

OSEPP Mechanical & Functional Kits Tutorials



create interactive robotics projects with our Robotics Functional Kit!

ROBOTICS FUNCTIONAL KIT

The **Robotics Functional Kit** (<http://osepp.com/functional-kit/>) is a kit geared towards the Mechanical Kit line (though not limited). From here on out, I'll refer to the Robotics Functional Kit by its part number, **MECHF-01**.

MECHF-01 contains an Arduino UNO microcontroller, our new TB6612 motor driver shield, a wide field of view line follower IR sensor, an ultrasonic range sensor and an IR object avoidance sensor.

We will look at how to connect these components together and use the sample code (download sample code from the main product page: <http://osepp.com/functional-kit/>).

MECHF-01 Sensors / Transmitters

Bluetooth (HC-06) Module – This module allows you to control your robot wirelessly using an Android device (phones, tablets, etc).



Ultrasonic Sensor – This module allows your robot to avoid walls/obstacles.



IR Follower – With this module, we show you how to turn any directed light source (led, flashlight, etc) into a remote control.

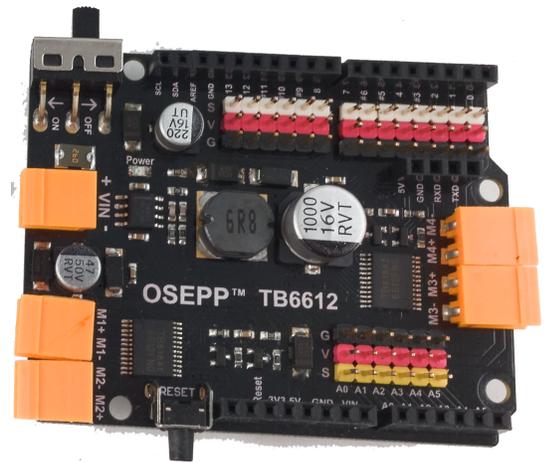


Line Tracker Module - create your own custom course (using a solid black line) to create a line following robot!

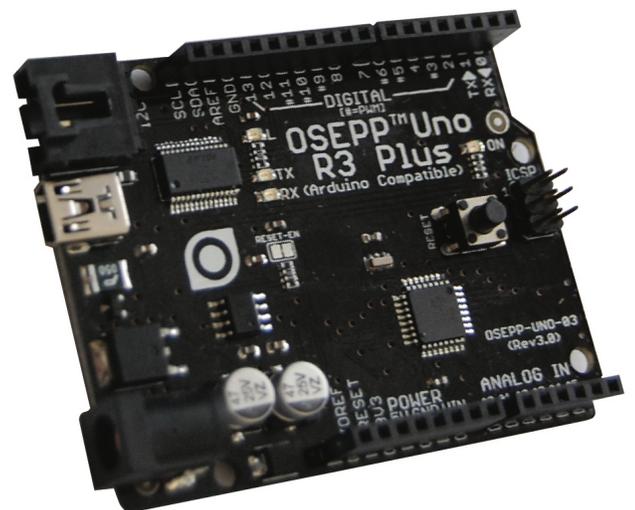


Controller & Motor Driver

TB6612 Motor Shield - drive up to 13v motors! A TVS diode (SMAJ13A) to limit motor interference and a MAX rating of 5 Amps!



OSEPP UNO R3 - Our most popular Arduino compatible microcontroller!



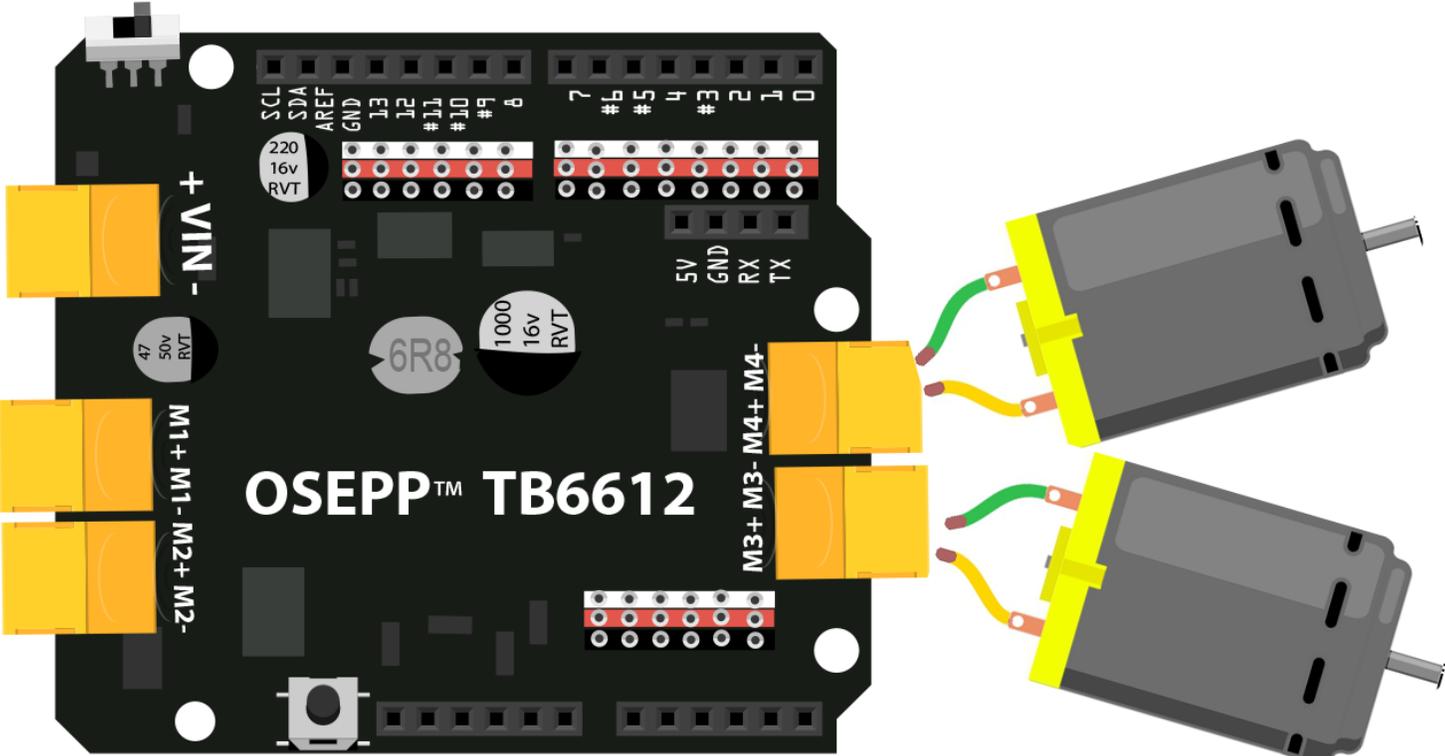
Jumper Wire FF 10cm		20
Jumper Wire FF 15cm		20
Screw M3*8		10
Screw M3*6		10
Screw M1.6*8+Nut M1.6		4
Nut M3		10
Phillips screw driver		1
USB Cable Wire		1
Standoff M3*10		2
Standoff M3*40+6		2

TUTORIALS

The following tutorials show you the most popular and commonly used applications with the parts included in the MECHF-01.

The MECHF-01 kit is 100% compatible with all of the Mechanical Kits. The assembling of MECHF-01 components will vary depending on your Mechanical Kit, but the arrangement should be the same.

The example code takes into account your Mechanical Kits motors attached to TB6612 motor driver pins M3 + M4. If you are having issues, check the code and switch motors to M1 + M2 pins.

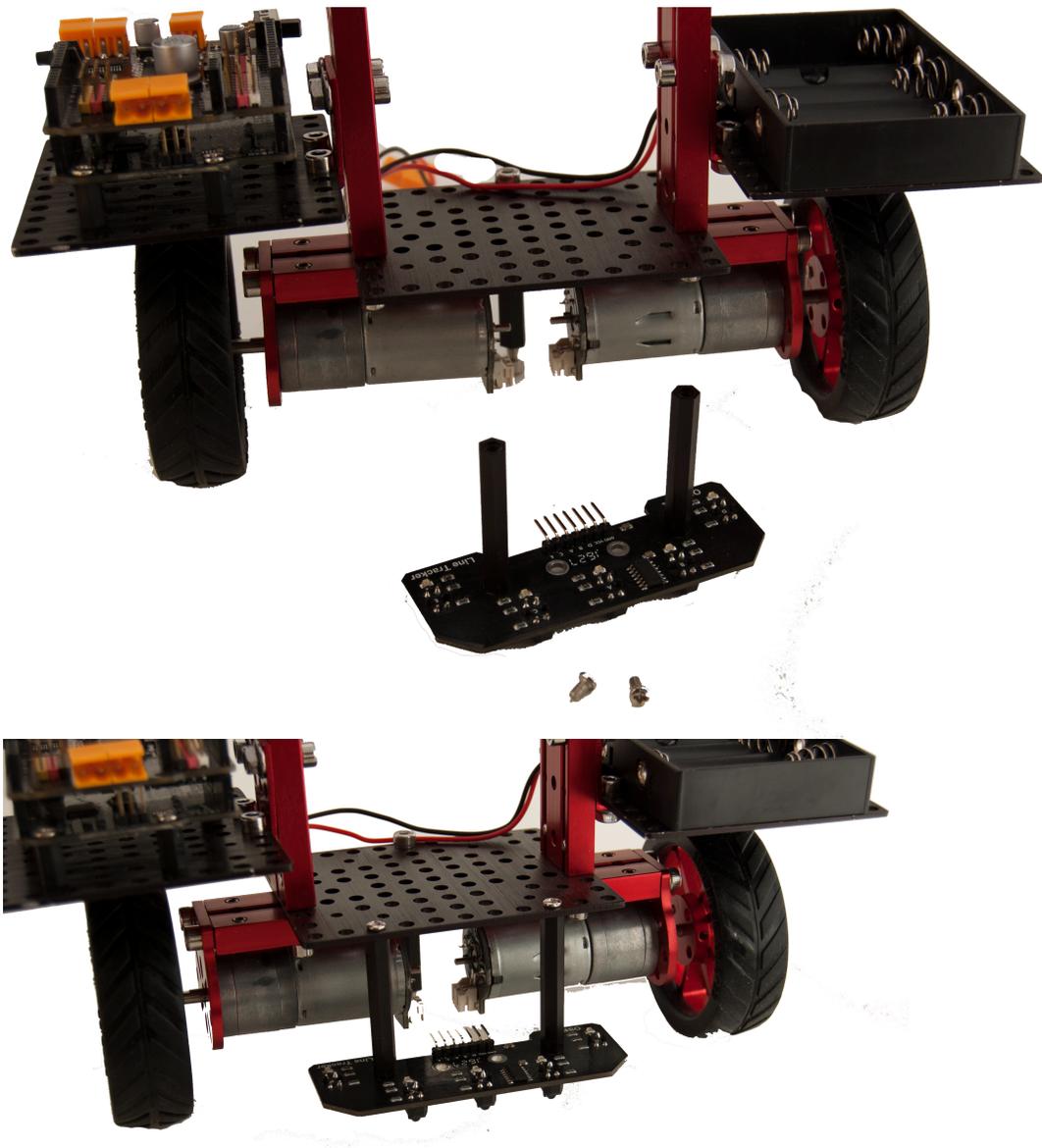


LINE FOLLOWER

In this example, we will have our Mechanical Kit follow a solid black line autonomously.

Parts Needed:

Standoff M3*40+6	 2
Screw M3*8	 2
Screw M3*6	 2
Nut M3	 2
Line Follower	 1



screw in the **M3*8 screws** into the **Line Follower**

Module into the **Standoff M3*40+6**. Make sure the IR Modules are pointing down.

INSTALL EXAMPLES

Depending on your computer system, you will need to download the Arduino software for your OS (Mac, Windows or Linux).

