# Developer Guide: SwarmBot

A project by

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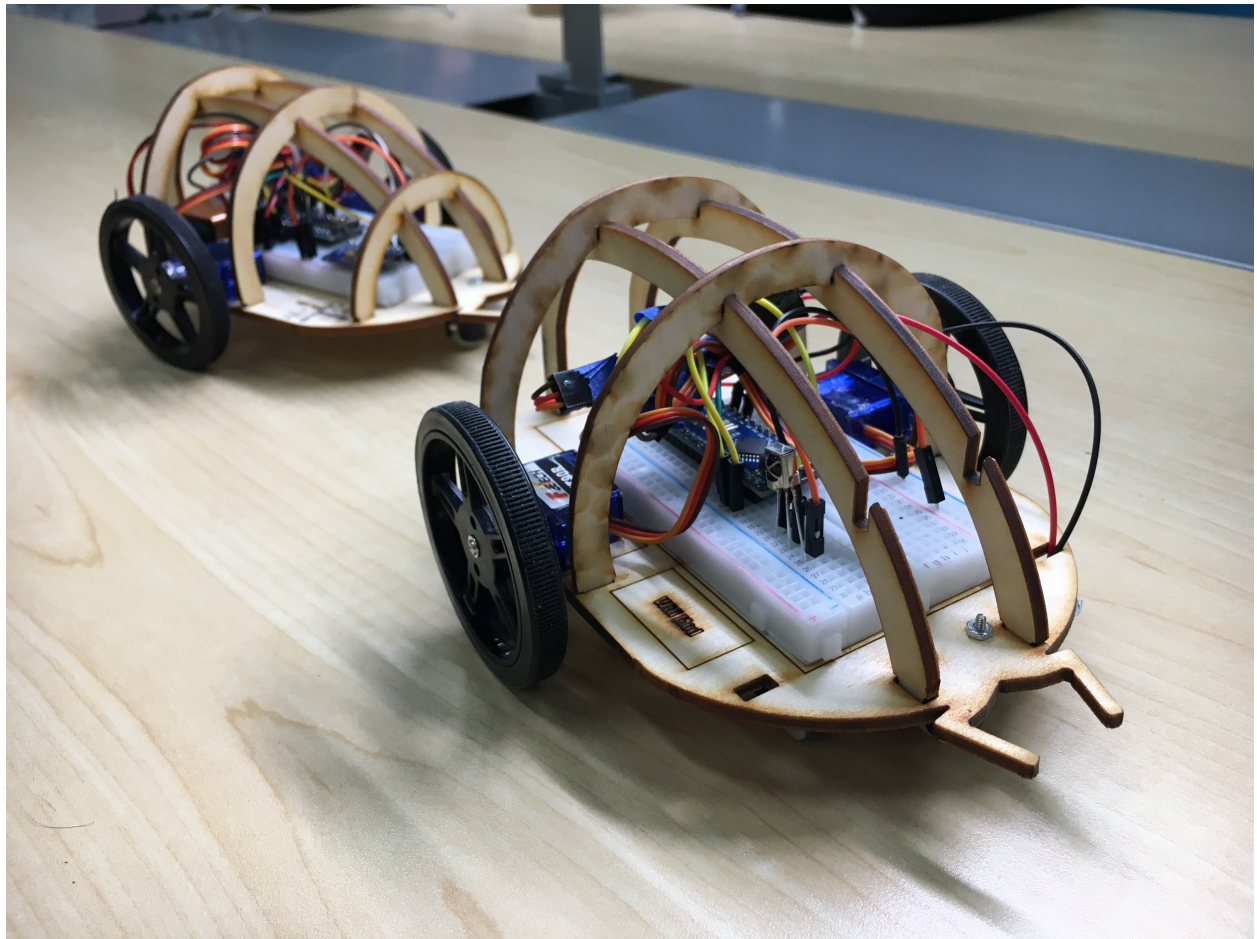
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# Introduction

The idea of this project is to build two robots that can follow each other. Scheme is simple:

1.  Leader robot can be controlled via IR remote.
2.  Follower robot will follow the leader robot.

# Hardware

- Arduino Nano
- Servo + Wheels → allow robots to move around
- Caster Ball ½" → support the robot
- IR Remote
- IR Receiver
- MPU-9250 3-Axis Accelerometer, Gyro, & Magnetometer → location tracking
  - We only use the magnetometer. At least for now.
  - Magnetometer measures magnetic field (intensity, direction)
  - This sensor is installed on **follower robot**. It tracks the location of leader robot
- Breadboard
- **Magnet** → This is only installed on **leader robot**. It allows follower robot to track leader robot's location using magnetometer.

