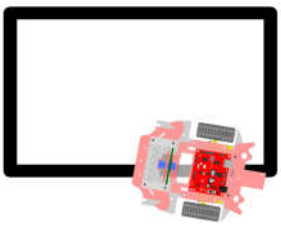
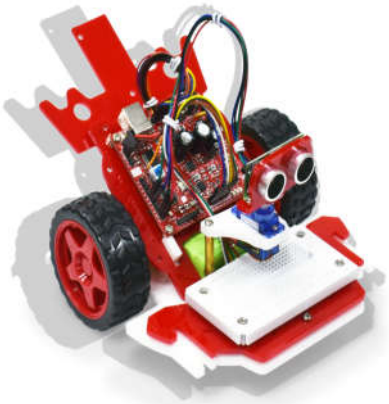
P-BOT JUNIOR rev2.0

AN ENTRY LEVEL MOBILE ROBOT



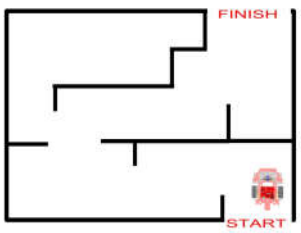
JUNIOR Line Follower

AN ENTRY LEVEL MOBILE ROBOT



JUNIOR Sumo

WITH LINE AVOIDANCE

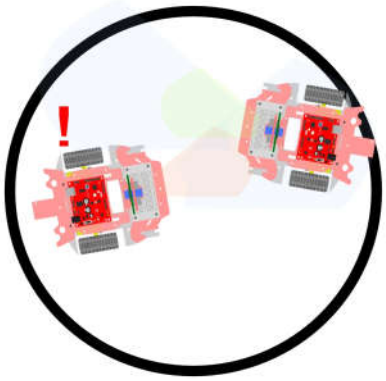


JUNIOR Maze

SOLVING THE OBSTACLES

JUNIOR Bluetooth Controlled

BLUETOOTH WIRELESS CONTROLLED



JUNIOR PS2 Controlled

UHF WIRELESS CONTROLLED

e-Gizmo PBOT Junior rev2 is a type of mobile robot that is so affortable price. It was developed to be more lightweight and easy to use. It is adapted to the version of PBOT rev1 & 2. This board is an all in one Mobile Robot board with on board IC ATmega168 MCU (16KB Flash memory and A3966 dual full-bridge PWM Motor driver. Directly upload using the USB cable from Computer to the PBOT junior board.

FEATURES:

- Built-in IC ATMEGA168 with 16KB Flash Memory.
- Programmable MCU inside
- With A3966 dual full-bridge PWM Motor driver.
- Directly upload using the USB cable.
- With Optional HC-05 Bluetooth module and UHF Wireless controlled available.

GENERAL SPECIFICATIONS:

Power Input: *7 to 9VDC*
External Input: *9 to 10VDC Adaptor Charger*
On Board Peripherals:
- 2CH DC Motor Driver 6V 1.5A
- 3CH IR Line Sensor CNY70 sensor, 10mm range.
PCB Dimensions: *62mmx67mm.*

Weight	*Name*	*Height/Vertical Clearance*
0.566 kg	*w/HC-05 BT*	*10.5 cm*
0.558 kg	*Standard*	*10.5 cm*
0.613 kg	*w/ EGRA*	*21.5 cm*
0.362 kg	*Chassis Only*	*10.5 cm*

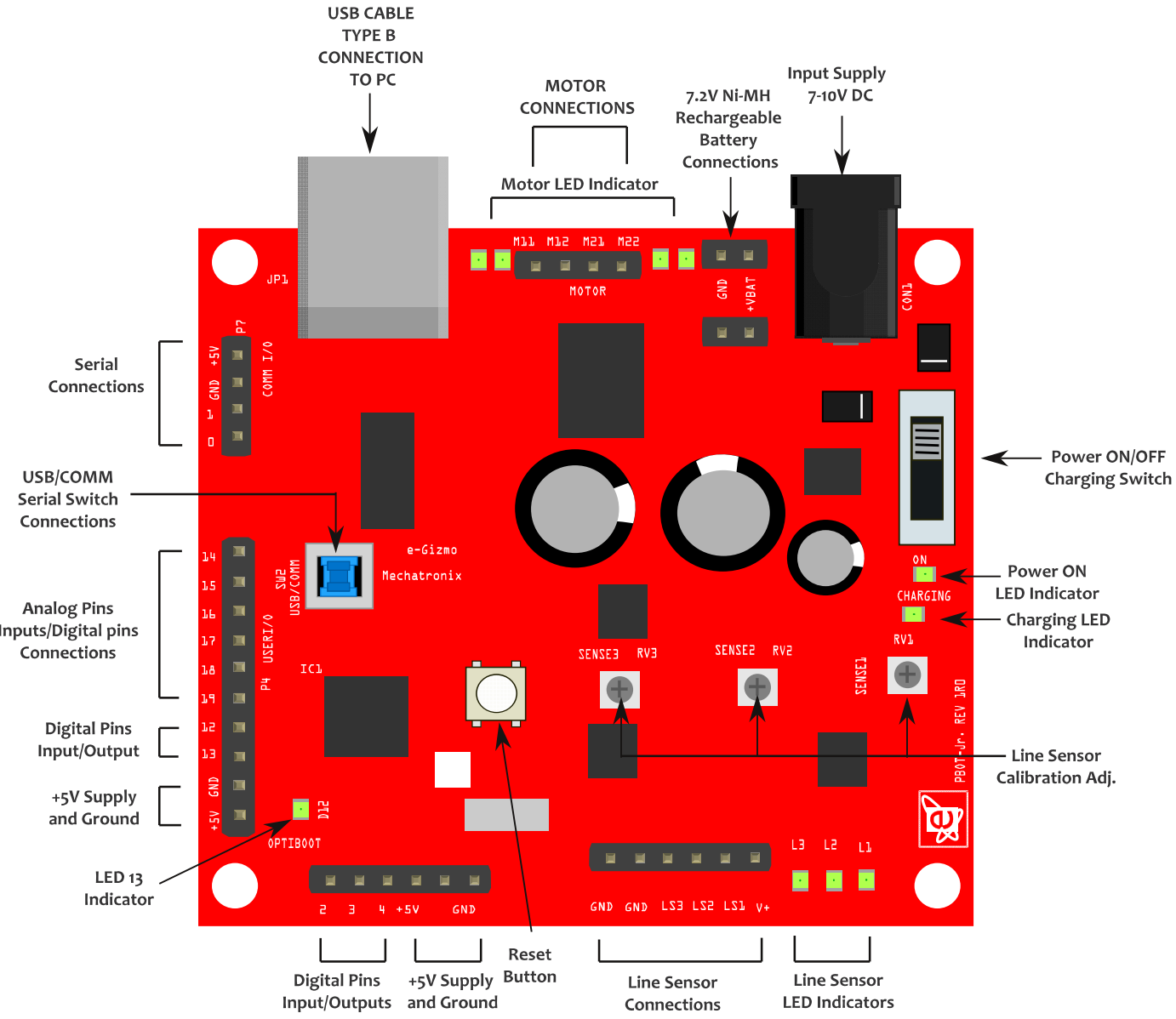


FIGURE 1: PBOT JUNIOR MAJOR PARTS

Table 1. P3 Motor Connections

PIN	Descriptions
M11	Motor 1 Direction
M12	Motor 1 Run (Left Motor)
M21	Motor 2 Run (Right Motor)
M22	Motor 2 Direction

