

Made in China SKU:2022005100

OPH

# OSOYOO BUILDING BLOCK BOBOT CAR KET





Detection





Line Tracking Robot gripper

Learn STEM through hand-on projects Increase visual perception and intelligence Develop logical thinking and creativity

Avoidance





WARNING: CHOKING HAZARD. It contains small prats . Not for children under 3 years.

## Preface



About this kit

- 400+ parts includes bricks, gears, axis and 1 piece Controller board, expansion board, ultrasonic sensor, wifi module, servo motor, humidity and temperature, battery, 2pcs tracking sensor modules, Photoresistor, motors, and wheels
- The building Robot Car Kit designed to provide kids through DIY different Robot car to interesting and challenging building experience, robotic movement and mechanical structure
- The building Robot Car Kit helps to enhance kids' imagination and creativity, hand-eye coordination, self-confidence and promotes the importance of teamwork & collaboration

- This kit is based on OSOYOO basic board compatible with UNO. This is a an open source electronics archetype platform for electronics engineers, hobbyist, designers or anyone interested in creating interactive electronics projects
- This building Robot car kit has provide graphical programming (for basic projects) and IDE (for IOT projects). It's really suitable for teenage or adults to learn basic program language
- This learning kit provides 7 sample lessons including basic movement, following light, line tracking, obstacle avoidance, robot gripper, wifi remote control and IOT project. These tutorials teach how to build, code, and run the robot car
- OSOYOO Expansion board and Sensor modules are designed with XH2.
   54 ports to avoid the many potential errors novice users encounter with similar products



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## Preparation before Class 1: Graphical programming – mBlock

mBlock is designed for the Science, Technology, Engineering, Arts and Mathematics (STEAM) education. Inspired by Scratch 3.0, it supports both graphical and textual programming languages.

## Software versions

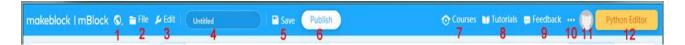
Currently, the following versions are available:

- For PCs (software required): <u>https://www.mblock.cc/en-us/download</u>
- Web version (no software required): <u>https://ide.mblock.cc/</u>
- For Android and iOS: Search for **mBlock** on any app store to download it

By signing in to mBlock 5, you can have your projects automatically stored in the cloud. Try synchronizing your projects across devices (such as PCs and mobile devices) now!

## Get to Know the UIToolbar

#### Toolbar



- 1. Language: Click it to change the UI language.
- 2. File: Click it to create, open, save a project, import a project from your PC, or export your project to PC.
- 3. Edit: Click it to turn on/off the stage turbo mode or hide/unhide the stage.
- 4. Title: Click it to set or change the title of the current project.

- 5. Save: Click it to save the current project to My Projects.
- 6. Publish: Cick it to publish the current project to the mBlock community.
- 7. Courses: Click it to visit the website: https://education.makeblock.com/resource/
- 8. Tutorials: Click it to view online user guide and example programs.
- 9. Feedback: Click it to give your feedback for mblock.
- 10. More: Click it to see more functions about Check For Updates, About mBlock, About version 5.4.0, Serial driver quick install, Set as default editor, Cooperation
- 11. Sign up/Sign in: Click it to sign up an mBlock account or sign in. After signing in to mBlock 5, you can click it to view your projects, profile, account center, and cloud service authentication code, or click to sign out.
- 12. Python Editor: Click it to enter mBlock-Python Editor.



### **Editing area**

- Stage area: You can present your designs, connect devices, and set your sprites and backdrops here.
- Blocks area: You can find the blocks you need by category and color here.

• Scripts area: You can compile your program by dragging blocks to this area.



When you drag a block in Scripts area, and right click on the block, you will can do these operation for the block as the above picture

	Light	LED pin 13 HIGH •		Blocks	Arduino C
<u>ē</u> -ā	Action	LED pin 1 analog value 255		LED pin 13 HIGH •	
0	Sensor	LED RGB pin 11 12 13 R 29		Undo Redo	
	Show			Clean up Blocks Add Comment Delete Block	8 8 2 12 8 9 - 5
Devices Sprites Background	Cound			Export all scripts to image	

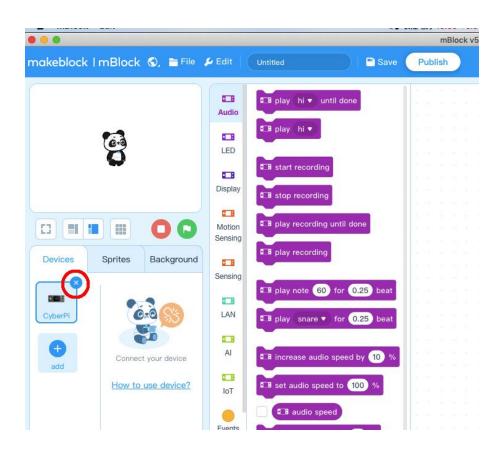
When you drag a block in Scripts area, and right click on blank, you will can do these operation for the block as the above picture

## Connect OSOYOO basic board

**Step1)**Download OSOYOO\_UNO.mext device file from

https://osoyoo.com/driver/mblock/osoyoo\_uno.mext

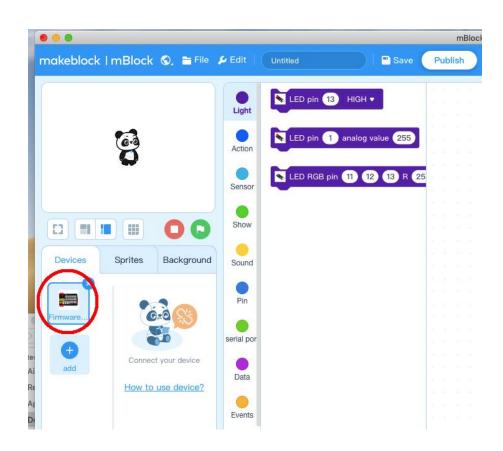
**Step2)**Run the mBlock PC software by double click the lovely Panda icon. you will see mBlock UI as following picture. Please delete the default device **CyberPi** by click the cross in the red circle.