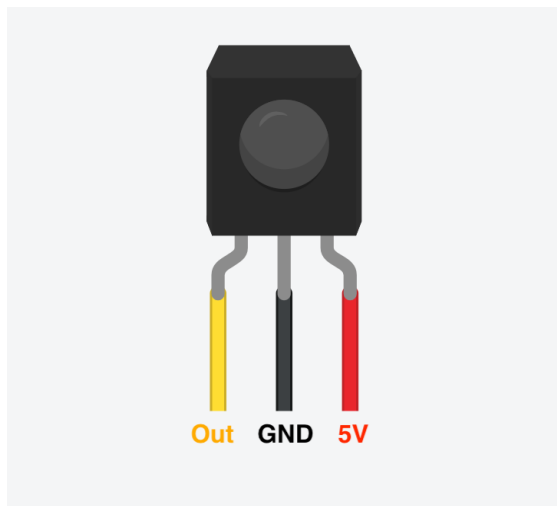For more details. Visit [Parts List](#).

# Assembly and Code
## Leader Robot
### 1. Connect two servos



Yellow wire is signal  Any digital pin
Red is positive        5V
Black is negative       GND
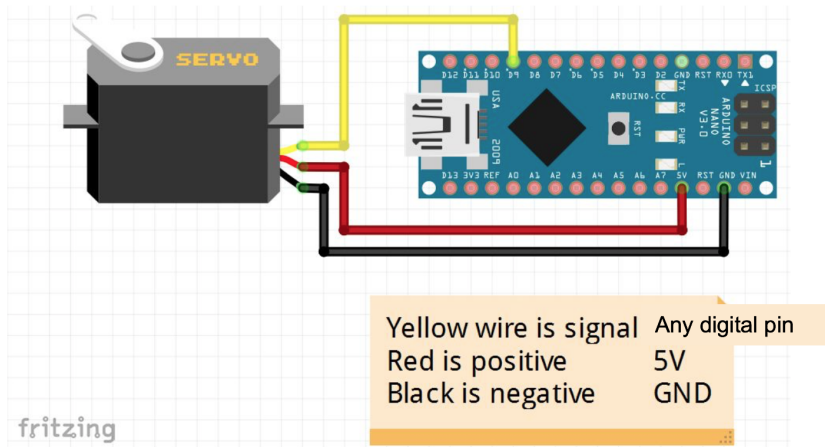
Example code us pin 10 and 11.

### 2. Connect IR receiver



Out → Any digital pin. Example code use pin 12.
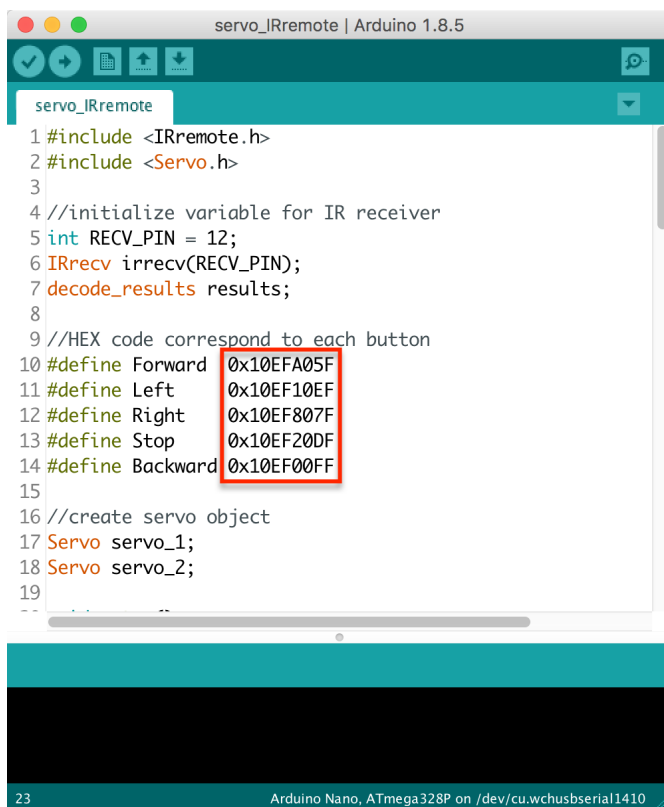
## 3. Decode signal from IR remote

You need to decode signal from IR remote because arduino needs to know what command (in the form of he1x code) it will receive if a particular button is pressed. Upload this code to arduino and press up (forward), down (backward), left, right, and ok button (stop). Record the hex code for above five buttons.