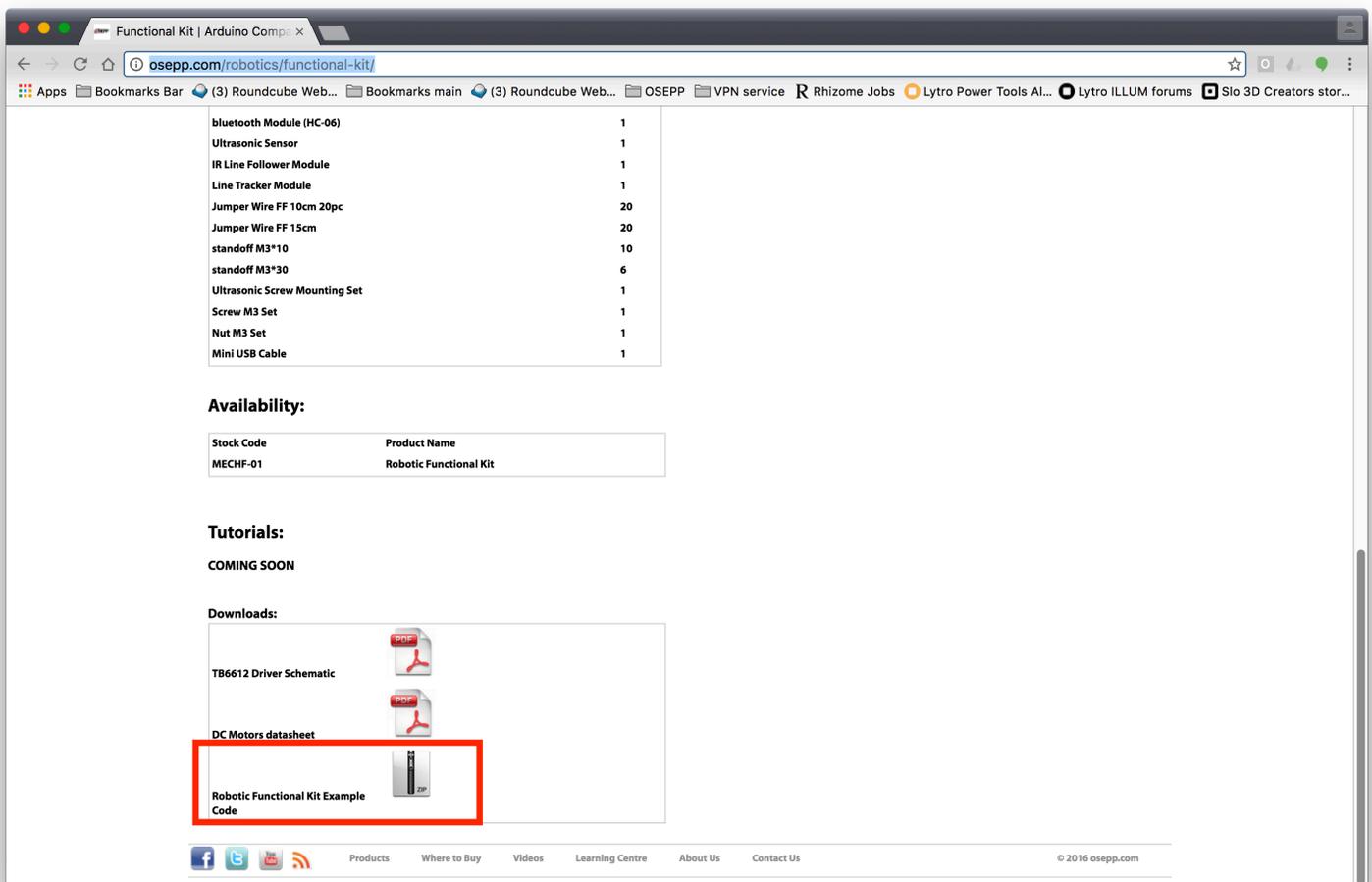
Follow the guides below to install the Arduino software for your OS:

Windows : <http://arduino.cc/en/guide/windows>

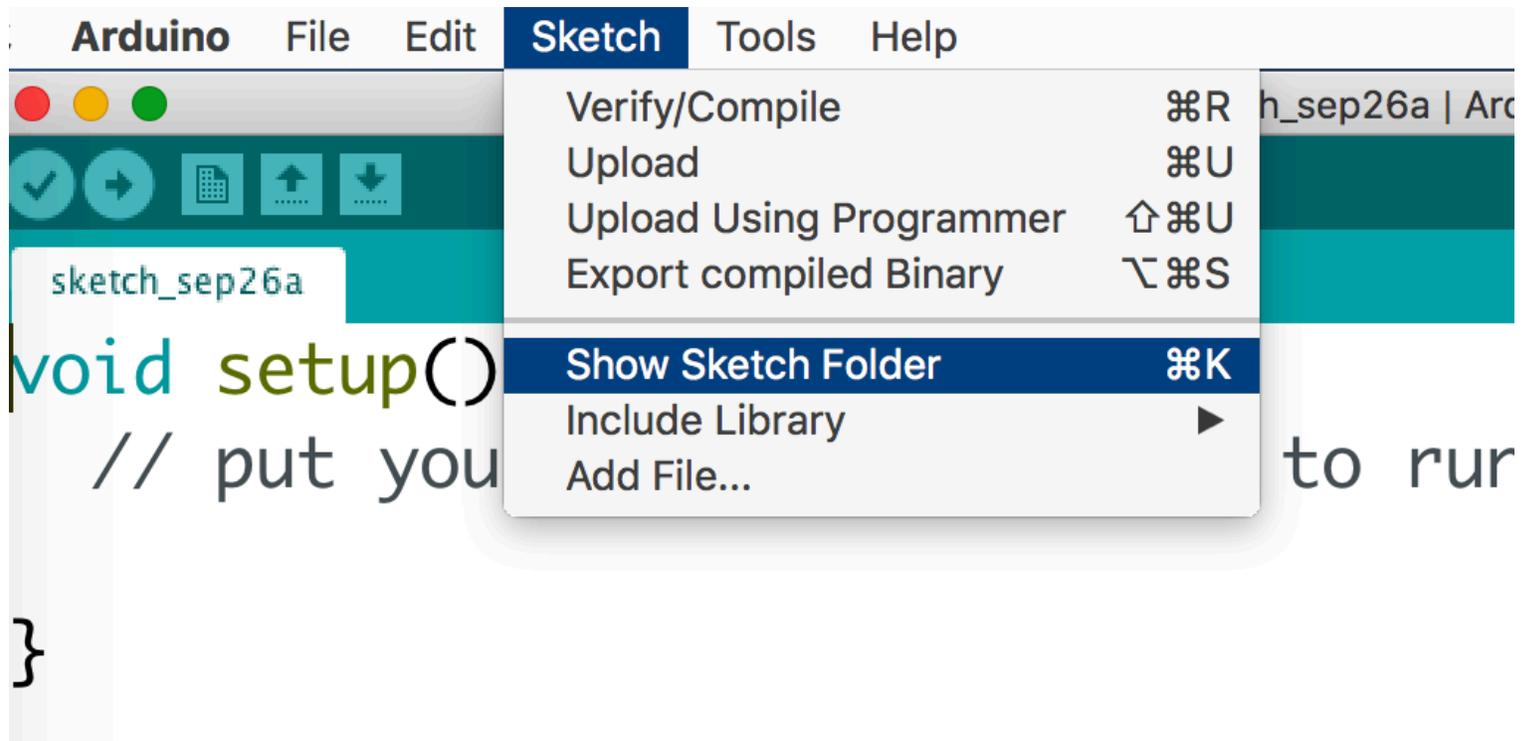
Mac : <http://arduino.cc/en/guide/macOSX>

Linux : <http://playground.arduino.cc/Learning/Linux>

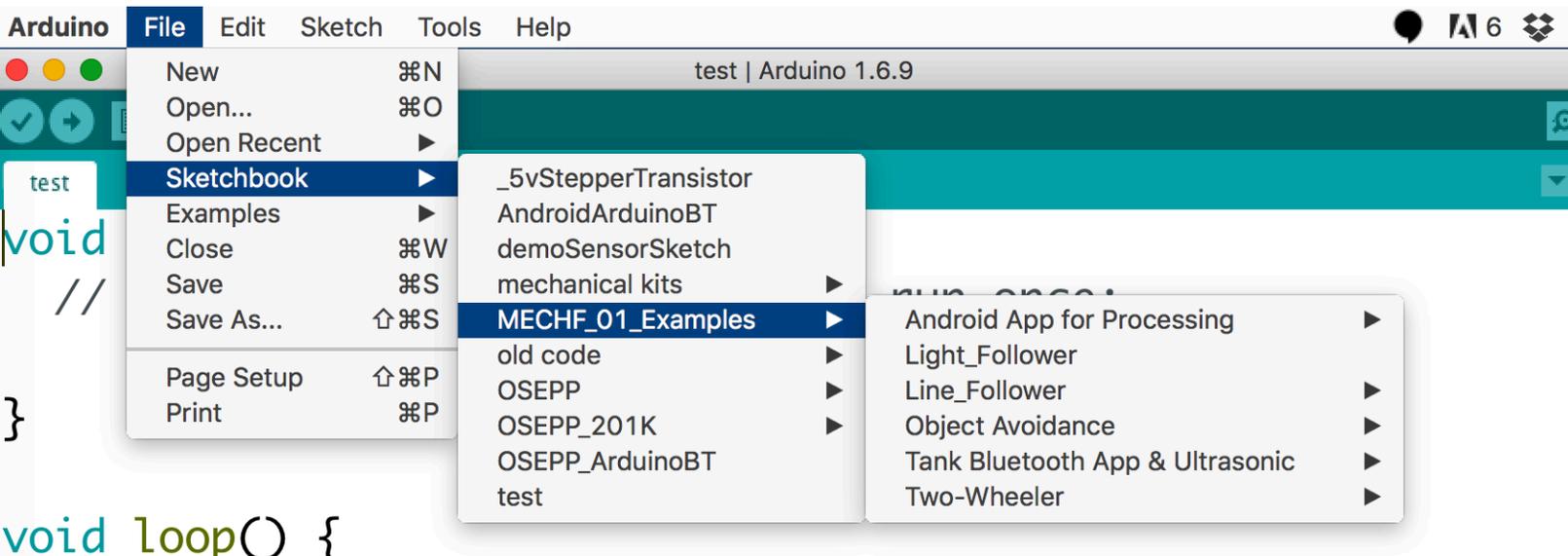
After you install the Arduino software, you will need to download the MECHF-01 Examples from our website:
<http://osepp.com/robotics/functional-kit/>



You will need to unzip the sketches folder and install in your Arduino sketch folder:

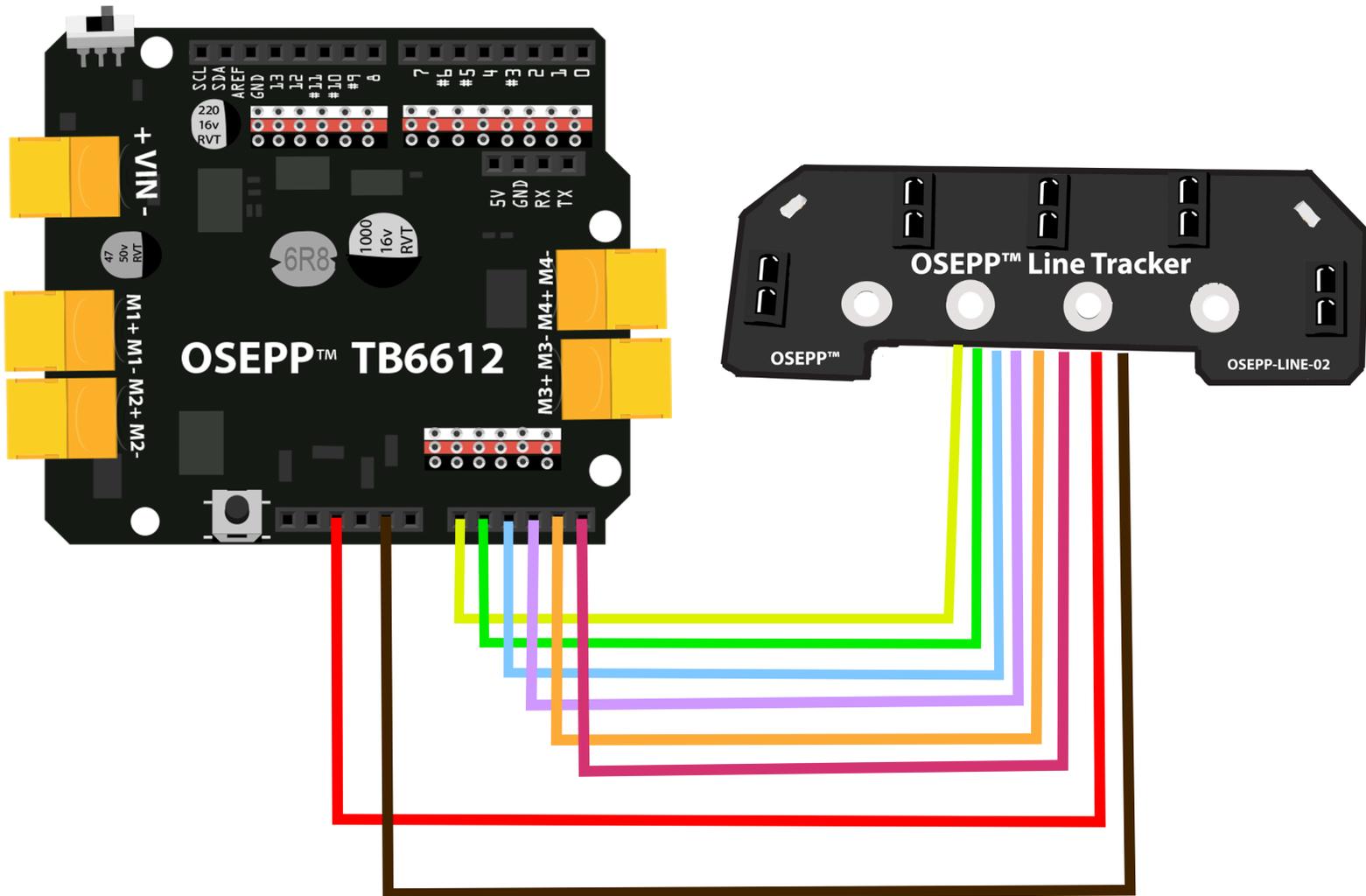


Dropped the unzipped MECHF-01 examples sketch folder into the sketch folder. Quit the Arduino software (completely! force close!) and relaunch. You will see the new MECHF-01 examples in your sketches folder:



