Robot Car Components - Ackermann

Datasheet

Provides components for an Ackermann Chassis Robot Car.
Includes a Car Base Board.
Includes a BlackPill board.
MIT License.

Version 1.0

Applying Microcontroller Solutions
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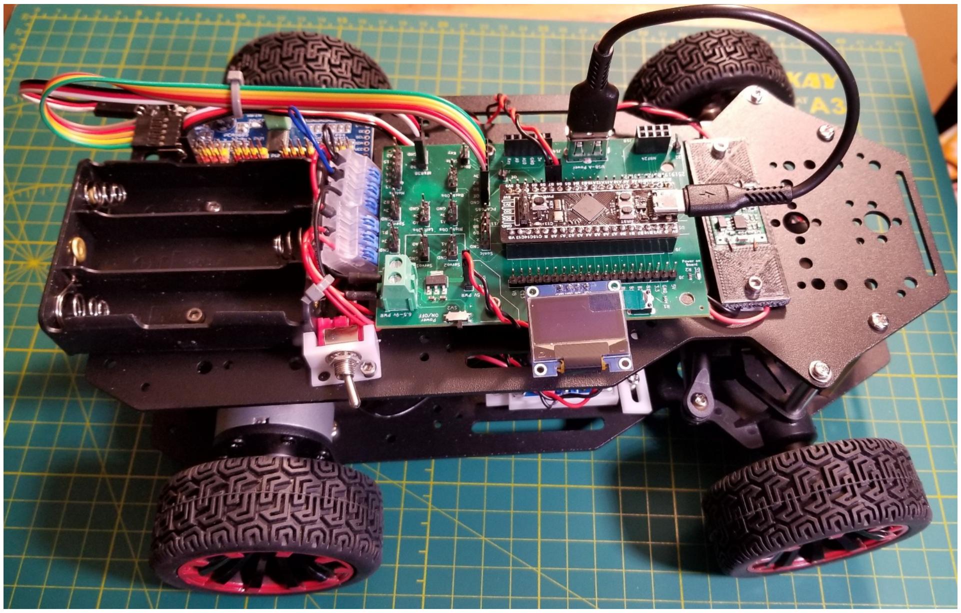
The [Ackermann Chassis Encoder Motor Robot Car Kit]is a great chassis for building a Robot Car. The kit provides an assembled metal car and a Motor Drive Module. Using the kit, a builder can invent their own design that adds a controller and battery power.

Product Overview

The *Applying Microcontroller Solutions'* design is the **Robot Car Components-Ackermann** product.

The **Robot Car Components** product provides the remaining components for building a working car: Car Base Board (aka Controller), BlackPill board, power devices, remote and connection parts.   Using this product wiring and cables simply plug into connectors, headers or terminal blocks to interconnect the devices. The resulting robot car will operate autonomously. Finally, the provided GitHub code is uncomplicated and allows the user to easily add logic enhancements.

The Ackermann Chassis kit and the 18650 batteries must be purchased directly from Amazon. Note: Light soldering of the BlackPill headers, and the small buck converter is required.



Expandable

Since only a portion of the controller is utilized, the user can plug in additional sensors to further expand the Robot Car capabilities. Example MicroPython code for popular sensors are found at the GitHub site.

FEATURES

- **STM32 BlackPill, controller and servo boards.**
- **Battery Power Management.**
- **Remote and cables, wiring, etc.**

APPLICATION

- **Ackermann Robot Car**

Product Component List

The below components in the Robot Car Components product nicely complement the Ackermann Robot Car kit, and include:

STM32 BlackPill, controller and servo boards

- BlackPill — STM32F411CEU6 chip on a USB stick with 8MB flash.
- Car Base Board and OLED — Controller supports development and run time operation.
- Servo Module — Sixteen channel servo module.
- OLED board — Small display board for user messages.
- Cables — Cable wires to the two module boards.

Battery Power Management

- Battery holder — Holds three 18650 batteries (11 – 12.6 volts).
- Switch — Switch and plastic mount.
- Main buck converter — Converts power source to nine volts for motors and Car Base Board.
- Small buck converter — Converts power source to six volts for the servos.
- Connectors — Multi-wire connector for power distribution.
- Wires — Wiring to connect power source and converters.
- Mounts — Plastic mounts for the converter board to ease attachment to the chassis.