Table 2. P6 Line sensor Connections

PIN	Descriptions
GND	Ground 0V
GND	Ground 0V
LS3	Line sensor 3 (Right)
LS2	Line sensor 2 (Center)
LS1	Line sensor 1 (Left)

PIN	Descriptions
RV1	Sense 1 Line sensor Adjustment
RV2	Sense 2 Line sensor Adjustment
RV3	Sense 3 Line sensor Adjustment

Table 3. P7 Serial and Power Connections

PIN	Descriptions
0	Digital 0/ Receiver pin
1	Digital 1/Transmitter pin
GND	Ground 0V
+5v	Power Source 5V

SW2	**USB / COMM Selection**

Table 4. P4 Digital I/Os and Power Connections

PIN	Descriptions
14	Digital I/O pin 14, Analog 0
15	Digital I/O pin 15, Analog 1
16	Digital I/O pin 16, Analog 2
17	Digital I/O pin 17, Analog 3
18	Digital I/O pin 18, Analog 4
19	Digital I/O pin 19, Analog 5
12	Digital I/O pin 12, MISO
13	Digital I/O pin 13, SCK
GND	Ground 0V
+5V	Power Source 5V

Table 5. P5 Digital I/Os pin and Power Connections

PIN	Descriptions
2	Digital I/O pin 2
3	Digital I/O pin 3, PWM
4	Digital I/O pin 4
+5v	Power Source 5V
NC	Open pin, Ground 0V
GND	Ground 0V

Table 6. LED Indicators

PIN	Descriptions
D3	Charging
D4	Power ON
D5	Motor 11 LED Indicator
D6	Motor 12 LED Indicator
D7	Motor 21 LED Indicator
D8	Motor 22 LED Indicator
D9	L1 LED Indicator
D10	L2 LED Indicator
D11	L3 LED Indicator
D12	Optiboot LED Indicator

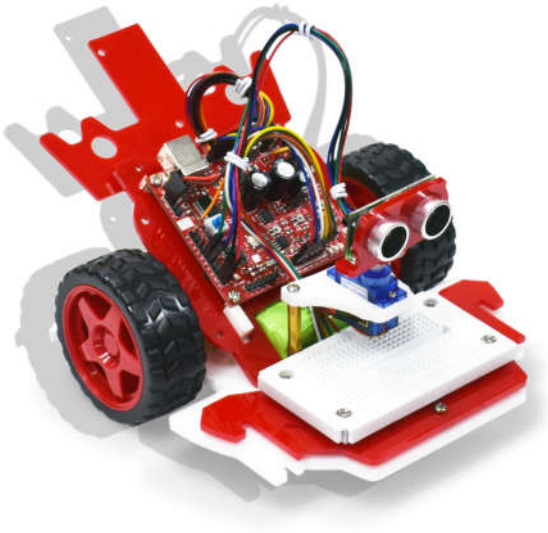
Table 7. Power Connections
P1 & P2 Battery Connections

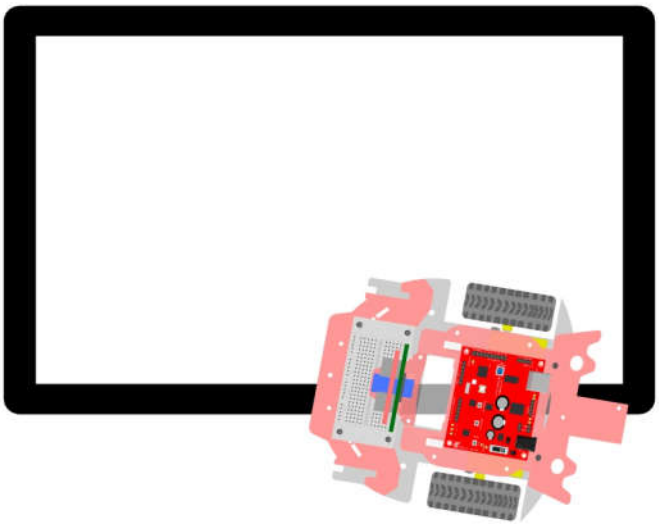
PIN	Descriptions
GND	Ground 0V
+VBAT	Input Voltage 7-8VDC

CON1 External Supply
7 to 9VDC Adaptor

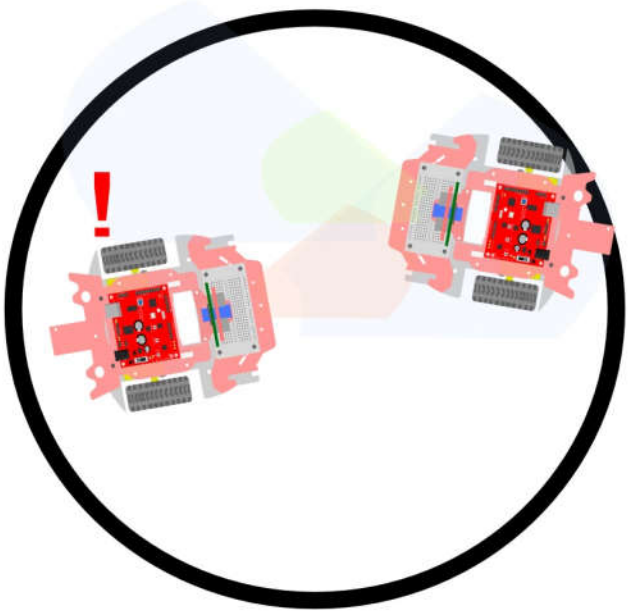
JP1 USB Connection
Connection to PC for Uploading the codes

SW1 Power ON/OFF/Charging Switch



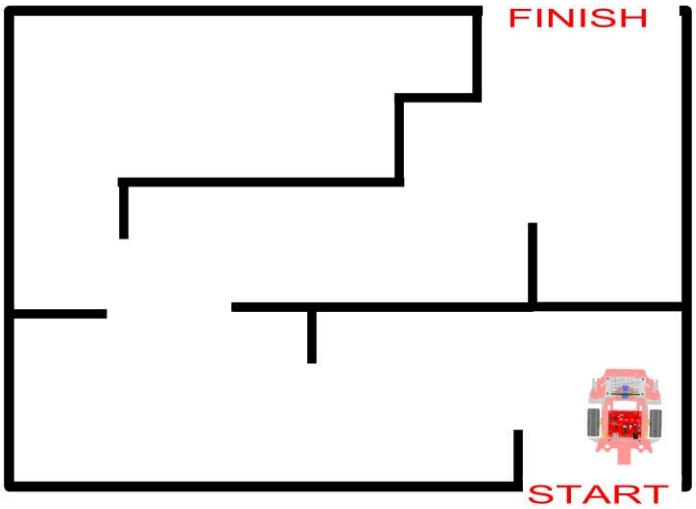


LINE FOLLOWER



SUMO TOURNAMENT

MAZE SOLVER



DEFINE MOTOR PINS

The U3 Motor Driver A3966 Dual Full-Bridge PWM are designed to drive both windings of two-phase bipolar stepper motor. For each bridge, the Logic inputs on the Enable input turns off all four output drivers of that H-Bridge.