You will get something like this. <u>Note</u> hex code might vary depending on model and manufacturer of the IR remote.

```
//HEX code correspond to each button
#define Forward   0x10EFA05F
#define Left      0x10EF10EF
#define Right     0x10EF807F
#define Stop      0x10EF20DF
#define Backward  0x10EF00FF
```

## 4. Example code

This code allows you to control the leader robot with IR remote. You might need to update the hex code for each button if yours are different.

```
servo_IRremote | Arduino 1.8.5

servo_IRremote

1  #include <IRremote.h>
2  #include <Servo.h>
3
4  //initialize variable for IR receiver
5  int RECV_PIN = 12;
6  IRrecv irrecv(RECV_PIN);
7  decode_results results;
8
9  //HEX code correspond to each button
10 #define Forward   0x10EFA05F
11 #define Left      0x10EF10EF
12 #define Right     0x10EF807F
13 #define Stop      0x10EF20DF
14 #define Backward  0x10EF00FF
15
16 //create servo object
17 Servo servo_1;
18 Servo servo_2;
19

23                    Arduino Nano, ATmega328P on /dev/cu.wchusbserial1410
```

## 5. Attach magnet
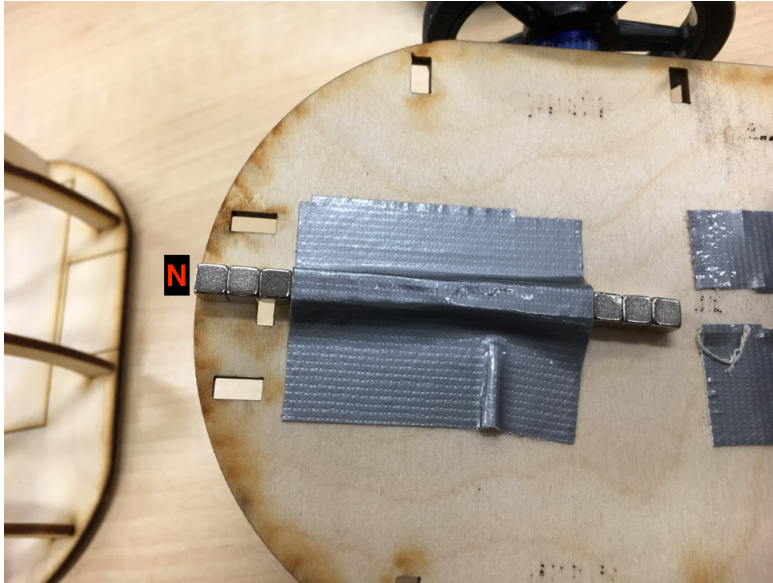


Make sure the **north** pole of magnet is pointing away from the robot itself. Sensor will have different readings if polarity of magnet is reversed.

## 6. Connect battery
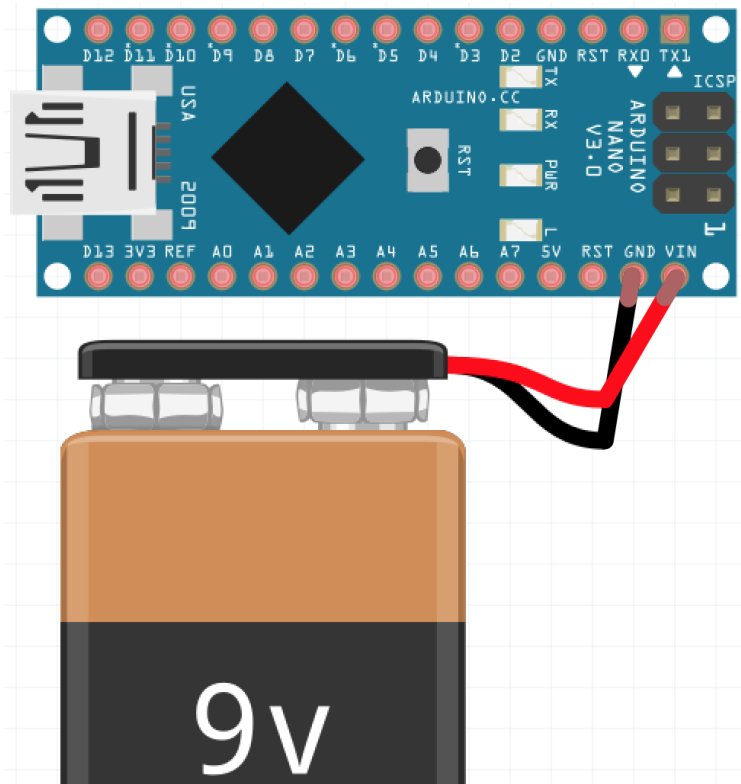


Positive (red) → VIN

Negative (**black**) → GND

## Follower Robot

### 1. Connect two servos
Same as the [leader robot](#).

### 2. Connect magnetometer
See instructions [here](#).

### 3. How it works?
Check out [this](#) demo video. As the leader robot moves, you can see the change of reading on follower robot.

- Absolute value of reading tells distance
  - Leader robot is further → absolute value of reading gets smaller
  - Leader robot is cloer → absolute value of reading gets larger
- Sign of Y reading tells direction
  - Leader robot moving left → Y is negative
  - Leader robot moving right → Y is positive