

# PBOT2018 MANUAL GUIDE



Included: - USB Cable Type A to mini B - 5V 1A adaptor



FUNCTIONS : PBOT 2018



> Maze Solver

> Collision Avoidance



> Sumo fight





# **PBOT 2018**

### VARIANTS: PBOT2018 - has new comptible PBOT 2018 Board and gizDuino 168 Microcontroller for basic entry level robot functions and open Circuit board. The Open circuit enables the user to boarden the Capabilities of prototyping by adding certain peripheral to the Board. Line follower - to follow the black line on the track from start to finish line. It has Digital line calibration to make it easy.

- Maze Solver

   to solve the maze courses, you can upload the sketch given or modify It to remote control via wireless devices (Optional).
- Sumo fight to fight with other opponents robots with in the ring, it has line/ Outside avoidance.

>Optional - you can add bluetooth, PS2 controller with UHF STD, Wifi.. etc
 - Add wireless devices to control it wirelessly.



## SPECIFICATIONS

#### General Specifications:

- Battery: 3.7V Li-Ion 1650mAh rechargeable
- On-board Peripherals:
- IC <u>Atmega168</u> w/16KB Flash memory
- IC A3966 Dual Full-bridge PWM Motor Driver
- 2-Ch DC Motor 6V geared 1.5A
- 3-Ch IR line sensor CNY70,10mm range
- 3-Ch IR proximity sensor 2-4inches range
- 4-Ch servo output.
- Bluetooth/Wireless Expansion port
- Built-in Li-ion Battery Charger
- PCB Dimensions: 62 mm x 67 mm

\* <u>Note</u>: Analog pins A4 and A5 are used to interface with the system controller, hence are not available for user shields/application.

# **PBOT 2018**

#### <u>Features:</u>

<u>- Basic Arduino Programming, Include eGizmo\_PB0T2018 library.</u>

The operation of motor to its maximum power

- Efficient Motor Driver circuitry enables The operation of motor to its maximum power At the same time eliminating the need for An heatsink.
- -On board 4 ch servo motor driver port
- -Sensor managed by independent controller
- -Collision sensor are pulsed to saved battery Power.

-Line sensors are digitally calibrated making Calibration process delightfully easy

- -Arduino Compatible
- -Program it using Arduino IDE 100% code Compatible
- 3-4hours charging full

-Arduino external I/O pin layout allows you to Plug in any Arduino compatible Shield\*



# LINE SENSOR LINE FOLLOWER CONNECTIONS



LINE CAL – for making line sensor calibrated as easy. (to calibrate read the page 5)

LINE SENSORS CONNECTION (P7): GND,DRV,LN3,LN2,LN1

#### LINE SENSOR LED INDICATORS:

- LN3(D13), LN2(D12), LN1(D11)
- if LED is ON, black color detected
- if LED is OFF, white color detected

#### LINE SENSOR ARRAY:

• 3 channel Line sensors



# **Softwares and library**

# Arduino IDE

www.e-gizmo.net/oc/kits documents/ARDUIN0 IDE SOFTWARES

- Download Arduino 1.8.5 egizmo themes new (Windows)
- Choose your Arduino IDE for your OS.

## **Drivers** Install this first! Republic PL2303\_Prolific\_DriverInstaller\_v1.10.0

www.e-gizmo.net/oc/kits documents/ARDUIN0 IDE SOFTWARES

- Download Prolific Driver v10.0 (Windows)
- (For Mac OS users) Download md\_PL2303\_MacOSX

## Library Add to My Documents>Arduino>libraries

www.e-gizmo.net/oc/kits documents/PB0T2018

Download eGizmo\_PB0T2018.zip (Unzip this before you move to libraries)



👶 sketch_jun22a   Arduino 1.8.5	-		×
File Edit Sketch Tools Help			
			ø
sketch_jun22a			-
<pre>void setup() {     // put your setup code }</pre>			e: ^
<pre>void loop() {    // put your main code 1 }</pre>			ated.
<			> ~
	Arduino/Genui	no Uno or	COM5



## Setting Up your Arduino IDE with Ardublock





ArduBlock MOD: "Ardublock-060118.jar"

Go to <u>My Documents>Arduino.</u>

Create filename "tools" folder then "ArduBlockTool" folder and "tool" folder. Inside the tool folder <u>place the "ardublock-060118.jar".</u>

> This PC > Documents > Arduino > tools > ArduBlockTool > tool

Now Open your Arduino 1.8.5 IDE.