The direction of motor are depends on the logic output, if it is in HIGH state (forward) or LOW state (Reversed). On the other hand there is also a pin controls for the speed of motors, using the Pulse Width Modulation (PWM) pins and that is ranges from 0 = full speed and 255 = full stop.

The Motor left pin assignment in Motor 1 Direction is D8 and Motor 1 Run is D9 while the Motor Right pin assignment in Motor 2 Direction D11 and Motor 2 Run is D10. Example line code for assigned motor pins.

LEFT MOTOR 1 PINS

```
#define MOTOR_1_DIRECTION   8
#define MOTOR_1_SPEED       9
```

RIGHT MOTOR 2 PINS

```
#define MOTOR_2_SPEED       10
#define MOTOR_2_DIRECTION   11
```

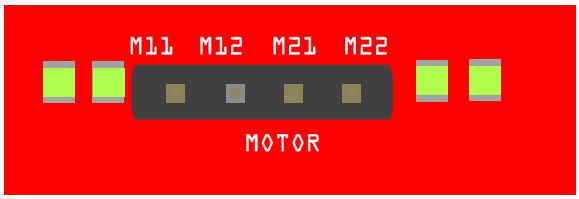


Figure 2: Motor Connections

DEFINE LINE SENSOR PINS

The 3 channel Line sensor P6 has an analog comparator to change analog voltage appear as its input into a single bit digital logic signal.

The reference voltage is fed to the positive input of the comparator. If the analog input fed through the input exceeds the refer voltage, the comparator output switches to logic low or else, it assumes a logic HIGH state.

The sensitivity of the three comparators can be independently set by adjusting their reference voltage through their corresponding adjustable trimmers.

3-Channel analog comparator is a typical analog interface cricuit. It can be used as well with other sensors with 0~5VDC output range functioning as a single bit ADC.

LINE SENSOR PINS

```
#define LEFT_LINE_SENSOR      5
#define CENTER_LINE_SENSOR    6
#define RIGHT_LINE_SENSOR     7
```

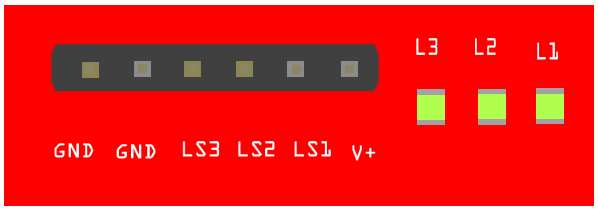
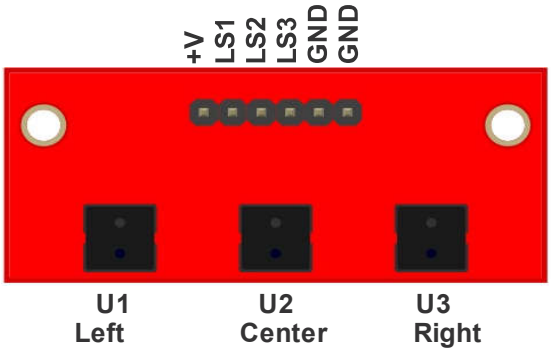


Figure 3: Line Sensor Connections



DEFINE SERVO PINS

The Pbot Junior standard has additional servo motor SG-90 for turning the Distance sensor from looking to the left side view, center/front view and right side view. This is usually used for sumo fighting to overlook and avoiding block objects for obstacles/Maze solver.

The servo pin is connected to the Digital 4. Using this type of mobile robot its #include <Servo.h> library from Arduino IDE softwares for making it easy to used and understand the codes.

SERVO LIBRARY

```
#include <Servo.h>
```

CREATE SERVO OBJECT TO CONTROL

```
Servo MYSERVO;
```

ATTACH SERVO PIN (SETUP)

```
MYSERVO.attach(2);
```

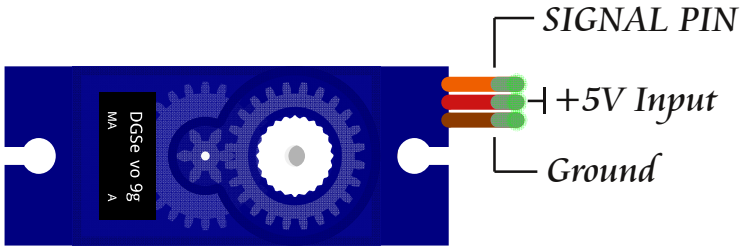


Figure 4: Servo Motor pin outs

DEFINE US-100 PINS

Ultrasonic Sensor or US-100 is a type of sensor that can measure the distance of an object by using the sound waves. It measures distance by sending out a sound wave at a specific frequency and the sound bounce back to the receiver to listen.

ULTRASONIC DISTANCE SENSOR PINS

```
int TRIGPIN = 18;
int ECHOPIN = 19;
float DISTANCE;
float DURATION;
```