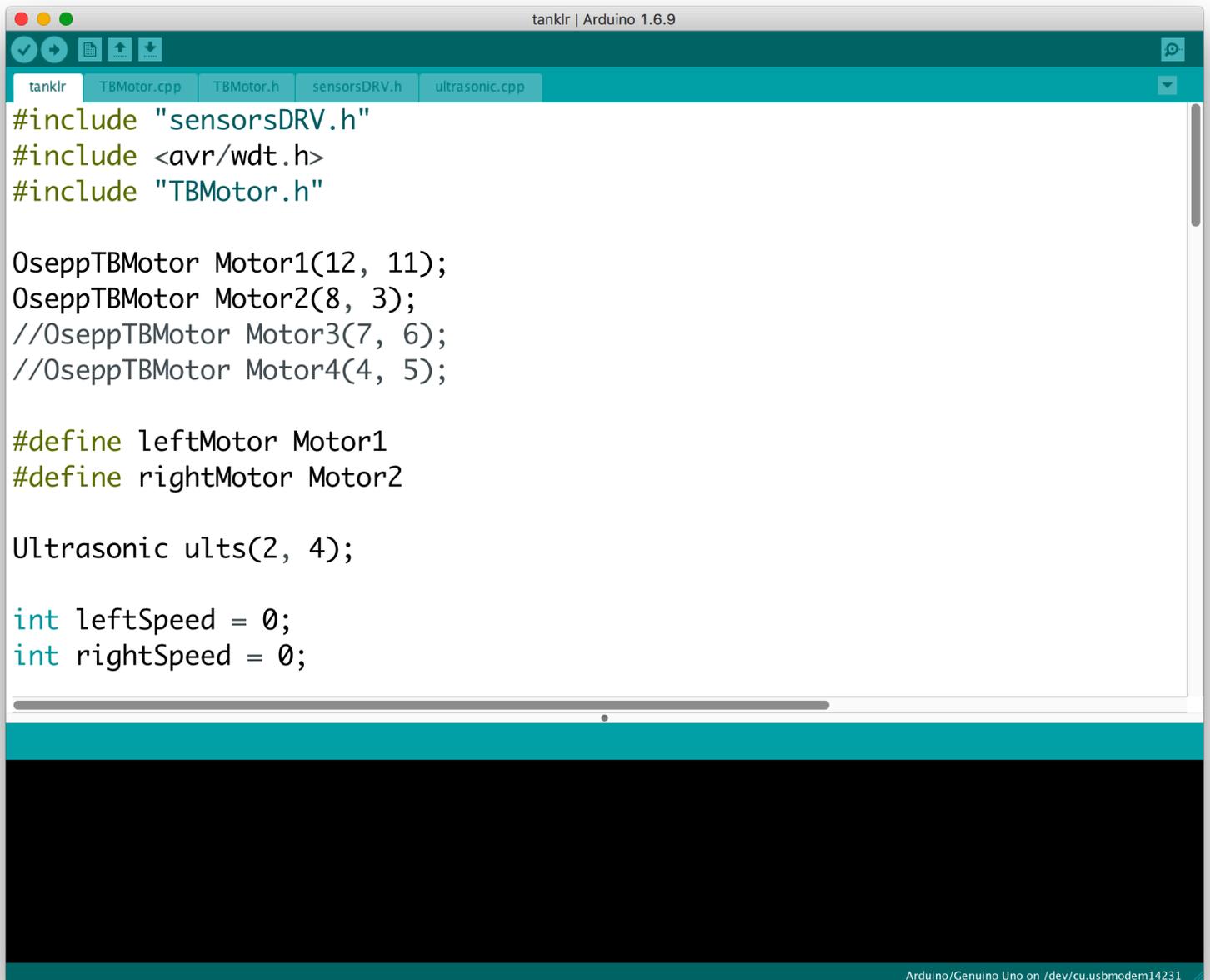
```
void loop() {  
  // put your main code here, to run repeatedly:  
}
```

WIRING



ARDUINO CODE

Navigate to the “Line Follower” example in the sketches folder, then to the advanced folder. Open the “Tanklr” example.

A screenshot of the Arduino IDE interface. The window title is "tanklr | Arduino 1.6.9". The top toolbar shows icons for file operations and a search icon. The tab bar shows "tanklr", "TBMotor.cpp", "TBMotor.h", "sensorsDRV.h", and "ultrasonic.cpp". The main editor area contains the following C++ code:

```
#include "sensorsDRV.h"
#include <avr/wdt.h>
#include "TBMotor.h"

OseppTBMotor Motor1(12, 11);
OseppTBMotor Motor2(8, 3);
//OseppTBMotor Motor3(7, 6);
//OseppTBMotor Motor4(4, 5);

#define leftMotor Motor1
#define rightMotor Motor2

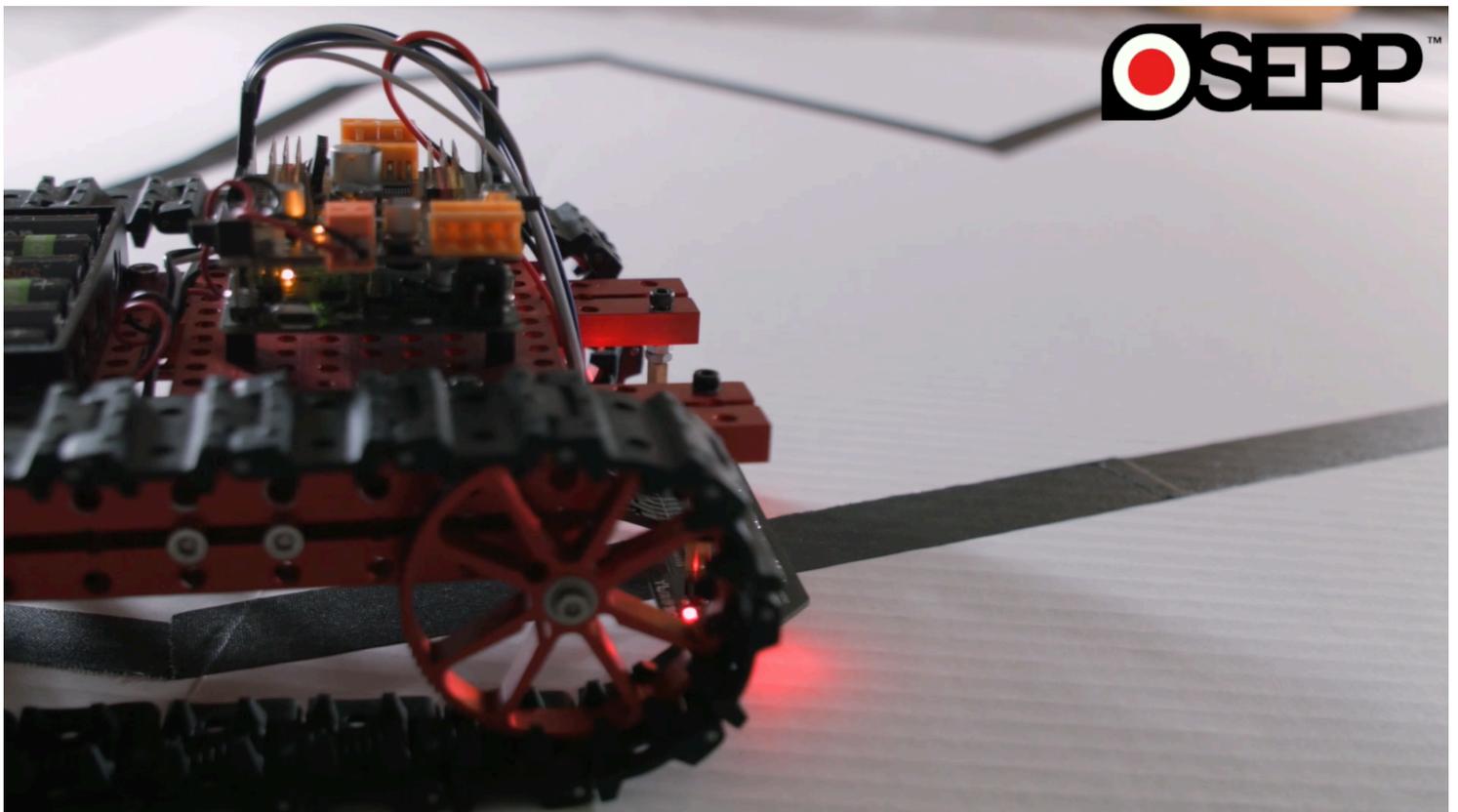
Ultrasonic ults(2, 4);

int leftSpeed = 0;
int rightSpeed = 0;
```

The bottom status bar shows "Arduino/Genuino Uno on /dev/cu.usbmodem14231".

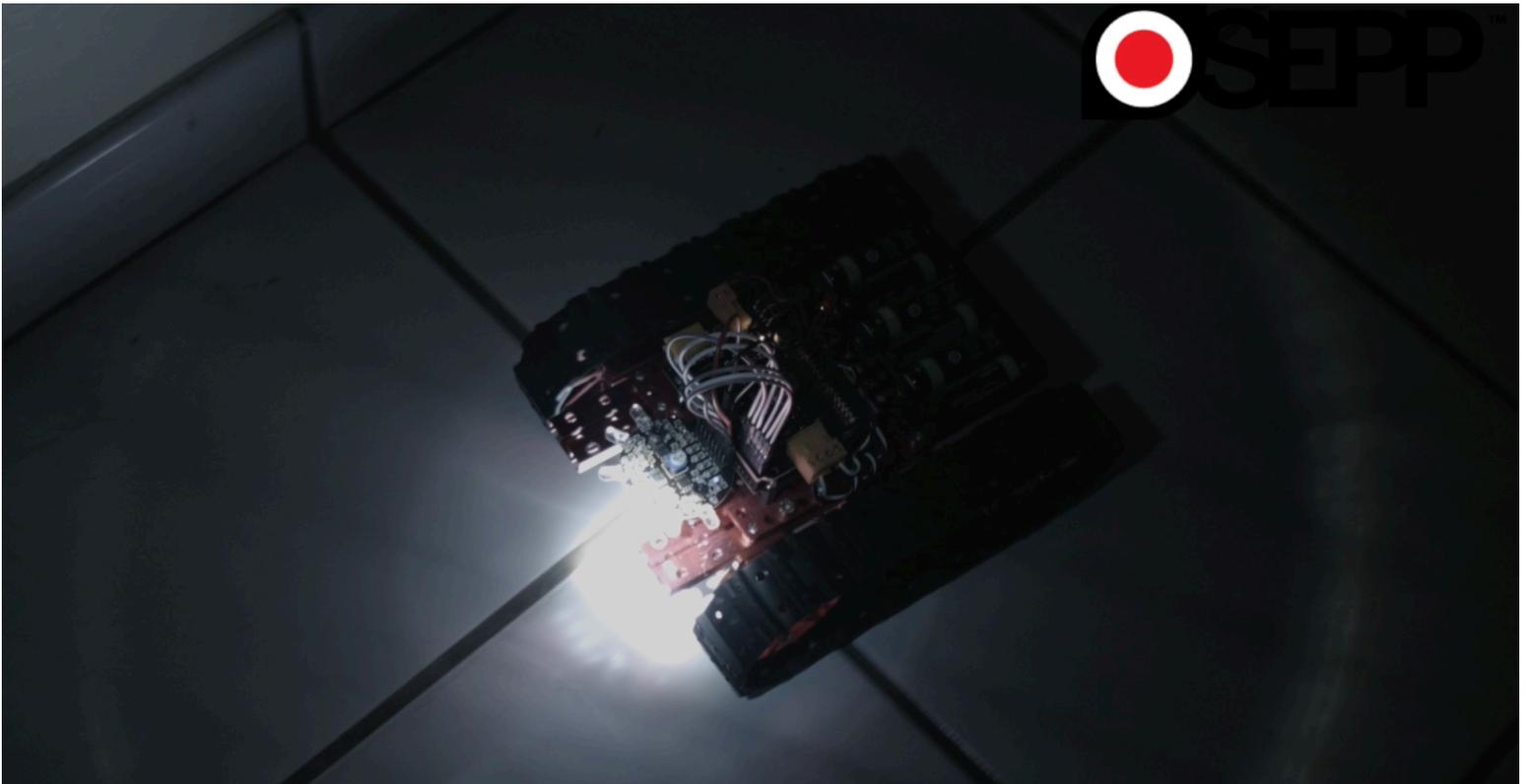
After you press the “upload” button, your Mech Kit will now have Line following capabilities!