**Step3)** Drag and Drop osoyoo\_uno\_mext file(downloaded in Step 1) to mBlock software as following:

000				m	Block v5.3.5		
makeblock   I	mBlock 🛇, 🗎	File 🔑 Edit 🕴	Untitled	Save Publish	D	0	Cours
			switch backdrop to back	drop1 =			
		Looks					
			switch backdrop to back	drop1 v and			
	6.3						
	8	Sound	next backdrop				
	<b>W</b>	100	next backdrop				
		Events	change color V effect b	25			
			change color v effect L	y 25			
	-						
C = 1		Control	set color ▼ effect to				
				1			
Devices	Sprites Backgro		clear graphic effects	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1			
Devices	Sprites Backgro	ound Sensing			l na sea a		
				D	rag and Drop os	oyoo_uno.mext	
•		Operators	backdrop number 🔻		this area		
		Operators		1			
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		888 <b>=</b> 00 9	🔜 🧱 🖌 🏘 🖌 🖞			Q Se	arch
orites		Name		Size	Kind	Date Added	
AirDrop		Sosoyoo-r	notor.pdf	17 KB	Adobecument	Jul 15, 2021 at 3:20 PM	
Recents		🔯 osoyoo-r	motor	9 145 KB	Micros(.docx)	Jul 15, 2021 at 3:22 PM	
Recents		= OSOYOC	-Logo.png	11 KB	PNG image	Jan 29, 2021 at 12:39 Pl	N
		😑 osoyoo-l		485 KB	PNG image	Sep 1, 2020 at 12:01 PM	
Applications			dit ing	263 KB	JPEG image	Mar 31, 2021 at 12:04 Al	
		💷 osoyoo-l			PNG image	Feb 26, 2021 at 1:49 AM	
Downloads		💽 osoyoo-i	con	3 KB			
Downloads		osoyoo-i	con esp8266.jpg	60 KB	JPEG image	Dec 19, 2020 at 12:56 P	M
Downloads	O	osoyoo-i     osoyoo-i     osoyoo-i     osoyoo-i	con esp8266.jpg panner.jpg	60 KB 4.2 MB	JPEG image JPEG image	Dec 19, 2020 at 12:56 P Jan 29, 2021 at 12:43 P	M
A Applications Downloads L Could Drive D Cloud Drive D Desktop	O	osoyoo-i     osoyoo-i     osoyoo-i     osoyoo-i     osoyoo-i	con esp8266.jpg banner.jpg banner	60 KB 4.2 MB 550 KB	JPEG image JPEG image PNG image	Dec 19, 2020 at 12:56 P Jan 29, 2021 at 12:43 Pl Feb 8, 2021 at 2:14 PM	M
Downloads	O	osoyoo-i     osoyoo-i     osoyoo-i     osoyoo-i	con esp8266.jpg banner.jpg banner	60 KB 4.2 MB	JPEG image JPEG image	Dec 19, 2020 at 12:56 P Jan 29, 2021 at 12:43 P	M M M

Now you will see a new device firmware in mBlock, see following picture:



Now mBlock software and OSOYOO\_UNO device firmware have been successfully installed in our PC!

## Upload program to OSOYOO Basic board

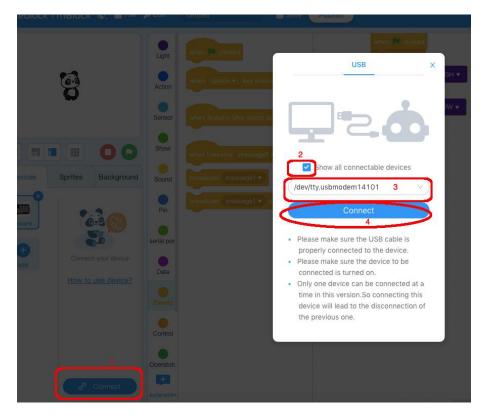
1) You need connect your board to your PC with a USB cable first. Then click the

Connect button in the bottom of the mBlock software, you will see a USB window pop

up,

2) Select Show all connectable device check box, then a device drop-down menu will show up,

- 3) Select your port from device drop-down menu
- 4) Click Connect button to connect your PC to your board



5)After you PC is connected to your board, please click Upload button in the bottom

of your software, then the code will be uploaded to your board:



For more information, please click user guide to learn more or visit the link:

https://www.yuque.com/makeblock-help-center-en/mblock-5

## Preparation before Class 2: Download and Install Arduino IDE

- Introdution
- Preparation
- Extending Reading
- Install the Software (IDE) on Windows PC
- Install the Software (IDE) on MAC OS X
- Install the Software (IDE) on on Linux

## Introduction

This lesson will walk you through downloading, installing, and testing the IDE (short for Arduino Integrated Development Environment).Before you jump to the page for your operating system, make sure you've got every thing prepared.

## Preparation:

- A computer (Windows, Mac, or Linux)
- An Arduino-compatible microcontroller(Osoyoo NodeMCU here)
- A USB A-to-B cable, or another appropriate way to connect your
   Arduino-compatible microcontroller to your computer (check out this USB
   buying guide if you're not sure which cable to get).

## **Extended Reading:**

If you are new to Arduino general, check below links and you will be more familiar with it:

• What is Arduino and why we want to use it

• Introduction of Arduino IDE

If you're ready to get started, click on the link in the column on the left that matches up with your operating system, or you can jump to your operating system here.

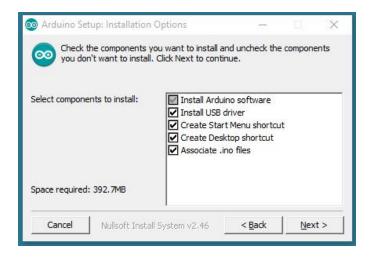
- Windows
- Mac
- Linux

## INSTALL THE SOFTWARE (IDE) ON WINDOWS PC

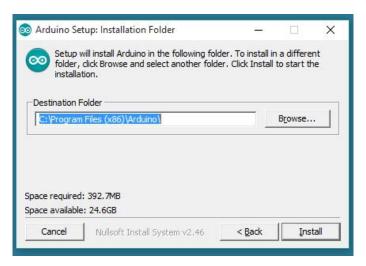
## Download the Software (IDE)

Get the latest version from the download page. You can choose between the Installer (.exe) and the Zip packages. We suggest you use the first one that installs directly everything you need to use the Software (IDE), including the drivers. With the Zip package you need to install the drivers manually. The Zip file is also useful if you want to create a portable installation.

When the download finishes, proceed with the installation and please allow the driver installation process when you get a warning from the operating system.



Choose the components to install



Choose the installation directory (we suggest to keep the default one)

🥺 Arduino Setup: Installing	(1 <del>11)</del>		X
Extract: c++.exe			
Show details			
Cancel Nullsoft Install System v2.46	< Back	Clos	
Cancel Nullsoft Install System v2.46	< your		c

The process will extract and install all the required files to execute properly the

## Software (IDE)

## Proceed with board specific instructions

When the Software (IDE) is properly installed you can go back to the Getting Started

Home and choose your board from the list on the right of the page.

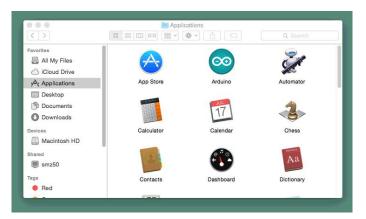
## INSTALL THE SOFTWARE (IDE) ON MAC OS X

#### Download the Software (IDE)

Get the latest version from the download page. The file is in Zip format; if you use Safari it will be automatically expanded. If you use a different browser you may need to extract it manually.

		Downloads ▼ ✿ Y ①		Q Search
Favorites	Name	Size	Kind	Date Added
All My Files	👓 Arduino	426,6 MB	Application	Today 15:04
iCloud Drive				
<sup>™</sup> Applications				
Desktop				
Documents				
O Downloads				
Devices				
Macintosh HD				
Tags				
Red				
😑 Orange				
Yellow				
O Ourse	-			

Copy the application into the Applications folder (or elsewhere on your computer).



### Proceed with board specific instructions

When the Software (IDE) is properly installed you can go back to the Getting Started

Home and choose your board from the list on the right of the page.

## INSTALL THE SOFTWARE (IDE) ON ON LINUX

## **Quick Start**

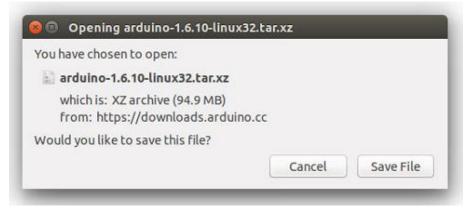
The Linux build of the Software (IDE) is now a package that doesn't require ansy specific procedure for the various distributions availabe of Linux. The only relevant information is the 32 or 64 bit version of the OS.