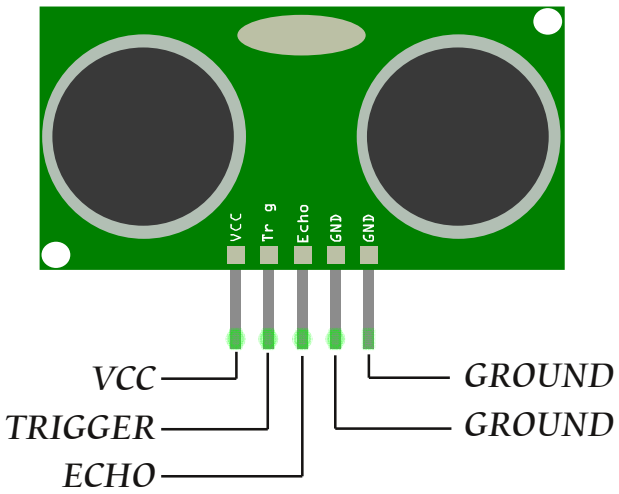
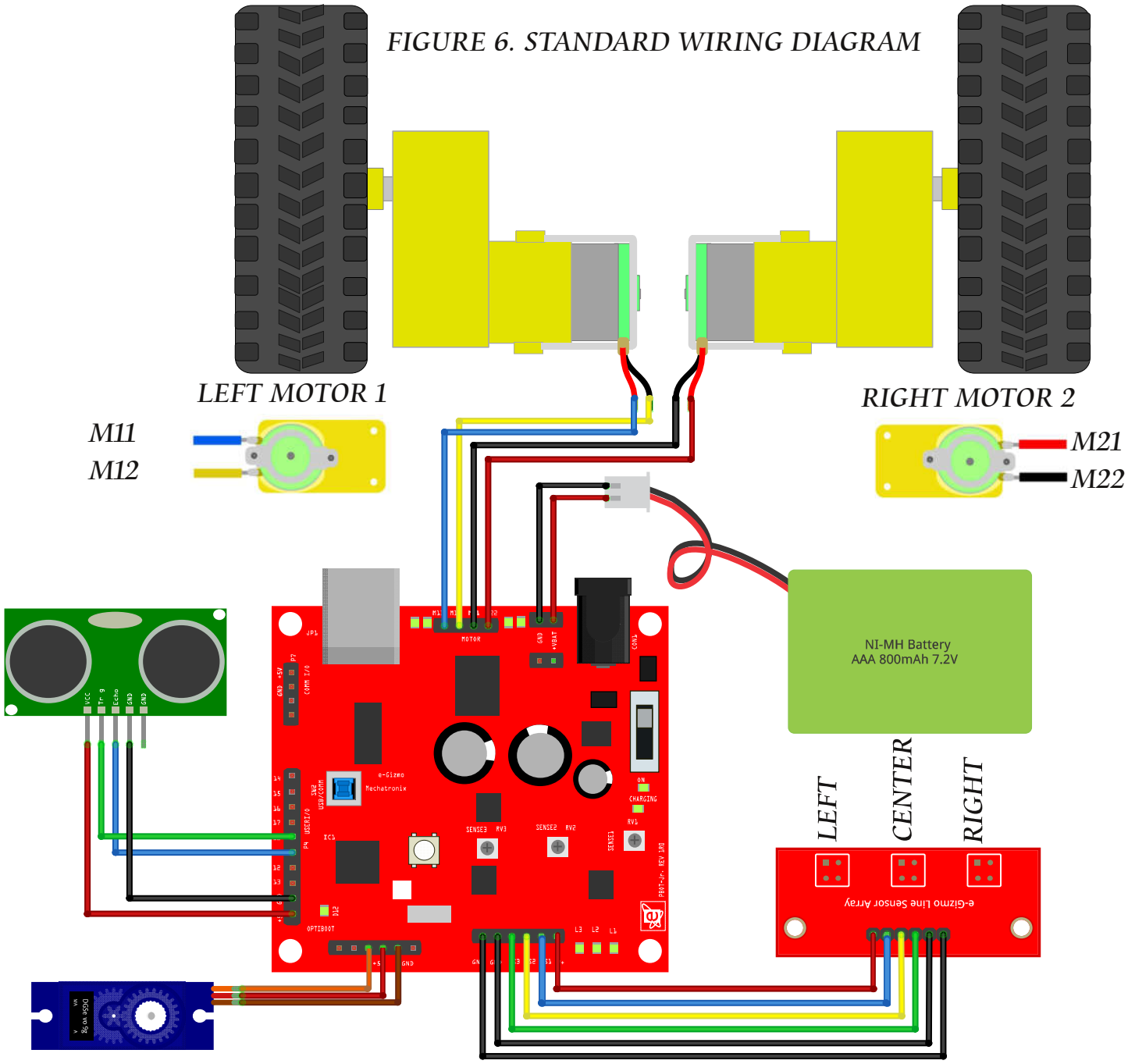


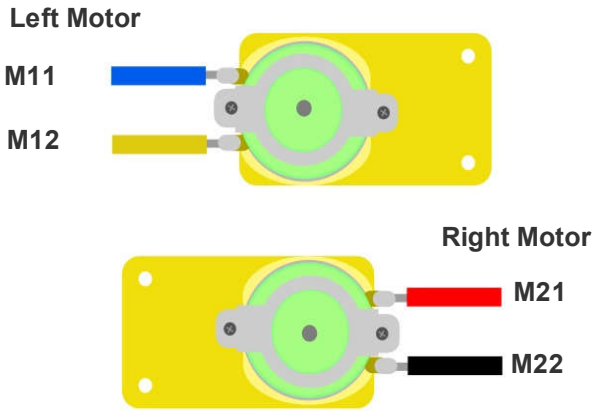
Figure 5: US-100 pin outs

SAMPLE CODES TO UPLOAD

1. JR_LINE.ino
2. JR_ULTRASONIC_MAZE_WITH_SERVO.ino
3. JR_ULTRASONIC_SUMO_WITH_SERVO.ino

FIGURE 6. STANDARD WIRING DIAGRAM

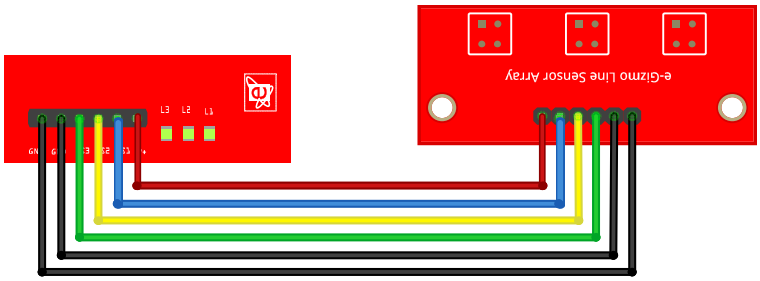




LEFT MOTOR
BLUE wire to **M11**
YELLOW wire to **M12**

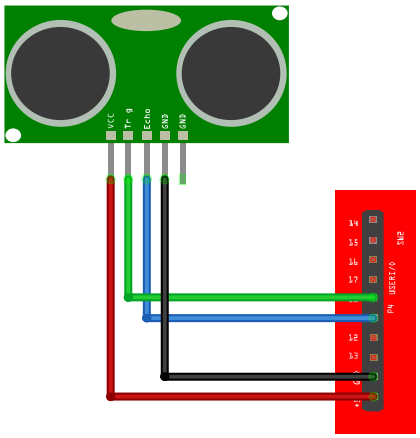
RIGHT MOTOR
BLACK wire to **M21**
RED wire to **M22**

Figure 7. 6VDC Motor Wirings



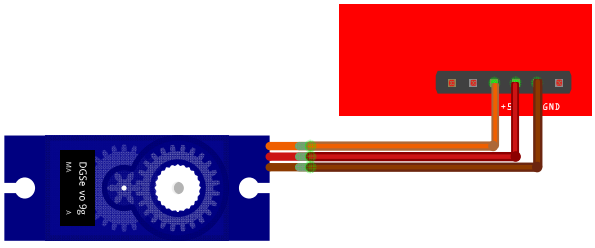
LINE SENSOR
RED wire to **V+**
BLUE wire to **LS1**
YELLOW wire to **LS2**
GREEN wire to **LS3**
BLACK wire to **Ground**
BLACK wire to **Ground**

Figure 8. Line sensor Wirings



US-100 Distance Sensor
RED wire to **+5V**
GREEN wire to **Digital pin 18**
BLUE wire to **Digital pin 19**
BLACK wire to **Ground**

Figure 9. US-100 Wirings



SERVO MOTOR SG-90
BROWN wire to **Ground**
RED wire to **+5V**
ORANGE wire to **Digital pin 4,PWM**

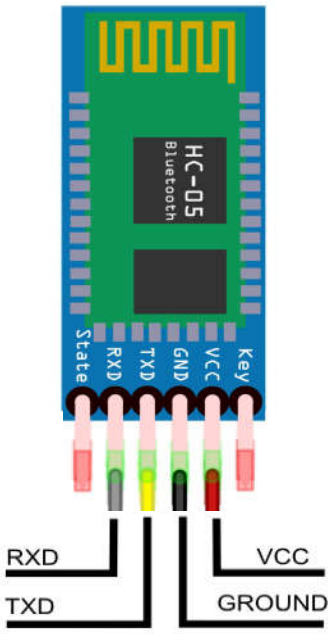
Figure 10. Servo SG-90 Wirings

DEFINE BLUETOOTH PINS

The HC-05 Bluetooth Module is a low cost bluetooth module and a master/slave functions EGBT-04MS. Class II Bluetooth module. User Configurable parameter using simple set of AT commands. Using this type of wireless device you can use it to control the Pbot junior moving forward,backward,left,right, controlling the servo angles and getting the data from sensors. On PBOT junior connection see the pin assignments.