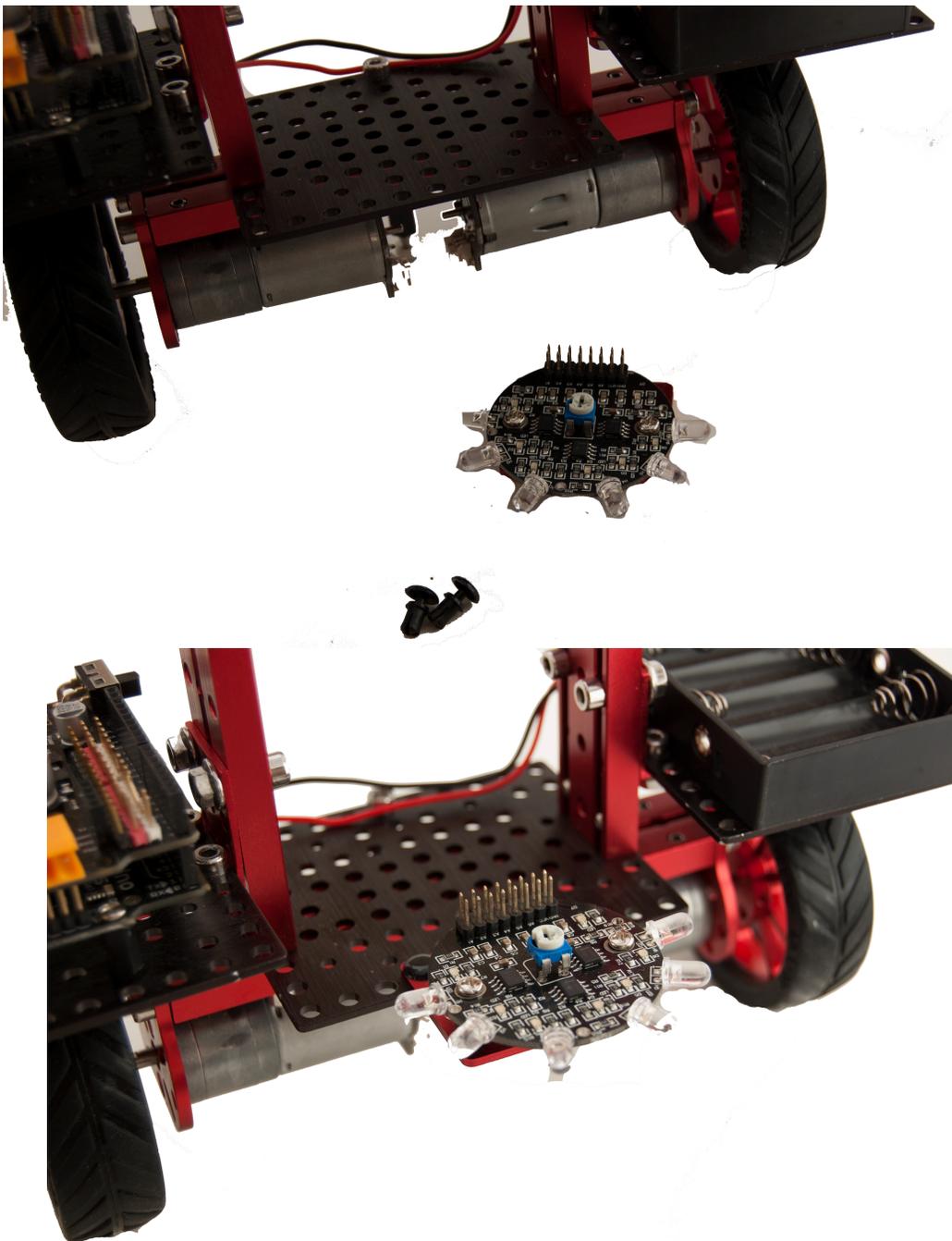
Now we need to build a specific course for our robot to navigate. You **MUST** use black tape on a solid white surface for the robot to register a line:



LIGHT FOLLOWER

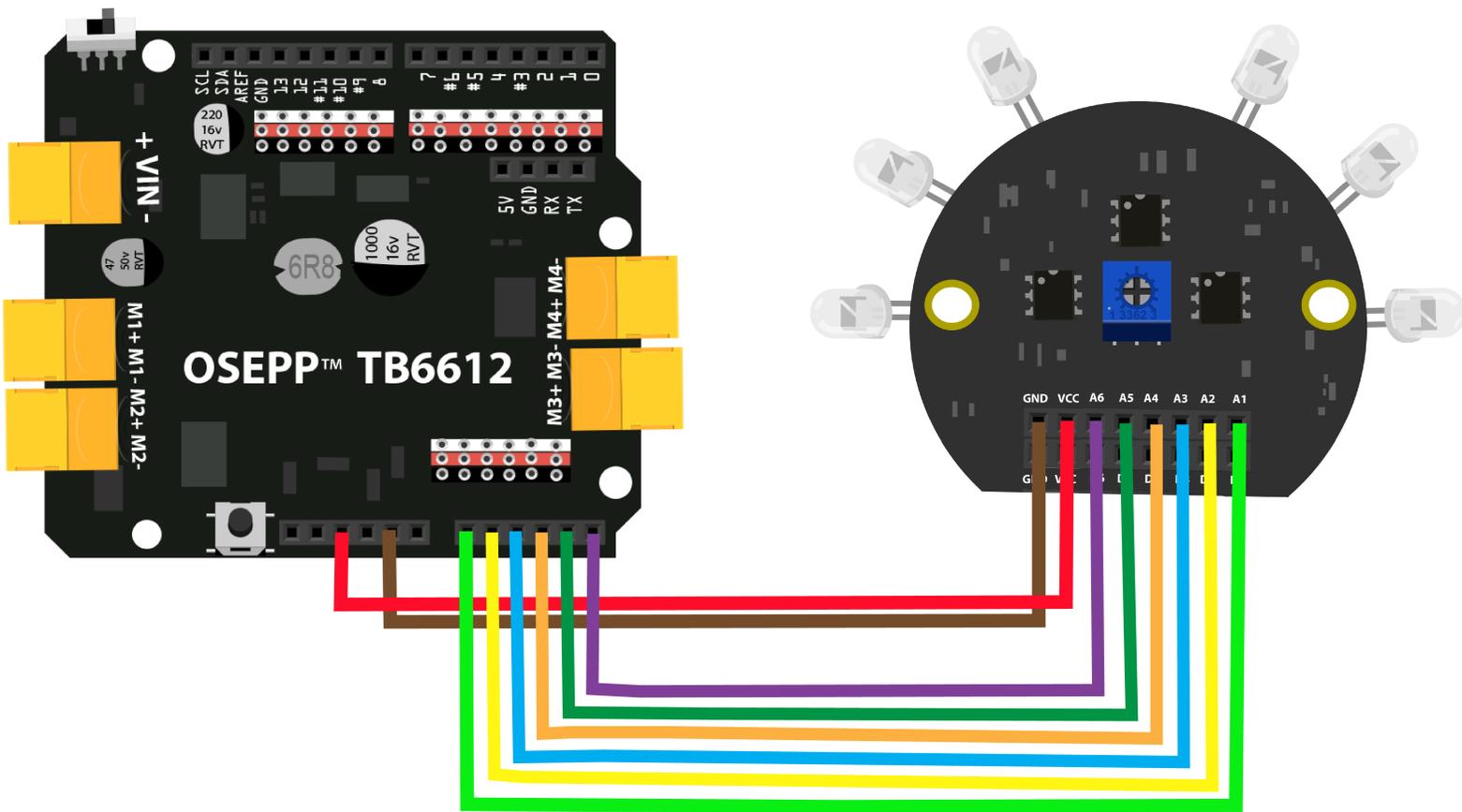
In this tutorial, we will make our Mech Kit robot follow a light source using our Light Follower Module:





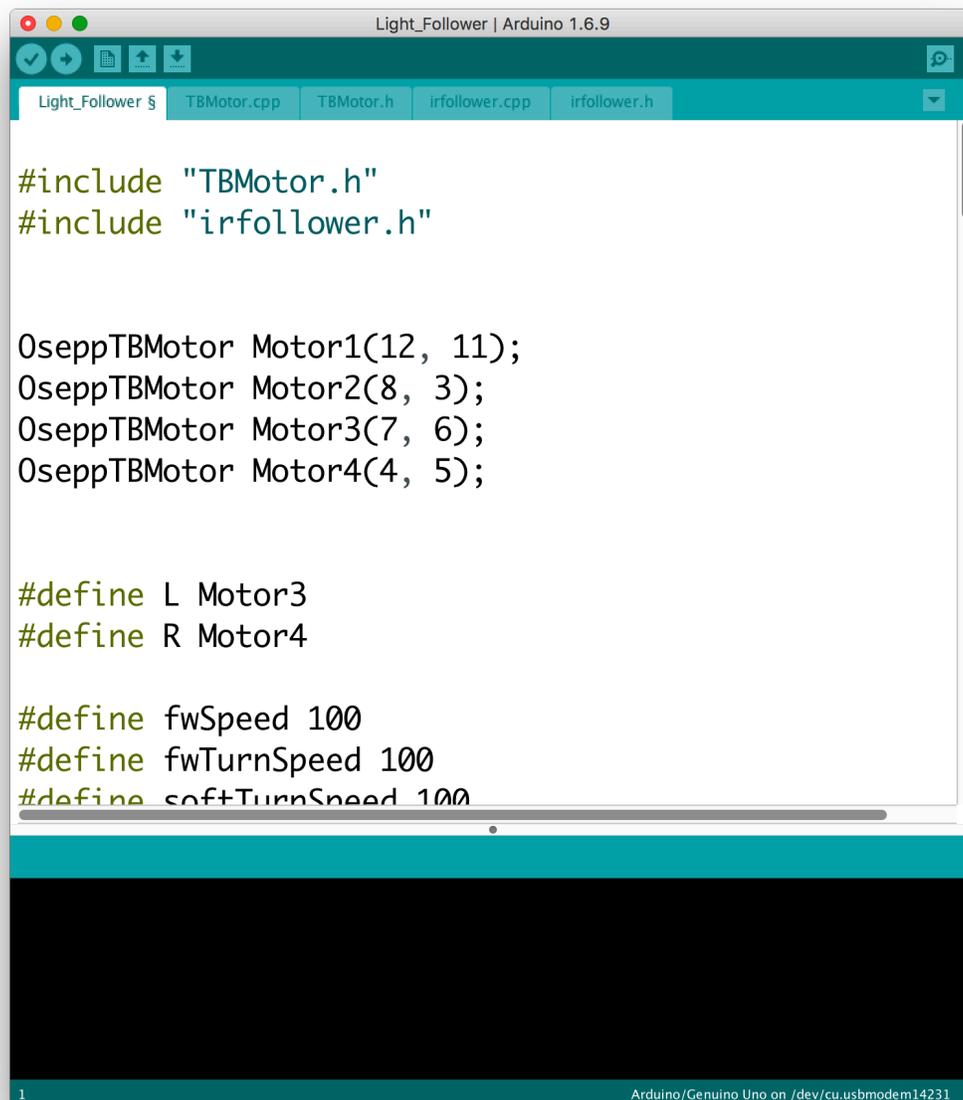
Depending on your Mechanical Kit, you will have a mounting plate/screws to attach the light follower sensor.

