7 template<class Ret, class T, class P1, class P2, class P3> ArRetFunctor3C< Ret, T, P1, P2, P3 >::ArRetFunctor3C (T ∗ *obj*, Ret(T::∗ *func*)(P1, P2, P3), P1 *p1*, P2 *p2*) `[inline]`

Constructor - supply function pointer, default parameters.

Parameters:

func member function pointer

p1 default first parameter

p2 default second parameter

4.99.2.8 template<class Ret, class T, class P1, class P2, class P3> ArRetFunctor3C< Ret, T, P1, P2, P3 >::ArRetFunctor3C (T * *obj*, Ret(T::* *func*)(P1, P2, P3), P1 *p1*, P2 *p2*, P3 *p3*) `[inline]`

Constructor - supply function pointer, default parameters.

Parameters:

func member function pointer

p1 default first parameter

p2 default second parameter

p3 default third parameter

4.99.3 Member Function Documentation

4.99.3.1 template<class Ret, class T, class P1, class P2, class P3> virtual Ret ArRetFunctor3C< Ret, T, P1, P2, P3 >::invokeR (P1 *p1*, P2 *p2*, P3 *p3*) `[inline, virtual]`

Invokes the functor with return value.

Parameters:

p1 first parameter

p2 second parameter

Reimplemented from **ArRetFunctor3** (p. 343).

4.99.3.2 template<class Ret, class T, class P1, class P2, class P3> virtual Ret ArRetFunctor3C< Ret, T, P1, P2, P3 >::invokeR (P1 *p1*, P2 *p2*) `[inline, virtual]`

Invokes the functor with return value.

Parameters:

p1 first parameter

p2 second parameter

Reimplemented from **ArRetFunctor3** (p. 343).

4.99.3.3 template<class Ret, class T, class P1, class P2, class P3> virtual Ret ArRetFunctor3C< Ret, T, P1, P2, P3 >::invokeR (P1 *p1*) `[inline, virtual]`

Invokes the functor with return value.

Parameters:

p1 first parameter

Reimplemented from **ArRetFunctor3** (p. 343).

4.99.3.4 template<class Ret, class T, class P1, class P2, class P3> virtual void ArRetFunctor3C< Ret, T, P1, P2, P3 >::setP1 (P1 *p1*) `[inline, virtual]`

Set the default parameter.

Parameters:

p1 default first parameter

4.99.3.5 template<class Ret, class T, class P1, class P2, class P3> virtual void ArRetFunctor3C< Ret, T, P1, P2, P3 >::setP2 (P2 *p2*) `[inline, virtual]`

Set the default 2nd parameter.

Parameters:

p2 default second parameter

4.99.3.6 template<class Ret, class T, class P1, class P2, class P3> virtual void ArRetFunctor3C< Ret, T, P1, P2, P3 >::setP3 (P3 *p3*) `[inline, virtual]`

Set the default third parameter.

Parameters:

p3 default third parameter

4.99.3.7 template<class Ret, class T, class P1, class P2, class P3> virtual void ArRetFunctor3C< Ret, T, P1, P2, P3 >::setThis (T & *obj*) [inline, virtual]

Set the 'this' pointer.

Parameters:

obj the 'this' pointer

4.99.3.8 template<class Ret, class T, class P1, class P2, class P3> virtual void ArRetFunctor3C< Ret, T, P1, P2, P3 >::setThis (T * *obj*) [inline, virtual]

Set the 'this' pointer.

Parameters:

obj the 'this' pointer

The documentation for this class was generated from the following file:

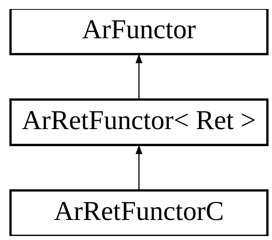
- ArFunctor.h

4.100 ArRetFunctorC Class Template Reference

Functor for a member function with return value.

#include <ArFunctor.h>

Inheritance diagram for ArRetFunctorC::



Public Methods

- **ArRetFunctorC** ()

  Constructor.

- **ArRetFunctorC** (T &obj, Ret(T::∗func)(void))

  Constructor - supply function pointer.

- **ArRetFunctorC** (T ∗obj, Ret(T::∗func)(void))

  Constructor - supply function pointer.

- virtual ∼**ArRetFunctorC** ()

  Destructor - supply function pointer.

- virtual Ret **invokeR** (void)

  Invokes the functor with return value.

- virtual void **setThis** (T ∗obj)

  Set the 'this' pointer.

- virtual void **setThis** (T &obj)

  Set the 'this' pointer.

4.100.1 Detailed Description

template<class Ret, class T> class ArRetFunctorC< Ret, T >

Functor for a member function with return value.

This is a class for member functions which return a value. This class contains the knowledge on how to call a member function on a particular instance of a class. This class should be instantiated by code that wishes to pass off a functor to another piece of code.

For an overall description of functors, see **ArFunctor** (p. 139).

4.100.2 Constructor & Destructor Documentation

4.100.2.1 template<class Ret, class T> ArRetFunctorC< Ret, T >::ArRetFunctorC (T & *obj*, Ret(T::∗ *func*)(void)) `[inline]`

Constructor - supply function pointer.

Parameters:
func member function pointer

4.100.2.2 template<class Ret, class T> ArRetFunctorC< Ret, T >::ArRetFunctorC (T ∗ *obj*, Ret(T::∗ *func*)(void)) `[inline]`

Constructor - supply function pointer.

Parameters:
func member function pointer

4.100.3 Member Function Documentation

4.100.3.1 template<class Ret, class T> virtual void ArRetFunctorC< Ret, T >::setThis (T & *obj*) `[inline, virtual]`

Set the 'this' pointer.

Parameters:
obj the 'this' pointer

4.100.3.2 template<class Ret, class T> virtual void ArRetFunctorC< Ret, T >::setThis (T * *obj*) [inline, virtual]

Set the 'this' pointer.

Parameters:

obj the 'this' pointer

The documentation for this class was generated from the following file:

- ArFunctor.h

4.101 ArRobot Class Reference

THE important class.

`#include <ArRobot.h>`

Public Types

- enum **WaitState** { **WAIT_CONNECTED**, **WAIT_FAILED_CONN**, **WAIT_RUN_EXIT**, **WAIT_TIMEDOUT**, **WAIT_INTR**, **WAIT_FAIL** }

Public Methods

- **ArRobot** (const char ∗name=NULL, bool doStateReflection=true, bool doSigHandle=true, bool normalInit=true)

  Constructor.

- ∼**ArRobot** ()

  Destructor.

- void **run** (bool stopRunIfNotConnected)

  Starts the instance to do processing in this thread.

- void **runAsync** (bool stopRunIfNotConnected)

  Starts the instance to do processing in its own new thread.

- bool **isRunning** (void) const

  Returns whether the robot is currently running or not.

- void **stopRunning** (bool doDisconnect=true)

  Stops the robot from doing any more processing.

- void **setDeviceConnection** (**ArDeviceConnection** ∗connection)

  Sets the connection this instance uses.

- **ArDeviceConnection** ∗ **getDeviceConnection** (void) const

  Gets the connection this instance uses.

- bool **isConnected** (void) const

  Questions whether the robot is connected or not.

- bool **blockingConnect** (void)

  Connects to a robot, not returning until connection made or failed.

- bool **asyncConnect** (void)

  Connects to a robot, from the robots own thread.

- bool **disconnect** (void)

  Disconnects from a robot.

- void **clearDirectMotion** (void)

  Clears what direct motion commands have been given, so actions work.

- bool **isDirectMotion** (void) const

  Returns true if direct motion commands are blocking actions.

- void **enableMotors** ()

  Enables the motors on the robot.

- void **disableMotors** ()

  Disables the motors on the robot.

- void **stop** (void)

  Stops the robot

  See also:

  clearDirectMotion (p. 380).

- void **setVel** (double velocity)

  Sets the velocity

  See also:

  clearDirectMotion (p. 380).

- void **setVel2** (double leftVelocity, double rightVelocity)

  Sets the velocity of the wheels independently

  See also:

  clearDirectMotion (p. 380).

- void **move** (double distance)

  Move the given distance forward/backwards

  See also:

  clearDirectMotion (p. 380).

- bool **isMoveDone** (double delta=0.0)

  Sees if the robot is done moving the previously given move.

- void **setMoveDoneDist** (double dist)

  Sets the difference required for being done with a move.

- double **getMoveDoneDist** (void)

  Gets the difference required for being done with a move.

- void **setHeading** (double heading)

  Sets the heading
  See also:
  clearDirectMotion (p. 380).

- void **setRotVel** (double velocity)

  Sets the rotational velocity
  See also:
  clearDirectMotion (p. 380).

- void **setDeltaHeading** (double deltaHeading)

  Sets the delta heading
  See also:
  clearDirectMotion (p. 380).

- bool **isHeadingDone** (double delta=0.0) const

  Sees if the robot is done changing to the previously given setHeading.

- void **setHeadingDoneDiff** (double degrees)

  sets the difference required for being done with a heading change.

- double **getHeadingDoneDiff** (void) const

  Gets the difference required for being done with a heading change.

- void **setDirectMotionPrecedenceTime** (int mSec)

  Sets the length of time a direct motion command will take precedence over actions, in milliseconds.

- unsigned int **getDirectMotionPrecedenceTime** (void) const

  Gets the length of time a direct motion command will take precedence over actions, in milliseconds.

- bool **com** (unsigned char command)

  Sends a command to the robot with no arguments.

- bool **comInt** (unsigned char command, short int argument)

Sends a command to the robot with an int for argument.

- bool **com2Bytes** (unsigned char command, char high, char low)

  Sends a command to the robot with two bytes for argument.

- bool **comStr** (unsigned char command, const char ∗argument)

  Sends a command to the robot with a string for argument.

- bool **comStrN** (unsigned char command, const char ∗str, int size)

  Sends a command to the robot with a size bytes of str as argument.

- const char ∗ **getRobotName** (void) const

  Returns the Robot's name that is set in its onboard configuration.

- const char ∗ **getRobotType** (void) const

  Returns the type of the robot connected to.

- const char ∗ **getRobotSubType** (void) const

  Returns the subtype of the robot connected to.

- double **getMaxTransVel** (void) const

  Gets the robots maximum translational velocity.

- bool **setMaxTransVel** (double maxVel)

  Sets the robots maximum translational velocity.

- double **getMaxRotVel** (void) const

  Gets the robots maximum rotational velocity.

- bool **setMaxRotVel** (double myMaxVel)

  Sets the robots maximum rotational velocity.

- **ArPose getPose** (void) const

  Gets the global position of the robot.

- double **getX** (void) const

  Gets the global X location of the robot.

- double **getY** (void) const

  Gets the global Y location of the robot.

- double **getTh** (void) const

Gets the global Th location of the robot.

- double **getVel** (void) const

  Gets the translational velocity of the robot.

- double **getRotVel** (void) const

  Gets the rotational velocity of the robot.

- double **getRobotRadius** (void) const

  Gets the robot radius (in mm).

- double **getRobotDiagonal** (void) const

  Gets the robot diagonal (half-height to diagonal of octagon) (in mm).

- double **getBatteryVoltage** (void) const

  Gets the battery voltage of the robot.

- double **getLeftVel** (void) const

  Gets the velocity of the left wheel.

- double **getRightVel** (void) const

  Gets the velocity of the right wheel.

- int **getStallValue** (void) const

  Gets the 2 bytes of stall return from the robot.

- bool **isLeftMotorStalled** (void) const

  Returns true if the left motor is stalled.

- bool **isRightMotorStalled** (void) const

  Returns true if the left motor is stalled.

- double **getControl** (void) const

  Gets the control heading.

- int **getFlags** (void) const

  Gets the flags values.

- bool **areMotorsEnabled** (void) const

  returns true if the motors are enabled.

- bool **areSonarsEnabled** (void) const *returns true if the motors are enabled.*

- double **getCompass** (void) const

  Gets the compass heading from the robot.

- int **getAnalogPortSelected** (void) const

  Gets which analog port is selected.

- unsigned char **getAnalog** (void) const

  Gets the analog value.

- unsigned char **getDigIn** (void) const

  Gets the byte representing digital input status.

- unsigned char **getDigOut** (void) const

  Gets the byte representing digital output status.

- int **getIOAnalogSize** (void) const

  Gets the number of bytes in the analog IO buffer.

- int **getIODigInSize** (void) const

  Gets the number of bytes in the digital input IO buffer.

- int **getIODigOutSize** (void) const

  Gets the number of bytes in the digital output IO buffer.

- int **getIOAnalog** (int num) const

  Gets the n'th byte from the analog input data from the IO packet.

- unsigned char **getIODigIn** (int num) const

  Gets the n'th byte from the digital input data from the IO packet.

- unsigned char **getIODigOut** (int num) const

  Gets the n'th byte from the digital output data from the IO packet.

- bool **hasTableSensingIR** (void) const

  Gets whether the robot has table sensing IR or not (see params in docs).

- bool **isLeftTableSensingIRTriggered** (void) const

  Returns true if the left table sensing IR is triggered.

- bool **isRightTableSensingIRTriggered** (void) const

Returns true if the right table sensing IR is triggered.

- bool **isLeftBreakBeamTriggered** (void) const

  Returns true if the left break beam IR is triggered.

- bool **isRightBreakBeamTriggered** (void) const

  Returns true if the right break beam IR is triggered.

- **ArTime getIOPacketTime** (void) const

  Returns the time received of the last IO packet.

- bool **hasFrontBumpers** (void) const

  Gets whether the robot has front bumpers (see params in docs).

- unsigned int **getNumFrontBumpers** (void) const

  Gets the number of the front bumpers.

- bool **hasRearBumpers** (void) const

  Gets whether the robot has rear bumpers (see params in docs).

- unsigned int **getNumRearBumpers** (void) const

  Gets the number of the rear bumpers.

- **ArPose getEncoderPose** (void) const

  Gets the position of the robot according to the encoders.

- int **getMotorPacCount** (void) const

  Gets the number of motor packets received in the last second.

- int **getSonarPacCount** (void) const

  Gets the number of sonar returns received in the last second.

- int **getSonarRange** (int num) const

  Gets the range of the last sonar reading for the given sonar.

- bool **isSonarNew** (int num) const

  Find out if the given sonar has a new reading.

- int **getNumSonar** (void) const

  Find the number of sonar there are.

- **ArSensorReading** ∗ **getSonarReading** (int num) const

Returns the sonar reading for the given sonar.

- int **getClosestSonarRange** (double startAngle, double endAngle) const

  Returns the closest of the current sonar reading in the given range.

- int **getClosestSonarNumber** (double startAngle, double endAngle) const

  Returns the number of the sonar that has the closest current reading in the given range.

- const char ∗ **getName** (void) const

  Gets the robots name in ARIAs list.

- void **setName** (const char ∗name)

  Sets the robots name in ARIAs list.

- void **moveTo** (**ArPose** pose, bool doCumulative=true)

  Moves the robot's idea of its position to this position.

- void **moveTo** (**ArPose** to, **ArPose** from, bool doCumulative=true)

  Moves the robot's RW position to reflect pose From => pose To.

- void **setEncoderTransform** (**ArPose** deadReconPos, **ArPose** globalPos)

  Changes the transform.

- void **setEncoderTransform** (**ArPose** transformPos)

  Changes the transform directly.

- **ArTransform getEncoderTransform** (void) const

  Gets the encoder transform.

- **ArTransform getToGlobalTransform** (void) const

  This gets the transform from local coords to global coords.

- **ArTransform getToLocalTransform** (void) const

  This gets the transform for going from global coords to local coords.

- void **applyTransform** (**ArTransform** trans, bool doCumulative=true)

  This applies a transform to all the robot range devices and to the sonar.

- void **setDeadReconPose** (**ArPose** pose)

Sets the dead recon position of the robot.

- void **addRangeDevice** (**ArRangeDevice** ∗device)

  Adds a rangeDevice to the robot's list of them, and set the device's robot pointer.

- void **remRangeDevice** (const char ∗name)

  Remove a range device from the robot's list, by name.

- void **remRangeDevice** (**ArRangeDevice** ∗device)

  Remove a range device from the robot's list, by instance.

- const **ArRangeDevice** ∗ **findRangeDevice** (const char ∗name) const

  Finds a rangeDevice in the robot's list.

- **ArRangeDevice** ∗ **findRangeDevice** (const char ∗name)

  Finds a rangeDevice in the robot's list.

- std::list< **ArRangeDevice** ∗> ∗ **getRangeDeviceList** (void)

  Gets the range device list.

- bool **hasRangeDevice** (**ArRangeDevice** ∗device) const

  Finds whether a particular range device is attached to this robot or not.

- double **checkRangeDevicesCurrentPolar** (double startAngle, double endAngle, double ∗angle=NULL) const

  Goes through all the range devices and checks them.

- double **checkRangeDevicesCumulativePolar** (double startAngle, double endAngle, double ∗angle=NULL) const

  Goes through all the range devices and checks them.

- double **checkRangeDevicesCurrentBox** (double x1, double y1, double x2, double y2, **ArPose** ∗readingPos=NULL) const
- double **checkRangeDevicesCumulativeBox** (double x1, double y1, double x2, double y2, **ArPose** ∗readingPos=NULL) const
- void **setStateReflectionRefreshTime** (int msec)

  Sets the number of milliseconds between state reflection refreshes if the state has not changed.

- int **getStateReflectionRefreshTime** (void) const

  Sets the number of milliseconds between state reflection refreshes if the state has not changed.

- void **addPacketHandler** (**ArRetFunctor1**< bool, **ArRobotPacket** *> *functor, **ArListPos::Pos** position)

  Adds a packet handler to the list of packet handlers.

- void **remPacketHandler** (**ArRetFunctor1**< bool, **ArRobotPacket** *> *functor)

  Removes a packet handler from the list of packet handlers.

- void **addConnectCB** (**ArFunctor** *functor, **ArListPos::Pos** position)

  Adds a connect callback.

- void **remConnectCB** (**ArFunctor** *functor)

  Adds a disconnect callback.

- void **addFailedConnectCB** (**ArFunctor** *functor, **ArListPos::Pos** position)

  Adds a callback for when a connection to the robot is failed.

- void **remFailedConnectCB** (**ArFunctor** *functor)

  Removes a callback for when a connection to the robot is failed.

- void **addDisconnectNormallyCB** (**ArFunctor** *functor, **ArListPos::Pos** position)

  Adds a callback for when disconnect is called while connected.

- void **remDisconnectNormallyCB** (**ArFunctor** *functor)

  Removes a callback for when disconnect is called while connected.

- void **addDisconnectOnErrorCB** (**ArFunctor** *functor, **ArListPos::Pos** position)

  Adds a callback for when disconnection happens because of an error.

- void **remDisconnectOnErrorCB** (**ArFunctor** *functor)

  Removes a callback for when disconnection happens because of an error.

- void **addRunExitCB** (**ArFunctor** *functor, **ArListPos::Pos** position)

  Adds a callback for when the run loop exits for what ever reason.

- void **remRunExitCB** (**ArFunctor** *functor)

  Removes a callback for when the run loop exits for what ever reason.

- **WaitState waitForConnect** (unsigned int msecs=0)

  Suspend calling thread until the ArRobot is connected.

- **WaitState waitForConnectOrConnFail** (unsigned int msecs=0)

  Suspend calling thread until the ArRobot is connected or fails to connect.

- **WaitState waitForRunExit** (unsigned int msecs=0)

  Suspend calling thread until the ArRobot run loop has exited.

- void **wakeAllWaitingThreads** ()

  Wake up all threads waiting on this robot.

- void **wakeAllConnWaitingThreads** ()

  Wake up all threads waiting for connection.

- void **wakeAllConnOrFailWaitingThreads** ()

  Wake up all threads waiting for connection or connection failure.

- void **wakeAllRunExitWaitingThreads** ()

  Wake up all threads waiting for the run loop to exit.

- bool **addUserTask** (const char *name, int position, **ArFunctor** *functor, **ArTaskState::State** *state=NULL)

  Adds a user task to the list of synchronous taskes.

- void **remUserTask** (const char *name)

  Removes a user task from the list of synchronous taskes by name.

- void **remUserTask** (**ArFunctor** *functor)

  Removes a user task from the list of synchronous taskes by functor.

- **ArSyncTask** * **findUserTask** (const char *name)

  Finds a user task by name.

- **ArSyncTask** * **findUserTask** (**ArFunctor** *functor)

  Finds a user task by functor.

- void **logUserTasks** (void) const

  Logs the list of user tasks, strictly for your viewing pleasure.

- void **logAllTasks** (void) const

Logs the list of all tasks, strictly for your viewing pleasure.

- bool **addSensorInterpTask** (const char *name, int position, **ArFunctor** *functor, **ArTaskState::State** *state=NULL)

  Adds a task under the sensor interp part of the syncronous tasks.

- void **remSensorInterpTask** (const char *name)

  Removes a sensor interp tasks by name.

- void **remSensorInterpTask** (**ArFunctor** *functor)

  Removes a sensor interp tasks by functor.

- **ArSyncTask** * **findTask** (const char *name)

  Finds a task by name.

- **ArSyncTask** * **findTask** (**ArFunctor** *functor)

  Finds a task by functor.

- void **addAction** (**ArAction** *action, int priority)

  Adds an action to the list with the given priority.

- bool **remAction** (**ArAction** *action)

  Removes an action from the list, by pointer.

- bool **remAction** (const char *actionName)

  Removes an action from the list, by name.

- **ArAction** * **findAction** (const char *actionName)

  Returns the first (highest priority) action with the given name (or NULL).

- **ArResolver::ActionMap** * **getActionMap** (void)

  Returns the map of actions... don't do this unless you really know what you're doing.

- void **logActions** (void) const

  Logs out the actions and their priorities.

- **ArResolver** * **getResolver** (void)

  Gets the resolver the robot is using.

- void **setResolver** (**ArResolver** *resolver)

  Sets the resolver the robot is using.

- void **setEncoderCorrectionCallback** (**ArRetFunctor1**< double, **ArPoseWithTime** > *functor)

  Sets the encoderCorrectionCallback.

- **ArRetFunctor1**< double, **ArPoseWithTime** > * **getEncoderCorrectionCallback** (void) const

  Gets the encoderCorrectionCallback.

- void **setCycleTime** (unsigned int ms)

  Sets the number of ms between cycles.

- unsigned int **getCycleTime** (void) const

  Gets the number of ms between cycles.

- void **setConnectionCycleMultiplier** (unsigned int multiplier)

  Sets the multiplier for how many cycles ArRobot waits when connecting.

- unsigned int **getConnectionCycleMultiplier** (void) const

  Gets the multiplier for how many cycles ArRobot waits when connecting.

- void **setCycleChained** (bool cycleChained)

  Sets whether to chain the robot cycle to when we get in SIP packets.

- bool **isCycleChained** (void) const

  Gets whether we chain the robot cycle to when we get in SIP packets.

- void **setConnectionTimeoutTime** (int mSecs)

  Sets the time without a response until connection assumed lost.

- int **getConnectionTimeoutTime** (void) const

  Gets the time without a response until connection assumed lost.

- **ArTime getLastPacketTime** (void) const

  Gets the time the last packet was received.

- void **setPoseInterpNumReadings** (size_t numReadings)

  Sets the number of packets back in time the **ArInterpolation** (p. 210) *goes.*

- size_t **getPoseInterpNumReadings** (void) const

  Sets the number of packets back in time the position interpol goes.

- int **getPoseInterpPosition** (**ArTime** timeStamp, **ArPose** *position)

  Gets the position the robot was at at the given timestamp.

- unsigned int **getCounter** (void) const

  Gets the Counter for the time through the loop.

- const **ArRobotParams** ∗ **getRobotParams** (void) const

  Gets the parameters the robot is using.

- bool **loadParamFile** (const char ∗file)

  Loads a parameter file (replacing all other params).

- void **attachKeyHandler** (**ArKeyHandler** ∗keyHandler, bool exitOnEscape=true)

  Attachs a key handler.

- **ArKeyHandler** ∗ **getKeyHandler** (void) const

  Gets the key handler attached to this robot.

- int **lock** ()

  Lock the robot instance.

- int **tryLock** ()

  Try to lock the robot instance without blocking.

- int **unlock** ()

  Unlock the robot instance.

- **ArSyncTask** ∗ **getSyncTaskRoot** (void)

  This gets the root of the syncronous task tree, only serious developers should use it.