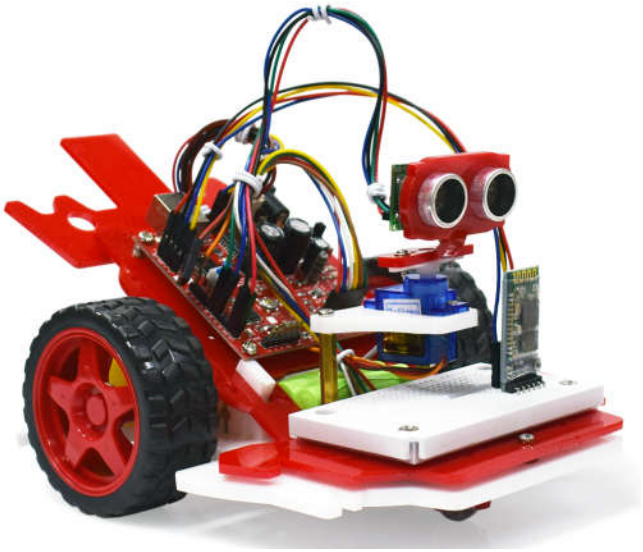
Make sure the connection is RX to TX or vise versa to communicate the MCU.

BLUETOOTH MODULE PINS



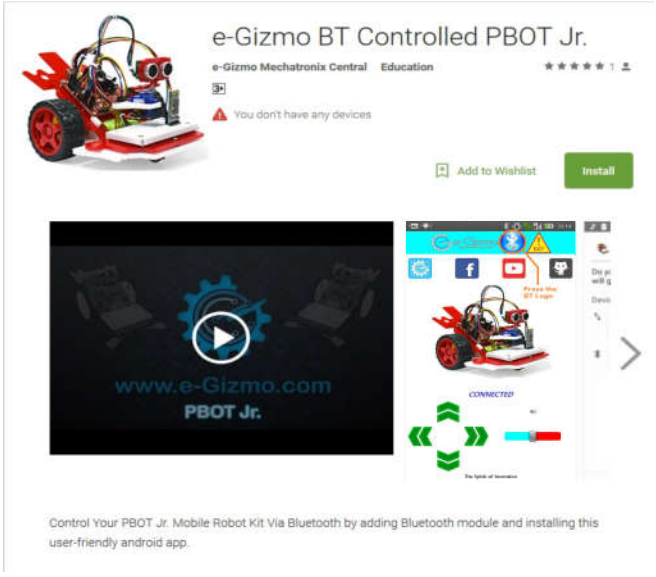
HC-05 Bluetooth wiring connections
RED wire to **+5Vcc**
BLACK wire to **Ground**
YELLOW wire to **Digital pin 0 or RXD**
GRAY wire to **Digital pin 1 or TXD**

Figure 11. HC-05 Bluetooth Module Wirings



DOWNLOAD
E-GIZMO PBOT JUNIOR APPS
ON GOOGLE PLAYSTORE

Google Play

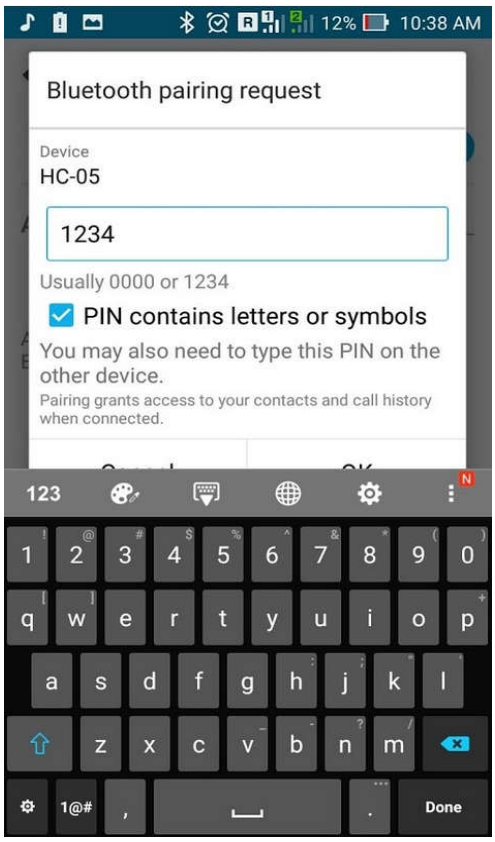


HOW TO CONNECT:

1. Power On the PBOT Junior with HC-05 Bluetooth Module.

SWITCH ON.

2. On your Mobile phone, go to Settings>Bluetooth connections (Look for available device: "HC-05" Password: "1234" or "0000") .



3. If the connection is established, open the PBOT JR application. Click the Bluetooth ICON, connect to HC-0, once the color has changed, it is successfully connected.
You may now control the Pbot Junior wirelessly.

Note: Unplug the USB cable if connected.