## Download the Software (IDE)

Get the latest version from the download page. You can choose between the 32, 64 and ARM versions. It is very important that you choose the right version for your

Linux distro. Clicking on the chosen version brings you to the donation page and then

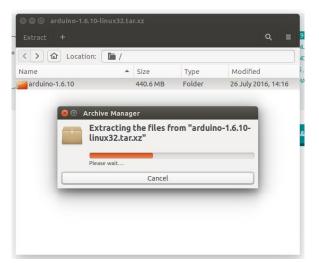
you can either open or save the file. Please save it on your computer.



### Extract the package

The file is compressed and you have to extract it in a suitable folder, remembering

that it will be executed from there.

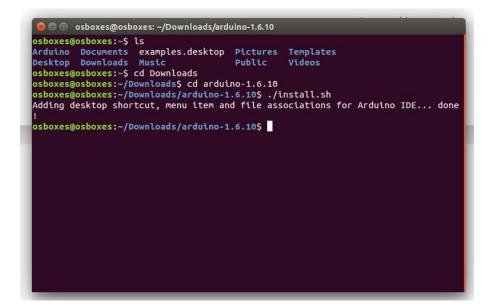


## Run the install script

Open the **arduino-1.6.x** folder just created by the extraction process and spot the **install.sh** file. Right click on it and choose **Run in Terminal** from the contextual menu. The installation process will quickly end and you should find a new icon on your desktop.

If you don't find the option to run the script from the contextual menu, you have to open a Terminal window and move into the **arduino-1.6.x** folder. Type the

command ./install.sh and wait for the process to finish. You should find a new icon on your desktop.



## Proceed with board specific instructions

When the Software (IDE) is properly installed you can go back to the Getting Started Home and choose your board from the list on the right of the page.

## Please Read...

It might hapen that when you upload a sketch – after you have selected your board and serial port -, you get an errorError opening serial port ... If you get this error, you need to set serial port permission.

Open Terminal and type:

```
Is -I /dev/ttyACM*
```

you will get something like:

crw-rw---- 1 root dialout 188, 0 5 apr 23.01 ttyACM0

The "0" at the end of ACM might be a different number, or multiple entries might be

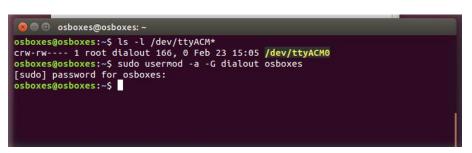
returned. The data we need is "dialout" (is the group owner of the file).

Now we just need to add our user to the group:

sudo usermod -a -G dialout

where is your linux user name. You will need to log out and log in again for this

### change to take effect.



This is the procedure to access the serial port from the Software (IDE) if you get an error

After this procedure, you should be able to proceed normally and upload the sketch

to your board or use the Serial Monitor.

The text of the Arduino getting started guide is licensed under a Creative Commons

Attribution-ShareAlike 3.0 License. Code samples in the guide are released into the

public domain.

This paper is from:https://www.arduino.cc/en/Guide/HomePage,more info please

click:https://www.arduino.cc/en/Guide/Environment

## Preparation before Class 3: OSOYOO basic board for Arduino UNO

## CONTENT

- 1. Overview
- 2. Specifications
- 3. Pinout

#### 4. Schematics

- 5. Documentations
  - 1. Programming
  - 2. Warnings
  - 3. Differences with other boards
  - 4. <u>Power</u>
  - 5. Memory
  - 6. Input and Output
  - 7. Communication
  - 8. Automatic (Software) Reset
  - 9. <u>Revisions</u>

"The UNO is the best board to get started with electronics and coding. If this is your first experience tinkering with the platform, the UNO is the most robust board you can start playing with. The UNO is the most used and documented board of the whole Arduino family." ———–

www.Arduino.cc



#### **Overview**

The Osoyoo basic Board is fully compatible with Arduino UNO rev.3, it is a microcontroller board based on the ATmega328P (datasheet). It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz quartz crystal, a USB connection, a power jack, an ICSP header and a reset button. It contains everything needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with a AC-to-DC adapter or battery to get started.. You can tinker with your board without worring too much about doing something wrong, worst case scenario you can replace the chip for a few dollars and start over again.

"Uno" means one in Italian and was chosen to mark the release of Arduino Software (IDE) 1.0. The Uno board and version 1.0 of Arduino Software (IDE) were the reference versions of Arduino, now evolved to newer releases. The board is the first in a series of Arduino boards, and the reference model for Arduino platform; for an extensive list of current, past or outdated boards see the index of boards.

#### Note:

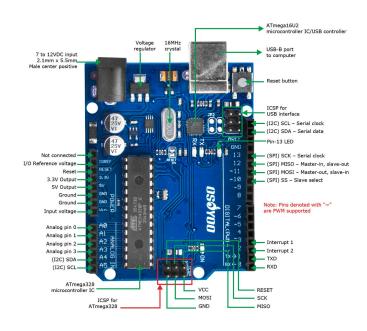
This is an Arduino Compatible board. It is NOT an original Arduino board, but is similar. None of the Arduino Uno R3 boards sold on the internet at this price are original, they are all copies. This is perfectly legal, seeing that the whole Arduino ecosystem is open source! Please note this board is manufactred by Osoyoo! We do have control of the brand and quality of components used! We have also carefully selected suppliers that consistently supply quality products. We strictly control the quality of the products before leaving the factory. The excellent after-sales service and professional technical support will ensure you have a good time with Osoyoo UNO Board



## **Specifications of Osoyoo UNO**

- Microcontroller: ATmega328P-PU
- Operating Voltage: 5V

- Input Voltage (recommended): 7-12V
- Input Voltage (limits): 6-20V
- Digital I/O Pins: 14 (of which 6 provide PWM output)
- Analog Input Pins: 6
- DC Current per I/O Pin: 40 mA
- DC Current for 3.3V Pin: 50 mA
- Flash Memory: 32 KB of which 0.5 KB used by bootloader
- SRAM: 2 KB (ATmega328)
- EEPROM: 1 KB (ATmega328)
- Clock Speed: 16 MHz



## **Pinout of Osoyoo Basic Board**

## **Schematics**

Arduino Uno is open-source hardware! You can build your own board using the following files from the Arduino official site:

- Arduino\_Uno\_Rev3 Eagle files
- Arduino\_Uno\_Rev3 schematic PDF file
- Arduino\_Uno\_Rev3 DXF file

#### **Documentations**

#### PROGRAMMING

The OSOYOO Basic board can be programmed with the (Arduino Software (IDE)). Select "Arduino/Genuino Uno from the Tools > Board menu (according to the microcontroller on your board). For details, see the reference and tutorials. The ATmega328 on the board comes preprogrammed with a bootloader that allows you to upload new code to it without the use of an external hardware programmer. It communicates using the original STK500 protocol (reference, C header files). You can also bypass the bootloader and program the microcontroller through the ICSP (In-Circuit Serial Programming) header using ISP or similar; see these instructions for details.