- void **loopOnce** (void)

  This function loops once... only serious developers should use it.

- void **incCounter** (void)

  This is only for use by syncLoop.

- void **packetHandler** (void)

  Packet Handler, internal.

- void **actionHandler** (void)

  Action Handler, internal.

- void **stateReflector** (void)

State Reflector, internal.

- void **robotLocker** (void)

  Robot locker, internal.

- void **robotUnlocker** (void)

  Robot unlocker, internal.

- void **keyHandlerExit** (void)

  For the key handler, escape calls this to exit, internal.

- bool **processMotorPacket** (**ArRobotPacket** *packet)

  Processes a motor packet, internal.

- void **processNewSonar** (char number, int range, **ArTime** timeReceived)

  Processes a new sonar reading, internal.

- bool **processEncoderPacket** (**ArRobotPacket** *packet)

  Processes a new encoder packet, internal.

- bool **processIOPacket** (**ArRobotPacket** *packet)

  Processes a new IO packet, internal.

- void **init** (void)

  Internal function, shouldn't be used.

- void **setUpSyncList** (void)

  Internal function, shouldn't be used, sets up the default sync list.

- void **setUpPacketHandlers** (void)

  Internal function, shouldn't be used, sets up the default packet handlers.

- int **asyncConnectHandler** (bool tryHarderToConnect)

  Internal function, shouldn't be used, does a single run of connecting.

- void **dropConnection** (void)

  Internal function, shouldn't be used, drops the conn because of error.

- void **failedConnect** (void)

  Internal function, shouldn't be used, denotes the conn failed.

- void **madeConnection** (void)

Internal function, shouldn't be used, does the after conn stuff.

- bool **handlePacket** (**ArRobotPacket** ∗packet)

  Internal function, takes a packet and passes it to the packet handlers, returns true if handled, false otherwise.

- std::list< **ArFunctor** ∗> ∗ **getRunExitListCopy** ()

  Internal function, shouldn't be used, does what its name says.

- void **processParamFile** (ArRobotParamFile ∗paramFile)

  Internal function, processes a parameter file.

4.101.1 Detailed Description

THE important class.

This is the most important class, the only classes most people will ever have to use are this one, and the **ArSerialConnection** (p. 424) and ArTCPConnection. NOTE: In Windows you cannot make an ArRobot a global, it will crash because the windows compiler initializes the constructors in the wrong order... you can make a pointer to an ArRobot and then new one however.

See also:
ArSerialConnection (p. 424) , **ArTcpConnection** (p. 481)

4.101.2 Member Enumeration Documentation

4.101.2.1 enum ArRobot::WaitState

Enumeration values:

WAIT_CONNECTED The robot has connected.

WAIT_FAILED_CONN The robot failed to connect.

WAIT_RUN_EXIT The run loop has exited.

WAIT_TIMEDOUT The wait reached the timeout specified.

WAIT_INTR The wait was interupted by a signal.

WAIT_FAIL The wait failed due to an error.

4.101.3 Constructor & Destructor Documentation

4.101.3.1 ArRobot::ArRobot (const char * *name* = NULL, bool *doStateReflection* = true, bool *doSigHandle* = true, bool *normalInit* = true)

Constructor.

Parameters:

doStateReflection whether the robot should use direct motion command reflection or simply send commands when it gets them. If stateReflection is on then when one of the movement commands is given it stores the value and then sends it at the appropriate spot in the cycle. If stateReflection isn't on, then a pulse will be sent every other cycle to make sure the watchdog timer doesn't kick off.

normalInit whether the robot should initializes its structures or the calling program will take care of it. No one will probalby ever use this value, since if they are doing that then overriding will probably be more useful, but there it is.

doSigHandle do normal signal handling and have this robot instance **stopRunning**() (p. 403) when the program is signaled

4.101.4 Member Function Documentation

4.101.4.1 void ArRobot::actionHandler (void)

Action Handler, internal.

Runs the resolver on the actions, if state reflection (direct motion reflection really) is enabled in the **ArRobot::ArRobot** (p. 371) constructor then it just saves these values for use by the stateReflector, otherwise it sends these values straight down to the robot.

See also:

addAction (p. 371) , **remAction** (p. 393)

4.101.4.2 void ArRobot::addAction (ArAction * *action*, int *priority*)

Adds an action to the list with the given priority.

Adds an action to the list of actions at the given priority, in the case of two (or more) actions with the same priority, the default resolver (**ArPriorityResolver** (p. 297)) averages the the multiple readings... the priority can be any integer, but as a convention 0 to 100 is used, with 100 being the highest priority.

Parameters:

action the action to add

priority what importance to give the action

4.101.4.3 void ArRobot::addConnectCB (ArFunctor ∗ *functor*, ArListPos::Pos *position*)

Adds a connect callback.

Adds a connect callback, which is an **ArFunctor** (p. 139), created as an **ArFunctorC** (p. 165). The entire list of connect callbacks is called when a connection is made with the robot. If you have some sort of module that adds a callback, that module must remove the callback when the module is removed.

Parameters:

functorfunctor created from **ArFunctorC** (p. 165) which refers to the function to call.

position whether to place the functor first or last

See also:

remConnectCB (p. 393)

4.101.4.4 void ArRobot::addDisconnectNormallyCB (ArFunctor ∗ *functor*, ArListPos::Pos *position*)

Adds a callback for when disconnect is called while connected.

Adds a disconnect normally callback,which is an **ArFunctor** (p. 139), created as an **ArFunctorC** (p. 165). This whole list of disconnect normally callbacks is called when something calls disconnect if the instance isConnected. If there is no connection and disconnect is called nothing is done. If you have some sort of module that adds a callback, that module must remove the callback when the module is removed.

Parameters:

functor functor created from **ArFunctorC** (p. 165) which refers to the function to call.

position whether to place the functor first or last

See also:

remFailedConnectCB (p. 394)

4.101.4.5 void ArRobot::addDisconnectOnErrorCB (ArFunctor * *functor*, ArListPos::Pos *position*)

Adds a callback for when disconnection happens because of an error.

Adds a disconnect on error callback, which is an **ArFunctor** (p. 139), created as an **ArFunctorC** (p. 165). This whole list of disconnect on error callbacks is called when ARIA loses connection to a robot because of an error. This can occur if the physical connection (ie serial cable) between the robot and the computer is severed/disconnected, if one of a pair of radio modems that connect the robot and computer are disconnected, if someone presses the reset button on the robot, or if the simulator is closed while ARIA is connected to it. Note that if the link between the two is lost the ARIA assumes it is temporary until it reaches a timeout value set with setConnectionTimeoutTime. If you have some sort of module that adds a callback, that module must remove the callback when the module removed.

Parameters:

functor functor created from **ArFunctorC** (p. 165) which refers to the function to call.

position whether to place the functor first or last

See also:

remFailedConnectCB (p. 394)

4.101.4.6 void ArRobot::addFailedConnectCB (ArFunctor * *functor*, ArListPos::Pos *position*)

Adds a callback for when a connection to the robot is failed.

Adds a failed connect callback,which is an **ArFunctor** (p. 139), created as an **ArFunctorC** (p. 165). This whole list of failed connect callbacks is called when an attempt is made to connect to the robot, but fails. The usual reason for this failure is either that there is no robot/sim where the connection was tried to be made, the robot wasn't given a connection, or the radio modems that communicate with the robot aren't on. If you have some sort of module that adds a callback, that module must remove the callback when the module removed.

Parameters:

functor functor created from **ArFunctorC** (p. 165) which refers to the function to call.

position whether to place the functor first or last

See also:

remFailedConnectCB (p. 394)

4.101.4.7 void ArRobot::addPacketHandler (ArRetFunctor1< bool, ArRobotPacket ∗> ∗ *functor*, ArListPos::Pos *position*)

Adds a packet handler to the list of packet handlers.

Adds a packet handler. A packet handler is an **ArRetFunctor1** (p. 328), created as an instance of **ArRetFunctor1C** (p. 330). The return is a boolean, while the functor takes an **ArRobotPacket** (p. 406) pointer as the argument. This functor is placed in the list of functors to call when a packet arrives. This list is gone through by order until one of the handlers returns true. @argument functor the functor to call when the packet comes in @argument position whether to place the functor first or last

See also:
remPacketHandler (p. 394)

4.101.4.8 void ArRobot::addRunExitCB (ArFunctor ∗ *functor*, ArListPos::Pos *position*)

Adds a callback for when the run loop exits for what ever reason.

Adds a callback that is called when the run loop exits. The functor is which is an **ArFunctor** (p. 139), created as an **ArFunctorC** (p. 165). The whole list of functors is called when the run loop exits. This is most usefull for threaded programs that run the robot using **ArRobot::runAsync** (p. 397). This will allow user threads to know when the robot loop has exited.

Parameters:
functor functor created from **ArFunctorC** (p. 165) which refers to the function to call.
position whether to place the functor first or last

See also:
remRunExitCB (p. 395)

4.101.4.9 bool ArRobot::addSensorInterpTask (const char ∗ *name*, int *position*, ArFunctor ∗ *functor*, ArTaskState::State ∗ *state* = NULL)

Adds a task under the sensor interp part of the syncronous tasks.

The synchronous tasks get called every robot cycle (every 100 ms by default).

Parameters:
name the name to give to the task, should be unique

position the place in the list of user tasks to place this task, this can be any integer, though by convention 0 to 100 is used. The tasks are called in order of highest number to lowest number.

functor functor created from **ArFunctorC** (p. 165) which refers to the function to call.

See also:
remSensorInterpTask (p. 395)

4.101.4.10 bool ArRobot::addUserTask (const char * *name*, int *position*, ArFunctor * *functor*, ArTaskState::State * *state* = NULL)

Adds a user task to the list of synchronous taskes.

The synchronous tasks get called every robot cycle (every 100 ms by default).

Parameters:

name the name to give to the task, should be unique

position the place in the list of user tasks to place this task, this can be any integer, though by convention 0 to 100 is used. The tasks are called in order of highest number to lowest position number.

functor functor created from **ArFunctorC** (p. 165) which refers to the function to call.

See also:
remUserTask (p. 396)

4.101.4.11 void ArRobot::applyTransform (ArTransform *trans*, bool *doCumulative* = true)

This applies a transform to all the robot range devices and to the sonar.

Applies a transform to the range devices... this is mostly useful for translating to/from local/global coords, but may have other uses

Parameters:

trans the transform to apply

doCumulative whether to transform the cumulative buffers or not

4.101.4.12 bool ArRobot::asyncConnect (void)

Connects to a robot, from the robots own thread.

Sets up the robot to connect, then returns, but the robot must be running (ie from runAsync) before you do this. Also this will fail if the robot is already connected. If you want to know what happened because of the connect then look at the callbacks. NOTE, this will not lock robot before setting values, so you MUST lock the robot before you call this function and unlock the robot after you call this function. If you fail to lock the robot, you'll may wind up with wierd behavior. Other than the aspect of blocking or not the only difference between async and blocking connects (other than the blocking) is that async is run every robot cycle, whereas blocking runs as fast as it can... also blocking will try to reconnect a radio modem if it looks like it didn't get connected in the first place, so blocking can wind up taking 10 or 12 seconds to decide it can't connect, whereas async doesn't try hard at all to reconnect the radio modem (beyond its first try) (under the assumption the async connect is user driven, so they'll just try again, and so that it won't mess up the sync loop by blocking for so long).

Returns:
true if the robot is running and the robot will try to connect, false if the robot isn't running so won't try to connect or if the robot is already connected

See also:
addConnectCB (p. 372)

See also:
addFailedConnectCB (p. 373)

See also:
runAsync (p. 397)

4.101.4.13 int ArRobot::asyncConnectHandler (bool *tryHarderToConnect*)

Internal function, shouldn't be used, does a single run of connecting.

This is an internal function that is used both for async connects and blocking connects use to connect. It does about the same thing for both, and it should only be used by asyncConnect and blockingConnect really. But here it is. The only difference between when its being used by blocking/async connect is that in blocking mode if it thinks there may be problems with the radio modem it pauses for two seconds trying to deal with this... whereas in async mode it tries to deal with this in a simpler way.

Parameters:

tryHarderToConnect if this is true, then if the radio modems look like they aren't working, it'll take about 2 seconds to try and connect them, whereas if its false, it'll do a little try, but won't try very hard

Returns:

0 if its still trying to connect, 1 if it connected, 2 if it failed

4.101.4.14 void ArRobot::attachKeyHandler (ArKeyHandler * *keyHandler*, bool *exitOnEscape* = true)

Attachs a key handler.

This will attach a key handler to a robot, by putting it into the robots sensor interp task list (a keyboards a sensor of users will, right?). By default exitOnEscape is true, which will cause this function to add an escape key handler to the key handler, this will make the program exit when escape is pressed... if you don't like this you can pass exitOnEscape in as false.

Parameters:

keyHandler the key handler to attach

exitOnEscape whether to exit when escape is pressed or not

4.101.4.15 bool ArRobot::blockingConnect (void)

Connects to a robot, not returning until connection made or failed.

Connects to the robot, returning only when a connection has been made or it has been established a connection can't be made. This connection usually is fast, but can take up to 30 seconds if the robot is in a wierd state (this is not often). If the robot is connected via **ArSerialConnection** (p. 424) then the connect will also connect the radio modems. Upon a successful connection all of the Connection Callback Functors that have been registered will be called. NOTE, this will lock the robot before setting values, so you MUST not have the robot locked from where you call this function. If you do, you'll wind up in a deadlock. This behavior is there because otherwise you'd have to lock the robot before calling this function, and normally blockingConnect will be called from a seperate thread, and that thread won't be doing anything else with the robot at that time. Other than the aspect of blocking or not the only difference between async and blocking connects (other than the blocking) is that async is run every robot cycle, whereas blocking runs as fast as it can... also blocking will try to reconnect a radio modem if it looks like it didn't get connected in the first place, so blocking can wind up taking 10 or 12 seconds to decide it can't connect, whereas async doesn't try hard at all to reconnect the radio modem (under the assumption the async connect is user driven, so they'll just try again, and so that it won't mess up the sync loop by blocking for so long).

Returns:

true if a connection could be made, false otherwise

4.101.4.16 double ArRobot::checkRangeDevicesCumulativeBox (double *x1*, double *y1*, double *x2*, double *y2*, ArPose * *readingPos* = NULL) const

This goes through all of the registered range devices and locks each, calls cumulativeReadingBox on it, and then unlocks it.

Gets the closest reading in a region defined by the two points of a rectangle.

Parameters:

x1 the x coordinate of one of the rectangle points

y1 the y coordinate of one of the rectangle points

x2 the x coordinate of the other rectangle point

y2 the y coordinate of the other rectangle point

readingPos a pointer to a position in which to store the location of the closest position

Returns:

if the return is >= 0 then this is the distance to the closest reading, if it is < 0 then there were no readings in the given region

4.101.4.17 double ArRobot::checkRangeDevicesCumulativePolar (double *startAngle*, double *endAngle*, double * *angle* = NULL) const

Goes through all the range devices and checks them.

This goes through all of the registered range devices and locks each, calls cumulativeReadingPolar on it, and then unlocks it.

Gets the closest reading in a region defined by startAngle going to endAngle... going counterclockwise (neg degrees to poseitive... with how the robot is set up, thats counterclockwise)... from -180 to 180... this means if you want the slice between 0 and 10 degrees, you must enter it as 0, 10, if you do 10, 0 you'll get the 350 degrees between 10 and 0... be especially careful with negative... for example -30 to -60 is everything from -30, around through 0, 90, and 180 back to -60... since -60 is actually to clockwise of -30

Parameters:

startAngle where to start the slice

endAngle where to end the slice, going clockwise from startAngle

angle a pointer return of the angle to the found reading

Returns:

if the return is >= 0 then this is the distance to the closest reading, if it is < 0 then there were no readings in the given region

4.101.4.18 double ArRobot::checkRangeDevicesCurrentBox (double *x1*, double *y1*, double *x2*, double *y2*, ArPose * *readingPos* = NULL) const

This goes through all of the registered range devices and locks each, calls currentReadingBox on it, and then unlocks it.

Gets the closest reading in a region defined by the two points of a rectangle.

Parameters:

x1 the x coordinate of one of the rectangle points

y1 the y coordinate of one of the rectangle points

x2 the x coordinate of the other rectangle point

y2 the y coordinate of the other rectangle point

readingPos a pointer to a position in which to store the location of the closest position

Returns:

if the return is >= 0 then this is the distance to the closest reading, if it is < 0 then there were no readings in the given region

4.101.4.19 double ArRobot::checkRangeDevicesCurrentPolar (double *startAngle*, double *endAngle*, double * *angle* = NULL) const

Goes through all the range devices and checks them.

This goes through all of the registered range devices and locks each, calls currentReadingPolar on it, and then unlocks it.

Gets the closest reading in a region defined by startAngle going to endAngle... going counterclockwise (neg degrees to poseitive... with how the robot is set up, thats counterclockwise)... from -180 to 180... this means if you want the slice between 0 and 10 degrees, you must enter it as 0, 10, if you do 10, 0 you'll get the 350 degrees between 10 and 0... be especially careful with negative... for example -30 to -60 is everything from -30, around through 0, 90, and 180 back to -60... since -60 is actually to clockwise of -30

Parameters:

startAngle where to start the slice

endAngle where to end the slice, going clockwise from startAngle

angle a pointer return of the angle to the found reading

Returns:

if the return is >= 0 then this is the distance to the closest reading, if it is < 0 then there were no readings in the given region

4.101.4.20 void ArRobot::clearDirectMotion (void)

Clears what direct motion commands have been given, so actions work.

This clears the direct motion commands so that actions will be allowed to control the robot again.

See also:

setDirectMotionPrecedenceTime (p. 399) , **getDirectMotion-PrecedenceTime** (p. 386)

4.101.4.21 bool ArRobot::com (unsigned char *command*)

Sends a command to the robot with no arguments.

Parameters:

command the command number to send

Returns:

whether the command could be sent or not

4.101.4.22 bool ArRobot::com2Bytes (unsigned char *command*, char *high*, char *low*)

Sends a command to the robot with two bytes for argument.

Parameters:

command the command number to send

high the high byte to send with the command

low the low byte to send with the command

Returns:

whether the command could be sent or not

4.101.4.23 bool ArRobot::comInt (unsigned char *command*, short int *argument*)

Sends a command to the robot with an int for argument.

Parameters:

command the command number to send

argument the integer argument to send with the command

Returns:

whether the command could be sent or not

4.101.4.24 bool ArRobot::comStr (unsigned char *command*, const char ∗ *argument*)

Sends a command to the robot with a string for argument.

Parameters:

command the command number to send

str the string to send with the command

Returns:

whether the command could be sent or not

4.101.4.25 bool ArRobot::comStrN (unsigned char *command*, const char ∗ *str*, int *size*)

Sends a command to the robot with a size bytes of str as argument.

Parameters:

command the command number to send

str the character array to send with the command

size length of the array to send

Returns:

whether the command could be sent or not

4.101.4.26 void ArRobot::disableMotors ()

Disables the motors on the robot.

This command disables the motors on the robot, if it is connected.

4.101.4.27 bool ArRobot::disconnect (void)

Disconnects from a robot.

Disconnects from a robot. This also calls of the DisconnectNormally Callback Functors if the robot was actually connected to a robot when this member was called.

Returns:
true if not connected to a robot (so no disconnect can happen, but it didn't failed either), also true if the command could be sent to the robot (ie connection hasn't failed)

4.101.4.28 void ArRobot::enableMotors ()

Enables the motors on the robot.

This command enables the motors on the robot, if it is connected.

4.101.4.29 ArAction * ArRobot::findAction (const char * *actionName*)

Returns the first (highest priority) action with the given name (or NULL).

Finds the action with the given name... if more than one action has that name it find the one with the highest priority

Parameters:
actionName the name of the action we want to find

Returns:
the action, if found. If not found, NULL

4.101.4.30 ArRangeDevice * ArRobot::findRangeDevice (const char * *name*)

Finds a rangeDevice in the robot's list.

Parameters:

name return the first device with this name

Returns:

if found, a range device with the given name, if not found NULL

4.101.4.31 const ArRangeDevice ∗ ArRobot::findRangeDevice (const char ∗ *name*) const

Finds a rangeDevice in the robot's list.

Parameters:

name return the first device with this name

Returns:

if found, a range device with the given name, if not found NULL

4.101.4.32 ArSyncTask ∗ ArRobot::findTask (ArFunctor ∗ *functor*)

Finds a task by functor.

Finds a task by its functor, searching the entire space of tasks

Returns:

NULL if no task with that functor found, otherwise a pointer to the **ArSyncTask** (p. 475) for the first task found with that functor

4.101.4.33 ArSyncTask ∗ ArRobot::findTask (const char ∗ *name*)

Finds a task by name.

Finds a task by its name, searching the entire space of tasks

Returns:

NULL if no task of that name found, otherwise a pointer to the **ArSyncTask** (p. 475) for the first task found with that name

4.101.4.34 ArSyncTask ∗ ArRobot::findUserTask (ArFunctor ∗ *functor*)

Finds a user task by functor.

Finds a user task by its functor, searching the entire space of tasks

Returns:

NULL if no user task with that functor found, otherwise a pointer to the **ArSyncTask** (p. 475) for the first task found with that functor

4.101.4.35 ArSyncTask ∗ ArRobot::findUserTask (const char ∗ *name*)

Finds a user task by name.

Finds a user task by its name, searching the entire space of tasks

Returns:

NULL if no user task of that name found, otherwise a pointer to the **ArSyncTask** (p. 475) for the first task found with that name

4.101.4.36 ArResolver::ActionMap ∗ ArRobot::getActionMap (void)

Returns the map of actions... don't do this unless you really know what you're doing.

This returns the actionMap the robot has... do not mess with this list except by using **ArRobot::addAction** (p. 371) and **ArRobot::remAction** (p. 393)... This is jsut for the things like **ArActionGroup** (p. 60) that want to deactivate or activate all the actions (well, only deactivating everything makes sense).

Returns:

the actions the robot is using

4.101.4.37 unsigned int ArRobot::getConnectionCycleMultiplier (void) const

Gets the multiplier for how many cycles ArRobot waits when connecting.

Returns:

when the ArRobot is waiting for a connection packet back from a robot, it waits for this multiplier times the cycle time for the packet to come back before it gives up on it... This should be small for normal connections but if doing something over a slow network then you may want to make it larger

4.101.4.38 int ArRobot::getConnectionTimeoutTime (void) const

Gets the time without a response until connection assumed lost.

Gets the number of seconds to go without response from the robot until it is assumed tha tthe connection with the robot has been broken and the disconnect on error events will happen.

4.101.4.39 double ArRobot::getControl (void) const `[inline]`

Gets the control heading.

Gets the control heading as an offset from the current heading.

See also:
getTh (p. 358)

4.101.4.40 unsigned int ArRobot::getCycleTime (void) const

Gets the number of ms between cycles.

Finds the number of milliseconds between cycles, at each cycle is when all packets are processed, all sensors are interpretted, all actions are called, and all user tasks are serviced. Be warned, if you set this too small you could overflow your serial connection.

Returns:
the number of milliseconds between cycles

4.101.4.41 ArDeviceConnection ∗ ArRobot::getDeviceConnection (void) const

Gets the connection this instance uses.

Gets the connection this instance uses to the actual robot. This is where commands will be sent and packets will be received from

Returns:
the deviceConnection used for this robot

See also:
ArDeviceConnection (p. 124) , **ArSerialConnection** (p. 424) , **ArTcpConnection** (p. 481)

4.101.4.42 unsigned int ArRobot::getDirectMotionPrecedenceTime (void) const

Gets the length of time a direct motion command will take precedence over actions, in milliseconds.

The direct motion precedence time determines how long actions will be ignored after a direct motion command is given. If the direct motion precedence time is 0, then direct motion will take precedence over actions until a clearDirectMotion command is issued. This value defaults to 0.

Returns:
the number of milliseconds direct movement will trump actions

See also:
setDirectMotionPrecedenceTime (p. 399) , **clearDirectMotion** (p. 380)

4.101.4.43 ArRetFunctor1< double, ArPoseWithTime > * ArRobot::getEncoderCorrectionCallback (void) const

Gets the encoderCorrectionCallback.

This gets the encoderCorrectionCB, see setEncoderCorrectionCallback for details.