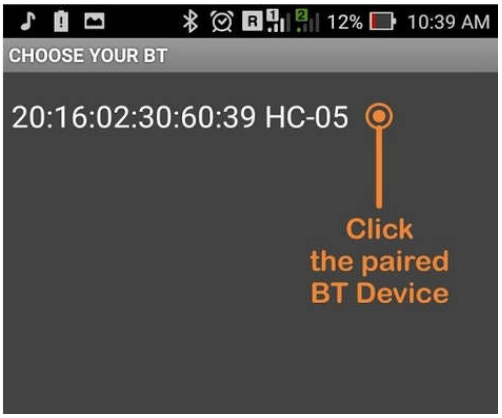
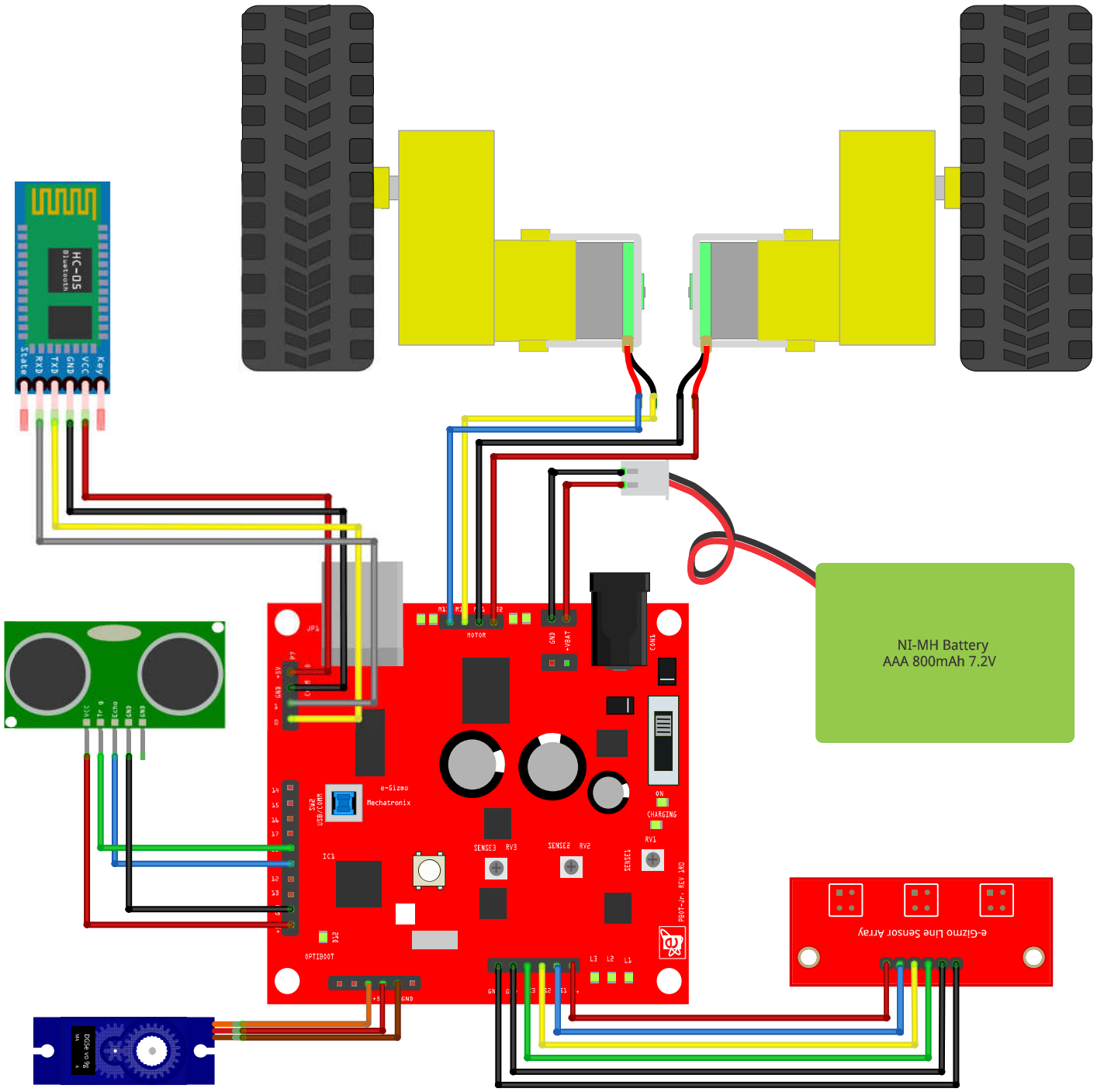


Figure 12. PBOT JR with Bluetooth Module Wirings



SAMPLE CODES TO UPLOAD

JR_BT_ANDROID.ino

DEFINE UHF RX STD ONLY PINS

The Multi-channel Data Receiver Only (UHF TX Standard) is designed as a UART wireless cable replacement operating in 9600 bps. Frequency Range: 431.1MHz - 437.3MHz. Channel Seperation 400KHz. The distance range up to 200meter without obstructions. .

UHF RX MODULE PINS

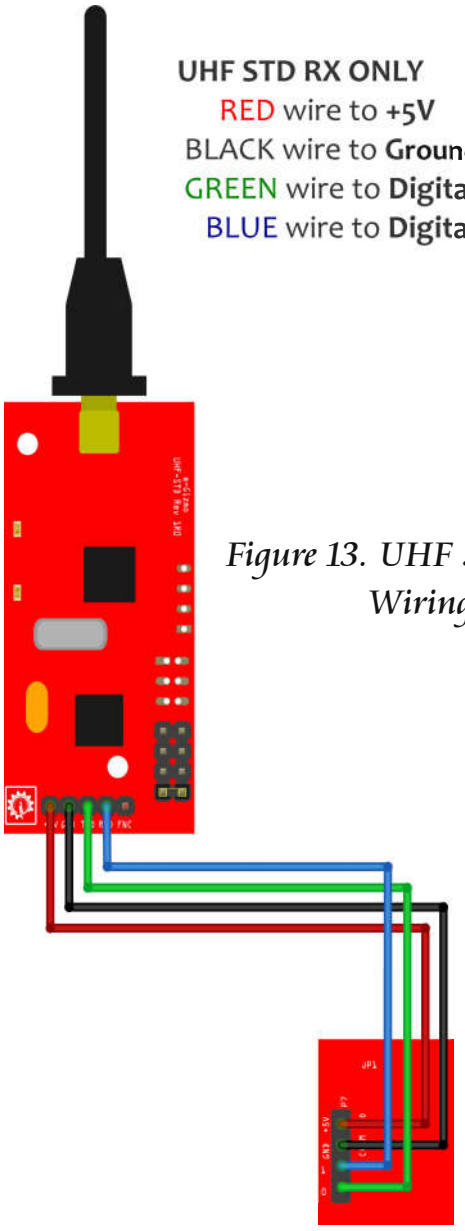


Figure 13. UHF STD RX Only Wirings

DEFINE PS2 CONTROLLER BUTTONS

With the PS2 controller it has modified to interface the UHF STD TX for Universal Wireless controlled.

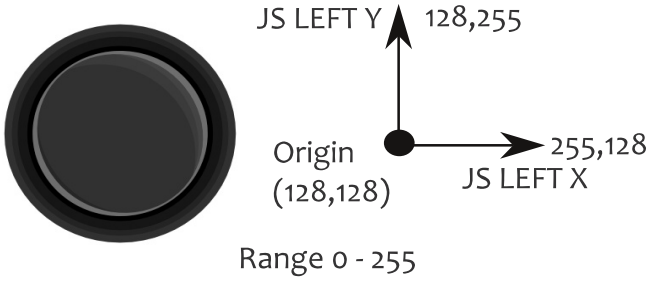
MOTORS:

