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Smart Make an Autonomous "Follow Me" Cooler

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Annotation. In this project, we use an Arduino Uno to build an autonomous "follow me" cooler. The robot cooler connects to a smartphone via Bluetooth and uses GPS to navigate. All the electronics will be contained in the base so that other objects can be carried as well.

Keywords: Follow Me, MDF, HMC6883L, MG996R, HC-05 Bluetooth module, Setup, Pin Configuration.

Make an Autonomous "Follow Me" Cooler Find all the 3D printable parts for this project on our Patreon

How We Built It

We created two videos about the build process for this project. In this first video, Davis explains how to build the base.

To construct the base, we used a large piece of scrap 1/4" MDF board and a couple 1x3" planks to serve as the sidewalls. Standing the boards up on end to create a box helped keep the cooler in place while the base was moving.

We measured the MDF to be about 1 inch larger on each side than the dimensions of the bottom of the cooler. In this case, the cooler was 17.5x11.5", so we cut the MDF to be about 19.5x13.5". The extra space allowed the 1x3" boards to be nailed on top of the MDF. Our jigsaw worked well to cut this piece.

The 1x3" planks were cut to the same length as the depth of the base, but we made them about 2 inches shorter on the width so that they could align with the edges of the MDF. The planks were attached to the MDF with a few small nails

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1-Figure

2-Figure

In order to house the electronics, we made a small box using the same process as the base platform (albeit using some 1x2" planks instead of 1x3"). We eyeballed the dimensions here, but

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it turned out to be about 11x9". The electronics box was nailed to the bottom of our platform after we cut a hole in the MDF with our jigsaw.

3-Figure

Finally, we added the components for the drive system. The wheels used a couple 3D printed brackets (3D parts provided below) to mount our high torque 12v motors. A 3D printed connector was attached to a metal hub to mount the wheel on the motor shafts.

A simple swivel wheel was used on the back of the platform. It was attached with another 3D printed bracket.The electronics were installed in the box cutout under the platform. We used an Arduino Uno and a 5v battery to power the sensors, Bluetooth, and control logic. A 3s LiPo battery was used to power the motors. A HC-05 Bluetooth module was mounted at the front of the platform for better range. The rest of the components including a L298N motor driver, PAM-7Q GPS, and HMC6883L compass were mounted inside and connected to the Arduino through the breadboard.The compass works with I2C, so we connected the SLC and SDA pins to A5 and A4 respectively. The rest of the pins were connected through digital I/O. For more information on how we connected the wires, see the diagrams provided in the schematics section below.