Returns:
the callback, or NULL if there isn't one

4.101.4.44 ArTransform ArRobot::getEncoderTransform (void) const

Gets the encoder transform.

Returns:
the transform from encoder to global coords

4.101.4.45 ArTime ArRobot::getLastPacketTime (void) const

Gets the time the last packet was received.

This gets the **ArTime** (p. 491) that the last packet was received at

Returns:
the time the last packet was received

4.101.4.46 int ArRobot::getPoseInterpPosition (ArTime *timeStamp*, ArPose * *position*) [inline]

Gets the position the robot was at at the given timestamp.

See also:
ArInterpolation::getPose (p. 211)

4.101.4.47 std::list< ArRangeDevice *> * ArRobot::getRangeDeviceList (void)

Gets the range device list.

This gets the list of range devices attached to this robot, do NOT manipulate this list directly. If you want to manipulate use the appropriate addRangeDevice, or remRangeDevice

Returns:
the list of range dvices attached to this robot

4.101.4.48 const ArRobotParams * ArRobot::getRobotParams (void) const

Gets the parameters the robot is using.

Returns:
the **ArRobotParams** (p. 415) instance the robot is using for its parameters

4.101.4.49 int ArRobot::getSonarRange (int *num*) const

Gets the range of the last sonar reading for the given sonar.

Parameters:
num the sonar number to check, should be between 0 and the number of sonar, the function won't fail if a bad number is given, will just return -1

Returns:
-1 if the sonar has never returned a reading, otherwise the sonar range, which is the distance from the physical sonar disc to where the sonar bounced back

See also:
getNumSonar (p. 361)

4.101.4.50 ArSensorReading * ArRobot::getSonarReading (int *num*) const

Returns the sonar reading for the given sonar.

Parameters:

num the sonar number to check, should be between 0 and the number of sonar, the function won't fail if a bad number is given, will just return false

Returns:

NULL if there is no sonar defined for the given number, otherwise it returns a pointer to an instance of the **ArSensorReading** (p. 419), note that this class retains ownership, so the instance pointed to should not be deleted and no pointers to it should be stored. Note that often there will be sonar defined but no readings for it (since the readings may be created by the parameter reader), if there has never been a reading from the sonar then the range of that sonar will be -1 and its counterTaken value will be 0

4.101.4.51 int ArRobot::getStateReflectionRefreshTime (void) const

Sets the number of milliseconds between state reflection refreshes if the state has not changed.

The state reflection refresh time is the number of milliseconds between when the state reflector will refresh the robot, if the command hasn't changed. The default is 500 milliseconds. If this number is less than the cyle time, it'll simply happen every cycle.

Returns:

the state reflection refresh time

4.101.4.52 ArSyncTask * ArRobot::getSyncTaskRoot (void)

This gets the root of the syncronous task tree, only serious developers should use it.

This gets the root of the synchronous task tree, so that someone can add their own new types of tasks, or find out more information about each task... only serious developers should use this.

Returns:

the root of the sycnhronous task tree

See also:
> **ArSyncTask** (p. 475)

4.101.4.53 ArTransform ArRobot::getToGlobalTransform (void) const

This gets the transform from local coords to global coords.

Returns:
> an **ArTransform** (p. 493) which can be used for transforming a position in local coordinates to one in global coordinates

4.101.4.54 ArTransform ArRobot::getToLocalTransform (void) const

This gets the transform for going from global coords to local coords.

Returns:
> an **ArTransform** (p. 493) which can be used for transforming a position in global coordinates to one in local coordinates

4.101.4.55 bool ArRobot::hasRangeDevice (ArRangeDevice * *device*) const

Finds whether a particular range device is attached to this robot or not.

Parameters:
> ***device*** the device to check for

4.101.4.56 void ArRobot::init (void)

Internal function, shouldn't be used.

Sets up the packet handlers, sets up the sync list and makes the default priority resolver.

4.101.4.57 bool ArRobot::isConnected (void) const `[inline]`

Questions whether the robot is connected or not.

Returns:
> true if connected to a robot, false if not

4.101.4.58 bool ArRobot::isDirectMotion (void) const

Returns true if direct motion commands are blocking actions.

Returns the state of direct motion commands: whether actions are allowed or not

See also:
clearDirectMotion (p. 380)

4.101.4.59 bool ArRobot::isHeadingDone (double *delta* = 0.0) const

Sees if the robot is done changing to the previously given setHeading.

Determines if a setHeading command is finished, to within a small distance. If delta = 0 (default), the delta distance is what was set with setHeadingDoneDiff, you can get the distnace with getHeadingDoneDiff

Parameters:
delta how close to the goal distance the robot must be

Returns:
true if the robot has achieved the heading given in a move command or if the robot is no longer in heading mode mode (because its now running off of actions, setDHeading, or setRotVel was called).

4.101.4.60 bool ArRobot::isMoveDone (double *delta* = 0.0)

Sees if the robot is done moving the previously given move.

Determines if a move command is finished, to within a small distance. If delta = 0 (default), the delta distance is what was set with setMoveDoneDist, you can get the distnace with getMoveDoneDist

Parameters:
delta how close to the goal distance the robot must be

Returns:
true if the robot has finished the distance given in a move command or if the robot is no longer in a move mode (because its now running off of actions, setVel, or setVel2 was called).

4.101.4.61 bool ArRobot::isRunning (void) const

Returns whether the robot is currently running or not.

Returns:
true if the robot is currently running in a run or runAsync, otherwise false

4.101.4.62 bool ArRobot::isSonarNew (int *num*) const

Find out if the given sonar has a new reading.

Parameters:
num the sonar number to check, should be between 0 and the number of sonar, the function won't fail if a bad number is given, will just return false

Returns:
false if the sonar reading is old, or if there is no reading from that sonar

4.101.4.63 bool ArRobot::loadParamFile (const char * *file*)

Loads a parameter file (replacing all other params).

Returns:
true if the file could be loaded, false otherwise

4.101.4.64 void ArRobot::logAllTasks (void) const

Logs the list of all tasks, strictly for your viewing pleasure.

See also:
ArLog (p. 231)

4.101.4.65 void ArRobot::logUserTasks (void) const

Logs the list of user tasks, strictly for your viewing pleasure.

See also:
ArLog (p. 231)

4.101.4.66 void ArRobot::loopOnce (void)

This function loops once... only serious developers should use it.

This function is only for serious developers, it basically runs the loop once. You would use this function if you were wanting to use robot control in some other monolithic program, so you could work within its framework, rather than trying to get it to work in ARIA.

4.101.4.67 void ArRobot::move (double *distance*)

Move the given distance forward/backwards

See also:
clearDirectMotion (p. 380).

Tells the robot to move the specified distance forward/backwards, if the constructor was created with state reflecting enabled then it caches this value, and sends it during the next cycle. If state reflecting is disabled it sends this value instantly.

Parameters:
distance the distance for the robot to move

4.101.4.68 void ArRobot::moveTo (ArPose *poseTo*, ArPose *poseFrom*, bool *doCumulative* = true)

Moves the robot's RW position to reflect pose From => pose To.

Parameters:
poseTo the absolute real world position to move to
poseFrom the original absolute real world position
doCumulative whether to update the cumulative buffers or not

4.101.4.69 void ArRobot::moveTo (ArPose *pose*, bool *doCumulative* = true)

Moves the robot's idea of its position to this position.

Parameters:
pose the absolute real world position to place the robot
doCumulative whether to update the cumulative buffers or not

4.101.4.70 void ArRobot::packetHandler (void)

Packet Handler, internal.

Reads in all of the packets that are available to read in, then runs through the list of packet handlers and tries to get each packet handled.

See also:
addPacketHandler (p. 374) , **remPacketHandler** (p. 394)

4.101.4.71 bool ArRobot::remAction (const char * *actionName*)

Removes an action from the list, by name.

Finds the action with the given name and removes it from the actions... if more than one action has that name it find the one with the lowest priority

Parameters:
actionName the name of the action we want to find

Returns:
whether remAction found anything with that action to remove or not

4.101.4.72 bool ArRobot::remAction (ArAction * *action*)

Removes an action from the list, by pointer.

Finds the action with the given pointer and removes it from the actions... if more than one action has that pointer it find the one with the lowest priority

Parameters:
action the action we want to remove

Returns:
whether remAction found anything with that action to remove or not

4.101.4.73 void ArRobot::remConnectCB (ArFunctor * *functor*)

Adds a disconnect callback.

Parameters:
functor the functor to remove from the list of connect callbacks

See also:
addConnectCB (p. 372)

4.101.4.74 void ArRobot::remDisconnectNormallyCB (ArFunctor * *functor*)

Removes a callback for when disconnect is called while connected.

Parameters:
functor the functor to remove from the list of connect callbacks

See also:
addDisconnectNormallyCB (p. 372)

4.101.4.75 void ArRobot::remDisconnectOnErrorCB (ArFunctor * *functor*)

Removes a callback for when disconnection happens because of an error.

Parameters:
functor the functor to remove from the list of connect callbacks

See also:
addDisconnectOnErrorCB (p. 373)

4.101.4.76 void ArRobot::remFailedConnectCB (ArFunctor * *functor*)

Removes a callback for when a connection to the robot is failed.

Parameters:
functor the functor to remove from the list of connect callbacks

See also:
addFailedConnectCB (p. 373)

4.101.4.77 void ArRobot::remPacketHandler (ArRetFunctor1< bool, ArRobotPacket *> * *functor*)

Removes a packet handler from the list of packet handlers.

Parameters:
functor the functor to remove from the list of packet handlers

See also:
addPacketHandler (p. 374)

4.101.4.78 void ArRobot::remRangeDevice (ArRangeDevice ∗ *device*)

Remove a range device from the robot's list, by instance.

Parameters:
- ***device*** remove the first device with this pointer value

4.101.4.79 void ArRobot::remRangeDevice (const char ∗ *name*)

Remove a range device from the robot's list, by name.

Parameters:
- ***name*** remove the first device with this name

4.101.4.80 void ArRobot::remRunExitCB (ArFunctor ∗ *functor*)

Removes a callback for when the run loop exits for what ever reason.

Parameters:
- ***functor*** the functor to remove from the list of run exit callbacks

See also:
addRunExitCB (p. 374)

4.101.4.81 void ArRobot::remSensorInterpTask (ArFunctor ∗ *functor*)

Removes a sensor interp tasks by functor.

See also:
addSensorInterpTask (p. 374) , remSensorInterpTask(std::string name)

4.101.4.82 void ArRobot::remSensorInterpTask (const char ∗ *name*)

Removes a sensor interp tasks by name.

See also:
addSensorInterpTask (p. 374) , **remSensorInterpTask**(ArFunctor ∗functor) (p. 395)

4.101.4.83 void ArRobot::remUserTask (ArFunctor * *functor*)

Removes a user task from the list of synchronous taskes by functor.

See also:
addUserTask (p. 375) , remUserTask(std::string name)

4.101.4.84 void ArRobot::remUserTask (const char * *name*)

Removes a user task from the list of synchronous taskes by name.

See also:
addUserTask (p. 375) , **remUserTask**(ArFunctor *functor) (p. 396)

4.101.4.85 void ArRobot::robotLocker (void)

Robot locker, internal.

This just locks the robot, so that its locked for all the user tasks

4.101.4.86 void ArRobot::robotUnlocker (void)

Robot unlocker, internal.

This just unlocks the robot

4.101.4.87 void ArRobot::run (bool *stopRunIfNotConnected*)

Starts the instance to do processing in this thread.

This starts the list of tasks to be run through until stopped. This function doesn't return until something calls stop on this instance.

Parameters:
stopRunIfNotConnected if true, the run will return if there is no connection to the robot at any given point, this is good for one-shot programs... if it is false the run won't return unless stop is called on the instance

4.101.4.88 void ArRobot::runAsync (bool *stopRunIfNotConnected*)

Starts the instance to do processing in its own new thread.

This starts a new thread then has runs through the tasks until stopped. This function doesn't return until something calls stop on this instance. This function returns immediately

Parameters:

stopRunIfNotConnected if true, the run will stop if there is no connection to the robot at any given point, this is good for one-shot programs... if it is false the run won't stop unless stop is called on the instance

4.101.4.89 void ArRobot::setConnectionCycleMultiplier (unsigned int *multiplier*)

Sets the multiplier for how many cycles ArRobot waits when connecting.

Parameters:

multiplier when the ArRobot is waiting for a connection packet back from a robot, it waits for this multiplier times the cycle time for the packet to come back before it gives up on it... This should be small for normal connections but if doing something over a slow network then you may want to make it larger

4.101.4.90 void ArRobot::setConnectionTimeoutTime (int *mSecs*)

Sets the time without a response until connection assumed lost.

Sets the number of seconds to go without a response from the robot until it is assumed that the connection with the robot has been broken and the disconnect on error events will happen. Note that this will only happen with the default packet handler.

Parameters:

seconds if seconds is 0 then the connection timeout feature will be disabled, otherwise disconnect on error will be triggered after this number of seconds...

4.101.4.91 void ArRobot::setCycleTime (unsigned int *ms*)

Sets the number of ms between cycles.

Sets the number of milliseconds between cycles, at each cycle is when all packets are processed, all sensors are interpretted, all actions are called, and all user tasks are serviced. Be warned, if you set this too small you could overflow your serial connection.

Parameters:
ms the number of milliseconds between cycles

4.101.4.92 void ArRobot::setDeadReconPose (ArPose *pose*)

Sets the dead recon position of the robot.

Parameters:
pose the position to set the dead recon position to

4.101.4.93 void ArRobot::setDeltaHeading (double *deltaHeading*)

Sets the delta heading

See also:
clearDirectMotion (p. 380).

Sets a delta heading to the robot, if the constructor was created with state reflecting enabled then it caches this value, and sends it during the next cycle. If state reflecting is disabled it sends this value instantly.

Parameters:
deltaHeading the desired amount to change the heading of the robot by

4.101.4.94 void ArRobot::setDeviceConnection (ArDeviceConnection * *connection*)

Sets the connection this instance uses.

Sets the connection this instance uses to the actual robot. This is where commands will be sent and packets will be received from

Parameters:
connection The deviceConnection to use for this robot

See also:
ArDeviceConnection (p. 124), **ArSerialConnection** (p. 424), **ArTcpConnection** (p. 481)

4.101.4.95 void ArRobot::setDirectMotionPrecedenceTime (int *mSec*)

Sets the length of time a direct motion command will take precedence over actions, in milliseconds.

The direct motion precedence time determines how long actions will be ignored after a direct motion command is given. If the direct motion precedence time is 0, then direct motion will take precedence over actions until a clearDirectMotion command is issued. This value defaults to 0.

Parameters:

the number of milliseconds direct movement should trump actions, if a negative number is given, then the value will be 0

See also:

setDirectMotionPrecedenceTime (p. 399) , **clearDirectMotion** (p. 380)

4.101.4.96 void ArRobot::setEncoderCorrectionCallback (ArRetFunctor1< double, ArPoseWithTime > * *functor*)

Sets the encoderCorrectionCallback.

This sets the encoderCorrectionCB, this callback returns the robots change in heading, it takes in the change in heading, x, and y, between the previous and current readings.

Parameters:

functor an **ArRetFunctor1** (p. 328) created as an **ArRetFunctor1C** (p. 330), that will be the callback... call this function NULL to clear the callback

See also:

getEncoderCorrectionCallback (p. 386)

4.101.4.97 void ArRobot::setEncoderTransform (ArPose *transformPos*)

Changes the transform directly.

Parameters:

transformPos the position to transform to

4.101.4.98 void ArRobot::setEncoderTransform (ArPose *deadReconPos*, ArPose *globalPos*)

Changes the transform.

Parameters:
- ***deadReconPos*** the dead recon position to transform from
- ***realWorldPos*** the real world global position to transform to

4.101.4.99 void ArRobot::setHeading (double *heading*)

Sets the heading

See also:
clearDirectMotion (p. 380).

Sets the heading of the robot, if the constructor was created with state reflecting enabled then it caches this value, and sends it during the next cycle. If state reflecting is disabled it sends this value instantly.

Parameters:
- ***heading*** the desired heading of the robot

4.101.4.100 bool ArRobot::setMaxRotVel (double *maxVel*)

Sets the robots maximum rotational velocity.

This sets the maximum velocity the robot will go... the maximum velocity can also be set by the actions, but it will not be allowed to go higher than this value.

Parameters:
- ***maxVel*** the maximum velocity to be set, it must be a non-zero number

Returns:
true if the value is good, false othrewise

4.101.4.101 bool ArRobot::setMaxTransVel (double *maxVel*)

Sets the robots maximum translational velocity.

This sets the maximum velocity the robot will go... the maximum velocity can also be set by the actions, but it will not be allowed to go higher than this value.

Parameters:

maxVel the maximum velocity to be set, it must be a non-zero number

Returns:

true if the value is good, false othrewise

4.101.4.102 void ArRobot::setRotVel (double *velocity*)

Sets the rotational velocity

See also:

clearDirectMotion (p. 380).

Sets the rotational velocity of the robot, if the constructor was created with state reflecting enabled then it caches this value, and sends it during the next cycle. If state reflecting is disabled it sends this value instantly.

Parameters:

velocity the desired rotational velocity of the robot

4.101.4.103 void ArRobot::setStateReflectionRefreshTime (int *mSec*)

Sets the number of milliseconds between state reflection refreshes if the state has not changed.

The state reflection refresh time is the number of milliseconds between when the state reflector will refresh the robot, if the command hasn't changed. The default is 500 milliseconds. If this number is less than the cyle time, it'll simply happen every cycle.

Parameters:

mSec the refresh time, in milliseconds, non-negative, if negative is given, then the value will be 0

4.101.4.104 void ArRobot::setVel (double *velocity*)

Sets the velocity

See also:

clearDirectMotion (p. 380).

Sets the velocity of the robot, if the constructor was created with state reflecting enabled then it caches this value, and sends it during the next cycle. If state reflecting is disabled it sends this value instantly.

Parameters:

velocity the desired translational velocity of the robot

4.101.4.105 void ArRobot::setVel2 (double *leftVelocity*, double *rightVelocity*)

Sets the velocity of the wheels independently

See also:

clearDirectMotion (p. 380).

Sets the velocity of each of the wheels on the robot independently. if the constructor was created with state reflecting enabled then it caches this value, and sends it during the next cycle. If state reflecting is disabled it sends this value instantly. Note that this cancels both translational velocity AND rotational velocity, and is canceled by any of the other direct motion commands.

Parameters:

leftVelocity the desired velocity of the left wheel

rightVelocity the desired velocity of the right wheel

4.101.4.106 void ArRobot::stateReflector (void)

State Reflector, internal.

If state reflecting (really direct motion command reflecting) was enabled in the constructor (**ArRobot::ArRobot** (p. 371)) then this will see if there are any direct motion commands to send, and if not then send the command given by the actions. If state reflection is disabled this will send a pulse to the robot every state reflection refresh time (setStateReflectionRefreshTime), if you don't wish this to happen simply set this to a very large value.

4.101.4.107 void ArRobot::stop (void)

Stops the robot

See also:

clearDirectMotion (p. 380).

Stops the robot, by telling it to have a translational velocity and rotational velocity of 0. Also note that if you are using actions, this will cause the actions to be ignored until the direct motion precedence timeout has been exceeded or clearDirectMotion is called.

See also:

setDirectMotionPrecedenceTime (p. 399) , **getDirectMotion-PrecedenceTime** (p. 386) , **clearDirectMotion** (p. 380)

4.101.4.108 void ArRobot::stopRunning (bool *doDisconnect* = true)

Stops the robot from doing any more processing.

This stops this robot from running anymore. If it is stopping from a runAsync it will cause the thread to return (exit), if it is running from a normal run, it will just cause the run function to return.

Parameters:

doDisconnect Disconnect from the robot. Defaulted to true.

4.101.4.109 ArRobot::WaitState ArRobot::waitForConnect (unsigned int *msecs* = 0)

Suspend calling thread until the ArRobot is connected.

This will suspend the calling thread until the ArRobot's run loop has managed to connect with the robot. There is an optional paramater of milliseconds to wait for the ArRobot to connect. If msecs is set to 0, it will wait until the ArRobot connects. This function will never return if the robot can not be connected with. If you want to be able to handle that case within the calling thread, you must call **waitForConnectOrConnFail**() (p. 404).

Parameters:

msecs milliseconds in which to wait for the ArRobot to connect

Returns:

WAIT_CONNECTED for success

See also:

waitForConnectOrConnFail (p. 404) , **wakeAllWaitingThreads** (p. 405) , **wakeAllConnWaitingThreads** (p. 405) , **wakeAllRunExit-WaitingThreads** (p. 405)

4.101.4.110 ArRobot::WaitState ArRobot::waitForConnectOrConnFail (unsigned int *msecs* = 0)

Suspend calling thread until the ArRobot is connected or fails to connect.

This will suspend the calling thread until the ArRobot's run loop has managed to connect with the robot or fails to connect with the robot. There is an optional paramater of milliseconds to wait for the ArRobot to connect. If msecs is set to 0, it will wait until the ArRobot connects.

Parameters:

msecs milliseconds in which to wait for the ArRobot to connect

Returns:

WAIT_CONNECTED for success

See also:

waitForConnect (p. 403)

4.101.4.111 ArRobot::WaitState ArRobot::waitForRunExit (unsigned int *msecs* = 0)

Suspend calling thread until the ArRobot run loop has exited.

This will suspend the calling thread until the ArRobot's run loop has exited. There is an optional paramater of milliseconds to wait for the ArRobot run loop to exit . If msecs is set to 0, it will wait until the ArRrobot run loop exits.

Parameters:

msecs milliseconds in which to wait for the robot to connect

Returns:

WAIT_RUN_EXIT for success

4.101.4.112 void ArRobot::wakeAllConnOrFailWaitingThreads ()

Wake up all threads waiting for connection or connection failure.

This will wake all the threads waiting for the robot to be connected or waiting for the robot to fail to connect.

See also:

wakeAllWaitingThreads (p. 405) , **wakeAllRunExitWaitingThreads** (p. 405)

4.101.4.113 void ArRobot::wakeAllConnWaitingThreads ()

Wake up all threads waiting for connection.

This will wake all the threads waiting for the robot to be connected.

See also:
wakeAllWaitingThreads (p. 405) , **wakeAllRunExitWaitingThreads** (p. 405)

4.101.4.114 void ArRobot::wakeAllRunExitWaitingThreads ()

Wake up all threads waiting for the run loop to exit.

This will wake all the threads waiting for the run loop to exit.

See also:
wakeAllWaitingThreads (p. 405) , **wakeAllConnWaitingThreads** (p. 405)

4.101.4.115 void ArRobot::wakeAllWaitingThreads ()

Wake up all threads waiting on this robot.

This will wake all the threads waiting for various major state changes in this particular ArRobot. This includes all threads waiting for the robot to be connected and all threads waiting for the run loop to exit.

See also:
wakeAllConnWaitingThreads (p. 405) , **wakeAllRunExitWaitingThreads** (p. 405)

The documentation for this class was generated from the following files:

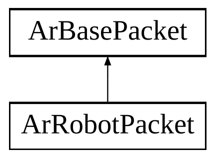
- ArRobot.h
- ArRobot.cpp

4.102 ArRobotPacket Class Reference

Represents the packets sent to the robot as well as those received from it.

#include <ArRobotPacket.h>

Inheritance diagram for ArRobotPacket::



Public Methods

- **ArRobotPacket** (unsigned char sync1=0xfa, unsigned char sync2=0xfb)

  Constructor.

- virtual ~**ArRobotPacket** ()

  Destructor.

- bool **verifyCheckSum** (void)

  returns true if the checksum matches what it should be.

- **ArTypes::UByte getID** (void)

  returns the ID of the packet.

- void **setID** (**ArTypes::UByte** id)

  Sets the ID of the packet.

- **ArTypes::Byte2 calcCheckSum** (void)

  returns the checksum, probably used only internally.

- virtual void **finalizePacket** (void)

  MakeFinals the packet in preparation for sending, must be done.

- **ArTime getTimeReceived** (void)

  Gets the time the packet was received at.

- void **setTimeReceived** (**ArTime** timeReceived)

  Sets the time the packet was received at.

4.102.1 Detailed Description

Represents the packets sent to the robot as well as those received from it.

This class reimplements some of the buf operations since the robot is opposeite endian from intel. Also has the getID for convenience.