UP = FORWARD / JS LEFT Y

DOWN = BACKWARD / JS LEFT Y

LEFT = TURN LEFT / JS LEFT X

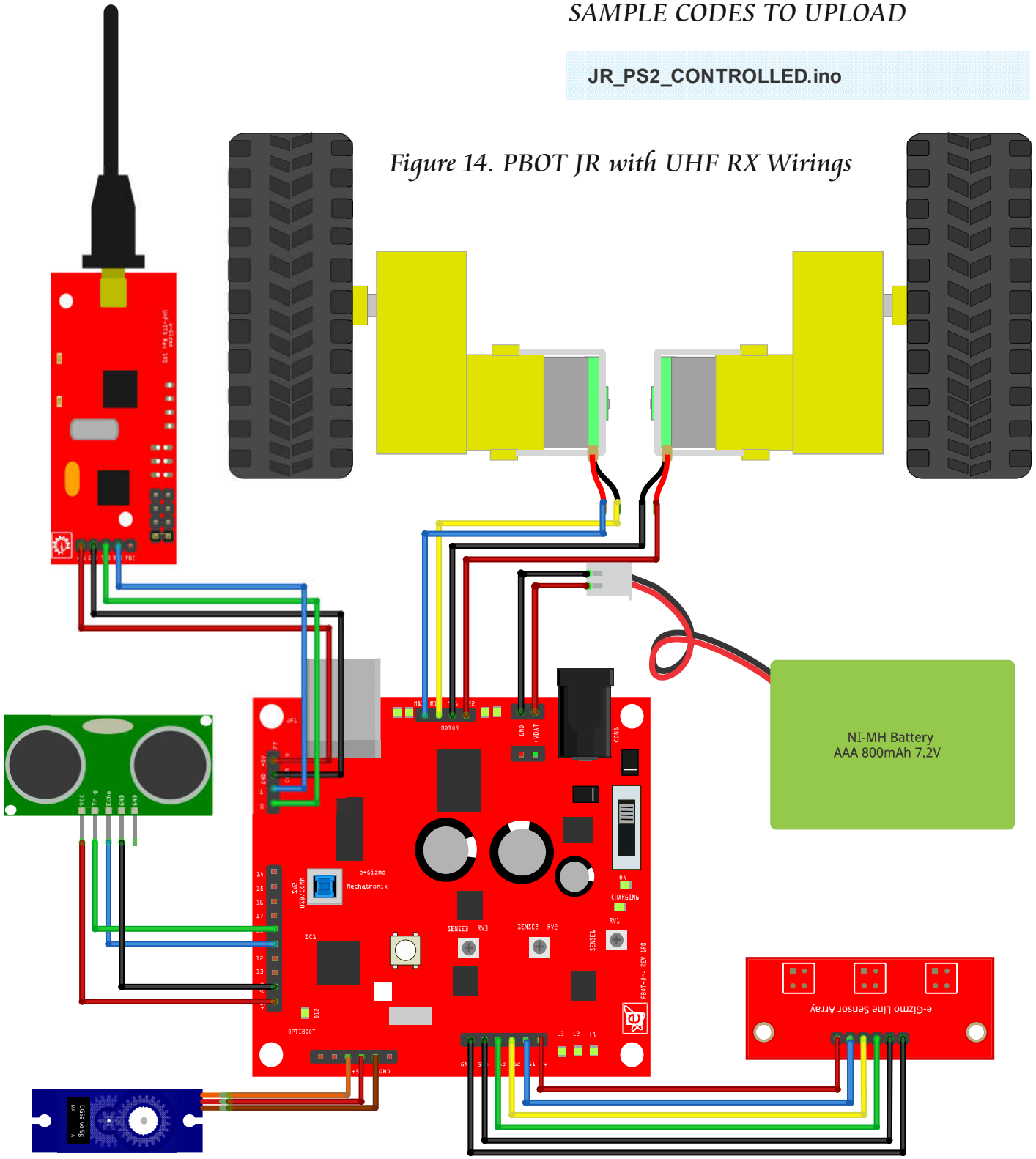
RIGHT = TURN RIGHT / JS LEFT X



SAMPLE CODES TO UPLOAD

JR_PS2_CONTROLLED.ino

Figure 14. PBOT JR with UHF RX Wirings



DEFINE EGRA PINS

EGRA (e-Gizmo Robotic Arm) is an Entry Level Robotic Arm. Works with USB (5V Input Supply) and 4 servo motors, It has gripper - for picking the object up to 9 grams, like an elbow, shoulder and a base to turn left to right on the 180 degrees angle.It needs a signal or square wave by sending a servo a PWM (Pulse-width modulation) signal, which is a series of repeating pulses for variable width where either the width of the pulse otr the duty cycle of a pulse train determines the position to be achieved by the servo. Below we used the Servo library that came from Arduino IDE for make it easy to use and understand the code.

SERVO LIBRARY

```
#include <Servo.h>
```

CREATE SERVO OBJECT TO CONTROL

```
Servo GRIPPER;
Servo ELBOW;
Servo SHOULDER;
Servo BASE;
```

ATTACH SERVO PIN (SETUP)

```
GRIPPER.attach(17);
ELBOW.attach(16);
SHOULDER.attach(15);
BASE.attach(14);
```