#### The Ardublock shown in Tools list > Click ArduBlock. Done





## Familiarize with Blocks





#### CONTROLS

- sketch, control structures
- loop
- delays (millis)
- if
- if else
- while
- do while
- repeat
- break





Pins

#### PINS [FUNCTIONS]

- Digital I/O, Analog I/O, Time, Advanced I/O
- read digital pin
- analog pin(INPUT)
- set digital pin(OUTPUT)
- analog pin
- servo
- ultrasonic
- Dht11
- tone
- set digital 8pins (0-7)





#### TESTS

- Comparison Operators, Boolean Operators
- greater than
- less than
- equal to
- greater than equal to
- less than equal to
- not equal to...





#### MATH OPERATORS

Arithmetic Operators, Math, Random Numbers
 addition, subtraction, multiplication,
 division, remainder, absolute, power,
 square root, sine, cosine, tangent, random...





VARIABLES/CONSTANTS

- Constants, Conversion
- Set integer variable, unsigned long, string,

boolean, low, high, true, false, double, int, byte, char...





#### COMMUNICATION

- Serial communication, Stream, Print, Serial read/write
- Serial data available, serial read, serial parseInt, Serial write, Serial print,...





## For PBOT2018 blocks

#### E-GIZMO PBOT2018 BLOCKS (USE FOR NEW PBOT BOARD)



## **Connect the PBOT to PC**



Open Arduino IDE.

# **Uploading Linebot.ino**

#### On the Arduino IDE.

1 Line Follower codes

# For line follower

Go to File>Examples>eGizmo\_PB0T2018>LINEB0T

eGizmo_PBOT2018	AVOID_COLLISION
EmonLib	LINEBOT
Esp8266EasyloT	MAZE
ESP8266wifi	MOTOR_TEST
Ethernet	SERVO_SWEEP
etherShield	SUMO

#### 2. Board select Go to Tools>Boards>gizDuino (mini) w/ Atmega168



3. Port select

- Go to Tools>Port>COM#
- Select the correct port
- Go to Device Manager if you're not sure.

Tips for uploading:

• Press and Hold the SYS RST (SW3) switch ON the power and Click Upload. Release RST when done.





SYS RST

POWER SW

# LINE SENSOR

1. After uploading your code for linesensors. Turn OFF the POWER switch.



Turn

Off

2. Place the eGizmo PBOT controller to the "black line" then



Press and Hold LINE CAL and SYS RST, while pressing and holding the buttons,



Turn ON the POWER Switch.



CALIBRATION1,2

#### LN2 (D12 LED indicator) is ON.



## LINE SENSOR CALIBRATION 3

3. First RELEASE the SYS RST followed by LINE CAL. Make sure the 3CH Line sensors are faces on the "black line"



and you will see the LN1 and LN3 (D11 and D13 LED indicators) are Turn ON and LN1 is blinking. Now Press LINE CAL once for the black color calibration.





# LINE SENSOR

4. Next, if the L3 (D13 LED indicator) is blinking. CALIBRATION 4,5



Place the 3CH Line sensors on the "White track".



Then Press LINE CAL again once for the white color calibration.



After that you will see all the LEDS for linesensors are ON.



5. Now your eGizmo PBOT Controller Linesensors are calibrated. Then Press the RESET button or Switch off and turn ON again. You can now trace the line and DONE.