The ATmega16U2 (or 8U2 in the rev1 and rev2 boards) firmware source code is available in Arduino repository. The ATmega16U2/8U2 is loaded with a DFU bootloader, which can be activated by:

 On Rev1 boards: connecting the solder jumper on the back of the board (near the map of Italy) and then rese ing the 8U2.

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 On Rev2 or later boards: there is a resistor that pulling the 8U2/16U2 HWB line to ground, making it easier to put into DFU mode.

You can then use Atmel's FLIP software (Windows) or the DFU programmer (Mac OS X and Linux) to load a new firmware. Or you can use the ISP header with an external programmer (overwriting the DFU bootloader). See this user-contributed tutorial for more information.

#### WARNINGS

The board has a resettable polyfuse that protects your computer's USB ports from shorts and overcurrent. Although most computers provide their own internal protection, the fuse provides an extra layer of protection. If more than 500 mA is applied to the USB port, the fuse will automatically break the connection until the short or overload is removed.

#### DIFFERENCES WITH OTHER BOARDS

The Uno differs from all preceding boards in that it does not use the FTDI USB-to-serial driver chip. Instead, it features the Atmega16U2 (Atmega8U2 up to version R2) programmed as a USB-to-serial converter.

#### POWER

The board can be powered via the USB connection or with an external power supply. The power source is selected automatically.

External (non-USB) power can come either from an AC-to-DC adapter (wall-wart) or battery. The adapter can be connected by plugging a 2.1mm center-positive plug into the board's power jack. Leads from a battery can be inserted in the GND and Vin pin headers of the POWER connector. The board can operate on an external supply from 6 to 20 volts. If supplied with less than 7V, however, the 5V pin may supply less than five volts and the board may become unstable. If using more than 12V, the voltage regulator may overheat and damage the board. The recommended range is 7 to 12 volts.

The power pins are as follows:

- Vin. The input voltage to the board when it's using an external power source (as opposed to 5 volts from the USB connection or other regulated power source). You can supply voltage through this pin, or, if supplying voltage via the power jack, access it through this pin.
- 5V.This pin outputs a regulated 5V from the regulator on the board. The board can be supplied with power either from the DC power jack (7 12V), the USB connector (5V), or the VIN pin of the board (7-12V). Supplying voltage via the 5V or 3.3V pins bypasses the regulator, and can damage your board. We don't advise it.
- 3V3. A 3.3 volt supply generated by the on-board regulator. Maximum current draw is 50 mA.
- GND. Ground pins.
- IOREF. This pin on the board provides the voltage reference with which the microcontroller operates. A properly configured shield can read the IOREF pin voltage and select the appropriate power source or enable voltage translators on the outputs to work with the 5V or 3.3V.

#### MEMORY

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The ATmega328 has 32 KB (with 0.5 KB occupied by the bootloader). It also has 2 KB of SRAM and 1 KB of EEPROM (which can be read and written with the EEPROM library).

#### **INPUT AND OUTPUT**

See the mapping between pins and ATmega328P ports. The mapping for the Atmega8, 168, and 328 is identical.

#### PIN MAPPING ATmega328P

Each of the 14 digital pins on the Uno can be used as an input or output, using pinMode(),digitalWrite(), and digitalRead() functions. They operate at 5 volts. Each pin can provide or receive 20 mA as recommended operating condition and has an internal pull-up resistor (disconnected by default) of 20-50k ohm. A maximum of 40mA is the value that must not be exceeded on any I/O pin to avoid permanent damage to the microcontroller.

In addition, some pins have specialized functions:

- Serial: 0 (RX) and 1 (TX). Used to receive (RX) and transmit (TX) TTL serial data. These pins are connected to the corresponding pins of the ATmega8U2 USB-to-TTL Serial chip.
- External Interrupts: 2 and 3. These pins can be configured to trigger an interrupt on a low value, a rising or falling edge, or a change in value. See the attachInterrupt() function for details.
- PWM: 3, 5, 6, 9, 10, and 11. Provide 8-bit PWM output with the analogWrite() function.

- SPI: 10 (SS), 11 (MOSI), 12 (MISO), 13 (SCK). These pins support SPI communication using the SPI library.
- LED: 13. There is a built-in LED driven by digital pin 13. When the pin is HIGH value, the LED is on, when the pin is LOW, it's off.
- TWI: A4 or SDA pin and A5 or SCL pin. Support TWI communication using the Wire library.

The Uno has 6 analog inputs, labeled A0 through A5, each of which provide 10 bits of resolution (i.e. 1024 different values). By default they measure from ground to 5 volts, though is it possible to change the upper end of their range using the AREF pin and the analogReference() function. There are a couple of other pins on the board:

- AREF. Reference voltage for the analog inputs. Used with analogReference().
- Reset. Bring this line LOW to reset the microcontroller. Typically used to add a reset button to shields which block the one on the board.

#### COMMUNICATION

The board has a number of facilities for communicating with a computer, another Arduino/Genuino board, or other microcontrollers. The ATmega328 provides UART TTL (5V) serial communication, which is available on digital pins 0 (RX) and 1 (TX). An ATmega16U2 on the board channels this serial communication over USB and appears as a virtual com port to software on the computer. The 16U2 firmware uses the standard USB COM drivers, and no external driver is needed. However, on Windows, a .inf file is required. The Software (IDE) includes a serial monitor which allows simple textual data to be sent to and from the board. The RX and TX LEDs on the board will flash when data is being transmitted via the USB-to-serial chip and USB connection to the computer (but not for serial communication on pins 0 and 1). A SoftwareSerial library allows serial communication on any of the Uno's digital pins. The ATmega328 also supports I2C (TWI) and SPI communication. The Software (IDE) includes a Wire library to simplify use of the I2C bus; see the documentation for details. For SPI communication, use the SPI library.

#### Automatic (Software) Reset

Rather than requiring a physical press of the reset button before an upload, the board is designed in a way that allows it to be reset by software running on a connected computer. One of the hardware flow control lines (DTR) of the ATmega8U2/16U2 is connected to the reset line of the ATmega328 via a 100 nanofarad capacitor. When this line is asserted (taken low), the reset line drops long enough to reset the chip. The Software (IDE) uses this capability to allow you to upload code by simply pressing the upload button in the interface toolbar. This means that the bootloader can have a shorter timeout, as the lowering of DTR can be well-coordinated with the start of the upload.

This setup has other implications. When the Uno is connected to either a computer running Mac OS X or Linux, it resets each time a connection is made to it from software (via USB). For the following half-second or so, the bootloader is running on the Uno. While it is programmed to ignore malformed data (i.e. anything besides an upload of new code), it will intercept the first few bytes of data sent to the board after a connection is opened. If a sketch running on the board receives one-time configuration or other data when it first starts, make sure that the software with which

28

it communicates waits a second after opening the connection and before sending this data.

The Uno board contains a trace that can be cut to disable the auto-reset. The pads on either side of the trace can be soldered together to re-enable it. It's labeled "RESET-EN". You may also be able to disable the auto-reset by connecting a 110 ohm resistor from 5V to the reset line; see this forum thread for details.