You can just look at the documentation for the **ArBasePacket** (p. 112) except for the 4 new functions here, verifyCheckSum, getID, print, and calcCheckSum.

4.102.2 Constructor & Destructor Documentation

4.102.2.1 ArRobotPacket::ArRobotPacket (unsigned char *sync1* = 0xfa, unsigned char *sync2* = 0xfb)

Constructor.

Parameters:

sync1 first byte of the header of this packet, this should be left as the default in nearly all cases, ie don't mess with it

sync2 second byte of the header of this packet, this should be left as the default in nearly all cases, ie don't mess with it

The documentation for this class was generated from the following files:

- ArRobotPacket.h
- ArRobotPacket.cpp

4.103 ArRobotPacketReceiver Class Reference

Given a device connection it receives packets from the robot through it.

`#include <ArRobotPacketReceiver.h>`

Public Methods

- **ArRobotPacketReceiver** (bool allocatePackets=false, unsigned char sync1=0xfa, unsigned char sync2=0xfb)

  Constructor without an already assigned device connection.

- **ArRobotPacketReceiver** (**ArDeviceConnection** ∗deviceConnection, bool allocatePackets=false, unsigned char sync1=0xfa, unsigned char sync2=0xfb)

  Constructor with assignment of a device connection.

- virtual ∼**ArRobotPacketReceiver** ()

  Destructor.

- **ArRobotPacket** ∗ **receivePacket** (unsigned int msWait=0)

  Receives a packet from the robot if there is one available.

- void **setDeviceConnection** (**ArDeviceConnection** ∗deviceConnection)

  Sets the device this instance receives packets from.

- **ArDeviceConnection** ∗ **getDeviceConnection** (void)

  Gets the device this instance receives packets from.

- bool **isAllocatingPackets** (void)

  Gets whether or not the receiver is allocating packets.

4.103.1 Detailed Description

Given a device connection it receives packets from the robot through it.

4.103.2 Constructor & Destructor Documentation

4.103.2.1 ArRobotPacketReceiver::ArRobotPacketReceiver (bool *allocatePackets* = false, unsigned char *sync1* = 0xfa, unsigned char *sync2* = 0xfb)

Constructor without an already assigned device connection.

Parameters:

allocatePackets whether to allocate memory for the packets before returning them (true) or to just return a pointer to an internal packet (false)... most everything should use false as this will help prevent many memory leaks or corruptions

sync1 first byte of the header this receiver will receive, this should be left as the default in nearly all cases, ie don't mess with it

sync2 second byte of the header this receiver will receive, this should be left as the default in nearly all cases, ie don't mess with it

4.103.2.2 ArRobotPacketReceiver::ArRobotPacketReceiver (ArDeviceConnection * *deviceConnection*, bool *allocatePackets* = false, unsigned char *sync1* = 0xfa, unsigned char *sync2* = 0xfb)

Constructor with assignment of a device connection.

Parameters:

deviceConnection the connection which the receiver will use

allocatePackets whether to allocate memory for the packets before returning them (true) or to just return a pointer to an internal packet (false)... most everything should use false as this will help prevent many memory leaks or corruptions

sync1 first byte of the header this receiver will receive, this should be left as the default in nearly all cases, ie don't mess with it

sync2 second byte of the header this receiver will receive, this should be left as the default in nearly all cases, ie don't mess with it

4.103.3 Member Function Documentation

4.103.3.1 ArRobotPacket * ArRobotPacketReceiver::receivePacket (unsigned int *msWait* = 0)

Receives a packet from the robot if there is one available.

Parameters:

msWait how long to block for the start of a packet, nonblocking if 0

Returns:

NULL if there are no packets in alloted time, otherwise a pointer to the packet received, if allocatePackets is true than the place that called this function owns the packet and should delete the packet when done... if allocatePackets is false then nothing must store a pointer to this packet, the packet must be used and done with by the time this method is called again

The documentation for this class was generated from the following files:

- ArRobotPacketReceiver.h
- ArRobotPacketReceiver.cpp

4.104 ArRobotPacketSender Class Reference

Given a device connection this sends commands through it to the robot.

`#include <ArRobotPacketSender.h>`

Public Methods

- **ArRobotPacketSender** (unsigned char sync1=0xfa, unsigned char sync2=0xfb)

  Constructor without an already assigned device connection.

- **ArRobotPacketSender** (**ArDeviceConnection** ∗deviceConnection, unsigned char sync1=0xfa, unsigned char sync2=0xfb)

  Constructor with assignment of a device connection.

- virtual ∼**ArRobotPacketSender** ()

  Destructor.

- bool **com** (unsigned char command)

  Sends a command to the robot with no arguments.

- bool **comInt** (unsigned char command, short int argument)

  Sends a command to the robot with an int for argument.

- bool **com2Bytes** (unsigned char command, char high, char low)

  Sends a command to the robot with two bytes for argument.

- bool **comStr** (unsigned char command, const char ∗argument)

  Sends a command to the robot with a string for argument.

- bool **comStrN** (unsigned char command, const char ∗str, int size)

  Sends a command to the robot with a size bytes of str as argument.

- void **setDeviceConnection** (**ArDeviceConnection** ∗deviceConnection)

  Sets the device this instance sends commands to.

- **ArDeviceConnection** ∗ **getDeviceConnection** (void)

  Gets the device this instance sends commands to.

4.104.1 Detailed Description

Given a device connection this sends commands through it to the robot.

4.104.2 Constructor & Destructor Documentation

4.104.2.1 ArRobotPacketSender::ArRobotPacketSender (unsigned char *sync1* = 0xfa, unsigned char *sync2* = 0xfb)

Constructor without an already assigned device connection.

Parameters:

sync1 first byte of the header this sender will send, this should be left as the default in nearly all cases, ie don't mess with it

sync2 second byte of the header this sender will send, this should be left as the default in nearly all cases, ie don't mess with it

4.104.2.2 ArRobotPacketSender::ArRobotPacketSender (ArDeviceConnection ∗ *deviceConnection*, unsigned char *sync1* = 0xfa, unsigned char *sync2* = 0xfb)

Constructor with assignment of a device connection.

Parameters:

sync1 first byte of the header this sender will send, this should be left as the default in nearly all cases, ie don't mess with it

sync2 second byte of the header this sender will send, this should be left as the default in nearly all cases, ie don't mess with it

4.104.3 Member Function Documentation

4.104.3.1 bool ArRobotPacketSender::com (unsigned char *number*)

Sends a command to the robot with no arguments.

Parameters:

command the command number to send

Returns:

whether the command could be sent or not

4.104.3.2 bool ArRobotPacketSender::com2Bytes (unsigned char *command*, char *high*, char *low*)

Sends a command to the robot with two bytes for argument.

Parameters:

command the command number to send

high the high byte to send with the command

low the low byte to send with the command

Returns:

whether the command could be sent or not

4.104.3.3 bool ArRobotPacketSender::comInt (unsigned char *command*, short int *argument*)

Sends a command to the robot with an int for argument.

Parameters:

command the command number to send

argument the integer argument to send with the command

Returns:

whether the command could be sent or not

4.104.3.4 bool ArRobotPacketSender::comStr (unsigned char *command*, const char * *argument*)

Sends a command to the robot with a string for argument.

Parameters:

command the command number to send

str the string to send with the command

Returns:

whether the command could be sent or not

4.104.3.5 bool ArRobotPacketSender::comStrN (unsigned char *command*, const char ∗ *str*, int *size*)

Sends a command to the robot with a size bytes of str as argument.

Parameters:

command the command number to send

str the character array to send with the command

size length of the array to send

Returns:

whether the command could be sent or not

The documentation for this class was generated from the following files:

- ArRobotPacketSender.h
- ArRobotPacketSender.cpp

4.105 ArRobotParams Class Reference

Contains the robot parameters, according to the parameter file.

`#include <ArRobotParams.h>`

Public Methods

- **ArRobotParams** ()

  Constructor.

- virtual ~**ArRobotParams** ()

  Destructor.

- void **init** (ArRobotParamFile *param)

  Given the robot parameters in preference form, fills in this instance.

- const char * **getClassName** (void) const

  Returns the class from the parameter file.

- const char * **getSubClassName** (void) const

  Returns the subclass from the parameter file.

- double **getRobotRadius** (void) const

  Returns the robot's radius.

- double **getRobotDiagonal** (void) const

  Returns the robot diagonal (half-height to diagonal of octagon).

- bool **isHolonomic** (void) const

  Returns whether the robot is holonomic or not.

- bool **hasMoveCommand** (void) const

  Returns if the robot has a built in move command.

- int **getMaxVelocity** (void) const

  Returns the max velocity of the robot.

- int **getMaxRotVelocity** (void) const

  Returns the max rotational velocity of the robot.

- bool **getRequestIOPackets** (void) const

Returns true if IO packets are automatically requested upon connection to the robot.

- double **getAngleConvFactor** (void) const

  Returns the angle conversion factor.

- double **getDistConvFactor** (void) const

  Returns the distance conversion factor.

- double **getVelConvFactor** (void) const

  Returns the velocity conversion factor.

- double **getRangeConvFactor** (void) const

  Returns the sonar range conversion factor.

- double **getDiffConvFactor** (void) const

  Returns the wheel velocity difference to angular velocity conv factor.

- double **getVel2Divisor** (void) const

  Returns the multiplier for VEL2 commands.

- bool **haveTableSensingIR** (void) const

  Returns true if the robot has table sensing IR.

- bool **haveNewTableSensingIR** (void) const

  Returns true if the robot's table sensing IR bits are sent in the 4th-byte of the IO packet.

- bool **haveFrontBumpers** (void) const

  Returns true if the robot has front bumpers.

- int **numFrontBumpers** (void) const

  Returns the number of front bumpers.

- bool **haveRearBumpers** (void) const

  Returns true if the robot has rear bumpers.

- int **numRearBumpers** (void) const

  Returns the number of rear bumpers.

- int **getNumSonar** (void) const

  Returns the number of sonar.

- bool **haveSonar** (int number)

  Returns if the sonar of the given number is valid.

- int **getSonarX** (int number)

  Returns the X location of the given numbered sonar disc.

- int **getSonarY** (int number)

  Returns the Y location of the given numbered sonar disc.

- int **getSonarTh** (int number)

  Returns the heading of the given numbered sonar disc.

- bool **getLaserPossessed** (void) const

  Returns if the robot has a laser (according to param file).

- const char * **getLaserPort** (void) const

  What port the laser is on.

- bool **getLaserPowerControlled** (void) const

  If the laser power is controlled by the serial port lines.

- bool **getLaserFlipped** (void) const

  If the laser is flipped on the robot.

- int **getLaserX** (void) const

  The X location of the laser.

- int **getLaserY** (void) const

  The Y location of the laser.

4.105.1 Detailed Description

Contains the robot parameters, according to the parameter file.

The documentation for this class was generated from the following files:

- ArRobotParams.h
- ArRobotParams.cpp

4.106 ArSectors Class Reference

A class for keeping track of if a complete revolution has been attained.

`#include <ariaUtil.h>`

Public Methods

- **ArSectors** (int numSectors=8)

  Constructor.

- virtual ~**ArSectors** ()

  Destructor.

- void **clear** (void)

  Clears all quadrants.

- void **update** (double angle)

  Updates the appropriate quadrant for the given angle.

- bool **didAll** (void) const

  Returns true if the all of the quadrants have been gone through.

4.106.1 Detailed Description

A class for keeping track of if a complete revolution has been attained.

This class can be used to keep track of if a complete revolution has been done, it is used by doing doing a clearQuadrants when you want to stat the revolution. Then at each point doing an updateQuadrant with the current heading of the robot. When didAllQuadrants returns true, then all the quadrants have been done.

The documentation for this class was generated from the following file:

- ariaUtil.h

4.107 ArSensorReading Class Reference

A class to hold a sensor reading, should be one instance per sensor.

`#include <ArSensorReading.h>`

Public Methods

- **ArSensorReading** (double xPos=0.0, double yPos=0.0, double th-Pos=0.0)

  Constructor, the three args are the physical location of the sonar.

- int **getRange** (void)

  Gets the range of the reading.

- bool **isNew** (unsigned int counter)

  Given the counter from the robot, it returns whether the reading is new.

- double **getX** (void)

  Gets the X location of the sensor reading.

- double **getY** (void)

  Gets the Y location of the sensor reading.

- **ArPose getPose** (void)

  Gets the position of the reading
  Returns:
  the position of the reading (ie where the sonar pinged back).

- **ArPose getPoseTaken** (void)

  Gets the pose the reading was taken at.

- **ArPose getEncoderPoseTaken** (void)

  Gets the encoder pose the reading was taken at.

- double **getSensorX** (void)

  Gets the X location of the sonar on the robot.

- double **getSensorY** (void)

  Gets the Y location of the sensor on the robot.

- double **getSensorTh** (void)

  Gets the heading of the sensor on the robot.

- **ArPose getSensorPosition** (void)

  Gets the sensors position on the robot.

- double **getSensorDX** (void)

  Gets the cos component of the heading of the sensor reading.

- double **getSensorDY** (void)

  Gets the sin component of the heading of the sensor reading.

- double **getXTaken** (void)

  Gets the X locaiton of the robot when the reading was received.

- double **getYTaken** (void)

  Gets the Y location of the robot when the reading was received.

- double **getThTaken** (void)

  Gets the th (heading) of the robot when the reading was received.

- unsigned int **getCounterTaken** (void)

  Gets the counter from when the reading arrived.

- void **newData** (int range, **ArPose** robotPose, **ArPose** encoderPose, **ArTransform** trans, unsigned int counter, **ArTime** timeTaken)

  Takes the data and makes the reading reflect it.

- void **ArSensorReading::newData** (int sx, int sy, **ArPose** robotPose, **ArPose** encoderPose, **ArTransform** trans, unsigned int counter, **ArTime** timeTaken)

  Takes the data and makes the reading reflect it.

- void **resetSensorPosition** (double xPos, double yPos, double thPos, bool forceComputation=false)

  Resets the sensors idea of its physical location on the robot.

- void **applyTransform** (**ArTransform** trans)

  Applies a transform to the reading position, and where it was taken.

4.107.1 Detailed Description

A class to hold a sensor reading, should be one instance per sensor.

This class holds sensor data and a sensor reading... it can happen that it contains the data for a sonar, but not the reading, in which case the range (from getRange) will be -1, and the counter it was taken (from getCounterTaken) will be 0, also it will never be new (from isNew)

4.107.2 Constructor & Destructor Documentation

4.107.2.1 ArSensorReading::ArSensorReading (double *xPos* = 0.0, double *yPos* = 0.0, double *thPos* = 0.0)

Constructor, the three args are the physical location of the sonar.

Parameters:

xPos the x position of the sensor on the robot (mm)

yPos the y position of the sensor on the robot (mm)

thPos the heading of the sensor on the robot (deg)

4.107.3 Member Function Documentation

4.107.3.1 void ArSensorReading::applyTransform (ArTransform *trans*)

Applies a transform to the reading position, and where it was taken.

Parameters:

trans the transform to apply to the reading and where the reading was taken

4.107.3.2 unsigned int ArSensorReading::getCounterTaken (void) `[inline]`

Gets the counter from when the reading arrived.

Returns:

the counter from the robot when the sonar reading was taken

See also:

isNew (p. 422)

4.107.3.3 int ArSensorReading::getRange (void) `[inline]`

Gets the range of the reading.

Returns:
the distance return from the sensor (how far from the robot)

4.107.3.4 ArPose ArSensorReading::getSensorPosition (void) `[inline]`

Gets the sensors position on the robot.

Returns:
the position of the sensor on the robot

4.107.3.5 bool ArSensorReading::isNew (unsigned int *counter*) `[inline]`

Given the counter from the robot, it returns whether the reading is new.

Parameters:
counter the counter from the robot at the current time

Returns:
true if the reading was taken on the current loop

See also:
getCounter

4.107.3.6 void ArSensorReading::newData (int *range*, ArPose *robotPose*, ArPose *encoderPose*, ArTransform *trans*, unsigned int *counter*, ArTime *timeTaken*)

Takes the data and makes the reading reflect it.

Parameters:
range the distance from the sensor to the sensor return (mm)
x the x location of the robot when the sensor reading was taken (mm)
y the y location of the robot when the sensor reading was taken (mm)
th the heading of the robot when the sensor reading was taken (deg)
trans the transform from local coords to global coords
counter the counter from the robot when the sensor reading was taken

4.107.3.7 void ArSensorReading::resetSensorPosition (double *xPos*, double *yPos*, double *thPos*, bool *forceComputation* = false)

Resets the sensors idea of its physical location on the robot.

Parameters:

xPos the x position of the sensor on the robot (mm)

yPos the y position of the sensor on the robot (mm)

thPos the heading of the sensor on the robot (deg)

The documentation for this class was generated from the following files:

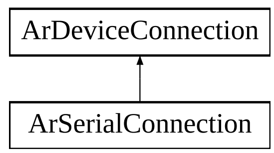
- ArSensorReading.h
- ArSensorReading.cpp

4.108 ArSerialConnection Class Reference

For connecting to devices through a serial port.

#include <ArSerialConnection.h>

Inheritance diagram for ArSerialConnection::



Public Types

- enum **Open** { **OPEN_COULD_NOT_OPEN_PORT** = 1, **OPEN_COULD_NOT_SET_UP_PORT**, **OPEN_INVALID_BAUD_RATE**, **OPEN_COULD_NOT_SET_BAUD**, **OPEN_ALREADY_OPEN** }

Public Methods

- **ArSerialConnection** ()

  Constructor.

- virtual ~**ArSerialConnection** ()

  Destructor also closes the connection.

- int **open** (const char *port=NULL)

  Opens the serial port.

- void **setPort** (const char *port=NULL)

  Sets the port this will use.

- const char * **getPort** (void)

  Gets the port this is using.

- virtual bool **openSimple** (void)

  Opens the connection again, using the values from setLocation or.

- virtual int **getStatus** (void)

  Gets the status of the connection, which is one of the enum status.

- virtual bool **close** (void)

  Closes the connection.

- virtual int **read** (const char ∗data, unsigned int size, unsigned int ms-Wait=0)

  Reads data from connection.

- virtual int **write** (const char ∗data, unsigned int size)

  Writes data to connection.

- virtual const char ∗ **getOpenMessage** (int messageNumber)

  Gets the string of the message associated with opening the device.

- bool **setBaud** (int baud)

  Sets the baud rate on the connection.

- int **getBaud** (void)

  Gets what the current baud rate is set to.

- bool **setHardwareControl** (bool hardwareControl)

  Sets whether to enable or disable the hardware control lines.

- bool **getHardwareControl** (void)

  Gets whether the hardware control lines are enabled or disabled.

- bool **getDCD** (void)

  Sees how the DCD is set (true = high).

- bool **getCTS** (void)

  Sees how the CTS is set (true = high).

- virtual **ArTime getTimeRead** (int index)

  Gets the time data was read in.

- virtual bool **isTimeStamping** (void)

  sees if timestamping is really going on or not.

4.108.1 Detailed Description

For connecting to devices through a serial port.

4.108.2 Member Enumeration Documentation

4.108.2.1 enum ArSerialConnection::Open

Enumeration values:

OPEN_COULD_NOT_OPEN_PORT Could not open the port.

OPEN_COULD_NOT_SET_UP_PORT Could not set up the port.

OPEN_INVALID_BAUD_RATE Baud rate is not valid.

OPEN_COULD_NOT_SET_BAUD Baud rate valid, but could not set it.

OPEN_ALREADY_OPEN Connection was already open.

4.108.3 Member Function Documentation

4.108.3.1 bool ArSerialConnection::close (void) `[virtual]`

Closes the connection.

Returns:
whether the close succeeded or not

Reimplemented from **ArDeviceConnection** (p. 126).

4.108.3.2 int ArSerialConnection::getBaud (void)

Gets what the current baud rate is set to.

Returns:
the current baud rate of the connection

4.108.3.3 bool ArSerialConnection::getHardwareControl (void)

Gets whether the hardware control lines are enabled or disabled.

Returns:
true if hardware control of lines is enabled, false otherwise

4.108.3.4 const char * ArSerialConnection::getOpenMessage (int *messageNumber*) [virtual]

Gets the string of the message associated with opening the device.

Each class inherited from this one has an open method which returns 0 for success or an integer which can be passed into this function to obtain a string describing the reason for failure

Parameters:
messageNumber the number returned from the open

Returns:
the error description associated with the messageNumber

Reimplemented from **ArDeviceConnection** (p. 126).

4.108.3.5 const char * ArSerialConnection::getPort (void)

Gets the port this is using.

Returns:
The seiral port to connect to

4.108.3.6 int ArSerialConnection::getStatus (void) [virtual]

Gets the status of the connection, which is one of the enum status.

Gets the status of the connection, which is one of the enum status. If you want to get a string to go along with the number, use getStatusMessage

Returns:
the status of the connection

See also:
getStatusMessage (p. 127)

Reimplemented from **ArDeviceConnection** (p. 126).

4.108.3.7 ArTime ArSerialConnection::getTimeRead (int *index*) [virtual]

Gets the time data was read in.

Parameters:

index looks like this is the index back in the number of bytes last read in

Returns:

the time the last read data was read in

Reimplemented from **ArDeviceConnection** (p. 127).

4.108.3.8 bool ArSerialConnection::isTimeStamping (void) `[virtual]`

sees if timestamping is really going on or not.

Returns:

true if real timestamping is happening, false otherwise

Reimplemented from **ArDeviceConnection** (p. 127).

4.108.3.9 int ArSerialConnection::open (const char * *port* = NULL)

Opens the serial port.

Parameters:

port The serial port to connect to, or NULL which defaults to COM1 for windows and /dev/ttyS0 for linux

Returns:

0 for success, otherwise one of the open enums

See also:

getOpenMessage (p. 427)

4.108.3.10 int ArSerialConnection::read (const char * *data*, unsigned int *size*, unsigned int *msWait* = 0) `[virtual]`

Reads data from connection.

Reads data from connection

Parameters:

data pointer to a character array to read the data into

size maximum number of bytes to read

msWait read blocks for this many milliseconds (not at all for < 0)

Returns:
number of bytes read, or -1 for failure

See also:
write (p. 430), **writePacket** (p. 129)

Reimplemented from **ArDeviceConnection** (p. 128).

4.108.3.11 bool ArSerialConnection::setBaud (int *baud*)

Sets the baud rate on the connection.

Parameters:
rate the baud rate to set the connection to

Returns:
whether the set succeeded

See also:
getBaud (p. 426)

4.108.3.12 bool ArSerialConnection::setHardwareControl (bool *hardwareControl*)

Sets whether to enable or disable the hardware control lines.

Parameters:
hardwareControl true to enable hardware control of lines

Returns:
true if the set succeeded

4.108.3.13 void ArSerialConnection::setPort (const char * *port* = NULL)

Sets the port this will use.

Parameters:
port The serial port to connect to, or NULL which defaults to COM1 for windows and /dev/ttyS0 for linux

See also:
getOpenMessage (p. 427)

4.108.3.14 int ArSerialConnection::write (const char * *data*, unsigned int *size*) [virtual]

Writes data to connection.

Writes data to connection

Parameters:

data pointer to a character array to write the data from

size number of bytes to write

Returns:

number of bytes read, or -1 for failure

See also:

read (p. 428), **writePacket** (p. 129)

Reimplemented from **ArDeviceConnection** (p. 128).

The documentation for this class was generated from the following files:

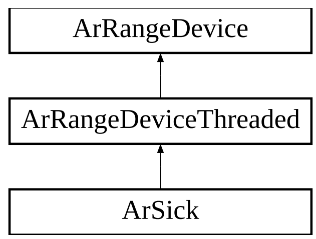
- ArSerialConnection.h
- ArSerialConnection_LIN.cpp
- ArSerialConnection_WIN.cpp

4.109 ArSick Class Reference

The sick driver.

#include <ArSick.h>

Inheritance diagram for ArSick::



Public Types

- enum **BaudRate** { **BAUD9600**, **BAUD19200**, **BAUD38400** }
- enum **Degrees** { **DEGREES180**, **DEGREES100** }
- enum **Increment** { **INCREMENT_ONE**, **INCREMENT_HALF** }

Public Methods

- **ArSick** (size_t currentBufferSize=361, size_t cumulativeBufferSize=0, const char ∗name="laser")

  Constructor.