#### SYNTAX

- PBOT.LS1\_LEFT();
- PBOT.LS2\_CENTER();
- PBOT.LS3\_RIGHT();

#### OUTPUT

- WHITE LINE DETECTED = 0 or LOW
- BLACK LINE DETECTED = 1 or HIGH



```
If (PBOT.LS2_CENTER() == HIGH) // if line sensor 2 center is high
{
   Serial.println("Black line detected!");
}
```





## START WITH ADDING A BLOCK "PBOT BEGIN"



*Adding PBOT BEGIN block – settting up the eGizmo\_PBOT2018, Wire library and turn ON all the motors.* 





### SERIAL MONITOR BY ADDING THE SERIAL PRINT BLOCK







### **USE THE DROP-DOWN ARROW TO SELECT SENSOR**



#### Click the Dropdown arrow to select immediately the line sensor



As you can see the 3 line sensors appears



### FOR BLACK LINE SENSING



18	if (( ( PBOT.LS1_LEFT() ) == ( HIGH ) ))
19	
20	Serial.print("BLACK COLOR SENSE ON THE LEFT");
21	Serial.print(" ");
22	Serial.println();
23	



### FOR BLACK LINE SENSING







### FOR BLACK LINE SENSING



18	if (( ( PBOT.LS3_RIGHT() ) == ( HIGH ) ))
19	{ · · · · · · · · · · · · · · · · · · ·
20	Serial.print("BLACK COLOR SENSE ON THE RIGHT");
21	Serial.print(" ");
22	Serial.println();
23	3



### FOR WHITE LINE SENSING







### FOR WHITE LINE SENSING







### FOR WHITE LINE SENSING





# MOTORS CONNECTION SECTION





\*Please don not depends on the color of the wires. Follow the location of it.

# **Uploading Motor Test.ino**

#### On the Arduino IDE.

1 Motor controls codes

## **Direction/Speed**

Go to File>Examples>eGizmo\_PB0T2018>M0T0R\_TEST

eGizmo_PBOT2018	AVOID_COLLISION
EmonLib	LINEBOT
Esp8266EasyloT	MAZE
ESP8266wifi	MOTOR_TEST
Ethernet	SERVO_SWEEP
etherShield	SUMO

- 3. Port select
  - Go to Tools>Port>COM#
- Select the correct port
- Go to Device Manager if you're not sure.

#### 2. Board select Go to Tools>Boards>gizDuino (mini) w/ Atmega168



Tips for uploading:

• Press and Hold the SYS RST (SW3) switch ON the power and Click Upload. Release RST when done.





**POWER SW** 

SYS RST

# MOTOR CONTROLS SYNTAX

#### SYNTAX

Set motor direction:

• **PBOT.DIRECTION(**whichmotor,dir);

#### where:

```
whichmotor = MOTOR_A or MOTOR_B, MOTOR_BOTH
dir = MOTOR_FWD,MOTOR_REV
```

Set motor speed:

• PBOT.SPEED(whichmotor,speed);

where:

whichmotor = MOTOR\_A or MOTOR\_B, MOTOR\_BOTH

• speed = 0 to 255, 0 = Full Stop, 80 = Neutral, 255 = High, limit 250

```
EXAMPLES;
```

```
PBOT.DIRECTION(MOTOR_BOTH, MOTOR_FWD); // Move Forward PBOT.SPEED(MOTOR_BOTH, 80);
```





## START WITH ADDING A BLOCK "PBOT BEGIN"



*Adding PBOT BEGIN block – settting up the eGizmo\_PBOT2018, Wire library and turn ON all the motors.* 





## **Move Forward**



16	void loop()
17	{
18	Serial.print("MOVE FORWARD");
19	Serial.print(" ");
20	Serial.printn();
21	PBOT.DIRECTION (MOTOR_BOTH, MOTOR_FWD);
22	PBOT.SPEED (MOTOR_BOTH, 120);
23	delay( 2000 );
24	}

Motors forward at 120 PWM speed in 2 secs



### **Reverse Motors**



	16	void loop()
-	17	{
-	18	Serial.print("REVERSE");
	19	Serial.print(" ");
	20	Serial.println();
	21	PBOT.DIRECTION (MOTOR_BOTH, MOTOR_REV);
	22	PBOT.SPEED (MOTOR_BOTH, 120);
	23	delay( 2000 );
	24	3