#### REVISIONS

Revision 3 of the board has the following new features:

- 1.0 pinout: added SDA and SCL pins that are near to the AREF pin and two other new pins placed near to the RESET pin, the IOREF that allow the shields to adapt to the voltage provided from the board. In future, shields will be compatible with both the board that uses the AVR, which operates with 5V and with Due that operates with 3.3V. The second one is a not connected pin, that is reserved for future purposes.
- Stronger RESET circuit.
- Atmega 16U2 replace the 8U2.

The Osoyoo basic Board is 100% Software and Hardware compatible with Arduino UNO Board, you can get more info from www.arduino.cc. Thanks for their efforts, it's easier for us to learn Arduino!

## Preparation before Class 4: OSOYOO Magic I/O Shield for Arduino

Arduino Uno is the most popular Arduino board, however it is often frustrating when your UNO board needs connect many sensors and actuators with jumper wires . In worst cases, wrong connection of wires can burn Arduino board , cause circuit short-cut fire and make your project become a nightmare. The purpose of creating the OSOYOO Magic I/O Shield for Arduino is to help people,

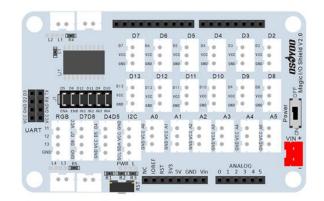
especially beginners to make wire connection simple, convenient and safe.

With the rich Plug and Play(PnP) connectors on the base board, you can connect standardized OSOYOO sensor/actuator modules with the Arduino Uno through this shield conveniently!

## INTRODUCTION

This OSOYOO Magic I/O Shield fits standard Arduino UNO compatible board. It is a connection bridge between the electronic block module and UNO board. It is has a build-in motor driver similar to L293/L298, which can provide adjustable power to inductive loads such as relays, solenoids, DC and stepping motors. It can drive two channels of DC motors with your Arduino board, controlling the speed and direction of each one independently.

It extends SPI port, UART, I2C, PWM and analog INPUT pins for Arduino board, so DIY enthusiasts, interactive designers can quickly attach the modules to the board for Arduino and accelerate project development progress. An intelligent power regulator allows you to connect a battery and USB cable simultaneously, and an on-board voltage switch makes it easy to change the output voltage, making 3.3V or 5V sensors compatible. With the plug-and-play interfaces, this board simplifies all your needs for an autonomous robot such as line tracer, obstacle avoidance, maze solver etc., The shield can be interfaced with 2 motors, 12 digital sensors, 6 analog sensors, a line array sensor and an ultrasonic sensor (4 pin and 3 pin).

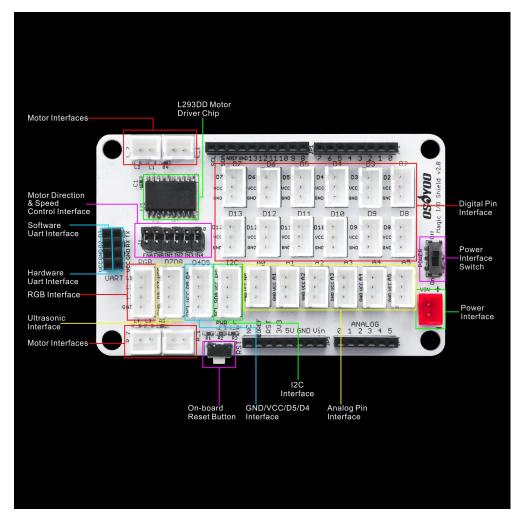


## FEATURES

- Compatible for Arduino UNO R3, Leonardo R3, Mega2560 R3
- All sockets onboard are XH 2.54mm pitch.
- Motor socket number: 4
- I2C socket number: 1
- RGB socket number: 1
- 4PIN socket number: 4
- Power socket number: 1(DC 5V~12V)
- Software Uart interface number: 1
- Hardware Uart interface number: 1

- Analog input socket number: 6(A0, A1, A2, A3,A4,A5)
- Digital pin socket number: 12 (D2~D13)
- Motor Driver socket: for OPEN-SMART car chassis
- L LED for D13 pin
- -3.3V/5V Operating Voltage Switch
- On-board reset button, power indicator led.

## WHAT'S ON BOARD



- 1. Power Interface
- 2. Power indicator led
- 3. L LED for D13 pin

- 4. 3.3V/5V Operating Voltage Switch
- 5. On-board reset button
- 6. Digital Pin Interface
- 7. Analog Pin Interface
- 8. I2C Interface
- 9. Software Uart Interface
- 10. Hardware Uart Interface
- 11. L293DD Motor Driver Chip
- 12. 4 Motor Interfaces
- 13. Motor Direction Control Interface
- 14. Motor Speed Control Interface

Easy to plug OPEN-SMART products with XH2.54 socket to this shield and do not

need to pay attention to the connection. So it is great for Training institutions and

visual programming education.

## **TECHNICAL DETAILS**

Dimensions:82mm x56mm x20mm

Weight:G.W 32g

## Lesson 1: Basic Car

- Objective
- Parts and Devices
- How to make
- Circuit connection
- How to code
- Program Explanation
- How to play

## **OBJECTIVE**

In this lesson, we will show how to assemble a simple robot car with OSOYOO Building Blocks and use mBlock to program its movement



## PARTS & DEVICES

Please prepare the following parts to complete this project

## NOTE:

1.the color of the building block is subject to the actual product, which does not affect the use.

2. ALL OSOYOO PRODUCTS FOR ARDUINO ARE THIRD PARTY BOARD WHICH

IS FULLY COMPATITABLE WITH ARDUINO



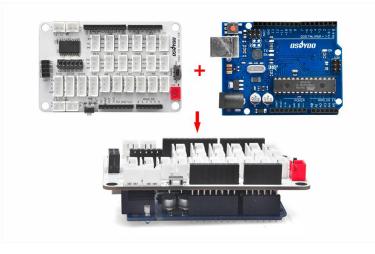
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Before you build the robot with blocks, please install OSOYOO basic board for

Arduino under OSOYOO Magic I/O shield as following (Attention please : the pins of

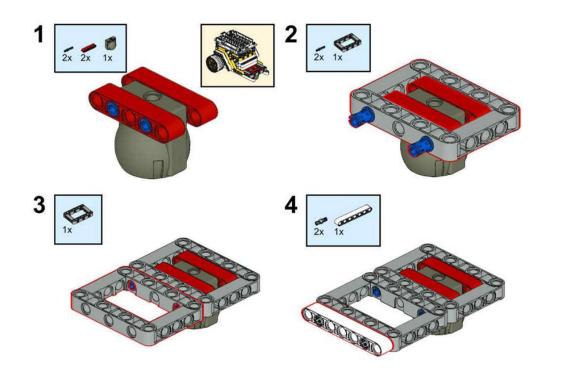
I/O shield is aligned with the port of basic the board firstly, then press the shield

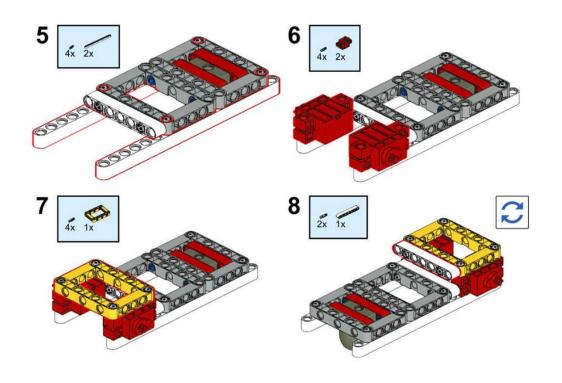
tightly on the board).