- ∼**ArSick** ()

  Destructor.

- void **configure** (bool useSim=false, bool powerControl=true, bool laserFlipped=false, **BaudRate** baud=BAUD38400, **Degrees** deg=DEGREES180, **Increment** incr=INCREMENT_ONE)

  Configure the laser before connecting to it.

- void **configureShort** (bool useSim=false, **BaudRate** baud=BAUD38400, **Degrees** deg=DEGREES180, **Increment** incr=INCREMENT_ONE)

  Shorter configure for the laser.

- void **setSensorPosition** (double x, double y, double th)

  Sets the position of the laser on the robot.

- void **setSensorPosition** (**ArPose** pose)
  Sets the position of the laser on the robot.
- **ArPose getSensorPosition** ()
  Gets the position of the laser on the robot.
- double **getSensorPositionX** ()
  Gets the X position of the laser on the robot.
- double **getSensorPositionY** ()
  Gets the Y position of the laser on the robot.
- double **getSensorPositionTh** ()
  Gets the heading of the laser on the robot.
- bool **blockingConnect** (void)
  Connect to the laser while blocking.
- bool **asyncConnect** (void)
  Connect to the laser asyncronously.
- bool **disconnect** (bool doNotLockRobotForSim=false)
  Disconnect from the laser.
- void **setDeviceConnection** (**ArDeviceConnection** *conn)
  Sets the device connection.
- **ArDeviceConnection** * **getDeviceConnection** (void)
  Gets the device connection.
- bool **isConnected** (void)
  Sees if this is connected to the laser.
- bool **tryingToConnect** (void)
  Sees if this is trying to connect to the laser at the moment.
- unsigned int **getMinRange** (void)
  Gets the minimum range for this device (defaults to 100 mm).
- void **setMinRange** (unsigned int minRange)
  Sets the maximum range for this device (defaults to 100 mm).

- void **setFilterNearDist** (double dist)

  Current readings closer than this are discarded as too close.

- double **getFilterNearDist** (void)

  Current readings closer than this are discarded as too close.

- void **ArSick::setFilterCumulativeMaxDist** (double dist)

  Cumulative readings must be within this distance of the robot to be saved.

- double **ArSick::getFilterCumulativeMaxDistance** (void)

  Cumulative readings must be within this distance of the robot to be saved.

- void **ArSick::setFilterCumulativeNearDist** (double dist)

  Cumulative readings closer than this are discarded as too close.

- double **ArSick::getFilterCumulativeNearDistance** (void)

  Cumulative readings closer than this are discarded as too close.

- void **ArSick::setFilterCumulativeCleanDist** (double dist)

  Cumulative readings that are this close to current beams are discarded.

- double **ArSick::getFilterCumulativeCleanDistance** (void)

  Cumulative readings that are this close to current beams are discarded.

- void **ArSick::setFilterCleanCumulativeInterval** (int interval)

  Cumulative readings are cleaned every this number of milliseconds.

- int **ArSick::getFilterCleanCumulativeInterval** (void)

  Cumulative readings are cleaned every this number of milliseconds.

- bool **runOnRobot** (void)

  Runs the laser off of the robot.

- int **getSickPacCount** ()

  Gets the number of laser packets received in the last second.

- void **addConnectCB** (**ArFunctor** *functor, **ArListPos::Pos** position)

  Adds a connect callback.

- void **remConnectCB** (**ArFunctor** *functor)

Adds a disconnect callback.

- void **addFailedConnectCB** (**ArFunctor** ∗functor, **ArListPos::Pos** position)

  Adds a callback for when a connection to the robot is failed.

- void **remFailedConnectCB** (**ArFunctor** ∗functor)

  Removes a callback for when a connection to the robot is failed.

- void **addDisconnectNormallyCB** (**ArFunctor** ∗functor, **ArList-Pos::Pos** position)

  Adds a callback for when disconnect is called while connected.

- void **remDisconnectNormallyCB** (**ArFunctor** ∗functor)

  Removes a callback for when disconnect is called while connected.

- void **addDisconnectOnErrorCB** (**ArFunctor** ∗functor, **ArList-Pos::Pos** position)

  Adds a callback for when disconnection happens because of an error.

- void **remDisconnectOnErrorCB** (**ArFunctor** ∗functor)

  Removes a callback for when disconnection happens because of an error.

- void **setConnectionTimeoutTime** (int mSecs)

  Sets the time without a response until connection assumed lost.

- int **getConnectionTimeoutTime** (void)

  Gets the time without a response until connection assumed lost.

- **ArTime getLastReadingTime** (void)

  Gets the time data was last receieved.

- bool **isUsingSim** (void)

  Gets whether the laser is simulated or not.

- bool **isControllingPower** (void)

  Gets whether the computer is controling laser power or not.

- bool **isLaserFlipped** (void)

  Gets whether the laser is flipped over or not.

- **Degrees getDegrees** (void)

  Gets the degrees the laser is scanning.

- **Increment getIncrement** (void)

  Gets the amount each scan increments.

- bool **simPacketHandler** (**ArRobotPacket** *packet)

  The packet handler for when connected to the simulator.

- void **sensorInterpCallback** (void)

  The function called if the laser isn't running in its own thread and isn't simulated.

- bool **internalConnectSim** (void)

  An internal function.

- int **internalConnectHandler** (void)

  An internal function, single loop event to connect to laser.

- virtual void * **runThread** (void *arg)

  The internal function used by the **ArRangeDeviceThreaded** (p. 320).

- void **processPacket** (**ArSickPacket** *packet, **ArPose** pose, **ArPose** encoderPose, unsigned int counter)

  The internal function which processes the sickPackets.

- void **runOnce** (bool lockRobot)

  The internal function that gets does the work.

- virtual void **setRobot** (**ArRobot** *robot)

  Sets the robot this device is attached to.

- void **dropConnection** (void)

  Internal function, shouldn't be used, drops the conn because of error.

- void **failedConnect** (void)

  Internal function, shouldn't be used, denotes the conn failed.

- void **madeConnection** (void)

  Internal function, shouldn't be used, does the after conn stuff.

- void **robotConnectCallback** (void)

  Internal function, shouldn't be used, gets params from the robot.

Protected Types

- enum **State** { **STATE_NONE**, **STATE_INIT**, **STATE_WAIT_FOR_POWER_ON**, **STATE_CHANGE_BAUD**, **STATE_CONFIGURE**, **STATE_WAIT_FOR_CONFIGURE_ACK**, **STATE_INSTALL_MODE**, **STATE_WAIT_FOR_INSTALL_MODE_ACK**, **STATE_SET_MODE**, **STATE_WAIT_FOR_SET_MODE_ACK**, **STATE_START_READINGS**, **STATE_WAIT_FOR_START_ACK**, **STATE_CONNECTED** }

Protected Methods

- void **filterReadings** ()

  Internal function for filtering the raw readings and updating buffers.

- void **filterAddAndCleanCumulative** (double x, double y, bool clean)

  Internal function for managing the cumulative.

- void **filterFarCumulative** (void)

  Internal function for managing the cumulative.

- void **switchState** (**State** state)

  Internal function for switching states.

4.109.1 Detailed Description

The sick driver.

4.109.2 Member Enumeration Documentation

4.109.2.1 enum ArSick::BaudRate

Enumeration values:

BAUD9600 9600 Baud.

BAUD19200 19200 Baud.

BAUD38400 38400 Baud.

4.109.2.2 enum ArSick::Degrees

Enumeration values:

DEGREES180 180 Degrees.

DEGREES100 100 Degrees.

4.109.2.3 enum ArSick::Increment

Enumeration values:

INCREMENT_ONE One degree increments.

INCREMENT_HALF Half a degree increments.

4.109.2.4 enum ArSick::State [protected]

Enumeration values:

STATE_NONE Nothing, haven't tried to connect or anything.

STATE_INIT Initializing the laser.

STATE_WAIT_FOR_POWER_ON Waiting for power on.

STATE_CHANGE_BAUD Change the baud, no confirm here.

STATE_CONFIGURE Send the width and increment to the laser.

STATE_WAIT_FOR_CONFIGURE_ACK Wait for the configuration Ack.

STATE_INSTALL_MODE Switch to install mode.

STATE_WAIT_FOR_INSTALL_MODE_ACK Wait until its switched to install mode.

STATE_SET_MODE Set the mode (mm/cm) and extra field bits.

STATE_WAIT_FOR_SET_MODE_ACK Waiting for set-mode ack.

STATE_START_READINGS Switch to monitoring mode.

STATE_WAIT_FOR_START_ACK Waiting for the switch-mode ack.

STATE_CONNECTED We're connected and getting readings.

4.109.3 Member Function Documentation

4.109.3.1 void ArSick::addConnectCB (ArFunctor * *functor*, ArListPos::Pos *position*)

Adds a connect callback.

Adds a connect callback, which is an **ArFunctor** (p. 139), created as an **ArFunctorC** (p. 165). The entire list of connect callbacks is called when a connection is made with the laser. If you have some sort of module that adds a callback, that module must remove the callback when the module is removed.

Parameters:

functorfunctor created from **ArFunctorC** (p. 165) which refers to the function to call.

position whether to place the functor first or last

See also:

remConnectCB (p. 442)

4.109.3.2 void ArSick::addDisconnectNormallyCB (ArFunctor ∗ *functor*, ArListPos::Pos *position*)

Adds a callback for when disconnect is called while connected.

Adds a disconnect normally callback,which is an **ArFunctor** (p. 139), created as an **ArFunctorC** (p. 165). This whole list of disconnect normally callbacks is called when something calls disconnect if the instance isConnected. If there is no connection and disconnect is called nothing is done. If you have some sort of module that adds a callback, that module must remove the callback when the module is removed.

Parameters:

functor functor created from **ArFunctorC** (p. 165) which refers to the function to call.

position whether to place the functor first or last

See also:

remFailedConnectCB (p. 443)

4.109.3.3 void ArSick::addDisconnectOnErrorCB (ArFunctor ∗ *functor*, ArListPos::Pos *position*)

Adds a callback for when disconnection happens because of an error.

Adds a disconnect on error callback, which is an **ArFunctor** (p. 139), created as an **ArFunctorC** (p. 165). This whole list of disconnect on error callbacks is called when ARIA loses connection to a laser because of an error. This can occur if the physical connection (ie serial cable) between the laser and the computer is severed/disconnected, or if the laser is turned off. Note that if the link between the two is lost the ARIA assumes it is temporary until it reaches a timeout value set with setConnectionTimeoutTime. If you have some sort of module that adds a callback, that module must remove the callback when the module removed.

Parameters:

functor functor created from **ArFunctorC** (p. 165) which refers to the function to call.

position whether to place the functor first or last

See also:

remFailedConnectCB (p. 443)

4.109.3.4 void ArSick::addFailedConnectCB (ArFunctor * *functor*, ArListPos::Pos *position*)

Adds a callback for when a connection to the robot is failed.

Adds a failed connect callback,which is an **ArFunctor** (p. 139), created as an **ArFunctorC** (p. 165). This whole list of failed connect callbacks is called when an attempt is made to connect to the laser, but fails. The usual reason for this failure is either that there is no laser/sim where the connection was tried to be made. If you have some sort of module that adds a callback, that module must remove the callback when the module removed.

Parameters:

functor functor created from **ArFunctorC** (p. 165) which refers to the function to call.

position whether to place the functor first or last

See also:

remFailedConnectCB (p. 443)

4.109.3.5 bool ArSick::asyncConnect (void)

Connect to the laser asyncronously.

This does not lockDevice the laser, but you should lockDevice the laser before you try to connect. Also note that if you are connecting to the sim the laser MUST be unlocked so that this can lock the laser and send the commands to the sim. To be connected successfully, either the useSim must be set from configure (and the laser must be connected to a simulator, or this will return true but connection will fail), the device must have been run or runasync, or the device must have been runOnLaser.

Returns:
true if a connection will be able to be tried, false otherwise

See also:
configure (p. 440), **ArRangeDeviceThreaded::run** (p. 320), **ArRangeDeviceThreaded::runAsync** (p. 320), **runOnRobot** (p. 443)

4.109.3.6 bool ArSick::blockingConnect (void)

Connect to the laser while blocking.

lockDevice s the laser, and then makes a connection. If it is connecting to the simulator (set with the useSim flag in configure) then it will lock the laser and send the commands to the sim. If where you are calling from has the laser locked, make sure you unlock it before calling this function.

Returns:
true if a connection was made, false otherwise

4.109.3.7 void ArSick::configure (bool *useSim* = false, bool *powerControl* = true, bool *laserFlipped* = false, BaudRate *baud* = BAUD38400, Degrees *deg* = DEGREES180, Increment *incr* = INCREMENT_ONE)

Configure the laser before connecting to it.

You must lockDevice the laser or not have the laser being poked at by multiple threads before you use htis function call

4.109.3.8 void ArSick::configureShort (bool *useSim* = false, BaudRate *baud* = BAUD38400, Degrees *deg* = DEGREES180, Increment *incr* = INCREMENT_ONE)

Shorter configure for the laser.

You must lockDevice the laser or not have the laser being poked at by multiple threads before you use htis function call

4.109.3.9 bool ArSick::disconnect (bool *doNotLockRobotForSim* = false)

Disconnect from the laser.

Disconnects from the laser. You should lockDevice the laser before calling this function. Also if you are using the simulator it will lock the robot so it can send the command to the simulator, so you should make sure the robot is unlocked.

Parameters:

doNotLockRobotForSim if this is true, this will not lock the robot if its trying to send a command to the sim... ONLY do this if you are calling this from within the robots sync loop (ie from a sync task, sensor interp task, or user task)

Returns:

true if it could disconnect from the laser cleanly

4.109.3.10 void ArSick::filterReadings () `[protected]`

Internal function for filtering the raw readings and updating buffers.

filter readings here, from raw current buffer to filtered current buffer of the range device object, and then to the cumulative buffer

current buffer filtering is to eliminate max (null) readings, and compress close readings

cumulative buffer filtering is to replace readings within the scope of the current sensor set

4.109.3.11 int ArSick::getConnectionTimeoutTime (void)

Gets the time without a response until connection assumed lost.

Gets the number of seconds to go without response from the laser until it is assumed tha tthe connection with the laser has been broken and the disconnect on error events will happen.

4.109.3.12 double ArSick::getFilterNearDist (void)

Current readings closer than this are discarded as too close.

When readings are put into the current buffer they are compared against the last reading and must be at least this distance away from the last reading. If this value is 0 then there is no filtering of this kind.

4.109.3.13 int ArSick::internalConnectHandler (void)

An internal function, single loop event to connect to laser.

Returns:
0 if its still trying to connect, 1 if it connected, 2 if it failed

4.109.3.14 bool ArSick::internalConnectSim (void)

An internal function.

Sends the commands to the sim to start up the connection

Returns:
true if the commands were sent, false otherwise

4.109.3.15 void ArSick::remConnectCB (ArFunctor ∗ *functor*)

Adds a disconnect callback.

Parameters:
functor the functor to remove from the list of connect callbacks

See also:
addConnectCB (p. 437)

4.109.3.16 void ArSick::remDisconnectNormallyCB (ArFunctor ∗ *functor*)

Removes a callback for when disconnect is called while connected.

Parameters:
functor the functor to remove from the list of connect callbacks

See also:
addDisconnectNormallyCB (p. 438)

4.109.3.17 void ArSick::remDisconnectOnErrorCB (ArFunctor ∗ *functor*)

Removes a callback for when disconnection happens because of an error.

Parameters:
functor the functor to remove from the list of connect callbacks

See also:
addDisconnectOnErrorCB (p. 438)

4.109.3.18 void ArSick::remFailedConnectCB (ArFunctor * *functor*)

Removes a callback for when a connection to the robot is failed.

Parameters:

functor the functor to remove from the list of connect callbacks

See also:

addFailedConnectCB (p. 439)

4.109.3.19 bool ArSick::runOnRobot (void)

Runs the laser off of the robot.

This sets up a sensor interp task on the robot, which is where the robot will be driven from. Note that the device must have been added to the robot already so that the device has a pointer to the robot. You should lock the robot and lockDevice the laser before doing this if other things are running already.

4.109.3.20 void ArSick::setConnectionTimeoutTime (int *mSecs*)

Sets the time without a response until connection assumed lost.

Sets the number of seconds to go without a response from the laser until it is assumed that the connection with the laser has been broken and the disconnect on error events will happen.

Parameters:

seconds if seconds is 0 then the connection timeout feature will be disabled, otherwise disconnect on error will be triggered after this number of seconds...

4.109.3.21 void ArSick::setFilterNearDist (double *dist*)

Current readings closer than this are discarded as too close.

When readings are put into the current buffer they are compared against the last reading and must be at least this distance away from the last reading. If this value is 0 then there is no filtering of this kind.

The documentation for this class was generated from the following files:

- ArSick.h
- ArSick.cpp

4.110 ArSickLogger Class Reference

This class can be used to create log files for the laser mapper.

`#include <ArSickLogger.h>`

Public Methods

- **ArSickLogger** (**ArRobot** ∗robot, **ArSick** ∗sick, double distDiff, double degDiff, const char ∗filename, bool addGoals=false, **ArJoyHandler** ∗joyHandler=NULL)

    Constructor.

- virtual ∼**ArSickLogger** ()

    Destructor.

- void **addTagToLog** (const char ∗str,...)

    Adds a string to the log file at the given moment.

- void **addTagToLogPlain** (const char ∗str)

    Same ass addToLog, but no varargs, wrapper for java.

- void **setDistDiff** (double distDiff)

    Sets the distance at which the robot will take a new reading.

- double **getDistDiff** (void)

    Gets the distance at which the robot will take a new reading.

- void **setDegDiff** (double degDiff)

    Sets the degrees to turn at which the robot will take a new reading.

- double **getDegDiff** (void)

    Gets the degrees to turn at which the robot will take a new reading.

- void **takeReading** (void)

    Explicitly tells the robot to take a reading.

- void **addGoal** (void)

    Adds a goal where the robot is at the moment.

- void **robotTask** (void)

    The task which gets attached to the robot.

4.110.1 Detailed Description

This class can be used to create log files for the laser mapper.

This class has a pointer to a robot and a laser... every time the robot has EITHER moved the distDiff, or turned the degDiff, it will take the current readings from the laser and log them into the log file given as the filename to the constructor. Readings can also be taken by calling takeReading which explicitly tells the logger to take a reading.

The class can also add goals, see the constructor arg addGoals for information about that... you can also explicitly have it add a goal by calling addGoal.

4.110.2 Constructor & Destructor Documentation

4.110.2.1 ArSickLogger::ArSickLogger (ArRobot ∗ *robot*, ArSick ∗ *sick*, double *distDiff*, double *degDiff*, const char ∗ *filename*, bool *addGoals* = false, ArJoyHandler ∗ *joyHandler* = NULL)

Constructor.

Make sure you have called **ArSick::configure** (p. 440) or **ArSick::configure-Short** (p. 440) on your laser before you make this class

Parameters:

robot The robot to attach to

sick the laser to log from

distDiff the distance traveled at which to take a new reading

degDiff the degrees turned at which to take a new reading

filename the file name in which to put the log

addGoals whether to add goals automatically or... if true then the sick logger puts hooks into places it needs this to happen, into any key-handler thats around (for a keypress of G), it pays attention to the flag bit of the robot, and it puts in a button press callback for the joyhandler passed in (if any)

4.110.3 Member Function Documentation

4.110.3.1 void ArSickLogger::addTagToLog (const char ∗ *str*, ...)

Adds a string to the log file at the given moment.

The robot MUST be locked before you call this function, so that this function is not adding to a list as the robotTask is using it.

This function takes the given tag

The documentation for this class was generated from the following files:

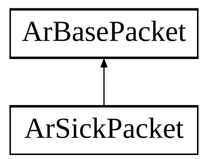
- ArSickLogger.h
- ArSickLogger.cpp

4.111 ArSickPacket Class Reference

Represents the packets sent to the sick as well as those received from it.

#include <ArSickPacket.h>

Inheritance diagram for ArSickPacket::



Public Methods

- **ArSickPacket** (unsigned char sendingAddress=0)

  Constructor.

- virtual ~**ArSickPacket** ()

  Destructor.

- void **setSendingAddress** (unsigned char address)

  Sets the address to send this packet to (only use for sending).

- unsigned char **getSendingAddress** (void)

  Sets the address to send this packet to (only use for sending).

- unsigned char **getReceivedAddress** (void)

  Gets the address this packet was sent from (only use for receiving).

- bool **verifyCRC** (void)

  returns true if the crc matches what it should be.

- **ArTypes::UByte getID** (void)

  returns the ID of the packet (first byte of data).

- **ArTypes::Byte2 calcCRC** (void)

  returns the crc, probably used only internally.

- virtual void **finalizePacket** (void)

  MakeFinals the packet in preparation for sending, must be done.

- virtual void **resetRead** (void)

  Restart the reading process.

- **ArTime getTimeReceived** (void)

  Gets the time the packet was received at.

- void **setTimeReceived** (**ArTime** timeReceived)

  Sets the time the packet was received at.

- virtual void **duplicatePacket** (ArSickPacket ∗packet)

  Duplicates the packet.

4.111.1 Detailed Description

Represents the packets sent to the sick as well as those received from it.

This class reimplements some of the buf operations since the robot is little endian.

You can just look at the documentation for the **ArBasePacket** (p. 112) except for these functions here, setAddress, getAddress, verifyCheckSum, print, getID, and calcCheckSum.

4.111.2 Member Function Documentation

4.111.2.1 void ArSickPacket::duplicatePacket (ArSickPacket ∗ *packet*) [virtual]

Duplicates the packet.

Copies the given packets buffer into the buffer of this packet, also sets this length and readlength to what the given packet has

Parameters:

packet the packet to duplicate

4.111.2.2 unsigned char ArSickPacket::getReceivedAddress (void)

Gets the address this packet was sent from (only use for receiving).

This gets the address that this packet was received from. Note that this is only valid if this packet was received from a laser, if you want to know where a packet was addressed to use getSendingAdress instead.

Returns:
the address a packet was received from

4.111.2.3 unsigned char ArSickPacket::getSendingAddress (void)

Sets the address to send this packet to (only use for sending).

This gets the address for use in sending packets, the address is what has been saved, then when a packet is finalizePacketd for sending, the address is put into the appropriate spot in the packet.

Returns:
the address of the laser to be addressed

4.111.2.4 void ArSickPacket::resetRead (void) `[virtual]`

Restart the reading process.

Sets the length read back to the header length so the packet can be reread using the other methods

Reimplemented from **ArBasePacket** (p. 117).

4.111.2.5 void ArSickPacket::setSendingAddress (unsigned char *address*)

Sets the address to send this packet to (only use for sending).

This sets the address for use in sending packets, the address is saved, then when a packet is finalizePacketd for sending, the address is put into the appropriate spot in the packet.

Parameters:
address the address of the laser to be addressed

The documentation for this class was generated from the following files:

- ArSickPacket.h
- ArSickPacket.cpp

4.112 ArSickPacketReceiver Class Reference

Given a device connection it receives packets from the sick through it.

`#include <ArSickPacketReceiver.h>`

Public Methods

- **ArSickPacketReceiver** (unsigned char receivingAddress=0, bool allocatePackets=false, bool useBase0Address=false)

  Constructor without an already assigned device connection.

- **ArSickPacketReceiver** (**ArDeviceConnection** *deviceConnection, unsigned char receivingAddress=0, bool allocatePackets=false, bool useBase0Address=false)

  Constructor with assignment of a device connection.

- virtual ~**ArSickPacketReceiver** ()

  Destructor.

- **ArSickPacket** * **receivePacket** (unsigned int msWait=0)

  Receives a packet from the robot if there is one available.

- void **setDeviceConnection** (**ArDeviceConnection** *deviceConnection)

  Sets the device this instance receives packets from.

- **ArDeviceConnection** * **getDeviceConnection** (void)

  Gets the device this instance receives packets from.

- bool **isAllocatingPackets** (void)

  Gets whether or not the receiver is allocating packets.

4.112.1 Detailed Description

Given a device connection it receives packets from the sick through it.

4.112.2 Constructor & Destructor Documentation

4.112.2.1 ArSickPacketReceiver::ArSickPacketReceiver (unsigned char *receivingAddress* = 0, bool *allocatePackets* = false, bool *useBase0Address* = false)

Constructor without an already assigned device connection.