Motors reverse at 120 PWM speed in 2 secs



## **Turn Right**



Motors A turning right at 120 PWM speed in 2 secs

## Turn Left



4	16	void loop()
•	17	{
	18	Serial.print("TURN LEFT");
	19	Serial.print(" ");
	20	Serial.println();
	21	PBOT.DIRECTION(MOTOR_B, MOTOR_FWD);
	22	PBOT.SPEED (MOTOR_A, 0);
	23	PBOT.SPEED (MOTOR_B, 120);
	24	delay( 2000 );
	25	}

Motors B turning left at 120 PWM speed in 2 secs



## **Motor Stops**



16	void loop()
17	{
18	Serial.print("STOP");
19	Serial.print(" ");
20	Serial.println();
21	PBOT.SPEED(MOTOR_BOTH, 0);
22	delay( 2000 );
23	}

Both Motor stops at 0 speed in 2 secs

e-Gizmo

### **Extreme Right**



Motors A forward and Motor B reverse at 120 PWM speed in 2 secs

Extreme Left

MECHATRONIX CENTRAL



Motors A reverse and Motor B forward at 120 PWM speed in 2 secs

# MAZE/SUMO IR SENSORS CONNECTIONS



- IR RECEIVERS 38Khz - U5, U6, U7
- IR LED TRASMITTER
  - D17, D18, D19
  - Distance Range: 2 4 inches
- IR LED INDICATORS
  - COL1 (D14), COL2 (D15), COL3 (D16)
  - if LED is ON, Object detected
  - if LED is OFF, No object detected

# **Uploading Maze.ino**

#### On the Arduino IDE.

#### 1. Maze Solver codes

#### Go to File>Examples>eGizmo\_PB0T2018>MAZE

eGizmo_PBOT2018	AVOID_COLLISION	1
EmonLib	LINEBOT	
Esp8266EasyloT	MAZE	
ESP8266wifi	MOTOR_TEST	
Ethernet	SERVO_SWEEP	
etherShield	SUMO	
	eGizmo_PBOT2018 EmonLib Esp8266EasyloT ESP8266wifi Ethernet etherShield	eGizmo_PBOT2018       AVOID_COLLISION         EmonLib       LINEBOT         Esp8266EasyloT       MAZE         ESP8266wifi       MOTOR_TEST         Ethernet       SERVO_SWEEP         etherShield       SUMO

#### 2. Board select Go to Tools>Boards>gizDuino (mini) w/ Atmega168

ool	s Help	
	Auto Format	Ctrl+T
	Archive Sketch	
	Fix Encoding & Reload	
	Serial Monitor	Ctrl+Shift+M
	Serial Plotter	Ctrl+Shift+L
WiFi101 Firmware Updater		
	ArduBlock	
	Board: "Gizduino (mini) w/ ATmega168"	
	Port	
Get Board Info		
	Programmer: "AVRISP mkII"	
	Burn Bootloader	

#### 3. Port select

**Maze Solver** 

- Go to Tools>Port>COM#
- Select the correct port
- Go to Device Manager if you're not sure.

#### Tips for uploading:

• Press and Hold the RST (SW3) switch ON the power and Click Upload. Release RST when done.

# **Uploading Sumo.ino**

#### On the Arduino IDE.

# Sumo Fight

1. Sumo fighting codes

Go to File>Examples>eGizmo\_PB0T2018>SUM0

eGizmo_PBOT2018	AVOID_COLLISION
EmonLib	LINEBOT
Esp8266EasyloT	MAZE
ESP8266wifi	MOTOR_TEST
Ethernet	SERVO_SWEEP
etherShield	SUMO

#### 3. Port select

- Go to Tools>Port>COM#
- Select the correct port
- Go to Device Manager if you're not sure.