WIRING



ARDUINO CODE

You will need to navigate to the folder of examples we installed in Arduino. Open the “Light_Follower.ino” example and upload to your Mechanical Kit. When you point a flashlight at your Mech Kit, it will follow the light.



```
Light_Follower | Arduino 1.6.9
Light_Follower $ TBMotor.cpp TBMotor.h irfollower.cpp irfollower.h

#include "TBMotor.h"
#include "irfollower.h"

OseppTBMotor Motor1(12, 11);
OseppTBMotor Motor2(8, 3);
OseppTBMotor Motor3(7, 6);
OseppTBMotor Motor4(4, 5);

#define L Motor3
#define R Motor4

#define fwSpeed 100
#define fwTurnSpeed 100
#define softTurnSpeed 100
```

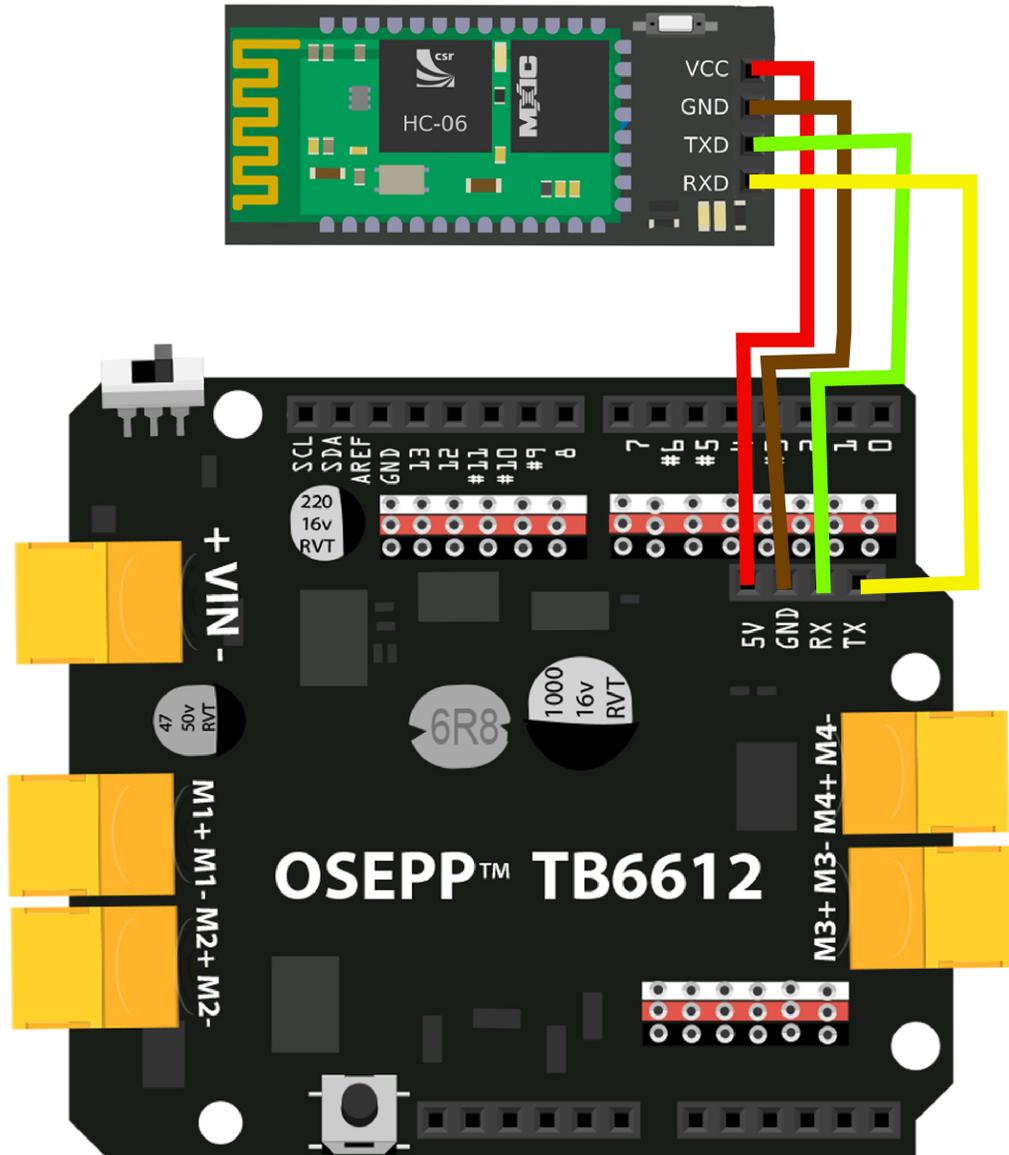
1 Arduino/Genuino Uno on /dev/cu.usbmodem14231

BLUETOOTH APP CONTROLLER

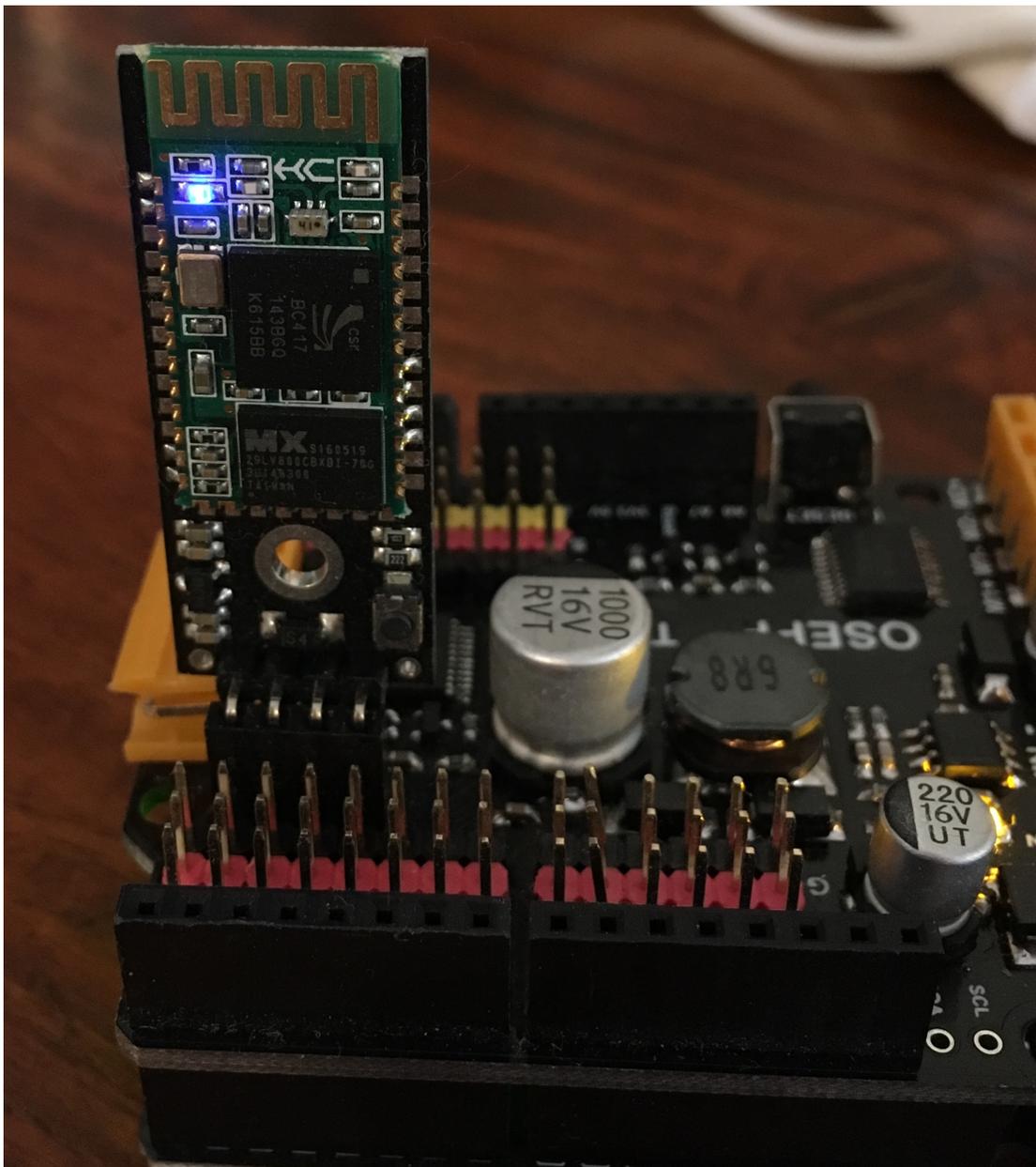
In this tutorial, we are going to control our Mechanical Kits with an Android app through bluetooth.

Parts Needed:

Screw M3*8		10
Bluetooth Module		1

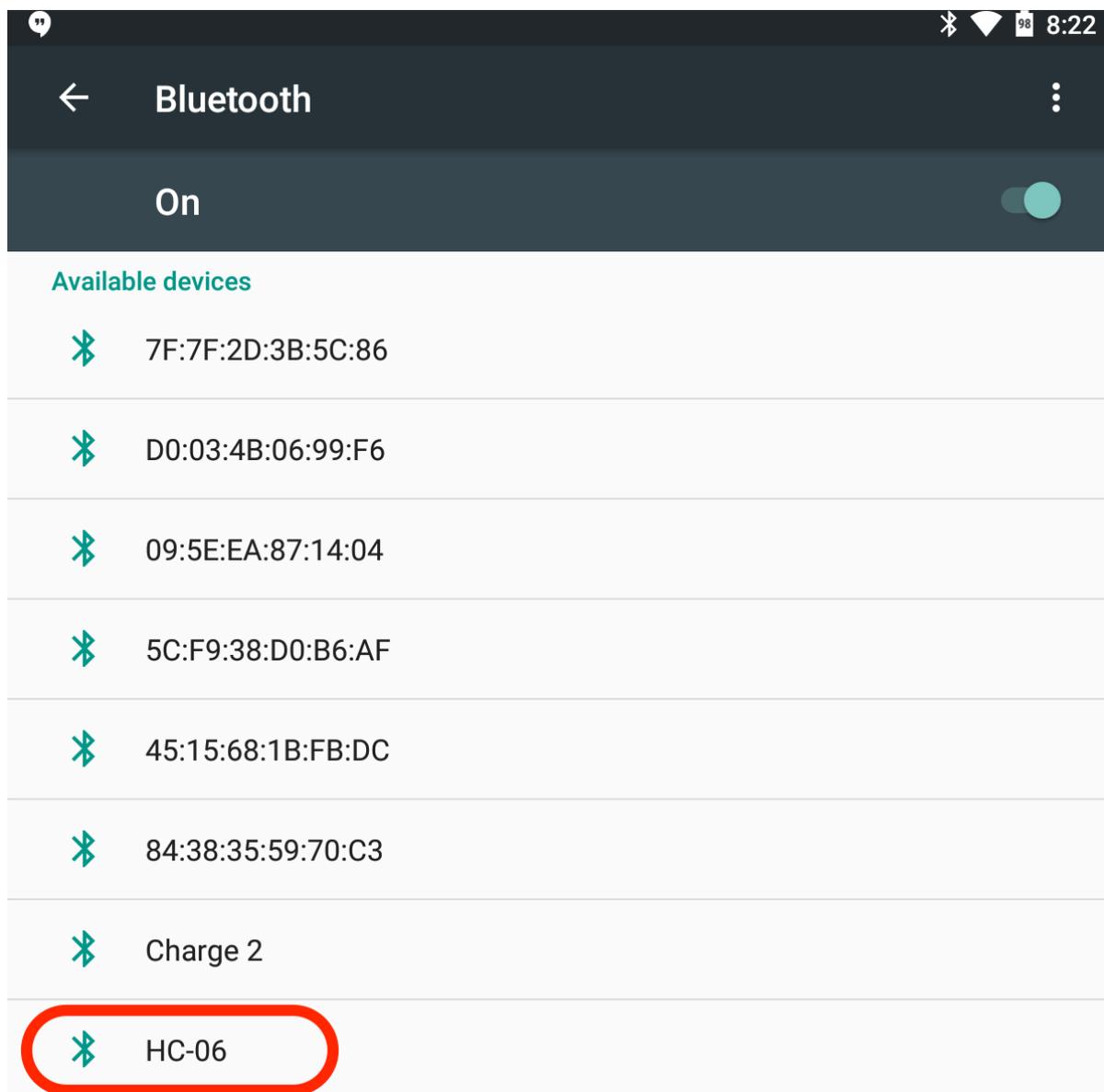


You can directly insert the **Bluetooth Module** into the TB6612 shield. We are on our way to adding Bluetooth control to our Mechanical Kit!