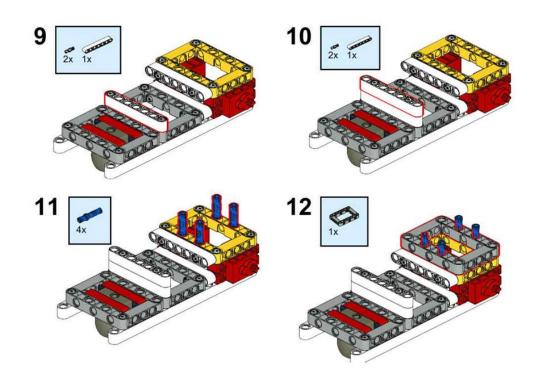


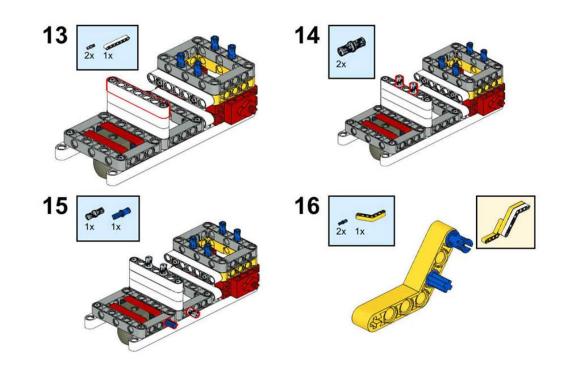
Please follow the building steps to build this robot car, If you want to get clear PDF building steps, please download

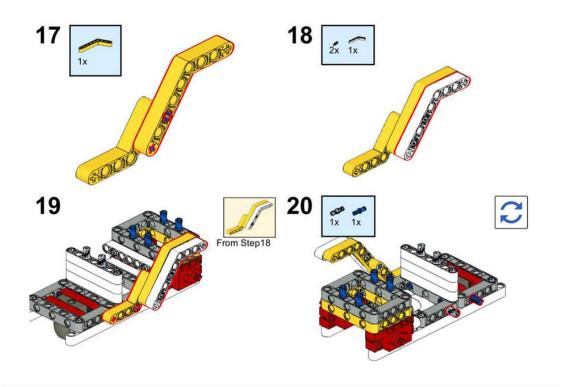
from https://osoyoo.com/picture/Building\_Robot\_Car/lesson1/lesson1.pdf

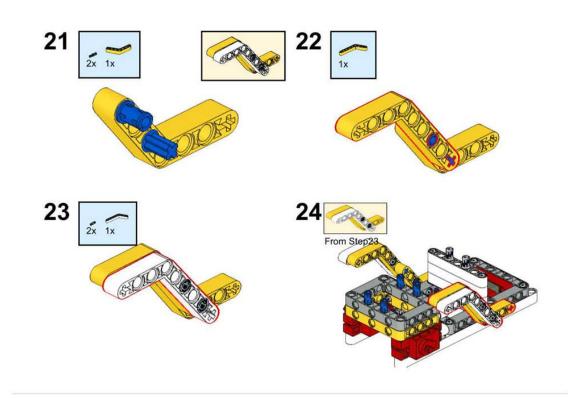


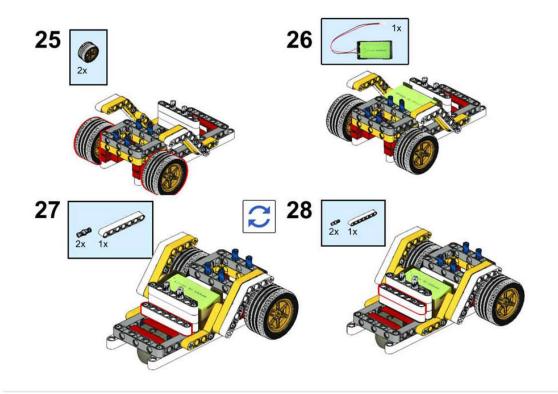


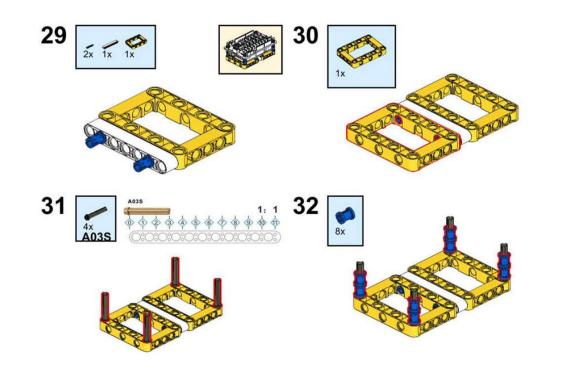


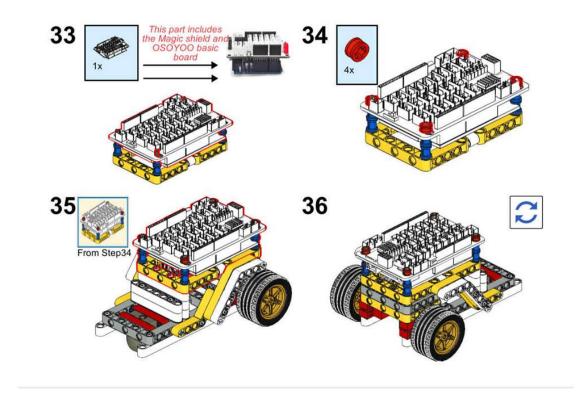






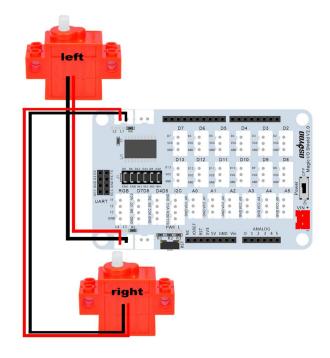




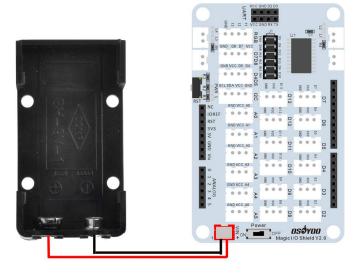


### **CIRCUIT CONNECTION**

Connect Left wheel motor to R1 or R2 port of Magic I/O shield; Connect Right wheel motor to L1 or L2 port as per following picture (Attention please: there are six jumper caps on ENA/ENB/IN1/IN2/IN3/IN4)



Connect 9V battery case to power port of Magic I/O shield as following:



# HOW TO CODE

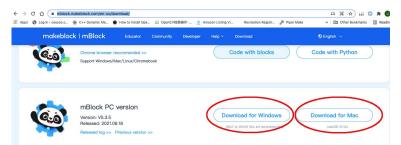
Note: In this kit, we use mblock as programming tool, if you want to learn more about

mblock, please visit preparation before class

1: <u>https://osoyoo.com/2021/12/01/preparation-before-class-1</u>

Step 1) Download mBlock PC from https://mblock.makeblock.com/en-us/download/,

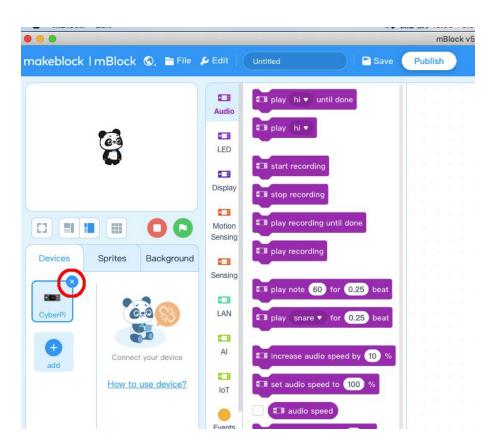
select the download file as per your computer OS type:



Step 2) Download OSOYOO\_UNO.mext device file

from https://osoyoo.com/driver/mblock/osoyoo\_uno.mext

**Step 3)** Run the mBlock PC software by double click the lovely Panda icon. you will see mBlock UI as following picture. Please delete the default device **CyberPi** by click the cross in the red circle.