Remote and Screws, etc.

- Sensor and remote. — Infrared receiver sensor and a hand-held remote.
- Screws, etc. — Screws/nuts, etc.

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Component Description

Controller

The controller is the Car Base Board with a BlackPill (STM32F411CEU6). The Car Base Board is also sold separately at this link. The BlackPill is pre-loaded with the MicroPython firmware. The user need only connect the board to a desktop and drag/drop files. On the desktop, two popular IDEs to use are Thonny and Visual Studio Code.

The controller uses a cable to connect to the Ackermann Motor Drive Module. A MicroPython program on the BlackPill will provide the logic to the Drive Module to operate the two rear car motors. The controller uses a cable to connect to a separate Servo board (aka Servo Module.) The BlackPill will provide the logic to the Servo Module to operate the robot car steering servo. Additionally the user can add-on additional servos for other functions as the Servo Module supports 16 channels.

A small light-weight OLED board (that plugs into the OLED port) provides a simple display. The board is programmable and will depict text and simple graphics. The display can provide interactive messages from the running program on the BlackPill.

Power Management

Battery Power is provided by three 18650 batteries, which are located in a plastic holder mounted on the top chassis for maintenance. The battery voltage (via distributed wiring) is then stepped down with two buck converters to nine and six volts respectively. The nine volt power is distributed to the battery terminal block on the Car Base Board and to the Motor Drive Module that controls the motors. The six volt power is distributed to the Servo Module which controls the steering servo (and can serve additional servos as needed.)

The Car Base Board regulates the incoming nine volts to five-volt power to be used by some sensors and also to the Power Port for the BlackPill during autonomous operation. The BlackPill regulates the five volts to the standard 3.3 volts for the STM32 chip and onboard devices.

Remote and Screws, etc.

A remote wirelessly connects to the IR sensor and allows the user to remotely command the Robot Car. It uses a standard 3-volt CR2032 coin battery.

Finally a set of M3 screws, spacers and nuts to mount the above parts.