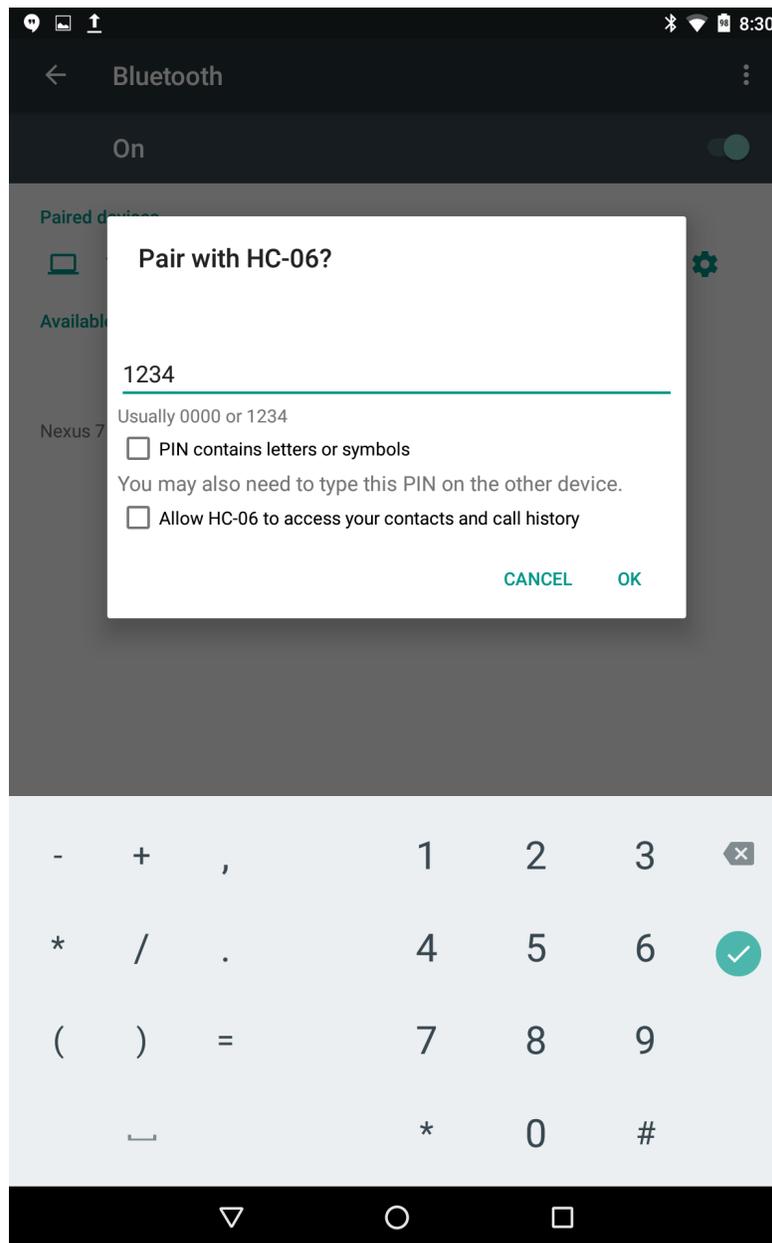


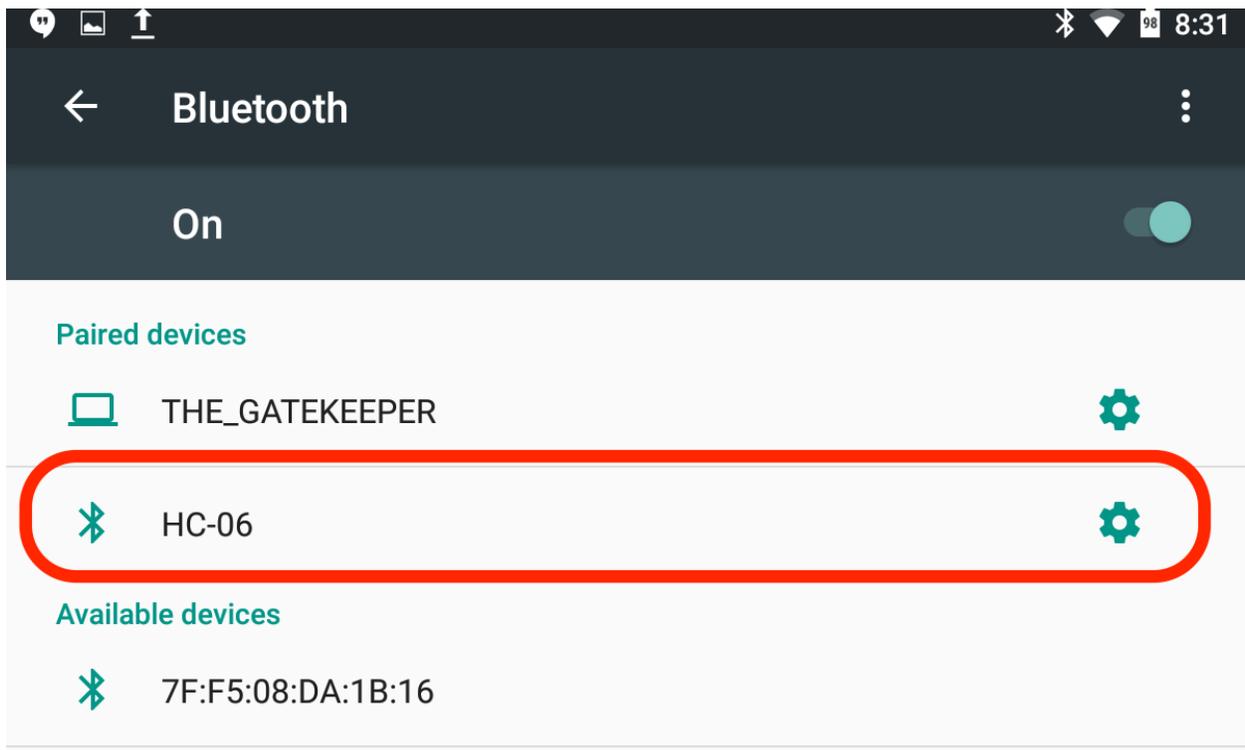
Once you have connected the Bluetooth Module to the TB6612 motor shield, you will see the LED on the Bluetooth Module continuously blink. The BT module is looking for devices close by to pair with. This is what we want. **We need to pair our Android device to our BT Module.**

Navigate to your Android devices settings and enter the bluetooth menu. As your BT module is powered and blinking, you will see “HC-06” as the BT module name pop up in the “available devices”.



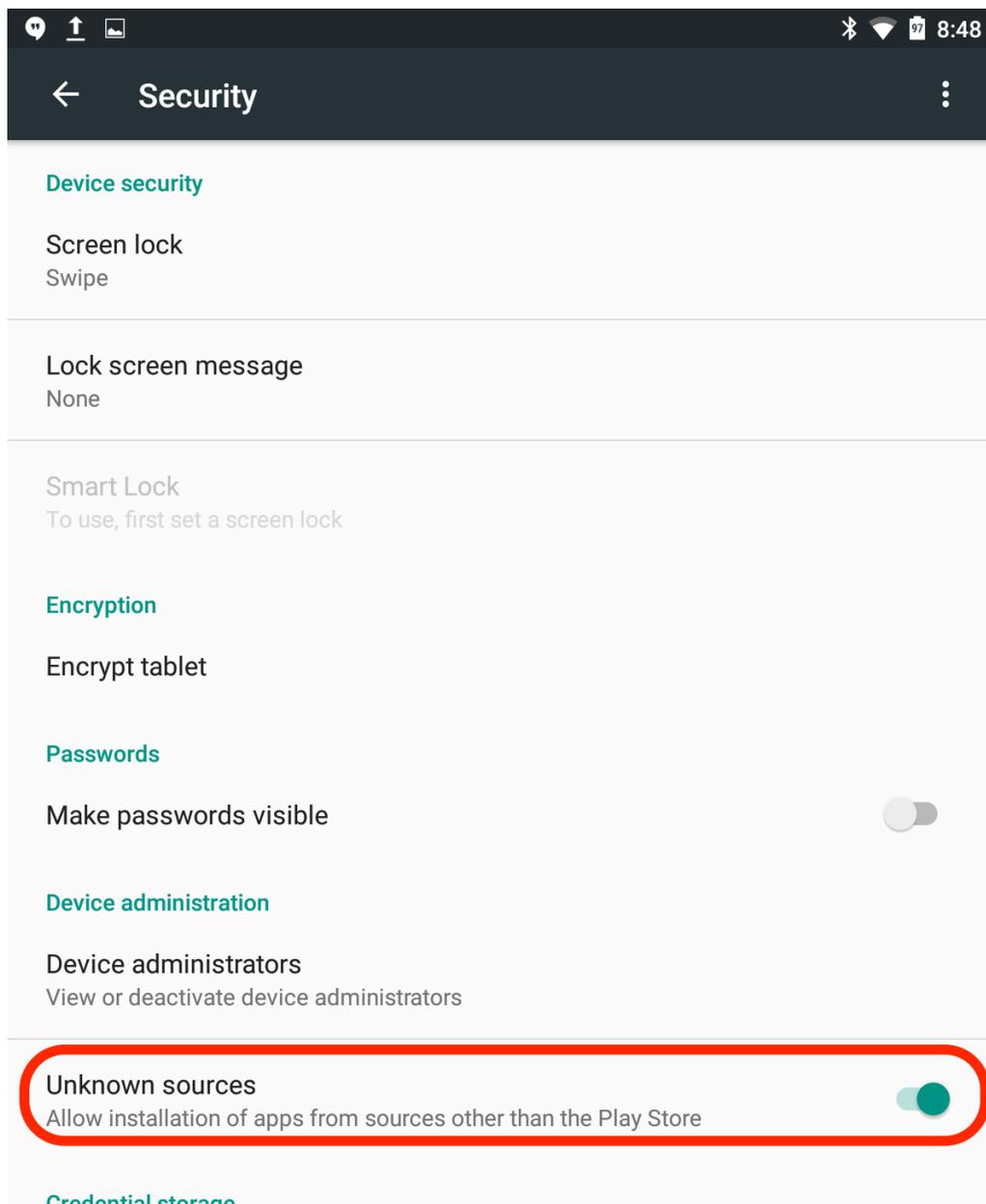
Once selected, you will need to enter the BT module security code. The code is “1234”.



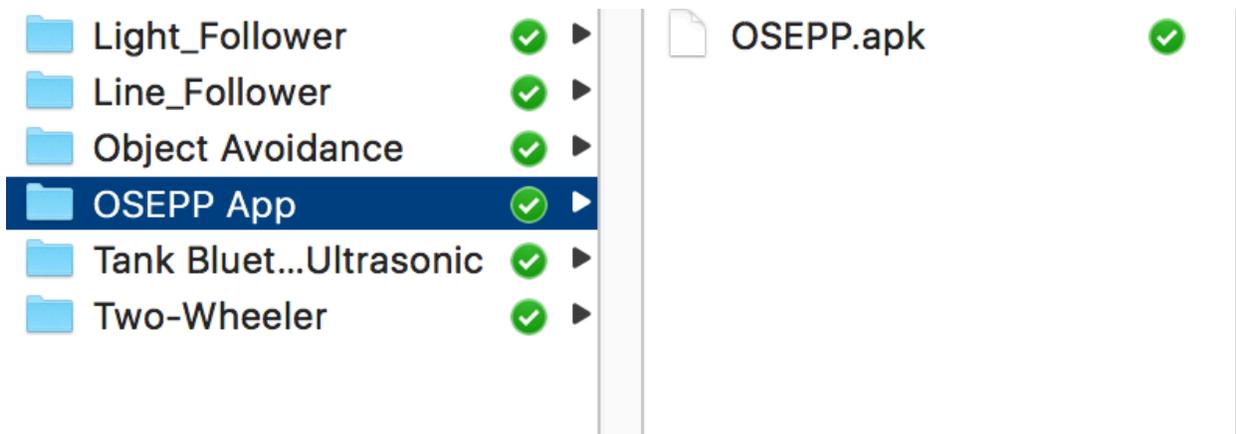


Congratulations! You have now paired your BT Module to your Android App! We are on our way to controlling our Mech Kit with a Bluetooth App.

Since our app is not in the Google Play store, we are an “unknown developer”. You need to allow unknown apps to be installed on your device. Navigate to the settings > security to allow unknown sources:



Next, you will need to transfer the .APK Android file that came with the MECHF-01 examples to your Android device:



****NOTE:** The App we have developed supports **Android 5.1.1 (API level 22)** and above.

Some Android users can open our APK file without any issues. If you do run into issues, we suggest downloading the .apk install program, “installer” (or a range of others that do the same thing):