Parameters:

allocatePackets whether to allocate memory for the packets before returning them (true) or to just return a pointer to an internal packet (false)... most everything should use false as this will help prevent many memory leaks or corruptions

4.112.2.2 ArSickPacketReceiver::ArSickPacketReceiver (ArDeviceConnection ∗ *deviceConnection*, unsigned char *receivingAddress* = 0, bool *allocatePackets* = false, bool *useBase0Address* = false)

Constructor with assignment of a device connection.

Parameters:

deviceConnection the connection which the receiver will use

allocatePackets whether to allocate memory for the packets before returning them (true) or to just return a pointer to an internal packet (false)... most everything should use false as this will help prevent many memory leaks or corruptions

4.112.3 Member Function Documentation

4.112.3.1 ArSickPacket ∗ ArSickPacketReceiver::receivePacket (unsigned int *msWait* = 0)

Receives a packet from the robot if there is one available.

Parameters:

msWait how long to block for the start of a packet, nonblocking if 0

Returns:

NULL if there are no packets in alloted time, otherwise a pointer to the packet received, if allocatePackets is true than the place that called this function owns the packet and should delete the packet when done... if allocatePackets is false then nothing must store a pointer to this packet, the packet must be used and done with by the time this method is called again

The documentation for this class was generated from the following files:

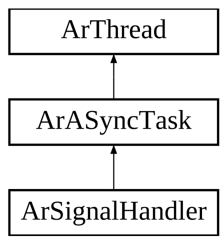
- ArSickPacketReceiver.h
- ArSickPacketReceiver.cpp

4.113 ArSignalHandler Class Reference

Signal handling class.

#include <ArSignalHandler.h>

Inheritance diagram for ArSignalHandler::



Public Methods

- virtual ~**ArSignalHandler** ()

  Destructor.

- virtual void ∗ **runThread** (void ∗arg)

  The main run loop.

Static Public Methods

- void **createHandlerNonThreaded** ()

  Setup the signal handling for a non-threaded program.

- void **createHandlerThreaded** ()

  Setup the signal handling for a multi-threaded program.

- void **blockCommon** ()

  Block all the common signals the kill a program.

- void **unblockAll** ()

  Unblock all the signals.

- void **block** (Signal sig)

  Block the given signal.

- void **unblock** (Signal sig)

  Unblock the given signal.

- void **handle** (Signal sig)

  Handle the given signal.

- void **unhandle** (Signal sig)

  Dont handle the given signal.

- void **addHandlerCB** (**ArFunctor1**< int > ∗func, **ArListPos::Pos** position)

  Add a handler callback.

- void **delHandlerCB** (**ArFunctor1**< int > ∗func)

  Remove a handler callback.

- ArSignalHandler ∗ **getHandler** ()

  Get a pointer to the single ArSignalHandler instance.

- std::string **nameSignal** (int sig)

  Get the name of the given signal.

- void **blockCommonThisThread** ()

  Block all the common signals for the calling thread only.

- void **blockAllThisThread** ()

  Block all the signals for the calling thread only.

4.113.1 Detailed Description

Signal handling class.

This is a signal handling class. It has both a threaded and non-threaded mode of operation. The non-threaded mode will work in a threaded application but it is best to use the threaded mode. The benefit of the threaded mode is that if the signal incures some processing, but does not shutdown the program (ie. SIGUSR1 or SIGUSR2), the threaded mode will handle the signal in its own thread and hopefully that will not hurt the performance of the tight loop robot control. Exaclty how much performance you get out of this depends on your machines physical hardware and exactly what the processing the signal handler does. For instance, a multi-processor machine has a much greater chance of the signal handler not interfering with the robot control loop.

See the **Aria** (p. 205) main class for how to initialize a default setup of the signal handling.

There are functions to block, unblock, handle and unhandle signals. These functions all must be called before creating the signalhandler. In either single or multi-threaded mode. The functions to block and handle signals creates a set of blocking and handling which is then used by the create functions to tell the Linux kernel what to do.

In the threaded mode, there is a signal handler thread that is created. That thread is created in a detached state, which means it can not be joined on. When the program exits, the signal handler thread will be ignored and that thread will never exit its run loop. This is perfectly fine behavior. There is no state that can be messed up in this fashion. It is just easier to exit the program than to try to wake up that thread and get it to exit itself.

This class is for Linux only. Windows has virtualy no support for signals and the little support that it does have is not realy usefull. There is an empty implementation of this class for Windows so that code can compile in both Linux and Windows. Just do not expect the code that uses this signal handling to do anything in Windows. This should not be a problem since signals are not used in Windows.

4.113.2 Member Function Documentation

4.113.2.1 void ArSignalHandler::addHandlerCB (ArFunctor1< int > * *func*, ArListPos::Pos *position*) `[static]`

Add a handler callback.

Add a handler callback to the list of callbacks. When there is a signal sent to the process, the list of callbacks are invoked and passed the signal number.

Parameters:

functor functor created from ArFunctorC1<int> which refers to the function to call.

position whether to place the functor first or last

4.113.2.2 void ArSignalHandler::block (Signal *sig*) `[static]`

Block the given signal.

Block the given signal. Call this before calling createHandlerNonThreaded or createHandlerThreaded.

Parameters:

sig the number of the signal

4.113.2.3 void ArSignalHandler::blockCommon () [static]

Block all the common signals the kill a program.

Sets the signal handler to block all the common signals. The 'common' signals are SIGHUP, SIGINT, SIGQUIT, SIGTERM, SIGSEGV, and SIGPIPE. Call this before calling createHandlerNonThreaded or createHandlerThreaded.

4.113.2.4 void ArSignalHandler::blockCommonThisThread () [static]

Block all the common signals for the calling thread only.

Block all the common signals for the calling thread. The calling thread will never recieve the common signals which are SIGHUP, SIGINT, SIGQUIT, and SIGTERM. This function can be called at any time.

4.113.2.5 void ArSignalHandler::createHandlerNonThreaded () [static]

Setup the signal handling for a non-threaded program.

Sets up the signal handling for a non-threaded program. When the program This uses the system call signal(2). This should not be used if you have a threaded program.

See also:
createHandlerThreaded (p. 456)

4.113.2.6 void ArSignalHandler::createHandlerThreaded () [static]

Setup the signal handling for a multi-threaded program.

Sets up the signal handling for a non-threaded program. This call is only usefull for Linux. This will create a dedicated thread in which to handle signals. The thread calls sigwait(3) and waits for a signal to be sent. By default all **ArThread** (p. 487) instances block all signals. Thus the signal is sent to the signal handler thread. This will allow the other threads to continue uninterrupted and not skew their timing loops.

See also:
createHandlerNonThreaded (p. 456)

4.113.2.7 void ArSignalHandler::delHandlerCB (ArFunctor1< int > * *func*) `[static]`

Remove a handler callback.

Remove a handler callback from the list of callbacks.

Parameters:
: ***functor*** functor created from ArFunctorC1<int> which refers to the function to call.

4.113.2.8 ArSignalHandler * ArSignalHandler::getHandler () `[static]`

Get a pointer to the single ArSignalHandler instance.

Get a pointer to the single instance of the ArSignalHandler. The signal handler uses the singleton model, which means there can only be one instance of ArSignalHandler. If the single instance of ArSignalHandler has not been created, getHandler will create it. This is how the handler should be created.

Returns:
: returns a pointer to the instance of the signal handler

4.113.2.9 void ArSignalHandler::handle (Signal *sig*) `[static]`

Handle the given signal.

Handle the given signal. All the handler callbacks will be called with this signal when it is recieved. Call this before calling createHandlerNonThreaded or createHandlerThreaded.

Parameters:
: ***sig*** the number of the signal

4.113.2.10 void * ArSignalHandler::runThread (void * *arg*) `[virtual]`

The main run loop.

Override this function and put your taskes run loop here. Check the value of **getRunning**() (p. 488) or myRunning periodicly in your loop. If the value goes false, the loop should exit and **runThread**() (p. 457) should return.

Reimplemented from **ArASyncTask** (p. 111).

4.113.2.11 void ArSignalHandler::unblock (Signal *sig*) [static]

Unblock the given signal.

Unblock the given signal. Call this before calling createHandlerNonThreaded or createHandlerThreaded.

Parameters:
sig the number of the signal

4.113.2.12 void ArSignalHandler::unblockAll () [static]

Unblock all the signals.

Unblock all the signals. Call this before calling createHandlerNonThreaded or createHandlerThreaded.

4.113.2.13 void ArSignalHandler::unhandle (Signal *sig*) [static]

Dont handle the given signal.

Do not handle the given signal. Call this before calling createHandlerNonThreaded or createHandlerThreaded.

Parameters:
sig the number of the signal

The documentation for this class was generated from the following files:

- ArSignalHandler.h
- ArSignalHandler_LIN.cpp
- ArSignalHandler_WIN.cpp

4.114 ArSimpleConnector Class Reference

This class simplifies connecting to the robot and/or laser.

`#include <ArSimpleConnector.h>`

Public Methods

- **ArSimpleConnector** (int ∗argc, char ∗∗argv)
  Constructor that takes args from the main.
- **ArSimpleConnector** (**ArArgumentBuilder** ∗builder)
  Constructor that takes argument builder.
- ∼**ArSimpleConnector** (void)
  Destructor.
- bool **setupRobot** (**ArRobot** ∗robot)
  Sets up the robot to be connected.
- bool **connectRobot** (**ArRobot** ∗robot)
  Sets up the robot then connects it.
- bool **setupLaser** (**ArSick** ∗sick)
  Sets up the laser to be connected.
- void **parseArgs** (void)
  Function to parse the arguments given.
- void **logOptions** (void) const
  Log the options the simple connector has.

4.114.1 Detailed Description

This class simplifies connecting to the robot and/or laser.

First of all, when you create your ArSimpleConnector you pass it either the argc and argv from main or you can pass it an **ArArgumentBuilder** (p. 106), which you might do if you were making a windows executable that had a WinMain instead of a main.

Then you need to tell it to parseArgs, which parses those arguments in order to know where to connect the robot and/or laser.

Then you can either set up the robot to be connected with setupRobot or just connect it with connectRobot. You'll still need to run or runAsync the robot.

You can then set up the laser with setupLaser, but you'll have to run or runAsync the laser and connect it yourself.

4.114.2 Member Function Documentation

4.114.2.1 bool ArSimpleConnector::setupLaser (ArSick ∗ *sick*)

Sets up the laser to be connected.

Description of the logic for connection to the laser. If –remoteHost then the laser will a tcp connection will be opened to that remoteHost at port 8102 or –remoteLaserTcpPort if that argument is given, if this connection fails then the setup fails. If –remoteHost wasn't provided and the robot connected to a simulator as described elsewhere then the laser is just configured to be simulated, if the robot isn't connected to a simulator it tries to open a serial connection to ArUtil::COM3 or –laserPort if that argument is given.

4.114.2.2 bool ArSimpleConnector::setupRobot (ArRobot ∗ *robot*)

Sets up the robot to be connected.

Description of the logic for connection to the robot. If –remoteHost is given then the connector tries to open a tcp connection to port 8101 by default, or –remoteRobotTcpPort if that was an option provided and if this tcp connection fails then the whole connection fails. If no remoteHost was given it first tries to open a tcp connection to localhost on port 8101 (or –remoteRoboTcpPort) which is the where the simulator runs, if this tcp connection succeeds then the connector assumes its connecting to the simulator, if this connection fails then it assumes a serial connection to the real robot is desired and connects to ArUtil::COM1 or –robotPort if that argument was supplied.

The documentation for this class was generated from the following files:

- ArSimpleConnector.h
- ArSimpleConnector.cpp

4.115 ArSocket Class Reference

socket communication wrapper.

`#include <ArSocket.h>`

Public Methods

- **ArSocket** ()
  Constructor.
- **ArSocket** (const char ∗host, int port, Type type)
  Constructor which connects to a server.
- **ArSocket** (int port, bool doClose, Type type)
  Constructor which opens a server port.
- ∼**ArSocket** ()
  Destructor.
- bool **copy** (int fd, bool doclose)
  Copy socket structures.
- void **copy** (ArSocket ∗s)
  Copy socket structures.
- void **transfer** (ArSocket ∗s)
  Transfer ownership of a socket.
- bool **connect** (const char ∗host, int port, Type type)
  Connect as a client to a server.
- bool **open** (int port, Type type)
  Open a server port.
- bool **create** (Type type)
  Simply create a port.
- bool **findValidPort** (int startPort)
  Find a valid unused port and bind the socket to it.
- bool **connectTo** (const char ∗host, int port)
  Connect the socket to the given address.

- bool **connectTo** (struct sockaddr_in ∗sin)

  Connect the socket to the given address.

- bool **accept** (ArSocket ∗sock)

  Accept a new connection.

- bool **close** ()

  Close the socket.

- int **write** (const void ∗buff, size_t len)

  Write to the socket.

- int **read** (void ∗buff, size_t len, unsigned int msWait=0)

  Read from the socket.

- int **sendTo** (const void ∗msg, int len)

  Send a message on the socket.

- int **sendTo** (const void ∗msg, int len, struct sockaddr_in ∗sin)

  Send a message on the socket.

- int **recvFrom** (void ∗msg, int len, sockaddr_in ∗sin)

  Receive a message from the socket.

- bool **getSockName** ()

  Get the socket name. Stored in ArSocket::mySin.

- sockaddr_in ∗ **sockAddrIn** ()

  Accessor for the sockaddr.

- in_addr ∗ **inAddr** ()

  Accessor for the in_addr.

- unsigned short int **inPort** ()

  Accessor for the port of the sockaddr.

- bool **setLinger** (int time)

  Set the linger value.

- bool **setBroadcast** ()

  Set broadcast value.

- bool **setReuseAddress** ()

  Set the reuse address value.

- bool **setNonBlock** ()

  Set socket to nonblocking.

- void **setDoClose** (bool yesno)

  Change the doClose value.

- int **getFD** () const

  Get the file descriptor.

- Type **getType** () const

  Get the protocol type.

- const std::string & **getErrorStr** () const

  Get the last error string.

- Error **getError** () const

  Get the last error.

- int **writeString** (const char *str,...)

  Writes a string to the socket (adding end of line characters).

- int **writeStringPlain** (const char *str)

  Same as writeString, but no varargs, wrapper for java.

- bool **readString** (char *buf, size_t len)

  Reads a string from the socket.

Static Public Methods

- bool **init** ()

  Initialize the network layer.

- void **shutdown** ()

  Shutdown the network layer.

- bool **hostAddr** (const char *host, struct in_addr &addr)

  Convert a host string to an address structure.

- bool **addrHost** (struct in_addr &addr, char *host)
  Convert an address structure to a host string.
- std::string **getHostName** ()
  Get the localhost address.
- void **inToA** (struct in_addr *addr, char *buff)
  Convert addr into string numerical address.
- const size_t **sockAddrLen** ()
  Size of the sockaddr.
- const size_t **maxHostNameLen** ()
  Max host name length.
- unsigned int **hostToNetOrder** (int i)
  Host byte order to network byte order.
- unsigned int **netToHostOrder** (int i)
  Network byte order to host byte order.

Static Public Attributes

- bool **ourInitialized** = true
  We're always initialized in Linux.

4.115.1 Detailed Description

socket communication wrapper.

ArSocket is a layer which allows people to use the sockets networking interface in an operating system independent manner. All of the standard commonly used socket functions are implemented. This class also contains the file descriptor which identifies the socket to the operating system.

In Windows, the networking subsystem needs to be initialized and shutdown individyaly by each program. So when a program starts they will need to call the static function **ArSocket::init**() (p. 465) and call **ArSocket::shutdown**() (p. 466) when it exits. For programs that use **Aria::init**() (p. 208) and **Aria::uninit**() (p. 209) calling the **ArSocket::init**() (p. 465) and **ArSocket::shutdown**() (p. 466) is unnecessary. The **Aria** (p. 205) initialization functions take care of this. These functions do nothing in Linux.

4.115.2 Constructor & Destructor Documentation

4.115.2.1 ArSocket::ArSocket (const char * *host*, int *port*, Type *type*)

Constructor which connects to a server.

Constructs the socket and connects it to the given host.

Parameters:

host hostname of the server to connect to

port port number of the server to connect to

type protocol type to use

4.115.2.2 ArSocket::ArSocket (int *port*, bool *doClose*, Type *type*)

Constructor which opens a server port.

Constructs the socket and opens it as a server port.

Parameters:

port port number to bind the socket to

doClose automaticaly close the port if the socket is destructed

type protocol type to use

4.115.3 Member Function Documentation

4.115.3.1 bool ArSocket::copy (int *fd*, bool *doclose*)

Copy socket structures.

Copy socket structures. Copy from one Socket to another will still have the first socket close the file descripter when it is destructed.

4.115.3.2 bool ArSocket::init (void) `[static]`

Initialize the network layer.

In Windows, the networking subsystem needs to be initialized and shutdown individyaly by each program. So when a program starts they will need to call the static function **ArSocket::init**() (p. 465) and call **ArSocket::shutdown**() (p. 466) when it exits. For programs that use **Aria::init**() (p. 208) and **Aria::uninit**() (p. 209) calling the **ArSocket::init**() (p. 465) and **ArSocket::shutdown**() (p. 466) is unnecessary. The **Aria** (p. 205) initialization functions take care of this. These functions do nothing in Linux.

4.115.3.3 int ArSocket::read (void * *buff*, size_t *len*, unsigned int *msWait* = 0) [inline]

Read from the socket.

Parameters:

buff buffer to read into

len how many bytes to read

msWait if 0, don't block, if > 0 wait this long for data

Returns:

number of bytes read

4.115.3.4 bool ArSocket::readString (char * *buf*, size_t *len*) [inline]

Reads a string from the socket.

Parameters:

buf the buffer to read the string into, if there is no error but there is no string to read then the first character of the buffer is set to the null character

len the lenth of the buffer

Returns:

true if the socket could be read from, false if it couldn't (which also means the connection should be closed)

4.115.3.5 void ArSocket::shutdown () [static]

Shutdown the network layer.

In Windows, the networking subsystem needs to be initialized and shutdown individyaly by each program. So when a program starts they will need to call the static function **ArSocket::init**() (p. 465) and call **ArSocket::shutdown**() (p. 466) when it exits. For programs that use **Aria::init**() (p. 208) and **Aria::uninit**() (p. 209) calling the **ArSocket::init**() (p. 465) and **ArSocket::shutdown**() (p. 466) is unnecessary. The **Aria** (p. 205) initialization functions take care of this. These functions do nothing in Linux.

4.115.3.6 void ArSocket::transfer (ArSocket * *s*) [inline]

Transfer ownership of a socket.

transfer() (p. 467) will transfer ownership to this socket. The input socket will no longer close the file descriptor when it is destructed.

4.115.3.7 int ArSocket::write (const void * *buff*, size_t *len*) [inline]

Write to the socket.

Parameters:

buff buffer to write from

len how many bytes to write

Returns:

number of bytes written

4.115.3.8 int ArSocket::writeString (const char * *str*, ...) [inline]

Writes a string to the socket (adding end of line characters).

This cannot write more than 2048 number of bytes

Parameters:

str the string to write to the socket

Returns:

number of bytes written

The documentation for this class was generated from the following files:

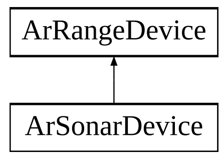
- ArSocket.h
- ArSocket_LIN.cpp
- ArSocket_WIN.cpp

4.116 ArSonarDevice Class Reference

A class for keeping track of sonar.

`#include <ArSonarDevice.h>`

Inheritance diagram for ArSonarDevice::



Public Methods

- **ArSonarDevice** (size_t currentBufferSize=24, size_t cumulativeBuffer-Size=64, const char *name="sonar")

  Constructor.

- ~**ArSonarDevice** ()

  Destructor.

- void **processReadings** (void)

  Grabs the new readigns from the robot and adds them to the buffers.

- virtual void **setRobot** (**ArRobot** *robot)

  Sets the robot pointer, also attaches its process function to the sensorInterp of the robot.

- virtual void **addReading** (double x, double y)

  Adds sonar readings to the current and cumulative buffers Overrides the **ArRangeDevice** (p. 312) *default action.*

- void **setCumulativeMaxRange** (double r)

  Maximum range for a reading to be added to the cumulative buffer (mm).

4.116.1 Detailed Description

A class for keeping track of sonar.

This class is for keeping a sonar history, and using that for obstacle avoidance and displays and what not

4.116.2 Member Function Documentation

4.116.2.1 void ArSonarDevice::addReading (double *x*, double *y*) `[virtual]`

Adds sonar readings to the current and cumulative buffers Overrides the **ArRangeDevice** (p. 312) default action.

Adds a sonar reading with the global coordinates x,y. Makes sure the reading is within the proper distance to the robot, for both current and cumulative buffers. Filters buffer points Note: please lock the device using **lockDevice**() (p. 318) / **unlockDevice**() (p. 319) if calling this from outside process().

Parameters:

x the global x coordinate of the reading

y the global y coordinate of the reading

Reimplemented from **ArRangeDevice** (p. 312).

The documentation for this class was generated from the following files:

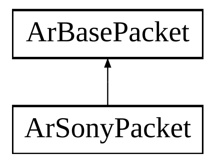
- ArSonarDevice.h
- ArSonarDevice.cpp

4.117 ArSonyPacket Class Reference

A class for for making commands to send to the sony.

`#include <ArSonyPTZ.h>`

Inheritance diagram for ArSonyPacket::



Public Methods

- **ArSonyPacket** (**ArTypes::UByte2** bufferSize=15)
  Constructor.
- virtual void **uByteToBuf** (**ArTypes::UByte** val)
  Puts **ArTypes::UByte** (p. 496) *into packets buffer.*
- virtual void **byte2ToBuf** (**ArTypes::Byte2** val)
  Puts **ArTypes::Byte2** (p. 496) *into packets buffer.*
- void **byte2ToBufAtPos** (**ArTypes::Byte2** val, **ArTypes::UByte2** pose)
  This is a new function, read the details before you try to use it.

4.117.1 Detailed Description

A class for for making commands to send to the sony.

There are only two functioning ways to put things into this packet, you MUST use thse, if you use anything else your commands won't work. You must use uByteToBuf and byte2ToBuf.

4.117.2 Member Function Documentation

4.117.2.1 void ArSonyPacket::byte2ToBufAtPos (ArTypes::Byte2 *val*, ArTypes::UByte2 *pose*)

This is a new function, read the details before you try to use it.

This function is my concession to not rebuilding a packet from scratch for every command, basicaly this is to not lose all speed over just using a character array. This is used by the default sony commands, unless you have a deep understanding of how the packets are working and what the packet structure looks like you should not play with this function, it also isn't worth it unless you'll be sending commands frequently.

Parameters:

val the Byte2 to put into the packet

pose the position in the packets array to put the value

The documentation for this class was generated from the following files:

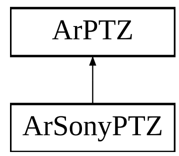
- ArSonyPTZ.h
- ArSonyPTZ.cpp

4.118 ArSonyPTZ Class Reference

A class to use the sony pan tilt zoom unit.

#include <ArSonyPTZ.h>

Inheritance diagram for ArSonyPTZ::



Public Types

- enum { **MAX_PAN** = 95, **MAX_TILT** = 25, **MIN_ZOOM** = 0, **MAX_ZOOM** = 1023 }

Public Methods

- virtual bool **init** (void)

  Initializes the camera.

- virtual bool **pan** (int degrees)

  Pans to the given degrees.

- virtual bool **panRel** (int degrees)

  Pans relative to current position by given degrees.

- virtual bool **tilt** (int degrees)

  Tilts to the given degrees.

- virtual bool **tiltRel** (int degrees)

  Tilts relative to the current position by given degrees.

- virtual bool **panTilt** (int degreesPan, int degreesTilt)

  Pans and tilts to the given degrees.

- virtual bool **panTiltRel** (int degreesPan, int degreesTilt)

  Pans and tilts relatives to the current position by the given degrees.

- virtual bool **canZoom** (void) const

Returns true if camera can zoom (or rather, if it is controlled by this).

- virtual bool **zoom** (int zoomValue)

  Zooms to the given value.

- virtual bool **zoomRel** (int zoomValue)

  Zooms relative to the current value, by the given value.