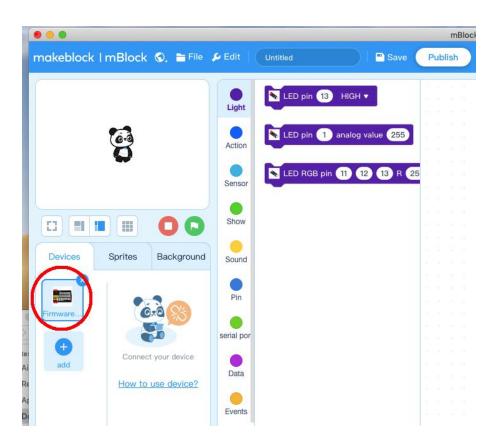


Step 4) Drag and Drop osoyoo\_uno\_mext file(downloaded in Step 2) to mBlock

software as following:

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Recents		i osoyoo-motor	• 145 KB	Micros(.docx)	Jul 15, 2021 at 3:22 PM	
A Applications		OSOYOO-Logo.png	11 KB	PNG image	Jan 29, 2021 at 12:39 PM	
		e osoyoo-kit.png	485 KB 263 KB	PNG image	Sep 1, 2020 at 12:01 PM	
O Downloads		osoyoo-kit.jpg osoyoo-icon	263 KB 3 KB	JPEG image	Mar 31, 2021 at 12:04 AM Feb 26, 2021 at 1:49 AM	
iCloud		osoyoo-icon osoyoo-esp8266.jpg	3 KB 60 KB	PNG image JPEG image	Dec 19, 2021 at 1:49 AM	
(1) iCloud Drive	O	<ul> <li>osoyoo-espozoo.jpg</li> <li>osoyoo-banner.jpg</li> </ul>	4.2 MB	JPEG image	Jan 29, 2021 at 12:43 PM	
	0	esoyou-banner	550 KB	PNG image	Feb 8, 2021 at 2:14 PM	
Desktop		osoyoo_uno.mext	7.7 MB	mext	Aug 4, 2021 at 9:52 AM	
Documents		1000 000 000 0000 MEXT	108 KB	mext	Jul 27, 2021 at 10:56 PM	

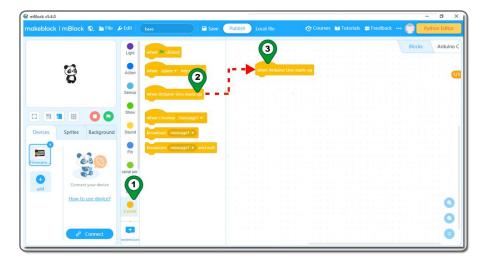
Now you will see a new device firmware in mBlock, see following picture:



Now mBlock software and OSOYOO\_UNO device firmware have been successfully installed in our PC!

Now we will show you how to use blocks to turn above idea into reality.

Step 5): Click Events, add when Arduino Uno starts up block to coding area:



Step 6): Click Action, add 5 action blocks below when Arduino Uno starts

up block .This part is to confirm the speed of the operation.If you want change the

speed ,you can change this value .On here we writed 100 as following picture;



Now we have completed the block programming. The final blocks look like following:

mBlock v5.4.0																		-	-	
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### Step 7) Upload the program to OSOYOO basic board

1) Please connect your OSOYOO basic board to your PC with USB cable firstly.

Then click the Connect button in the bottom of the mBlock software, you will see a

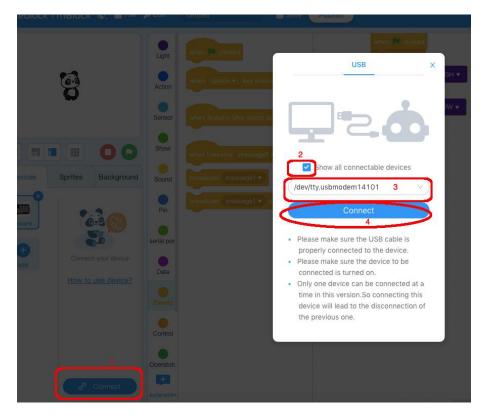
USB window pop up,

2) select **Show all connectable device** check box , then a device drop-down menu

will show up,

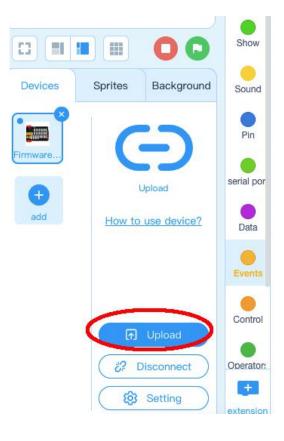
3) select your port from device drop-down menu

4) click **Connect** button to connect your PC to OSOYOO basic board.



5) After you PC is connected toOSOYOO basic board, please click Upload button in

the bottom of your software, then the code will be uploaded to OSOYOO basic board:



PROGRAM EXPLANATION

The program code blocks are quite straight forward, so we just make brief explanations as following:

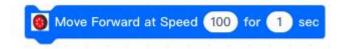
### i) The first yellow block



Above block is dragged from Events category. It tell the system that the blue blocks following it will start when the Arduino UNO board power is turned on. In other projects, you can see other yellow blocks from Events category. Their purpose are the same, define when should the following program blocks be

executed.

### ii)The blue blocks following the yellow event block



These blue blocks are from Action category which means the block defined some kind of actuator action.

Take above **Move Forward at Speed 100 for 1 sec** block example, it tells the car to move forward at speed 100 for one second then stop.

The speed value can be 0 (stop ) to 255 (maximum speed). You can change the

speed and rotation time in the code block.

Base on same logic, you can easily understand the meaning of other 4 blue blocks

which make the car move backward, left turn, right turn and stop.

### iii)Full program block explanation

Now we can review the whole blocks functionality in this lesson:



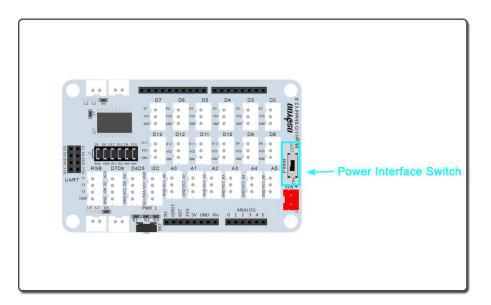
So in plain English, the program blocks in this lesson will ask the car to move forward for 1 second, then move backward for one second, then turn right for one second, then turn left for one second and finally stop. The program will start immediately after Arduino power is on.