Installer - Install APK



Rhythm Software

E Everyone

UNINSTALL

OPEN



Downloads



11,417



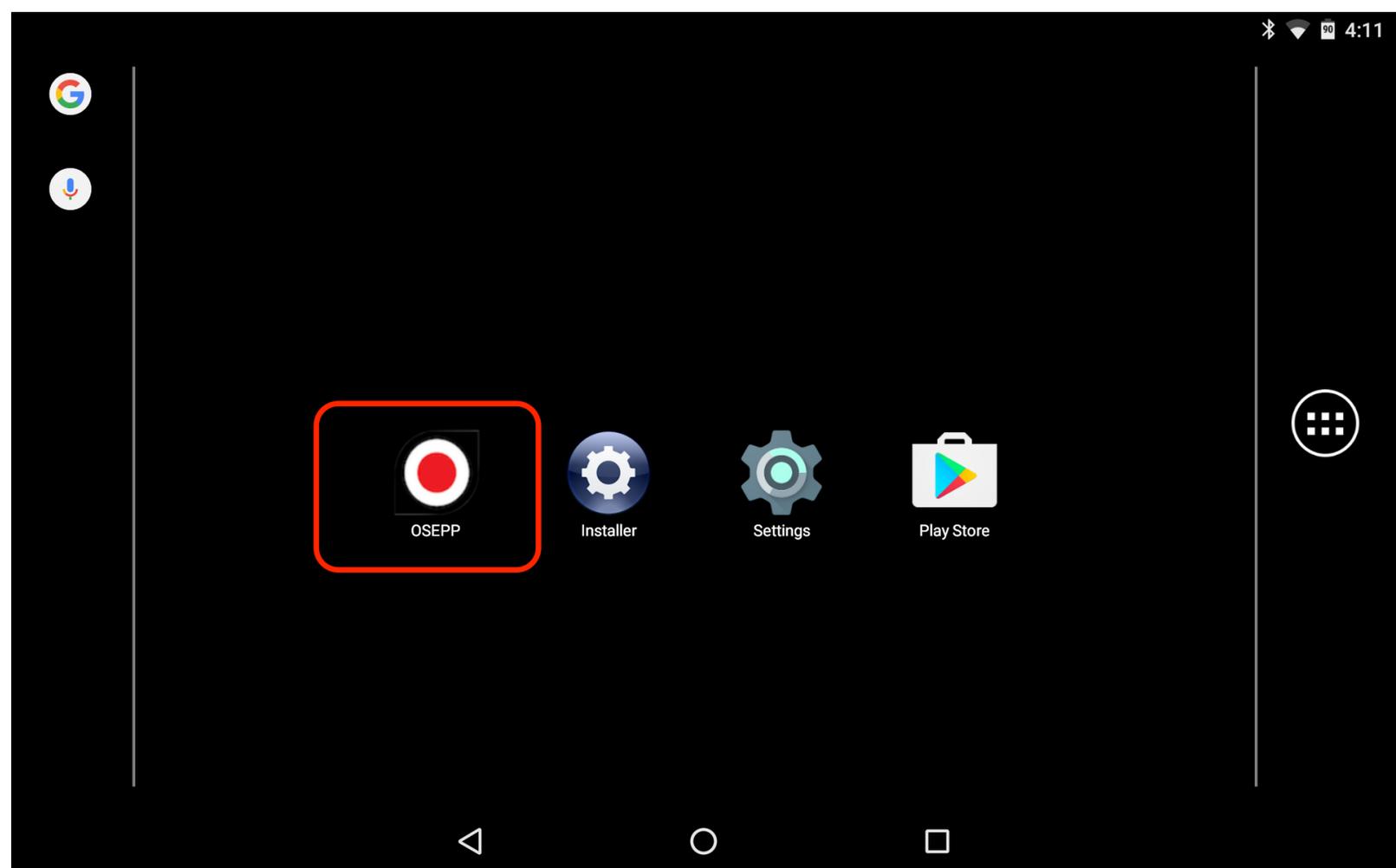
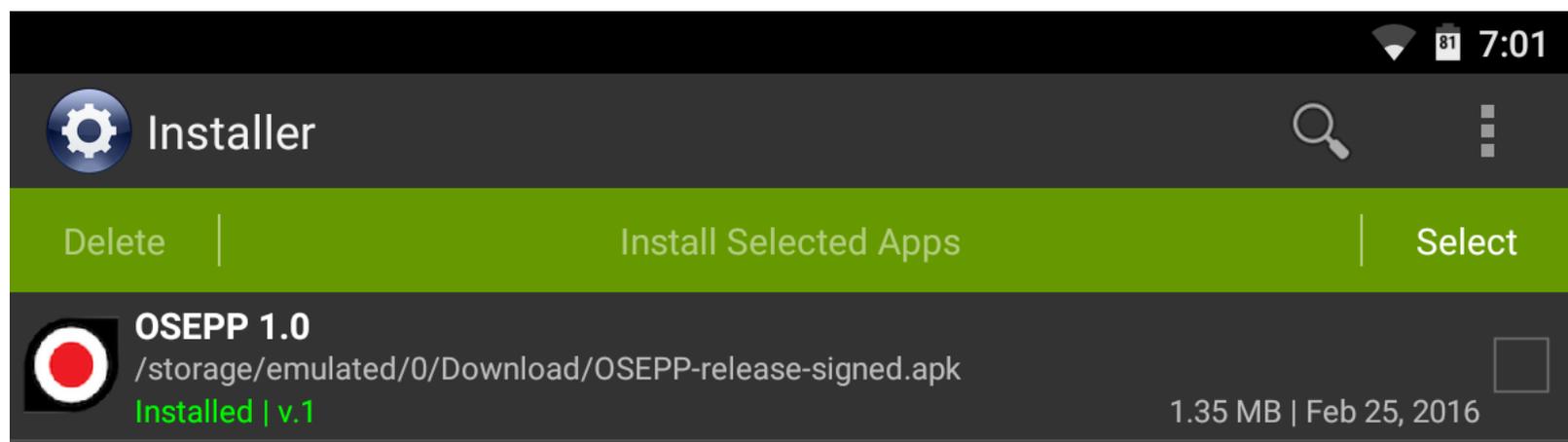
Productivity



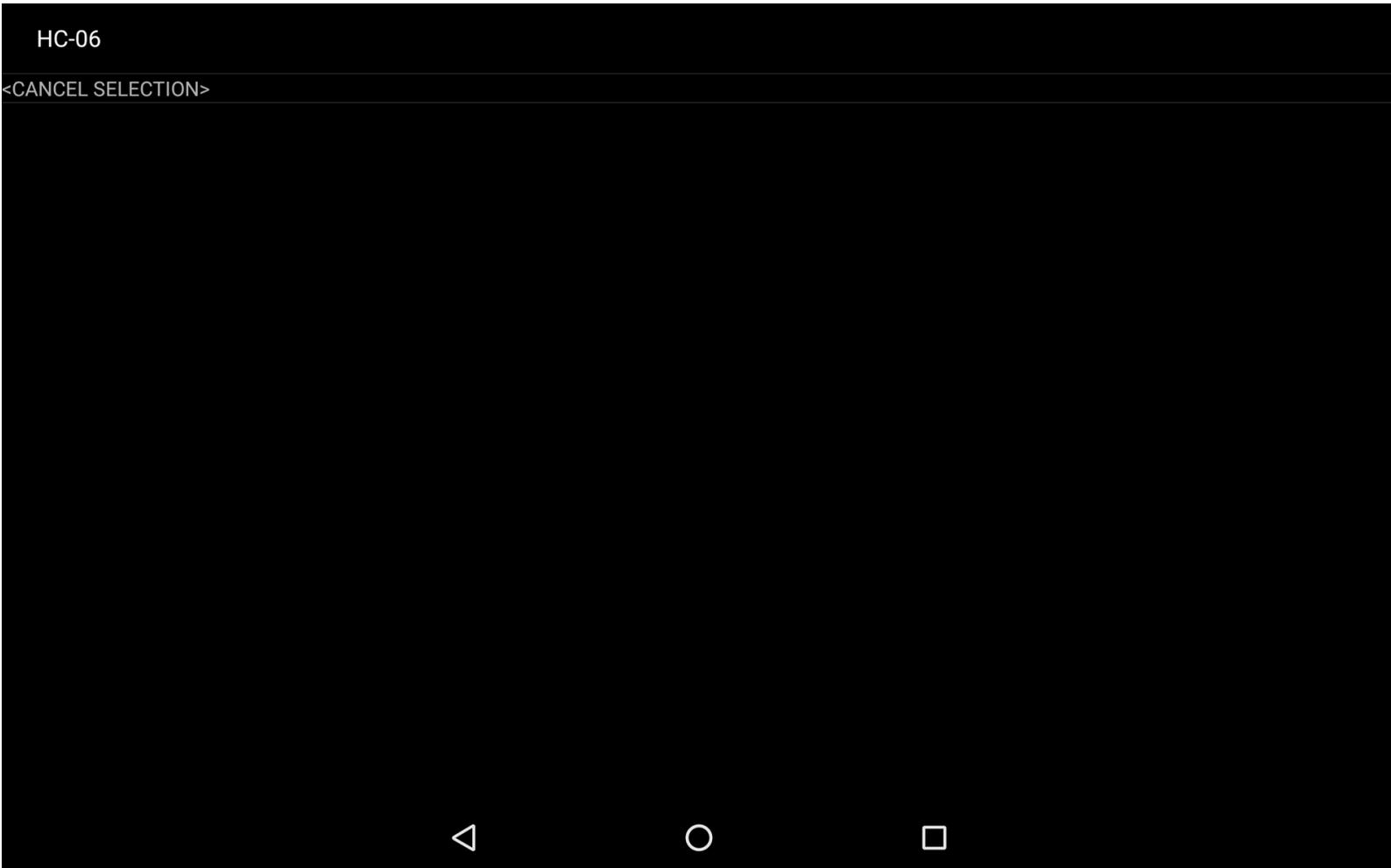
Similar

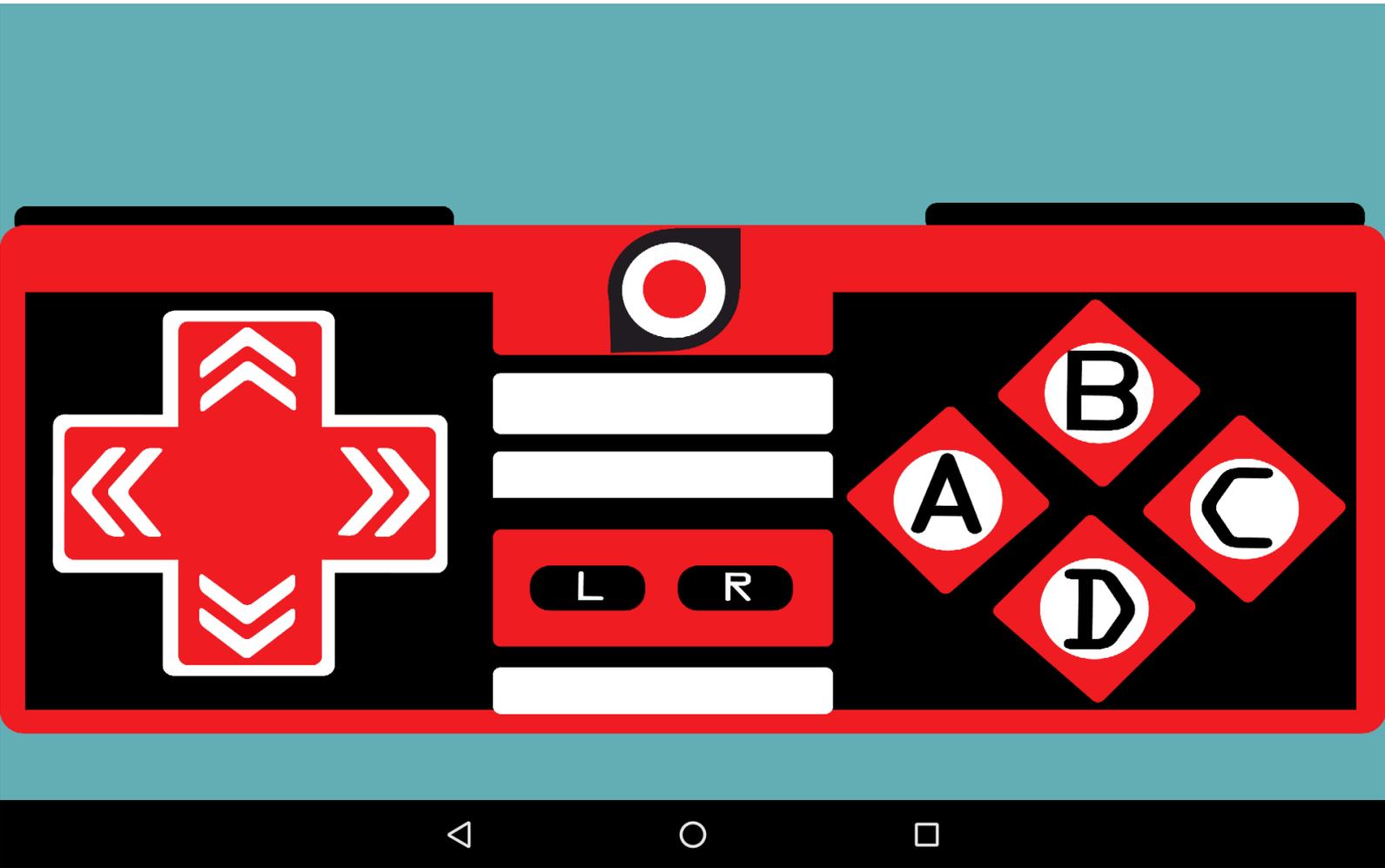
Tiny and full featured installer, easily manage APK files on your device!

Open the App and select our OSEPP.apk App to install :



After install, Open our App. It will present you with a screen to select which bluetooth device you want to pair with. Select "HC-06".