- virtual int **getPan** (void) const

  The angle the camera was last told to pan to.

- virtual int **getTilt** (void) const

  The angle the camera was last told to tilt to.

- virtual int **getZoom** (void) const

  The value the camera was last told to zoom to.

- virtual int **getMaxPosPan** (void) const

  Gets the highest positive degree the camera can pan to.

- virtual int **getMaxNegPan** (void) const

  Gets the lowest negative degree the camera can pan to.

- virtual int **getMaxPosTilt** (void) const

  Gets the highest positive degree the camera can tilt to.

- virtual int **getMaxNegTilt** (void) const

  Gets the lowest negative degree the camera can tilt to.

- virtual int **getMaxZoom** (void) const

  Gets the maximum value for the zoom on this camera.

- virtual int **getMinZoom** (void) const

  Gets the lowest value for the zoom on this camera.

4.118.1 Detailed Description

A class to use the sony pan tilt zoom unit.

4.118.2 Member Enumeration Documentation

4.118.2.1 anonymous enum

Enumeration values:

MAX_PAN maximum degrees the unit can pan (either direction).

MAX_TILT maximum degrees the unit can tilt (either direction).

MIN_ZOOM minimum value for zoom.

MAX_ZOOM maximum value for zoom.

The documentation for this class was generated from the following files:

- ArSonyPTZ.h
- ArSonyPTZ.cpp

4.119 ArSyncTask Class Reference

Class used internally to manage the functions that are called every cycle.

`#include <ArSyncTask.h>`

Public Methods

- **ArSyncTask** (const char ∗name, **ArFunctor** ∗functor=NULL, **ArTaskState::State** ∗state=NULL, ArSyncTask ∗parent=NULL)

  Constructor, shouldn't ever do a new on anything besides the root node.

- virtual ∼**ArSyncTask** ()

  Destructor.

- void **run** (void)

  Runs the node, which runs all children of this node as well.

- void **log** (int depth=0)

  Prints the node, which prints all the children of this node as well.

- **ArTaskState::State getState** (void)

  Gets the state of the task.

- void **setState** (**ArTaskState::State** state)

  Sets the state of the task.

- ArSyncTask ∗ **findNonRecursive** (const char ∗name)

  Finds the task in the instances list of children, by name.

- ArSyncTask ∗ **findNonRecursive** (**ArFunctor** ∗functor)

  Finds the task in the instances list of children, by functor.

- ArSyncTask ∗ **find** (const char ∗name)

  Finds the task recursively down the tree by name.

- ArSyncTask ∗ **find** (**ArFunctor** ∗functor)

  Finds the task recursively down the tree by functor.

- void **addNewBranch** (const char ∗nameOfNew, int position, **ArTaskState::State** ∗state=NULL)

  Adds a new branch to this instance.

- void **addNewLeaf** (const char *nameOfNew, int position, **ArFunctor** *functor, **ArTaskState::State** *state=NULL)

  Adds a new leaf to this instance.

- std::string **getName** (void)

  Gets the name of this task.

- **ArFunctor** * **getFunctor** (void)

  Gets the functor this instance runs, if there is one.

4.119.1 Detailed Description

Class used internally to manage the functions that are called every cycle.

This is used internally, no user should ever have to create one, but serious developers may want to use the members. Most users will be able to use the user tasks defined in the **ArRobot** (p. 355) class. This class should only be used by serious developers.

The way it works is that each instance is a node in a tree. The only node that should ever be created with a new is the top one. The run and print functions both call the run/print on themselves, then on all of their children, going from lowest numbered position to highest numbered, lower going first. There are no hard limits to the position, it can be any integer. ARIA uses the convention of 0 to 100, when you add things of your own you should leave room to add in between. Also you can add things with the same position, the only effect this has is that the first addition will show up first in the run or print.

After the top one is created, every other task should be created with either addNewBranch or addNewLeaf. Each node can either be a branch node or a list node. The list (multimap actually) of branches/nodes is ordered by the position passed in to the add function. addNewBranch adds a new branch node to the instance it is called on, with the given name and position. addNewLeaf adds a new leaf node to the instance it is called on, with the given name and position, and also with the **ArFunctor** (p. 139) given, this functor will be called when the leaf is run. Either add creates the new instance and puts it in the list of branches/nodes in the approriate spot.

The tree takes care of all of its own memory management and list management, the add functions put into the list and creates the memory, conversely if you delete an ArSyncTask (which is the correct way to get rid of one) it will remove itself from its parents list.

If you want to add something to the tree the proper way to do it is to get the pointer to the root of the tree (ie with ArRobot::getSyncProcRoot) and then to use find on the root to find the branch you want to travel down, then continue this until you find the node you want to add to. Once there just call addNewBranch or addNewLeaf and you're done.

There is now a pointer to an integer that is the state of the task, if this pointer is given whenever something changes the state of the task it will modify the value pointed to. If the pointer is NULL then the syncTask will use an integer of its own to keep track of the state of the process.

4.119.2 Constructor & Destructor Documentation

4.119.2.1 ArSyncTask::ArSyncTask (const char ∗ *name*, ArFunctor ∗ *functor* = NULL, ArTaskState::State ∗ *state* = NULL, ArSyncTask ∗ *parent* = NULL)

Constructor, shouldn't ever do a new on anything besides the root node.

New should never be called to create an ArSyncTask except to create the root node. Read the detailed documentation of the class for details.

4.119.2.2 ArSyncTask::~ArSyncTask () `[virtual]`

Destructor.

If you delete the task it deletes everything in its list, so to delete the whole tree just delete the top one... also note that if you delete a node, it will remove itself from its parents list.

4.119.3 Member Function Documentation

4.119.3.1 void ArSyncTask::addNewBranch (const char ∗ *nameOfNew*, int *position*, ArTaskState::State ∗ *state* = NULL)

Adds a new branch to this instance.

Creates a new task with the given name and puts the task into its own iternal list at the given position.

Parameters:

nameOfNew Name to give to the new task.

position place in list to put the branch, things are run/printed in the order of highest number to lowest number, no limit on numbers (other than that it is an int). ARIA uses 0 to 100 just as a convention.

4.119.3.2 void ArSyncTask::addNewLeaf (const char * *nameOfNew*, int *position*, ArFunctor * *functor*, ArTaskState::State * *state* = NULL)

Adds a new leaf to this instance.

Creates a new task with the given name and puts the task into its own iternal list at the given position. Sets the nodes functor so that it will call the functor when run is called.

Parameters:

nameOfNew Name to give to the new task.

position place in list to put the branch, things are run/printed in the order of highest number to lowest number, no limit on numbers (other than that it is an int). ARIA uses 0 to 100 just as a convention.

functor **ArFunctor** (p. 139) which contains the functor to invoke when run is called.

4.119.3.3 ArSyncTask * ArSyncTask::find (ArFunctor * *functor*)

Finds the task recursively down the tree by functor.

Finds a node below (or at) this level in the tree with the given name

Parameters:

name The name of the child we are interested in finding

Returns:

The task, if found. If not found, NULL.

4.119.3.4 ArSyncTask * ArSyncTask::find (const char * *name*)

Finds the task recursively down the tree by name.

Finds a node below (or at) this level in the tree with the given name

Parameters:

name The name of the child we are interested in finding

Returns:

The task, if found. If not found, NULL.

4.119.3.5 ArSyncTask * ArSyncTask::findNonRecursive (ArFunctor * *functor*)

Finds the task in the instances list of children, by functor.

Finds a child of this node with the given functor

Parameters:
functor the functor we are interested in finding

Returns:
The task, if found. If not found, NULL.

4.119.3.6 ArSyncTask * ArSyncTask::findNonRecursive (const char * *name*)

Finds the task in the instances list of children, by name.

Finds a child of this node with the given name

Parameters:
name The name of the child we are interested in finding

Returns:
The task, if found. If not found, NULL.

4.119.3.7 void ArSyncTask::log (int *depth* = 0)

Prints the node, which prints all the children of this node as well.

Prints the node... the defaulted depth parameter controls how far over to print the data (how many tabs)... it recurses down all its children.

4.119.3.8 void ArSyncTask::run (void)

Runs the node, which runs all children of this node as well.

If this node is a leaf it calls the functor for the node, if it is a branch it goes through all of the children in the order of highest position to lowest position and calls run on them.

The documentation for this class was generated from the following files:

- ArSyncTask.h
- ArSyncTask.cpp

4.120 ArTaskState Class Reference

Class with the different states a task can be in.

`#include <ArTaskState.h>`

Public Types

- enum **State** { **INIT** = 0, **RESUME**, **ACTIVE**, **SUSPEND**, **SUCCESS**, **FAILURE**, **USER_START** = 20 }

4.120.1 Detailed Description

Class with the different states a task can be in.

These are the defined states, if the state is anything other than is defined here that is annotated (not running) the process will be run. No one should have any of their own states less than the USER_START state. People's own states should start at USER_START or at USER_START plus a constant (so they can have different sets of states).

4.120.2 Member Enumeration Documentation

4.120.2.1 enum ArTaskState::State

Enumeration values:

INIT Initialized (running).

RESUME Resumed after being suspended (running).

ACTIVE Active (running).

SUSPEND Suspended (not running).

SUCCESS Succeeded and done (not running).

FAILURE Failed and done (not running).

USER_START This is where the user states should start (they will all be run).

The documentation for this class was generated from the following file:

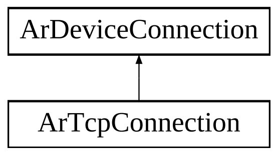
- ArTaskState.h

4.121 ArTcpConnection Class Reference

For connectiong to a device through a socket.

#include <ArTcpConnection.h>

Inheritance diagram for ArTcpConnection::



Public Types

- enum **Open** { **OPEN_NET_FAIL** = 1, **OPEN_BAD_HOST**, **OPEN_NO_ROUTE**, **OPEN_CON_REFUSED** }

Public Methods

- **ArTcpConnection** ()

  Constructor.

- virtual ~**ArTcpConnection** ()

  Destructor also closes connection.

- int **open** (const char *host=NULL, int port=8101)

  Opens a connection to the given host and port.

- virtual bool **openSimple** (void)

  Opens the connection again, using the values from setLocation or.

- virtual int **getStatus** (void)

  Gets the status of the connection, which is one of the enum status.

- virtual bool **close** (void)

  Closes the connection.

- virtual int **read** (const char *data, unsigned int size, unsigned int ms-Wait=0)

  Reads data from connection.

- virtual int **write** (const char ∗data, unsigned int size)

  Writes data to connection.

- virtual const char ∗ **getOpenMessage** (int messageNumber)

  Gets the string of the message associated with opening the device.

- virtual **ArTime getTimeRead** (int index)

  Gets the time data was read in.

- virtual bool **isTimeStamping** (void)

  sees if timestamping is really going on or not.

- std::string **getHost** (void)

  Gets the name of the host connected to.

- int **getPort** (void)

  Gets the number of the port connected to.

- int **internalOpen** (void)

  Internal function used by open and openSimple.

- void **setSocket** (**ArSocket** ∗socket)

  Sets the tcp connection to use this socket instead of its own.

- **ArSocket** ∗ **getSocket** (void)

  Gets the socket this tcp connection is using.

- void **setStatus** (int status)

  Sets the status of the device, ONLY use this if you're playing with setSocket and know what you're doing.

4.121.1 Detailed Description

For connectiong to a device through a socket.

4.121.2 Member Enumeration Documentation

4.121.2.1 enum ArTcpConnection::Open

Enumeration values:

OPEN_NET_FAIL Some critical part of the network isn't working.

OPEN_BAD_HOST Could not find the host.

OPEN_NO_ROUTE Know where the host is, but can't get to it.

OPEN_CON_REFUSED Got to the host but it didn't allow a connection.

4.121.3 Member Function Documentation

4.121.3.1 bool ArTcpConnection::close (void) [virtual]

Closes the connection.

Returns:
whether the close succeeded or not

Reimplemented from **ArDeviceConnection** (p. 126).

4.121.3.2 std::string ArTcpConnection::getHost (void)

Gets the name of the host connected to.

Returns:
the name of the host connected to

See also:
getPort (p. 484)

4.121.3.3 const char * ArTcpConnection::getOpenMessage (int *messageNumber*) [virtual]

Gets the string of the message associated with opening the device.

Each class inherited from this one has an open method which returns 0 for success or an integer which can be passed into this function to obtain a string describing the reason for failure

Parameters:
messageNumber the number returned from the open

Returns:
the error description associated with the messageNumber

Reimplemented from **ArDeviceConnection** (p. 126).

4.121.3.4 int ArTcpConnection::getPort (void)

Gets the number of the port connected to.

Returns:
the number of the port connected to

See also:
getHost (p. 483)

4.121.3.5 int ArTcpConnection::getStatus (void) `[virtual]`

Gets the status of the connection, which is one of the enum status.

Gets the status of the connection, which is one of the enum status. If you want to get a string to go along with the number, use getStatusMessage

Returns:
the status of the connection

See also:
getStatusMessage (p. 127)

Reimplemented from **ArDeviceConnection** (p. 126).

4.121.3.6 ArTime ArTcpConnection::getTimeRead (int *index*) `[virtual]`

Gets the time data was read in.

Parameters:
index looks like this is the index back in the number of bytes last read in

Returns:
the time the last read data was read in

Reimplemented from **ArDeviceConnection** (p. 127).

4.121.3.7 bool ArTcpConnection::isTimeStamping (void) `[virtual]`

sees if timestamping is really going on or not.

Returns:
true if real timestamping is happening, false otherwise

Reimplemented from **ArDeviceConnection** (p. 127).

4.121.3.8 int ArTcpConnection::open (const char * *host* = NULL, int *port* = 8101)

Opens a connection to the given host and port.

Parameters:

host the host to connect to, if NULL (default) then localhost

port the port to connect to

Returns:

0 for success, otherwise one of the open enums

See also:

getOpenMessage (p. 483)

4.121.3.9 int ArTcpConnection::read (const char * *data*, unsigned int *size*, unsigned int *msWait* = 0) `[virtual]`

Reads data from connection.

Reads data from connection

Parameters:

data pointer to a character array to read the data into

size maximum number of bytes to read

msWait read blocks for this many milliseconds (not at all for < 0)

Returns:

number of bytes read, or -1 for failure

See also:

write (p. 486), **writePacket** (p. 129)

Reimplemented from **ArDeviceConnection** (p. 128).

4.121.3.10 void ArTcpConnection::setSocket (ArSocket * *socket*)

Sets the tcp connection to use this socket instead of its own.

This will make the connection use this socket, its useful for doing funkier things with sockets but still being able to use a device connection.

Parameters:

sock the socket to use

4.121.3.11 int ArTcpConnection::write (const char * *data*, unsigned int *size*) [virtual]

Writes data to connection.

Writes data to connection

Parameters:

data pointer to a character array to write the data from

size number of bytes to write

Returns:

number of bytes read, or -1 for failure

See also:

read (p. 485), **writePacket** (p. 129)

Reimplemented from **ArDeviceConnection** (p. 128).

The documentation for this class was generated from the following files:

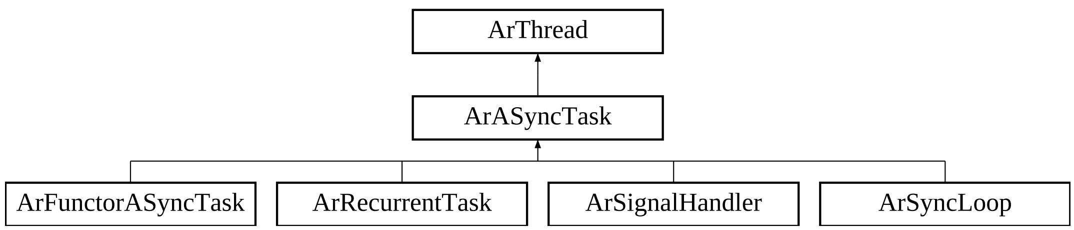
- ArTcpConnection.h
- ArTcpConnection.cpp

4.122 ArThread Class Reference

POSIX/WIN32 thread wrapper class.

#include <ArThread.h>

Inheritance diagram for ArThread::



Public Types

- enum **Status** { **STATUS_FAILED** = 1, **STATUS_NORESOURCE**, **STATUS_NO_SUCH_THREAD**, **STATUS_INVALID**, **STATUS_JOIN_SELF**, **STATUS_ALREADY_DETATCHED** }

Public Methods

- **ArThread** (bool blockAllSignals=true)

  Constructor.

- **ArThread** (ThreadType thread, bool joinable, bool blockAllSignals=true)

  Constructor - starts the thread.

- **ArThread** (**ArFunctor** ∗func, bool joinable=true, bool blockAllSignals=true)

  Constructor - starts the thread.

- virtual ∼**ArThread** ()

  Destructor.

- virtual int **create** (**ArFunctor** ∗func, bool joinable=true, bool lowerPriority=true)

  Create and start the thread.

- virtual void **stopRunning** (void)

Stop the thread.

- virtual int **join** (void **ret=NULL)

  Join on the thread.

- virtual int **detach** (void)

  Detatch the thread so it cant be joined.

- virtual void **cancel** (void)

  Cancel the thread.

- virtual bool **getRunning** (void) const

  Get the running status of the thread.

- virtual bool **getRunningWithLock** (void)

  Get the running status of the thread, locking around the variable.

- virtual bool **getJoinable** (void) const

  Get the joinable status of the thread.

- virtual const ThreadType * **getThread** (void) const

  Get the underlying thread type.

- virtual **ArFunctor** * **getFunc** (void) const

  Get the functor that the thread runs.

- virtual void **setRunning** (bool running)

  Set the running value on the thread.

- int **lock** (void)

  Lock the thread instance.

- int **tryLock** (void)

  Try to lock the thread instance without blocking.

- int **unlock** (void)

  Unlock the thread instance.

- bool **getBlockAllSignals** (void)

  Do we block all process signals at startup?

Static Public Methods

- void **init** (void)

  Initialize the internal book keeping structures.

- ArThread ∗ **self** (void)

  Returns the instance of your own thread.

- void **stopAll** ()

  Stop all threads.

- void **cancelAll** (void)

  Cancel all threads.

- void **joinAll** (void)

  Join on all threads.

- void **yieldProcessor** (void)

  Yield the processor to another thread.

Protected Attributes

- bool **myRunning**

  State variable to denote when the thread should continue or exit.

4.122.1 Detailed Description

POSIX/WIN32 thread wrapper class.

create() (p. 487) will create the thread. That thread will run the given Functor.

A thread can either be in a detached state or a joinable state. If the thread is in a detached state, that thread can not be **join**() (p. 488)'ed upon. The thread will simply run until the program exits, or its function exits. A joinable thread means that another thread and call **join**() (p. 488) upon it. If this function is called, the caller will block until the thread exits its function. This gives a way to synchronize upon the lifespan of threads.

Calling **cancel**() (p. 488) will cancel the thread.

The static function **self**() (p. 490) will return a thread

4.122.2 Member Enumeration Documentation

4.122.2.1 enum ArThread::Status

Enumeration values:

STATUS_FAILED Failed to create the thread.

STATUS_NORESOURCE Not enough system resources to create the thread.

STATUS_NO_SUCH_THREAD The thread can no longer be found.

STATUS_INVALID Thread is detached or another thread is joining on it.

STATUS_JOIN_SELF Thread is your own thread. Can't join on self.

STATUS_ALREADY_DETATCHED Thread is already detatched.

4.122.3 Member Function Documentation

4.122.3.1 void ArThread::init (void) `[static]`

Initialize the internal book keeping structures.

Initializes the internal structures which keep track of what thread is what. This is called by **Aria::init**() (p. 208), so the user will not normaly need to call this function themselves. This funtion ∗must∗ be called from the main thread of the application. In otherwords, it should be called by main().

4.122.3.2 ArThread ∗ ArThread::self (void) `[static]`

Returns the instance of your own thread.

If a newly created thread calls **self**() (p. 490) on itself too soon, this will return NULL. This is due to the fact that the thread is first created and started. Then the operating system returns the thread ID and thread that called **create**() (p. 487) then updates the list of threads with the new thread ID. There is just not much that can be done about that. The use should be aware of this caveat.

The documentation for this class was generated from the following files:

- ArThread.h
- ArThread.cpp
- ArThread_LIN.cpp
- ArThread_WIN.cpp

4.123 ArTime Class Reference

A class for time readings.

`#include <ariaUtil.h>`

Public Methods

- **ArTime** ()
  Constructor.
- ~**ArTime** ()
  Destructor.
- long **mSecSince** (ArTime since) const
  Gets the number of milliseconds since the given timestamp to this one.
- long **secSince** (ArTime since) const
  Gets the number of seconds since the given timestamp to this one.
- long **mSecTo** (void) const
  Finds the number of millisecs from when this timestamp is set to to now.
- long **secTo** (void) const
  Finds the number of seconds from when this timestamp is set to to now.
- long **mSecSince** (void) const
  Finds the number of milliseconds from this timestamp to now.
- long **secSince** (void) const
  Finds the number of seconds from when this timestamp was set to now.
- bool **isBefore** (ArTime testTime) const
  returns whether the given time is before this one or not.
- bool **isAt** (ArTime testTime) const
  returns whether the given time is equal to this time or not.
- bool **isAfter** (ArTime testTime) const
  returns whether the given time is after this one or not.
- void **setToNow** (void)
  Sets the time to now.

- void **addMSec** (long ms)

  Add some milliseconds (can be negative) to this time.

- void **setSec** (time_t sec)

  Sets the seconds since 1970.

- void **setMSec** (time_t msec)

  Sets the milliseconds.

- time_t **getSec** (void) const

  Gets the seconds since 1970.

- time_t **getMSec** (void) const

  Gets the milliseconds.

- void **log** (void) const

  Logs the time.

4.123.1 Detailed Description

A class for time readings.

This class is for getting the time of certain events. This class is not for generic time stuff, just for timeStamping, hence the only commands are very simple and the accessors for getting the data directly shouldn't really be used. DON'T use this for keeping track of what time it is, its just for relative timing (ie this loop needs to sleep another 100 ms);

The documentation for this class was generated from the following file:

- ariaUtil.h

4.124 ArTransform Class Reference

A class to handle transforms between different coordinates.

`#include <ArTransform.h>`

Public Methods

- **ArTransform** ()

  Constructor.

- **ArTransform** (**ArPose** pose)

  Constructor, Sets the transform so points in this coord system transform to abs world coords.

- **ArTransform** (**ArPose** pose1, **ArPose** pose2)

  Constructor, sets the transform so that pose1 will be transformed to pose2.

- virtual ~**ArTransform** ()

  Destructor.

- **ArPose doTransform** (**ArPose** source)

  Take the source pose and run the transform on it to put it into abs coordinates.

- **ArPoseWithTime doTransform** (**ArPoseWithTime** source)

  Take the source pose and run the transform on it to put it into abs coordinates.

- **ArPose doInvTransform** (**ArPose** source)

  Take the source pose and run the inverse transform on it, taking it from abs coords to local.

- **ArPoseWithTime doInvTransform** (**ArPoseWithTime** source)

  Take the source pose and run the inverse transform on it, taking it from abs coords to local.

- void **doTransform** (std::list< **ArPose** ∗> ∗poseList)

  Take a std::list of sensor readings and do the transform on it.

- void **doTransform** (std::list< **ArPoseWithTime** ∗> ∗poseList)

  Take a std::list of sensor readings and do the transform on it.

- void **setTransform** (**ArPose** pose)

  Sets the transform so points in this coord system transform to abs world coords.

- void **setTransform** (**ArPose** pose1, **ArPose** pose2)

  Sets the transform so that pose1 will be transformed to pose2.

- double **getTh** ()

  Gets the transform angle value (degrees).

4.124.1 Detailed Description

A class to handle transforms between different coordinates.

4.124.2 Member Function Documentation

4.124.2.1 ArPoseWithTime ArTransform::doInvTransform (ArPoseWithTime *source*) `[inline]`

Take the source pose and run the inverse transform on it, taking it from abs coords to local.

The source and result can be the same

Parameters:

source the parameter to transform

Returns:

the source transformed from absolute into local coords

4.124.2.2 ArPose ArTransform::doInvTransform (ArPose *source*) `[inline]`

Take the source pose and run the inverse transform on it, taking it from abs coords to local.