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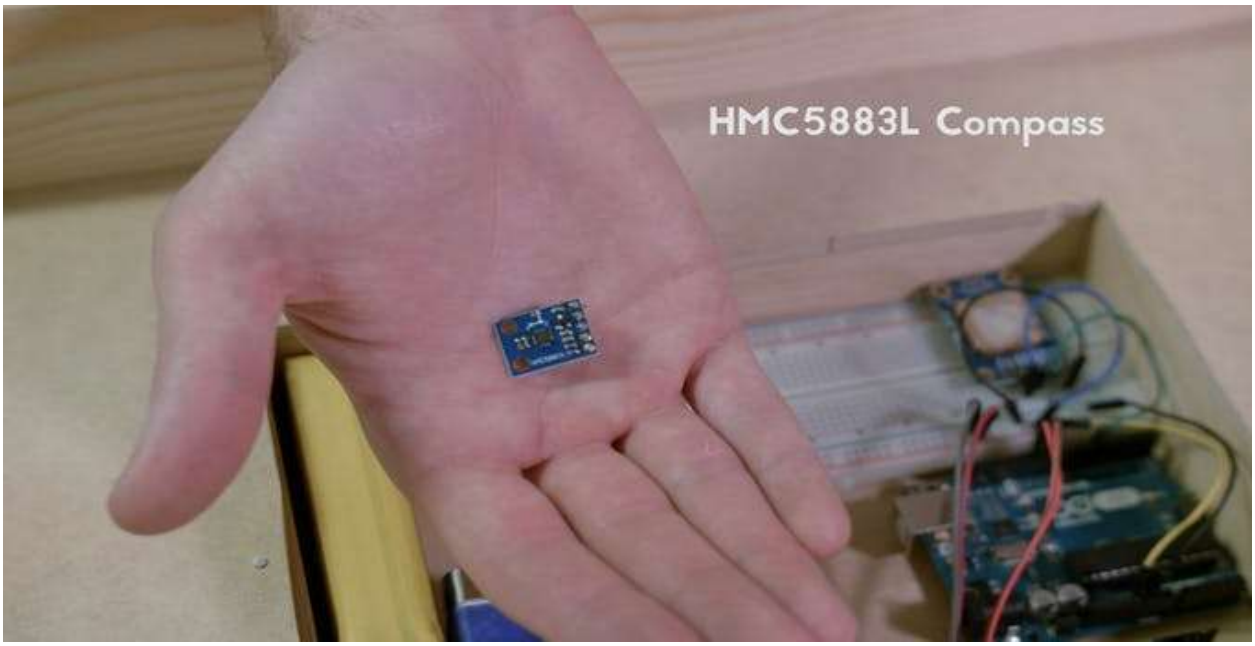
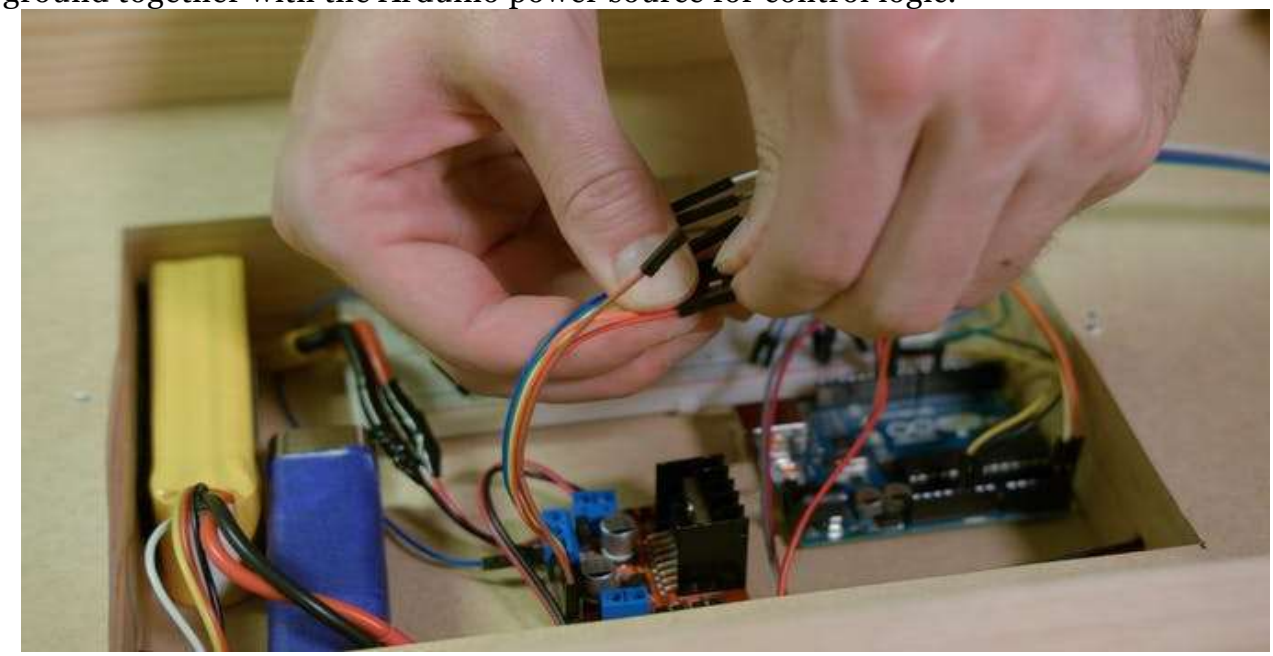


4-Figure

The motors were powered by drilling holes through the platform and attaching them the L298N motor driver board. The 3s LiPo was connected as the main power source and we tied the ground together with the Arduino power source for control logic.



5-Figure

The following image shows what everything looked like once it was connected in the electronics box.

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Motorized Lid

The motorized lid wasn't included in either of our build videos, so we posted some supplemental instructions on how to add it.

Our cooler lid had a couple notches that kept the lid snapped shut when it closed. Our servo wasn't strong enough to lift the lid when it was snapped shut, so we used a small Dremel tool to sand down the notches.

We used a MG996R high torque servo power the lid. We 3d printed a hinged arm to connect the servo horn to the top of the cooler. In order to keep it in place, we used some gorilla glue. The servo was mounted on the side of the cooler with a piece of 3M double sided outdoor mounting tape.

A hole was drilled on the back of the cooler to feed the servo wires through. We used a couple of extension wires to attach it to power, ground, and the signal wire pin 3 on the Arduino.