#### 2. Board select Go to Tools>Boards>gizDuino (mini) w/ Atmega168

ool	s Help	
	Auto Format	Ctrl+T
	Archive Sketch	
	Fix Encoding & Reload	
	Serial Monitor	Ctrl+Shift+M
	Serial Plotter	Ctrl+Shift+L
	WiFi101 Firmware Updater	
	ArduBlock	
	Board: "Gizduino (mini) w/ ATmega168"	
	Port	
	Get Board Info	
	Programmer: "AVRISP mkll"	
	Burn Bootloader	

Tips for uploading:

• Press and Hold the RST (SW3) switch ON the power and Click Upload. Release RST when done.



#### SYNTAX

- PBOT.COL1\_RIGHT();
- PBOT.COL2\_CENTER();
- PBOT.COL3\_LEFT();

#### OUTPUT

- NO OBJECT DETECTED = 0 or LOW
- OBJECT DETECTED = 1 or HIGH



#### EXAMPLES;

```
If (PBOT.COL2_CENTER() == HIGH) // if IR sensor 2 center is high
{
   Serial.println("Object detected!");
}
```



## START WITH ADDING A BLOCK "PBOT BEGIN"



*Adding PBOT BEGIN block – settting up the eGizmo\_PBOT2018, Wire library and turn ON all the motors.* 





### SERIAL MONITOR BY ADDING THE SERIAL PRINT BLOCK







### **USE THE DROP-DOWN ARROW TO SELECT SENSOR**



#### Click the Dropdown arrow to select immediately the collision sensor



As you can see the 3 IR collision sensors appears



### FOR OBJECT DETECTION







### FOR OBJECT DETECTION







### FOR OBJECT DETECTION



16	void loop()
17	{
18	if (( ( PBOT.COL3_LEFT() ) == ( HIGH ) ))
19	{
20	Serial.print("LEFT OBJECT DETECTED!!");
21	Serial.print(" ");
22	Serial.println();
23	}
24	}

# SERVO CONNECTION





# Uploading Servo sweep.ino

#### On the Arduino IDE.

#### 1. Servo codes

Go to File>Examples>eGizmo\_PB0T2018> Servo\_Sweep

eGizmo_PBOT2018	AVOID_COLLISION
EmonLib	LINEBOT
Esp8266EasyloT	MAZE
ESP8266wifi	MOTOR_TEST
Ethernet	SERVO_SWEEP
etherShield	SUMO

3. Port select Go to Tools>Port>COM# Select the correct port Go to Device Manager if you're not sure.

**Servo Controls** 

#### 2. Board select Go to Tools>Boards>gizDuino (mini) w/ Atmega168

ool	s Help	
	Auto Format	Ctrl+T
	Archive Sketch	
	Fix Encoding & Reload	
	Serial Monitor	Ctrl+Shift+M
	Serial Plotter	Ctrl+Shift+L
	WiFi101 Firmware Updater	
	ArduBlock	
	Board: "Gizduino (mini) w/ ATmega168"	:
	Port	;
	Get Board Info	
	Programmer: "AVRISP mkll"	:
	Burn Bootloader	

Tips for uploading: Press and Hold the RST (SW3) switch ON the power and Click Upload. Release RST when done.



#### SYNTAX

PBOT.SERVO(whichSERVO,pulsewidth);

where:

Whichservo = 1 to 4, ignore other values

Pulsewidth = 0 to 180 (degrees)

- value less than 500 stops the Servo PWM generator
- the pulsewidth converted to degrees from 0 to 180 (default)

EXAMPLES;

PBOT.SERVO(1, 15); delay(1000); PBOT.SERVo(1, 90); delay(1000);



## START WITH ADDING A BLOCK "PBOT BEGIN"



*Adding PBOT BEGIN block – settting up the eGizmo\_PBOT2018, Wire library and turn ON all the motors.* 





## **For Servo Blocks**



*Double Click the block 1 to change the servo number also the 90 degrees to change it.* 



Upload to Arduino. This will shown on the IDE. "





## For more info:

- Website: www.e-gizmo.net
- Egizmo Tech blog:www.e-gizmo.com/wp
- Facebook: eGizmoMechatronix
- Youtube Channel: e-Gizmo Mechatronix Central