Matlab-Aria Interface + MobilSim

Tutorial

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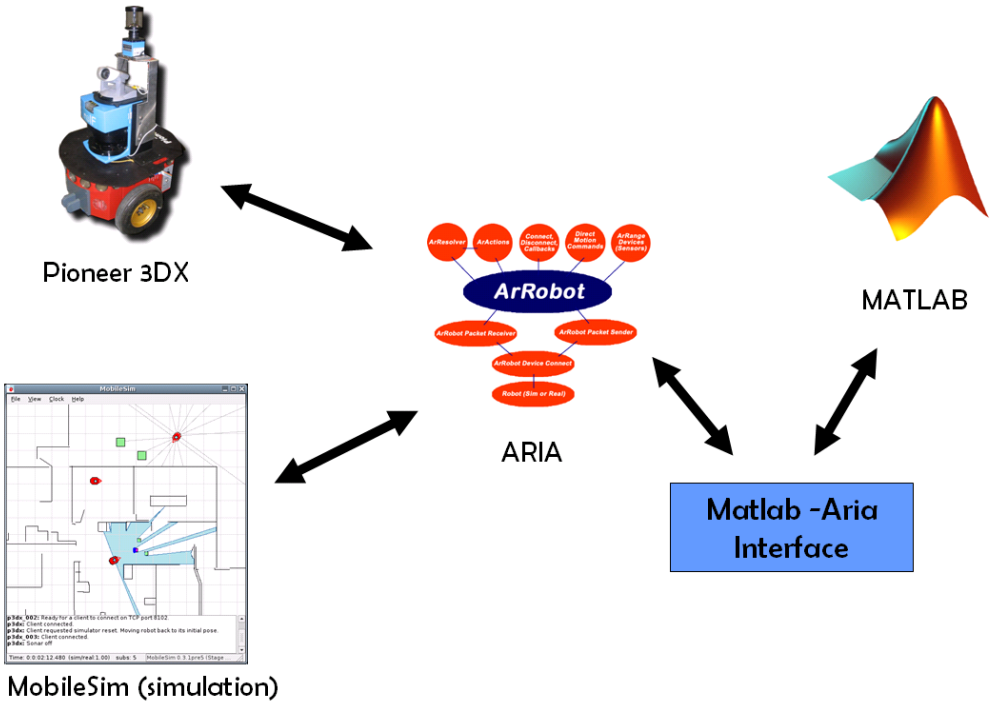

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Chapter 1

Introduction

1.1 What is ARIA?

ARIA (Advanced Robot Interface for Applications) is an object oriented C++ written library used to control the MobileRobots/ActivMedia robot's velocity, heading, relative heading, and many other navigation settings through simple low-level calls or using its high-level actions as well as manage odometry, sensor readings, and other operating data.
ARIA provides support for all MobileRobots/ActivMedia robot accessories, including the SICK LMS200 laser-range finder, pan-tilt-zoom cameras. For further information and complete documentation, ARIA can be freely downloaded at: http://robots.mobilerobots.com/ARIA/

1.2 What is MobilSim?

MobileSim is software for simulating mobile robots and their environments, for debugging and experimentation with ARIA. MobilSim can be freely downloaded at:
http://robots.mobilerobots.com/MobileSim/
MobileSim uses line data from a map (.map) file to simulate walls and other obstacles in the environment. In order to create those map commercial software like: Mapper3 or Mapper3-Basic can be used, however since these software are not freely available, we explain in a section 2.2 how to construct a map from a simple text editor like Notepad or Wordpad.

1.3 What is MATLAB?

MATLAB is a high-performance language for technical computing. It integrates computation, visualization, and programming in an easy-to-use environment where problems and solutions are expressed in familiar mathematical notation. Typical uses include: Math and computation, algorithm development, data acquisition, modeling, simulation and prototyping, scientific and engineering graphics. For more information visit: http://www.mathworks.com/products/matlab/

1.4 What is MATLAB-ARIA Interface?

The Matlab-Aria Interface is a C written application that allows calling many ARIA commands and actions from MATLAB, as it were built in MATLAB functions. Callable C programs from MATLAB are referred to as MEX-files. MEX-files are dynamically linked subroutines that the MATLAB interpreter can automatically load and execute.

The figure 1.1 shows the scheme how the Matlab-Aria Interface interacts with MATLAB, the simulation enviroment MobilSim and with the Pioneer mobile robot.