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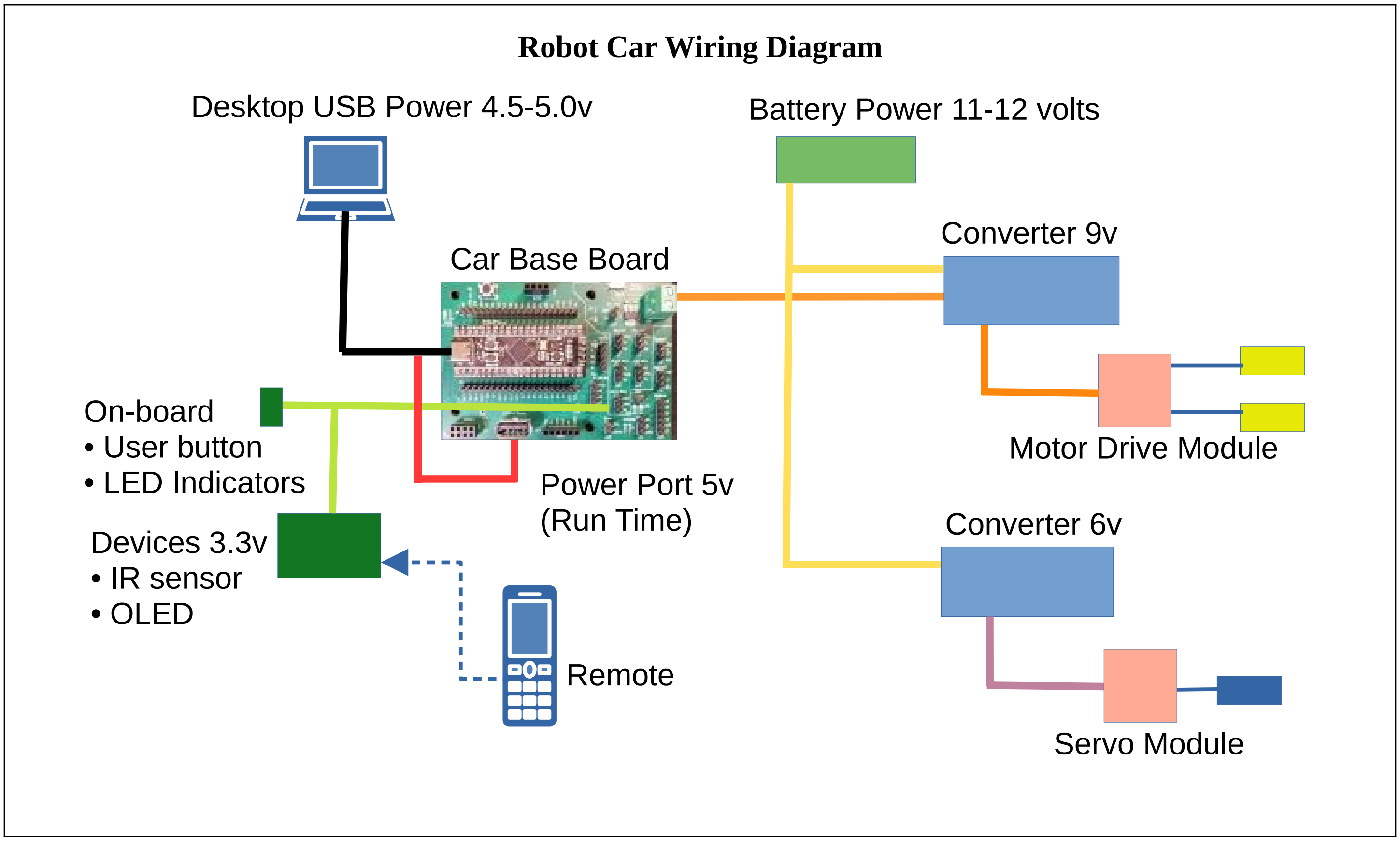
Wiring Diagram

Below is the component wiring diagram.



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Details

Car Base Board “The Controller”

The BlackPill board is mounted on to the generic Car Base Board. The BlackPill can be connected to a desktop computer for development. The BlackPill has an onboard 8-MB flash that acts like a filesystem and appears on the desktop. Files can simply be dragged/dropped to the filesystem. For runtime operation, the code is saved to the file “main.py” and power is cabled to the batteries. A working robot car is readily created using only a few features of the generic Car Base Board. Therefore, the user can easily expand the robot car functions by adding other sensors.

Battery Holder and Converters

This part includes a plastic holder mounted to the chassis and holds three 18650 batteries. A small mechanical switch is connected to the positive battery power lead and mounted to the chassis. The leads go to a pair of power connectors to distribute the power per the above Wiring Diagram.

The battery power is fed to the two buck converters (nine volts and six volts respectively). The main buck converter includes a built-in multi-segment display that lights with the value of the voltage source (or via a button click) the value of the converted voltage. Each buck converter can be adjusted to the desired output voltage via a tiny potentiometer and the user’s Multimeter.

Motor Drive Module

This device is an un-assembled part from the Ackermann Chassis kit. It includes two cables to connect to the motors. The logic is driven by I2C commands from the controller. Example code demonstrates how to interact with the motors.

Servo Module

This is a separate servo connection board with sixteen male headers (aka channels) for servos. The Steering Servo is cabled to and controlled by the board. The logic is driven by I2C commands via a cable from the controller. The Servo Module distributes six volt power (from the small buck converter) to the sixteen channels. Example code demonstrates the Servo Module’s capabilities.

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OLED Board

The Car Base Board has an I2C port for a small OLED display. The display inserts directly into the port. The display board is a small 0.96 inch OLED (Yellow/Blue 128*64 pixels). Example code demonstrates many of the display's capabilities.

Infrared Receiver Board

The product includes an Infrared Receiver board. The IR Board is cabled to a specific male header on the controller board. Also, the product includes a small handheld "remote". Example code tests the IR board reading the remote's keypresses as hex codes received on the BlackPill.

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