Preparing Your Blynk App

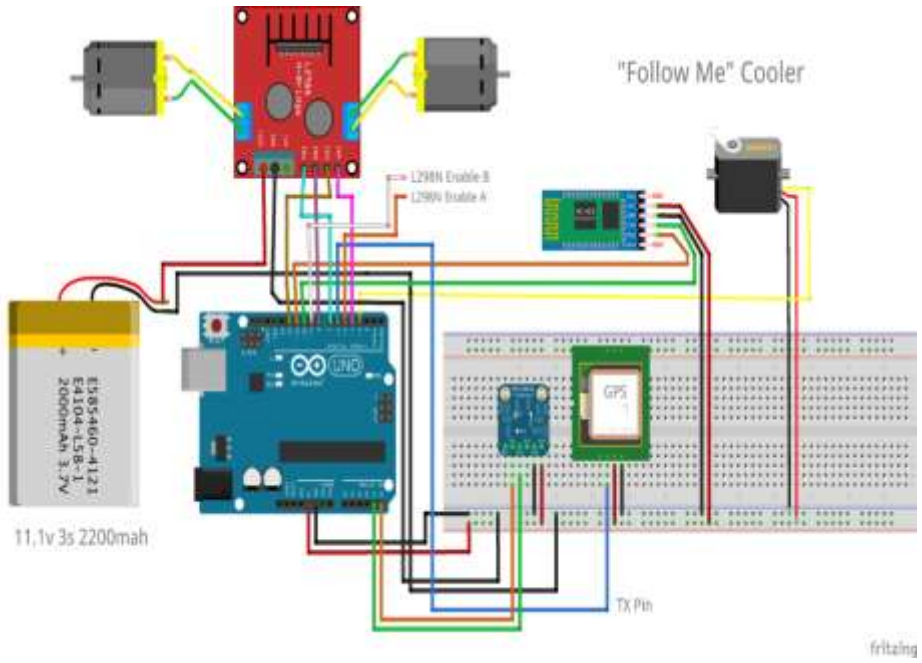
This is the configuration we used for our Blynk app.

Once you have everything configured property, verify and upload the code to your Arduino. If you are outside, it will take a few seconds for the GPS to acquire a satellite lock. Once it does, it will begin flashing.

Make sure your Android device is paired with HC-05 Bluetooth module. If it asks for a password, it should be default 1234. Open Blynk and press play!

SCHEMATICS

Circuit Diagram



6-Figure

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Autonomous-Follow-Me-Cooler

Our autonomous cooler has two modes: GPS Streaming and GPS Waypoint. While in GPS Streaming mode, the cooler will follow you by streaming coordinates from your phone. In GPS Waypoint mode, you can send a predetermined set of coordinates that the cooler will travel to.

Disclaimer: When testing the cooler, we noticed that the GPS coordinates streamed from Blynk were often inaccurate. While it works for some locations, it doesn't for others. If you want high precision, we highly suggest creating your own Android app to stream GPS coordinates.

Installation

All files for this project are contained in the /cooler directory. Open the directory and click the cooler.ino. The Arduino IDE should open with all of the files in that directory.

Dependencies

You need to make sure to install the following dependencies through the Arduino library manager (Sketch->Include Library->Manage Libraries...)

- Adafruit Sensor
- Blynk
- Adafruit_HMC5883_Unified

Setup

You'll need to configure a few variable definitions for the code to work with your configuration. CoolerDefinitions.h contains variables that you can edit to switch pins, tweak parameters, and configure your Blynk app.

Blynk

The most notable is the char auth[] variable. Replace the auth string (inside the quotes) with the auth token generated by your Blynk app.

Pin Configuration

Most of the components on this robot are connected via Digital I/O pins. These pins can be changed by adjusting the following variables in CoolerDefinitions.h.

```
#define SERVO_PIN 3
#define GPS_TX_PIN 6
#define BLUETOOTH_TX_PIN 10
#define BLUETOOTH_RX_PIN 11
#define MOTOR_A_EN_PIN 5
#define MOTOR_B_EN_PIN 9
#define MOTOR_A_IN_1_PIN 7
#define MOTOR_A_IN_2_PIN 8
#define MOTOR_B_IN_1_PIN 12
#define MOTOR_B_IN_2_PIN 4
```

Make sure that the following pins are connected to PWM ports (we had no available PWM ports left when everything was attached):

```
#define SERVO_PIN 3
#define GPS_TX_PIN 6
#define BLUETOOTH_TX_PIN 10
#define BLUETOOTH_RX_PIN 11
#define MOTOR_A_EN_PIN 5
```

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#define MOTOR_B_EN_PIN 9

Parameters

The following variables were used for configuration. Adjust them as you see fit.

#define MOTOR_A_OFFSET 20
#define MOTOR_B_OFFSET 0
#define DECLINATION_ANGLE 0.23f
#define COMPASS_OFFSET 0.0f
#define GPS_UPDATE_INTERVAL 1000
#define GPS_STREAM_TIMEOUT 18
#define GPS_WAYPOINT_TIMEOUT 45

In order for our servo-driven lid to work, we had to fine tune the start and stop angle so that we could get the right leverage on the lid. They can be given a value between 0 and 180.

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