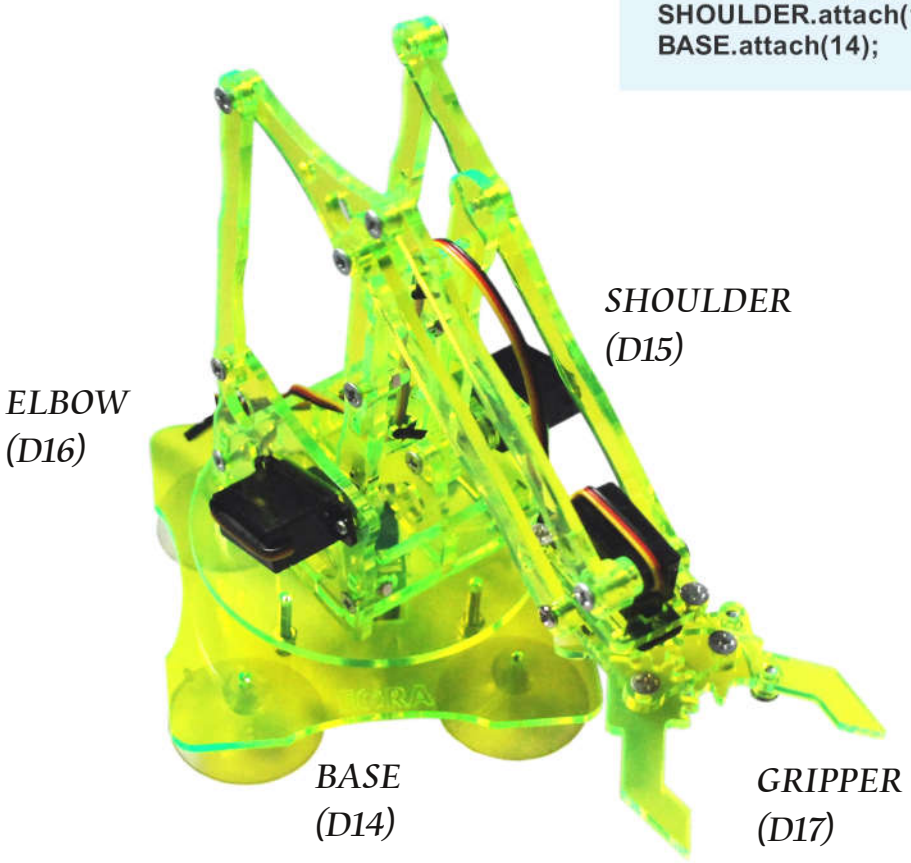


Figure 15. E-GRA (Robotic Arm) Servos joints

GRIPPER ELBOW SHOULDER BASE

SAMPLE CODES TO UPLOAD

JR_EGRA_PS2_CONTROLLED.ino

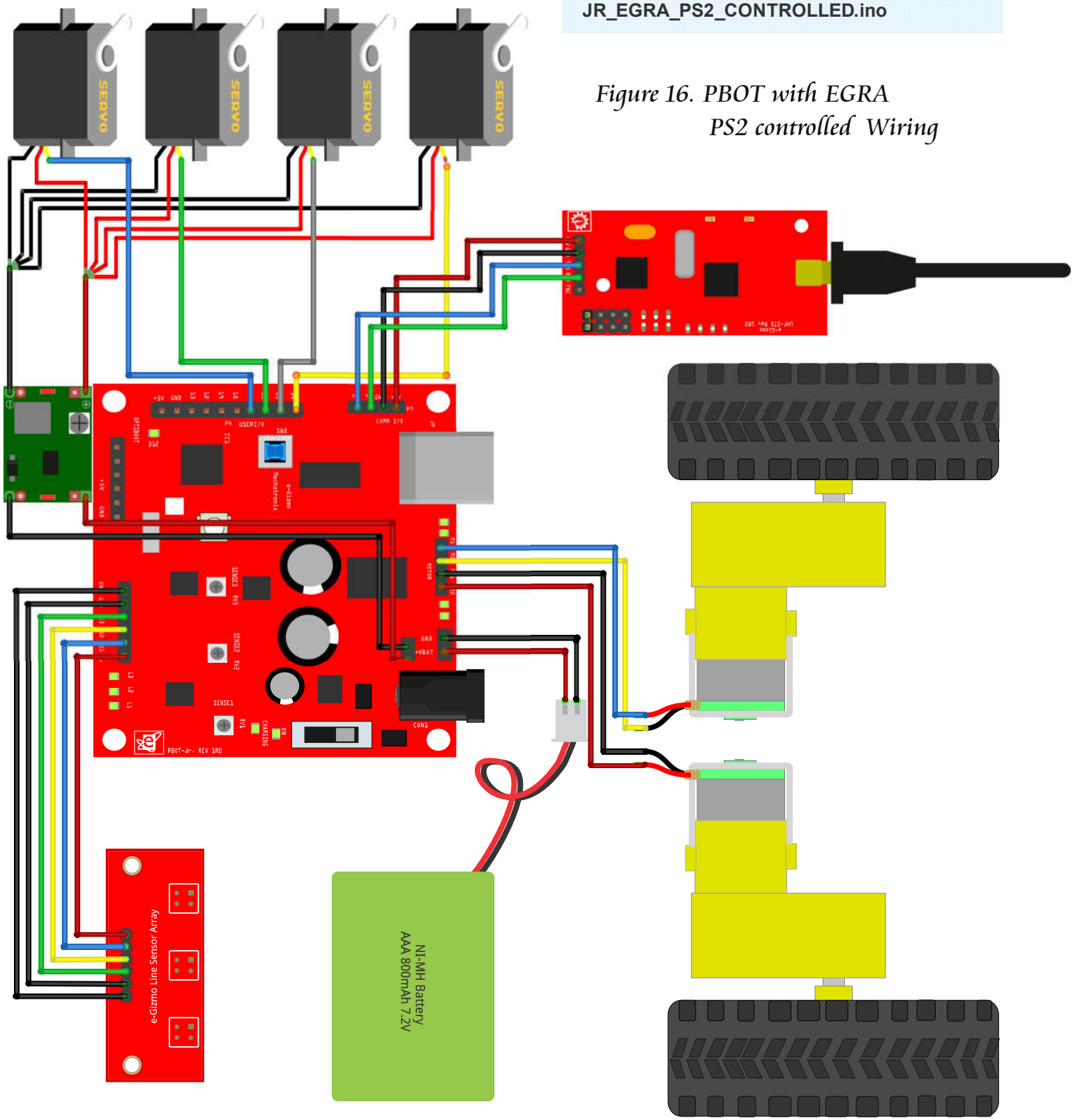
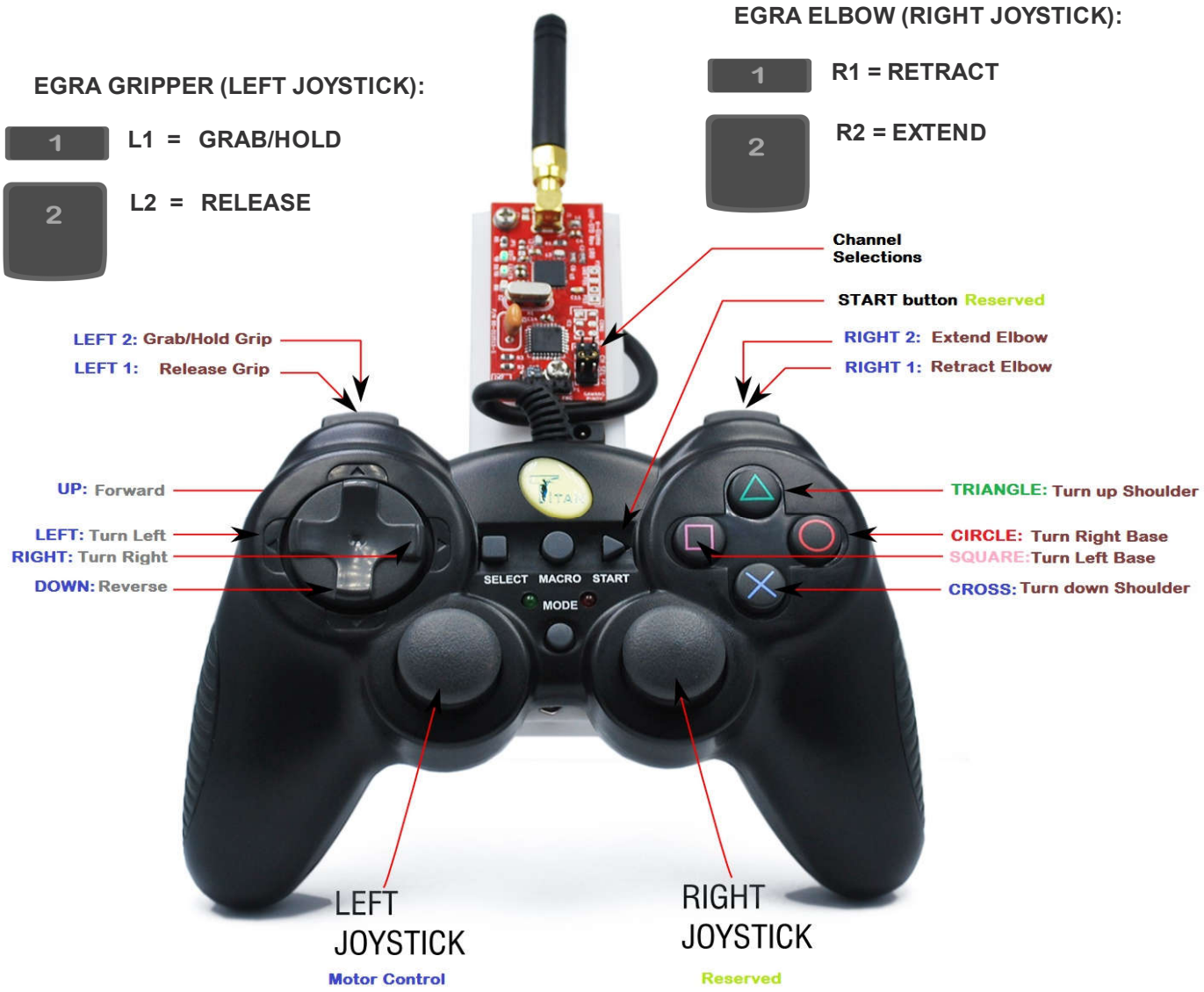


Figure 16. PBOT with EGRA PS2 controlled Wiring



EGRA SHOULDER

TRIANGLE = TURN UP

CROSS = TURN DOWN

EGRA BASE

CIRCLE = TURN RIGHT

SQUARE = TURN LEFT

RESERVED

~ RIGHT JOYSTICK Y-AXIS AND X-AXIS

~ START BUTTON

Figure 17. PS2 Controller Button Functions Wiring