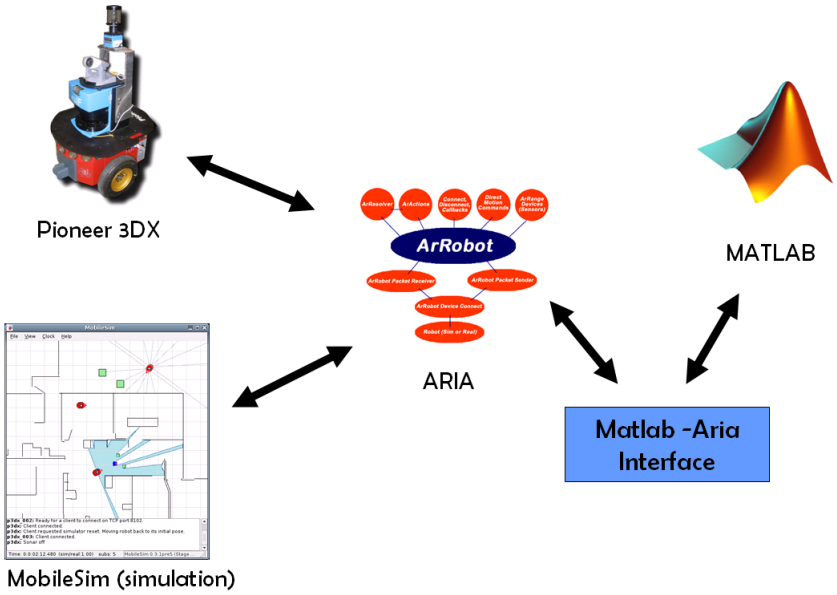

Figure 1.1: MATLAB-ARIA interface interaction with mobilSim, Matlab and the Pioneer Robot

Chapter 2

Working with MobilSim

2.1 Loading a map

MobilSim has example maps that come with the program installation. Typically these files are located by default in the folder C:\Program Files\MobileRobots. This path may change depending in the folder chosen at the program installation.
The two examples files are: **AMROffice.map** , **columbia-OL.map** notice however that you may also run the simulation without map.
To start a simulation environment **Run MobilSim** program and then open a map as shown in figure 2.1 and figure 2.2

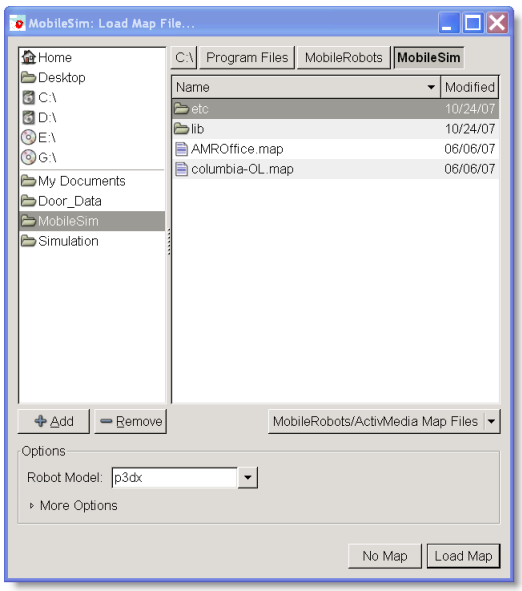

Figure 2.1: MobileSim start up window, before loading a map.

2.2 Creating a map

As mentioned in the introduction, there are special programs to create maps, but since they need a license, we explain now how to create simple maps using only a text editor. The output file should be saved with the extension (.map)

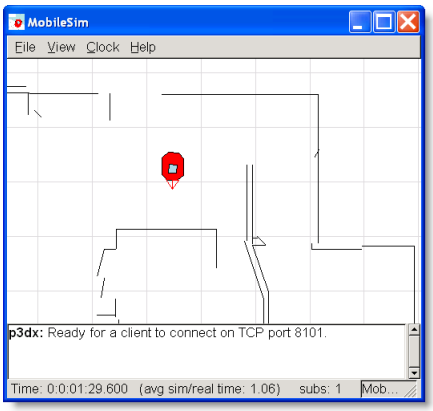

Figure 2.2: MobileSim simulation environment after a map is loaded.

The following example creates a rectangle of 5000mm x 1000mm. Each line is defined by the x,y coordinate of the starting point and the x,y coordinate of the end point.

```
2D-Map
LINES
-2500 -500 2500 -500
-2500 -500 -2500 500
-2500 500 2500 500
2500 500 2500 -500
```

Is very important not to avoid the headings `2D-Map` and `LINES` and saving the file with the extension `.map` After that the map is created can be loaded in MobilSim as shown in figure 2.3

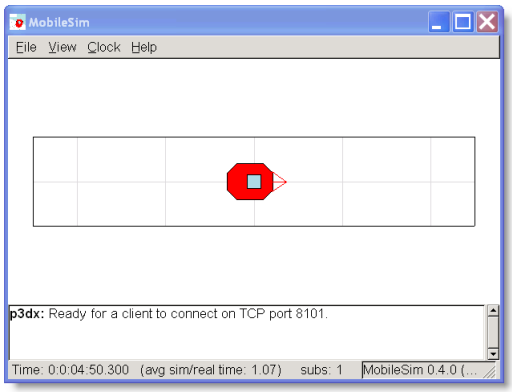

Figure 2.3: Map created in a text editor with walls of 5000mm x 1000mm.

If it is necessary to create a more complex map create a copy of the example maps **AMROffice.map** or **columbia-OL.map** and modify them as needed.