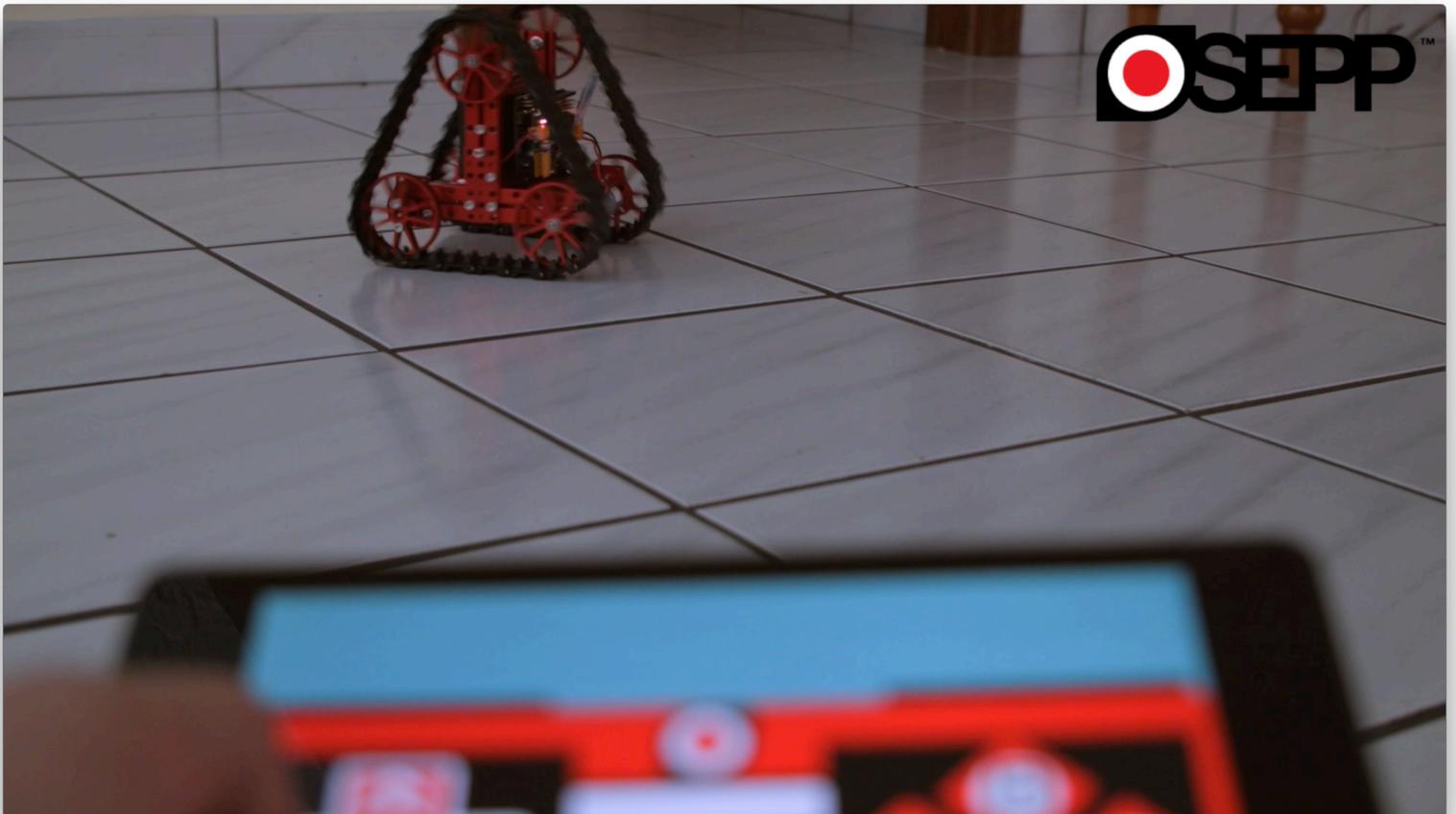




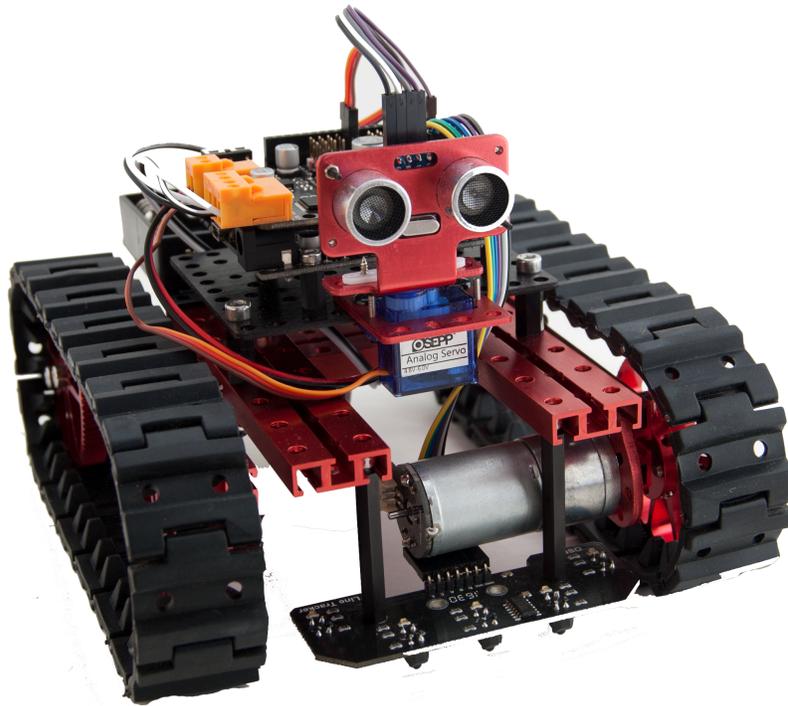
Congrats ! you have launched the BT app! We have an issue though... we need to upload the appropriate code to our Arduino Uno board. Navigate to our examples and upload the “tankBT1” example.



After you have uploaded the code, quit the Android app and relaunch. You will now be able to control any of our Mechanical Kits with the BT module from our MECHF-01 kit!



OBJECT AVOIDANCE



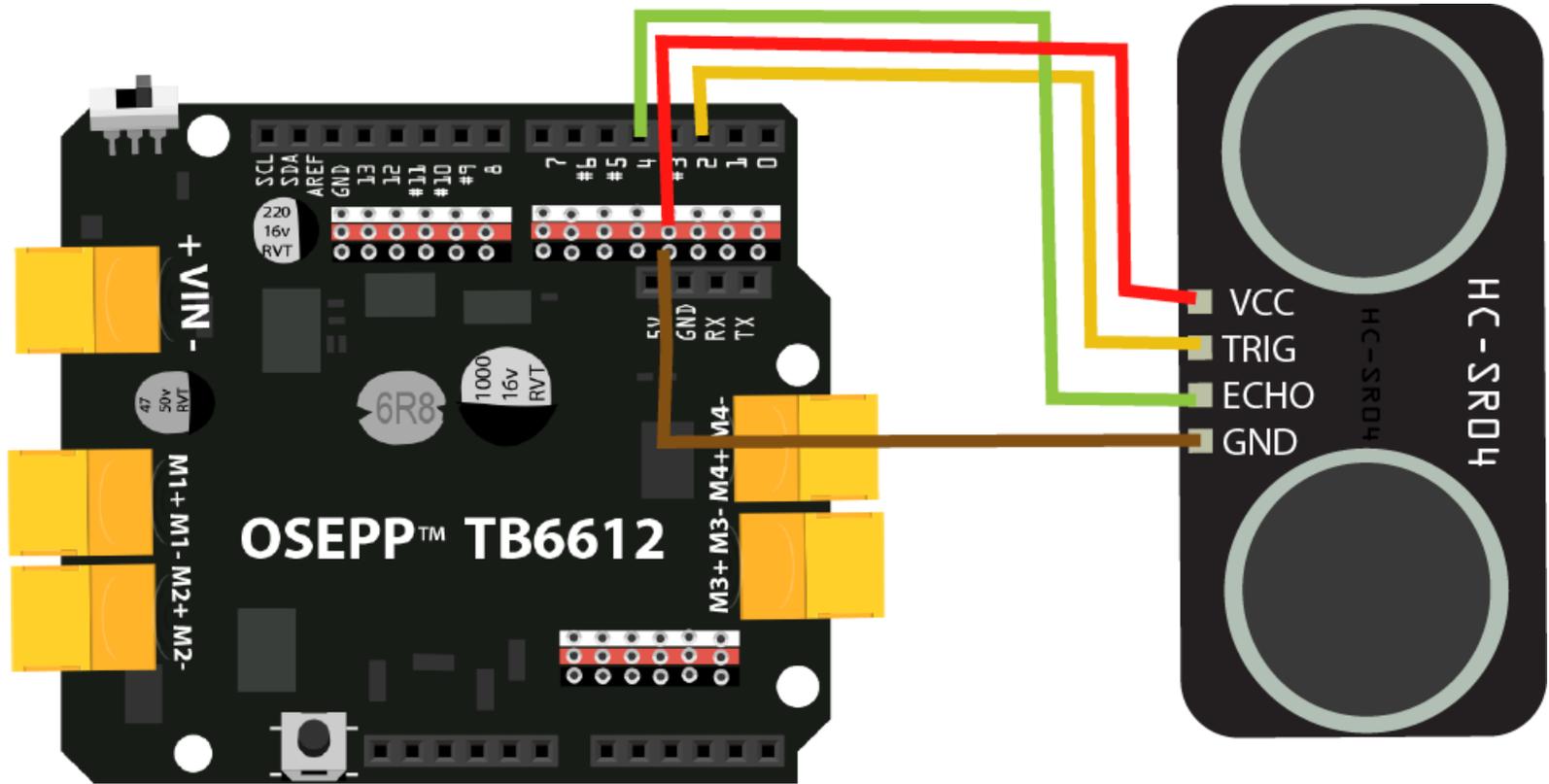
in this tutorial, we will create an autonomous robot that is able to navigate itself.

Parts Needed:

 <p>Ultrasonic Sensor</p>	1
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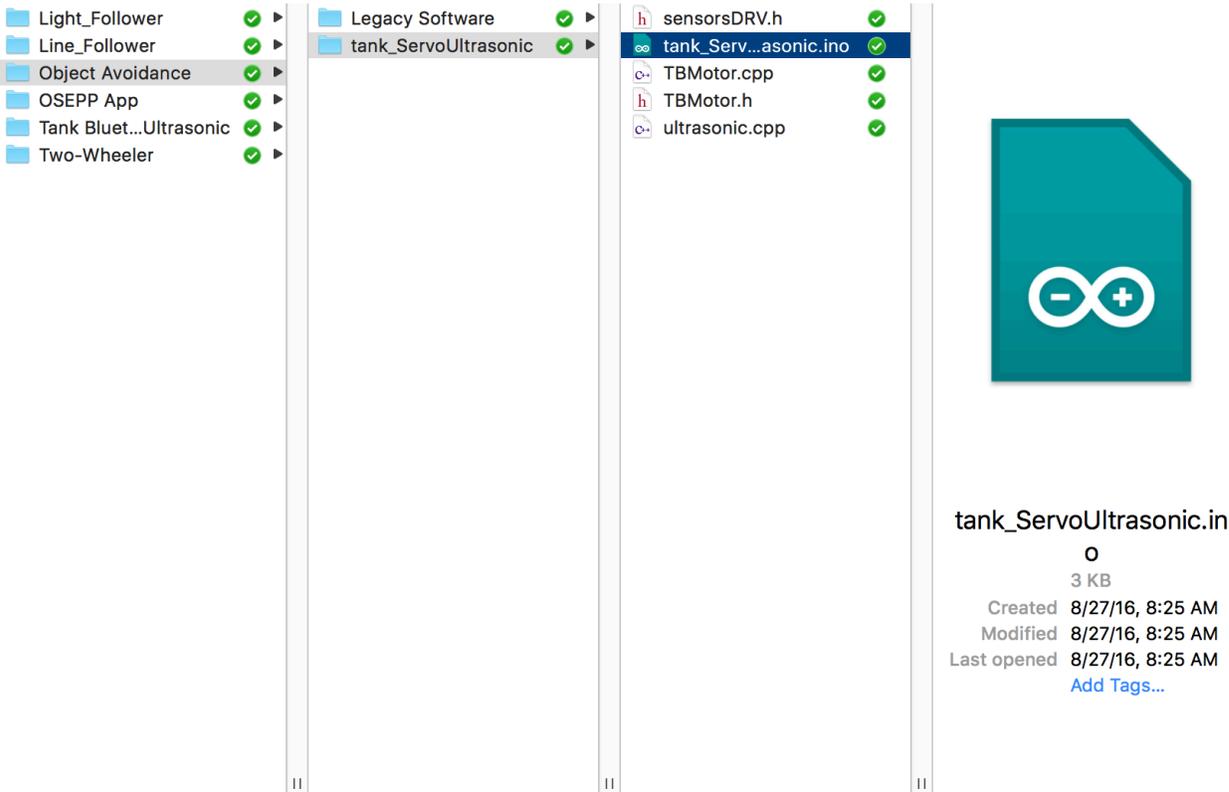
Depending on your Mechanical Kit, you will have all the hardware to mount the Ultrasonic sensor to the bot.

WIRING



INSTALL EXAMPLES

Navigate to the OSEPP example, “tank_ServoUltrasonic.ino”:





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