The source and result can be the same

Parameters:

source the parameter to transform

Returns:

the source transformed from absolute into local coords

4.124.2.3 ArPoseWithTime ArTransform::doTransform (ArPoseWithTime *source*) [inline]

Take the source pose and run the transform on it to put it into abs coordinates.

Parameters:
source the parameter to transform

Returns:
the source transformed into absolute coordinates

4.124.2.4 ArPose ArTransform::doTransform (ArPose *source*) [inline]

Take the source pose and run the transform on it to put it into abs coordinates.

Parameters:
source the parameter to transform

Returns:
the source transformed into absolute coordinates

4.124.2.5 void ArTransform::setTransform (ArPose *pose1*, ArPose *pose2*)

Sets the transform so that pose1 will be transformed to pose2.

Parameters:
pose1 transform this into pose2
pose2 transform pose1 into this

4.124.2.6 void ArTransform::setTransform (ArPose *pose*)

Sets the transform so points in this coord system transform to abs world coords.

Parameters:
pose the coord system from which we transform to abs world coords

The documentation for this class was generated from the following files:

- ArTransform.h
- ArTransform.cpp

4.125 ArTypes Class Reference

Contains platform independent sized variable types.

`#include <ariaTypedefs.h>`

Public Types

- typedef char **Byte**
  A single signed byte.
- typedef short **Byte2**
  Two signed bytes.
- typedef int **Byte4**
  Four signed bytes.
- typedef unsigned char **UByte**
  A single unsigned byte.
- typedef unsigned short **UByte2**
  Two unsigned bytes.
- typedef unsigned int **UByte4**
  Four unsigned bytes.

4.125.1 Detailed Description

Contains platform independent sized variable types.

The documentation for this class was generated from the following file:

- ariaTypedefs.h

4.126 ArUtil Class Reference

This class has utility functions.

`#include <ariaUtil.h>`

Public Types

- enum **BITS** { **BIT0** = 0x1, **BIT1** = 0x2, **BIT2** = 0x4, **BIT3** = 0x8, **BIT4** = 0x10, **BIT5** = 0x20, **BIT6** = 0x40, **BIT7** = 0x80, **BIT8** = 0x100, **BIT9** = 0x200, **BIT10** = 0x400, **BIT11** = 0x800, **BIT12** = 0x1000, **BIT13** = 0x2000, **BIT14** = 0x4000, **BIT15** = 0x8000 }

  Values for the bits from 0 to 16.

- enum **REGKEY** { **REGKEY_CLASSES_ROOT**, **REGKEY_CURRENT_CONFIG**, **REGKEY_CURRENT_USER**, **REGKEY_LOCAL_MACHINE**, **REGKEY_USERS** }

Static Public Methods

- void **sleep** (unsigned int ms)

  Sleep for the given number of milliseconds.

- unsigned int **getTime** (void)

  Get the time in milliseconds.

- template<class T> void **deleteSet** (T begin, T end)

  Delete all members of a set. Does NOT empty the set.

- template<class T> void **deleteSetPairs** (T begin, T end)

  Delete all members of a set. Does NOT empty the set.

- void **splitString** (std::string inString, std::list< std::string > &outList)

  Split a string into a set of words.

- long **sizeFile** (std::string fileName)

  OS-independent way of finding the size of a file.

- bool **findFile** (const char *fileName)

  OS-independent way of checking to see if a file exists and is readable.

- bool **stripDir** (std::string fileIn, std::string &fileOut)

  OS-independent way of stripping the directory from the filename.

- bool **stripFile** (std::string fileIn, std::string &fileOut)

  OS-independent way of stripping the filename from the directory.

- void **appendSlash** (std::string &path)

  Appends a slash to a path if there is not one there already.

- void **fixSlashes** (std::string &path)

  Fix the slash orientation in file path string for windows or linux.

- void **fixSlashesForward** (std::string &path)

  Fix the slash orientation in file path string to be all forward.

- void **fixSlashesBackward** (std::string &path)

  Fix the slash orientation in file path string to be all backward.

- int **strcmp** (std::string str, std::string str2)

  Finds out if two strings are equal.

- int **strcmp** (std::string str, const char ∗str2)

  Finds out if two strings are equal.

- int **strcmp** (const char ∗str, std::string str2)

  Finds out if two strings are equal.

- int **strcmp** (const char ∗str, const char ∗str2)

  Finds out if two strings are equal.

- void **escapeSpaces** (char ∗dest, const char ∗src)

  Puts a \ before spaces in src, puts it into dest.

- std::string **getStringFromFile** (const char ∗fileName)

  Returns a string contained in an arbitrary file.

- bool **getStringFromRegistry** (**REGKEY** root, const char ∗key, const char ∗value, char ∗str, int len)

  Returns a string from the Windows registry.

4.126.1 Detailed Description

This class has utility functions.

4.126.2 Member Enumeration Documentation

4.126.2.1 enum ArUtil::BITS

Values for the bits from 0 to 16.

Enumeration values:

- **BIT0** value of BIT0.
- **BIT1** value of BIT1.
- **BIT2** value of BIT2.
- **BIT3** value of BIT3.
- **BIT4** value of BIT4.
- **BIT5** value of BIT5.
- **BIT6** value of BIT6.
- **BIT7** value of BIT7.
- **BIT8** value of BIT8.
- **BIT9** value of BIT9.
- **BIT10** value of BIT10.
- **BIT11** value of BIT11.
- **BIT12** value of BIT12.
- **BIT13** value of BIT13.
- **BIT14** value of BIT14.
- **BIT15** value of BIT15.

4.126.2.2 enum ArUtil::REGKEY

These are for passing into getStringFromRegistry

Enumeration values:

- **REGKEY_CLASSES_ROOT** use HKEY_CLASSES_ROOT.
- **REGKEY_CURRENT_CONFIG** use HKEY_CURRENT_CONFIG.
- **REGKEY_CURRENT_USER** use HKEY_CURRENT_USER.
- **REGKEY_LOCAL_MACHINE** use HKEY_LOCAL_MACHIE.
- **REGKEY_USERS** use HKEY_USERS.

4.126.3 Member Function Documentation

4.126.3.1 void ArUtil::appendSlash (std::string & *path*) [static]

Appends a slash to a path if there is not one there already.

Parameters:
path the path to append a slash to

4.126.3.2 template<class T> void ArUtil::deleteSet (T *begin*, T *end*) [inline, static]

Delete all members of a set. Does NOT empty the set.

Assumes that T is an iterator that supports the operator ∗, operator!= and operator++. The return is assumed to be a pointer to a class that needs to be deleted.

4.126.3.3 template<class T> void ArUtil::deleteSetPairs (T *begin*, T *end*) [inline, static]

Delete all members of a set. Does NOT empty the set.

Assumes that T is an iterator that supports the operator ∗∗, operator!= and operator++. The return is assumed to be a pair. The second value of the pair is assumed to be a pointer to a class that needs to be deleted.

4.126.3.4 void ArUtil::escapeSpaces (char ∗ *dest*, const char ∗ *src*) [static]

Puts a \ before spaces in src, puts it into dest.

This copies src into dest but puts a \ before any spaces in src, escaping them... its mostly for use with **ArArgumentBuilder** (p. 106)... make sure you have enough space in the arrays that you're passing as dest... this allocates no memory

4.126.3.5 bool ArUtil::findFile (const char ∗ *fileName*) [static]

OS-independent way of checking to see if a file exists and is readable.

Returns:
true if file is found

Parameters:

fileName name of the file to size

4.126.3.6 void ArUtil::fixSlashes (std::string & *path*) [static]

Fix the slash orientation in file path string for windows or linux.

Parameters:

path the path in which to fix the orientation of the slashes

4.126.3.7 void ArUtil::fixSlashesBackward (std::string & *path*) [static]

Fix the slash orientation in file path string to be all backward.

Parameters:

path the path in which to fix the orientation of the slashes

4.126.3.8 void ArUtil::fixSlashesForward (std::string & *path*) [static]

Fix the slash orientation in file path string to be all forward.

Parameters:

path the path in which to fix the orientation of the slashes

4.126.3.9 std::string ArUtil::getStringFromFile (const char * *fileName*) [static]

Returns a string contained in an arbitrary file.

This function looks in the given filename and extracts a string from the file. The string can contain spaces or tabs, but a '\r' or '

' will be treated as the end of the string, and the string cannot have more than 1024 characters. This is mostly for use with Linux to pick up the **Aria** (p. 205) directory from a file in /etc, but will work with Linux or Windows.

Parameters:

filename the filename to look in

Returns:

the string that was in the file, or a string with length 0 if the file was not found or if the file was empty

4.126.3.10 bool ArUtil::getStringFromRegistry (REGKEY *root*, const char * *key*, const char * *value*, char * *str*, int *len*) [static]

Returns a string from the Windows registry.

This takes a root key, and looks up the given <key> within that root, then finds the string given to <value> and returns it.

Parameters:

root the root key to use, one of the REGKEY enums

key the name of the key to find

value the value to find the string contained in

str where to put the string sought, or if it could not be found for some reason an empty (length() == 0) string

len the length of the allocated memory in str

Returns:

true if the string was found, false if it was not found or if there was a problem such as the string not being long enough

4.126.3.11 unsigned int ArUtil::getTime (void) [static]

Get the time in milliseconds.

Get the time in milliseconds, counting from some arbitrary point. This time is only valid within this run of the program.

Returns:

millisecond time

4.126.3.12 long ArUtil::sizeFile (std::string *fileName*) [static]

OS-independent way of finding the size of a file.

Returns:

size in bytes. -1 on error.

Parameters:

fileName name of the file to size

4.126.3.13 void ArUtil::sleep (unsigned int *ms*) [static]

Sleep for the given number of milliseconds.

This sleeps for the given number of milliseconds... Note in linux it tries to sleep for 10 ms less than the amount given, which should wind up close to correct... Linux is broken in this regard and sleeps for too long... it sleeps for the ceiling of the current 10 ms range, then for an additional 10 ms... so: 11 to 20 ms sleeps for 30 ms... 21 to 30 ms sleeps for 40 ms... 31 to 40 ms sleeps for 50 ms... this continues on up to the values we care about of.. 81 to 90 ms sleeps for 100 ms... 91 to 100 ms sleeps for 110 ms... so we'll sleep for 10 ms less than we want to, which should put us about right... guh

Parameters:
 ms the number of milliseconds to sleep for

4.126.3.14 void ArUtil::splitString (std::string *inString*, std::list< std::string > & *outList*) [static]

Split a string into a set of words.

Takes a string and splits it into a list of words. It appends the words to the outList. If there is nothing found, it will not touch the outList.

Parameters:
 inString the input string to split
 ourList the list in which to store the words that are found

4.126.3.15 int ArUtil::strcmp (const char ∗ *str*, const char ∗ *str2*) [static]

Finds out if two strings are equal.

This compares two strings, it returns an integer less than, equal to, or greater than zero if str is found, respectively, to be less than, to match, or be greater than str2.

Parameters:
 str the string to compare
 str2 the second string to compare

Returns:
 an integer less than, equal to, or greater than zero if str is found, respectively, to be less than, to match, or be greater than str2.

4.126.3.16 int ArUtil::strcmp (const char * *str*, std::string *str2*) [static]

Finds out if two strings are equal.

This compares two strings, it returns an integer less than, equal to, or greater than zero if str is found, respectively, to be less than, to match, or be greater than str2.

Parameters:

str the string to compare

str2 the second string to compare

Returns:

an integer less than, equal to, or greater than zero if str is found, respectively, to be less than, to match, or be greater than str2.

4.126.3.17 int ArUtil::strcmp (std::string *str*, const char * *str2*) [static]

Finds out if two strings are equal.

This compares two strings, it returns an integer less than, equal to, or greater than zero if str is found, respectively, to be less than, to match, or be greater than str2.

Parameters:

str the string to compare

str2 the second string to compare

Returns:

an integer less than, equal to, or greater than zero if str is found, respectively, to be less than, to match, or be greater than str2.

4.126.3.18 int ArUtil::strcmp (std::string *str*, std::string *str2*) [static]

Finds out if two strings are equal.

This compares two strings, it returns an integer less than, equal to, or greater than zero if str is found, respectively, to be less than, to match, or be greater than str2.

Parameters:

str the string to compare

str2 the second string to compare

Returns:

an integer less than, equal to, or greater than zero if str is found, respectively, to be less than, to match, or be greater than str2.

4.126.3.19 bool ArUtil::stripDir (std::string ***fileIn***, std::string & ***fileOut***) [static]

OS-independent way of stripping the directory from the filename.

Works for \ and /. Returns true if something was actualy done. Sets fileOut to be what ever the answer is.

Returns:

true if the path contains a file

Parameters:

fileIn input path/filename

fileOut output filename

4.126.3.20 bool ArUtil::stripFile (std::string ***fileIn***, std::string & ***fileOut***) [static]

OS-independent way of stripping the filename from the directory.

Works for \ and /. Returns true if something was actualy done. Sets fileOut to be what ever the answer is.

Returns:

true if the file contains a path

Parameters:

fileIn input path/filename

fileOut output path

The documentation for this class was generated from the following files:

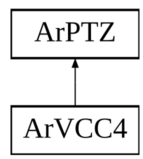
- ariaUtil.h
- ariaUtil.cpp

4.127 ArVCC4 Class Reference

Driver for the VCC4.

`#include <ArVCC4.h>`

Inheritance diagram for ArVCC4::



Public Methods

- **ArVCC4** (**ArRobot** ∗robot, bool inverted=false, CommState commDirection=COMM_UNKNOWN, bool autoUpdate=true)

  Constructor.

- virtual ∼**ArVCC4** ()

  Destructor.

- virtual bool **init** (void)

  Initializes the camera.

- bool **isInitted** (void)

  Returns true if the camera has been initialized.

- virtual void **connectHandler** (void)

  Internal, attached to robot, inits the camera when robot connects.

- virtual bool **packetHandler** (**ArBasePacket** ∗packet)

  Handles a packet that was read from the device.

- virtual bool **pan** (int deg)

  Pans to the given degrees.

- virtual bool **panRel** (int deg)

  Pans relative to current position by given degrees.

- virtual bool **tilt** (int deg)

  Tilts to the given degrees.

- virtual bool **tiltRel** (int deg)

  Tilts relative to the current position by given degrees.

- virtual bool **panTiltRel** (int pdeg, int tdeg)

  Pans and tilts relatives to the current position by the given degrees.

- virtual int **getMaxPosPan** (void) const

  Gets the highest positive degree the camera can pan to.

- virtual int **getMaxNegPan** (void) const

  Gets the lowest negative degree the camera can pan to.

- virtual int **getMaxPosTilt** (void) const

  Gets the highest positive degree the camera can tilt to.

- virtual int **getMaxNegTilt** (void) const

  Gets the lowest negative degree the camera can tilt to.

- void **getRealPanTilt** (void)

  Requests that a packet be sent to the camera to retrieve what the camera thinks are its pan/tilt positions.

- void **getRealZoomPos** (void)

  Requests that a packet be sent to the camera to retrieve what the camera thinks is its zoom position.

- virtual bool **canZoom** (void) const

  Returns true if camera can zoom (or rather, if it is controlled by this).

- virtual bool **panTilt** (int pdeg, int tdeg)

  Pans and tilts to the given degrees.

- virtual bool **zoom** (int deg)

  Zooms to the given value.

- void **addErrorCB** (**ArFunctor** ∗functor, **ArListPos::Pos** position)

  Adds an error callback to a list of callbacks to be called when there is a serious error in communicating - either the parameters were incorrect, the mode was incorrect, or there was an unknown error.

- void **remErrorCB** (**ArFunctor** ∗functor)

  Remove an error callback from the callback list.

- bool **haltPanTilt** (void)

  Halts all pan-tilt movement.

- bool **haltZoom** (void)

  Halts zoom movement.

- bool **panSlew** (int deg)

  Sets the rate that the unit pans at.

- bool **tiltSlew** (int deg)

  Sets the rate the unit tilts at.

- void **preparePacket** (**ArVCC4Packet** *packet)

  Adds device ID and delimeter to packet buffer.

- virtual int **getPan** (void) const

  The angle the camera was last told to pan to.

- virtual int **getTilt** (void) const

  The angle the camera was last told to tilt to.

- virtual int **getZoom** (void) const

  The value the camera was last told to zoom to.

- int **getPanSlew** (void)

  Gets the current pan slew.

- int **getMaxPanSlew** (void)

  Gets the maximum pan slew.

- int **getMinPanSlew** (void)

  Gets the minimum pan slew.

- int **getTiltSlew** (void)

  Gets the current tilt slew.

- int **getMaxTiltSlew** (void)

  Gets the maximum tilt slew.

- int **getMinTiltSlew** (void)

  Gets the minimum tilt slew.

- virtual int **getMaxZoom** (void) const

  Gets the maximum value for the zoom on this camera.

- virtual int **getMinZoom** (void) const

  Gets the lowest value for the zoom on this camera.

- bool **wasError** (void)

  Returns true if the error callback list was called during the last cycle.

Protected Types

- enum **Error** { **CAM_ERROR_NONE** = 0x30, **CAM_ERROR_BUSY** = 0x31, **CAM_ERROR_PARAM** = 0x35, **CAM_ERROR_MODE** = 0x39, **CAM_ERROR_UNKNOWN** = 0xFF }

Protected Methods

- virtual **ArBasePacket** ∗ **readPacket** (void)

  Reads a packet from the device connection, MUST NOT BLOCK.

4.127.1 Detailed Description

Driver for the VCC4.

4.127.2 Member Enumeration Documentation

4.127.2.1 enum ArVCC4::Error `[protected]`

Enumeration values:

CAM_ERROR_NONE No error.

CAM_ERROR_BUSY Camera busy, will not execute the command.

CAM_ERROR_PARAM Illegal parameters to function call.

CAM_ERROR_MODE Not in host control mode.

CAM_ERROR_UNKNOWN Unknown error condition. Should never happen.

4.127.3 Constructor & Destructor Documentation

4.127.3.1 ArVCC4::ArVCC4 (ArRobot * *robot*, bool *inverted* = false, CommState *commDirection* = COMM_UNKNOWN, bool *autoUpdate* = true)

Constructor.

Parameters:

robot the robot this camera is attached to

inverted if this camera is inverted or not, the only time a camera will normally be inverted is on a robot where it's mounted on the underside of something, ie like in a peoplebot

commDirection this is the type of communications that the camera should use. It can be unidirectional, bidirectional, or unknown. If unidirectional it sends packets without knowing if the camera has received them or not. This results in necessary 300 ms delays between packets, otherwise the packets will get dropped. In bidirectional mode, responses are received from the camera and evaluated for success of receipt of the previous command. In unknown mode, it will use bidirectional communication if a response is received, otherwise it will be unidirectional.

cameraPort this is microcontroller port to use, if the camera is plugged into the microcontroller. Use 1 for Aux1, and 2 for Aux2. Use 0 if using a computer serial port such as Com2. If set to 0, then the usertask will not do anything until the device connection has been set with myVCC4->setDeviceConnection(ArDeviceConnection *)

autoUpate this will cause the usertask to periodically query the camera for actual positional information (pan, tilt, zoom). This will happen every 1 sec idle time, and will switch between pan/tilt info and zoom info.

4.127.4 Member Function Documentation

4.127.4.1 bool ArVCC4::packetHandler (ArBasePacket * *packet*) [virtual]

Handles a packet that was read from the device.

This should work for the robot packet handler or for packets read in from readPacket (the joys of OO), but it can't deal with the need to check the id on robot packets, so you should check the id from robotPacketHandler and then call this one so that your stuff can be used by both robot and serial port connections.

Parameters:

packet the packet to handle

Returns:

true if this packet was handled (ie this knows what it is), false otherwise

Reimplemented from **ArPTZ** (p. 302).

4.127.4.2 ArBasePacket * ArVCC4::readPacket (void) `[protected, virtual]`

Reads a packet from the device connection, MUST NOT BLOCK.

This should read in a packet from the myConn connection and return a pointer to a packet if there was on to read in, or NULL if there wasn't one... this MUST not block if it is used with the default mode of being driven from the sensorInterpHandler, since that is on the robot loop.

Returns:

packet read in, or NULL if there was no packet read

Reimplemented from **ArPTZ** (p. 302).

The documentation for this class was generated from the following files:

- ArVCC4.h
- ArVCC4.cpp

4.128 ArVCC4Commands Class Reference

A class with the commands for the VCC4.

`#include <ArVCC4.h>`

Public Types

- enum **Command** { **DELIM** = 0x00, **DEVICEID** = 0x30, **PANSLEW** = 0x50, **TILTSLEW** = 0x51, **STOP** = 0x53, **INIT** = 0x58, **SLEWREQ** = 0x59, **ANGLEREQ** = 0x5c, **PANTILT** = 0x62, **SETRANGE** = 0x64, **PANTILTREQ** = 0x63, **CONTROL** = 0x90, **POWER** = 0xA0, **ZOOMSTOP** = 0xA2, **ZOOM** = 0xB3 , **FOOTER** = 0xEF, **RESPONSE** = 0xFE, **HEADER** = 0xFF }

4.128.1 Detailed Description

A class with the commands for the VCC4.

This class is for controlling the Canon VC-C4 camera.

This camera has a reponse mechanism, whereby each packet sent to the camera generates an answer within 300ms. For the most part, the answer consists of a 6-byte packet which has an error-status within it. Some commands generate longer packets.

In order for the the reponses to work, the CTS line on the camera must be high. This is pin 2 on the visca port. If your camera is not wired in such a fashion, then no answers will be sent to the computer, and the computer will not know whether or not the last packet was processed correctly. Because of this, systems operating without the answer feature will need to run with delays between sending packets. Otherwise, packets will be ignored, but you will have no way of knowing that. To achieve this, there are two types of communication modes that this class will operate under - COMM_UNIDIRECTIONAL or COMM_BIDIRECTIONAL. The default is COMM_UNKNOWN, in which it will use bidirectional commuication if a response is received.

To handle the states and packet processing, this class runs as a user-task, different than the other pan/tilt devices. Because of this, it must have a valid robot connection and a valid serial connection if using a computer serial port. Note that the computer port must be set independently of this class. The aux port can be selected via setAuxPort from the **ArPTZ** (p. 298) class.

The camera's pan and tilt commands work on a number of units equal to (degrees / 0.1125). The panTilt function always rounds the conversion closer to zero, so that a magnitude greater than the allowable range of movement is not sent to the camera.

4.128.2 Member Enumeration Documentation

4.128.2.1 enum ArVCC4Commands::Command

Enumeration values:

DELIM Delimeter character.

DEVICEID Default device ID.

PANSLEW Sets the pan slew.

TILTSLEW Sets the tilt slew.

STOP Stops current pan/tilt motion.

INIT Initializes the camera.

SLEWREQ Request pan/tilt min/max slew.

ANGLEREQ Request pan/tilt min/max angle.

PANTILT Pan/tilt command.

SETRANGE Pan/tilt min/max range assignment.

PANTILTREQ Request pan/tilt position.

CONTROL Puts camera in Control mode.

POWER Turns on/off power.

ZOOMSTOP Stops zoom motion.

ZOOM Zooms camera lens.

FOOTER Packet Footer.

RESPONSE Packet header for response.

HEADER Packet Header.

The documentation for this class was generated from the following file:

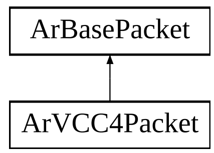
- ArVCC4.h

4.129 ArVCC4Packet Class Reference

A class for for making commands to send to the VCC4.

`#include <ArVCC4.h>`

Inheritance diagram for ArVCC4Packet::



Public Methods

- **ArVCC4Packet** (**ArTypes::UByte2** bufferSize=30)

  Constructor.

- virtual ~**ArVCC4Packet** ()

  Destructor.

- virtual void **finalizePacket** (void)

  MakeFinals the packet in preparation for sending, must be done.

4.129.1 Detailed Description

A class for for making commands to send to the VCC4.

There are only a few functioning ways to put things into this packet, you MUST use thse, if you use anything else your commands won't work. You must use byteToBuf and byte2ToBuf.

The documentation for this class was generated from the following files:

- ArVCC4.h
- ArVCC4.cpp

4.130 P2ArmJoint Class Reference

P2 Arm joint info.

`#include <ArP2Arm.h>`

4.130.1 Detailed Description

P2 Arm joint info.

The documentation for this class was generated from the following files:

- ArP2Arm.h
- ArP2Arm.cpp

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