Chapter 3

Working with the Interface

This chapter introduces the basics steps to work with the interface and the simulator. The steps consist of:

1. Setting the MATLAB path
2. Opening of MobileSim
3. Connection and initialization
4. Movement commands
5. Stop and shutdown

3.1 Setting the MATLAB path

In order that the ARIA functions can be called from MATLAB while working in a different directory, the MATLAB-ARIA Interface functions folder should be added into the MATLAB path.
To change the path, open the **Set Path** dialog box by pressing in the menu:
→ `File` → `Set Path` as shown in figure 3.1

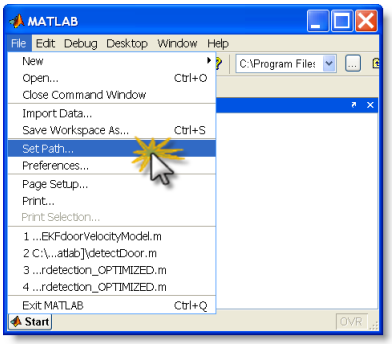

Figure 3.1: Procedure to change the path

Then add the **ArinterfaceMATLAB** folder to the path, then save and close as shown in figure 3.2

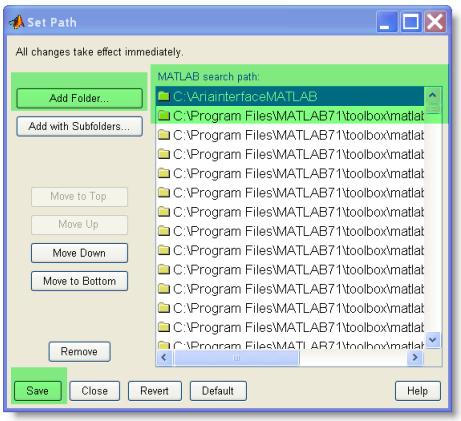

Figure 3.2: Matlab Set Path dialog box

3.2 Open MobilSim

After the path is set and MATLAB is still running, open MobilSim, the program window should look like figure 2.2 or figure 2.3

3.3 Connection and initialization

Now in the MATLAB command prompt, type:

» `robotInitSim`

Then check if the robot is connected on the MobilSim window as shown in figure 3.3

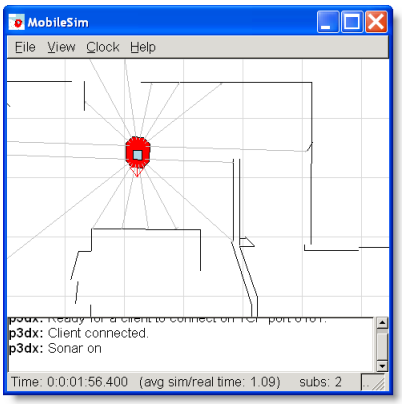

Figure 3.3: Robot Connected

3.4 Movement commands

Once the robot is connected and ready, apply some movement commands, in this example a linear velocity of 50mm/s and a rotational velocity of 2 rad/s are set. » `runAsync`
» `setVel(50)`
» `setRotVel(2)`

Visualize the robot movement in MobileSim (see figure 3.4)

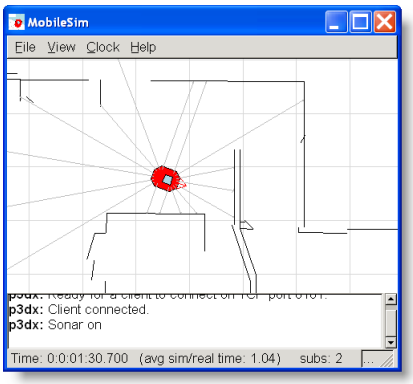

Figure 3.4: Robot movement after the motion commands

3.5 Stop and shutdown

When the robot has finish its task, should be stopped and shutted down:

» `stop`
» `shutdown`

3.6 Run a demo

The MATLAB-ARIA interface include some demos that show many capabilities of the interface package, to run these demos type in the MATLAB prompt:

» `demoMotionCommands`

Then follow the instructions as shown in figure 3.5

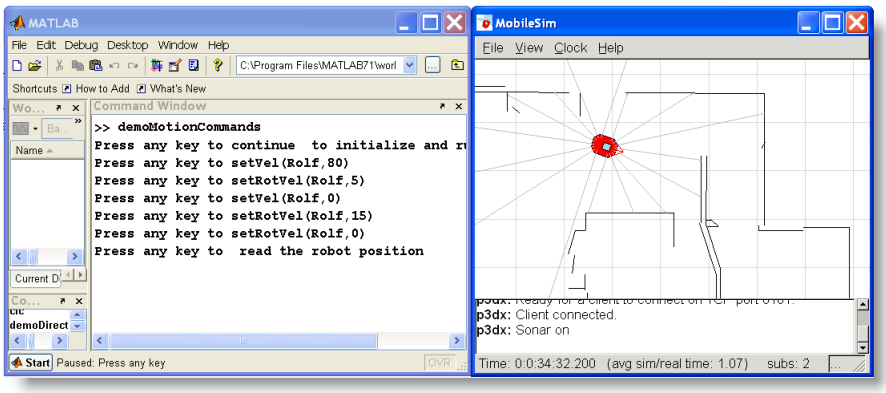

Figure 3.5: Demo of the robot driven by motion commands