Note:

If you want to use Arduino IDE to compile the program, here is the Arduino source code download link: https://osoyoo.com/driver/miniblock/basic-car/basic-car.zip

## HOW TO PLAY

Disconnect Arduino from PC, put a 9V battery into battery pox(make sure polar direction is correct, otherwise it can destroy your device and cause fire hazard). Put the car on the ground, wave the Motor Power switch on the OSOYOO Magic I/O Shield V2.0, the car should go forward 1 seconds, then go backward 1 seconds, then right turn for 1 seconds, then left turn for 1 seconds, then stop.



If the car does not move as per above mentioned result, you should check your wire connection, battery voltage(must over 7.2v).

# Lesson2: Line Tracking Car

- Objective
- Parts and Devices
- How to make
- <u>Circuit connection</u>
- How to code
- Program explanation
- How to play

## **OBJECTIVE**

In this project, we use two IR tracking sensors to design a simple line tracking Robot car. A Line tracking Robot, as the name suggests, is an auto-driving vehicle which follows a black track line printed in white ground. Tracking sensors in the robot keeps checking if the current car location is out of the track. If yes, then car will make a negative movement to draw the robot car back to track.



PARTS & DEVICES

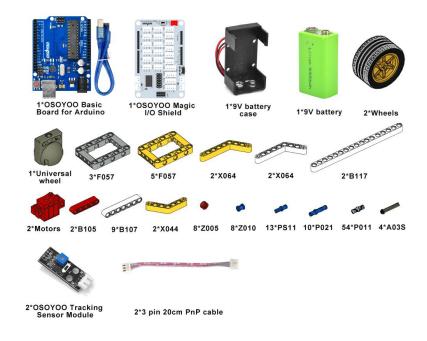
Please prepare the following parts to complete this project

#### NOTE:

1.the color of the building block is subject to the actual product, which does not affect

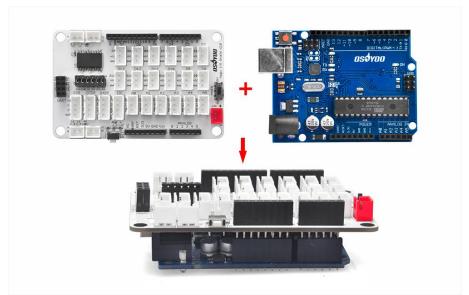
the use.

2. ALL OSOYOO PRODUCTS FOR ARDUINO ARE THIRD PARTY BOARD WHICH IS FULLY COMPATIBLE WITH ARDUINO

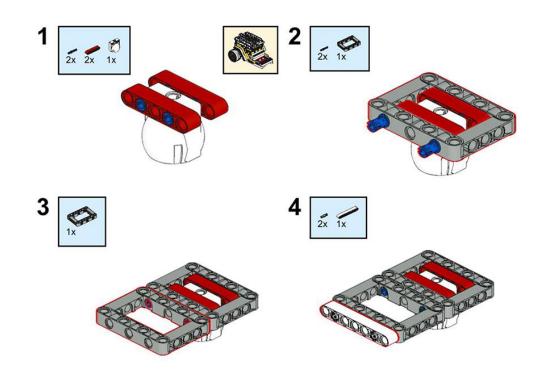


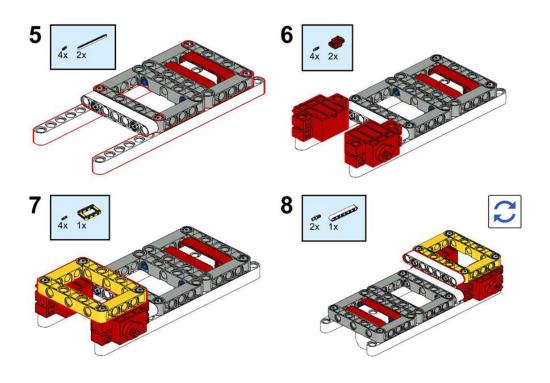
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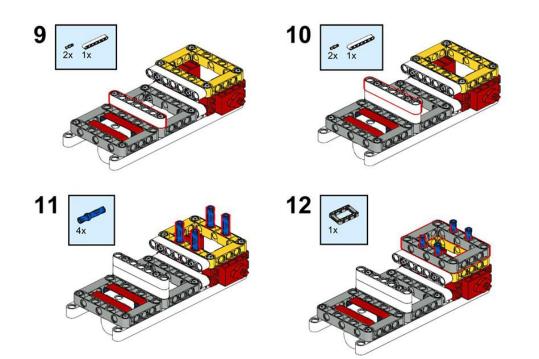
Before you build the robot with blocks, please install OSOYOO basic board for Arduino under OSOYOO Magic I/O shield as following *(Attention please : the pins of I/O shield is aligned with the port of basic the board firstly, then press the shield tightly on the board*.)

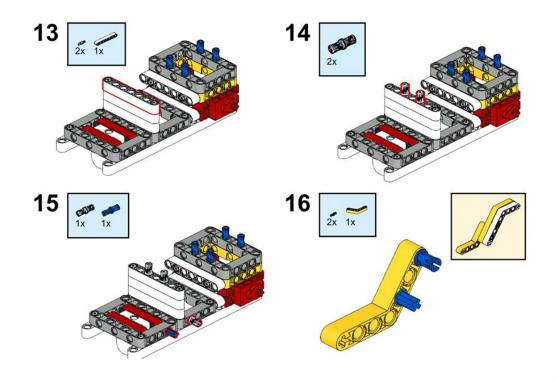


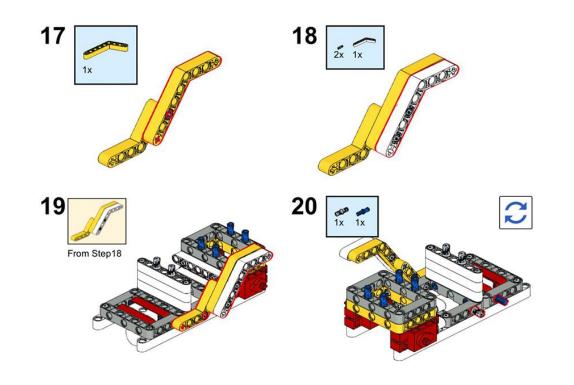
Please follow the building steps to build this robot car, If you want to get clear PDF building steps, please download from https://osoyoo.com/picture/Building\_Robot\_Car/lesson2/LESSON2.pdf Note: If you have built <u>the robot car for lesson1</u>, please skip to the step35 in this PDF.

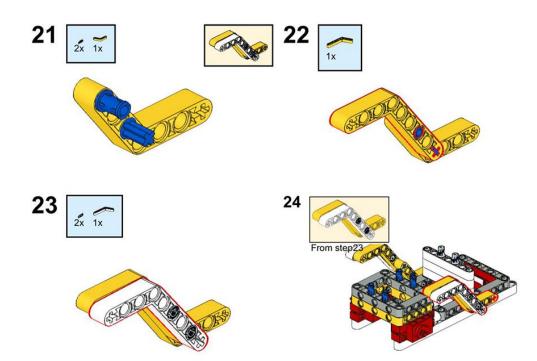


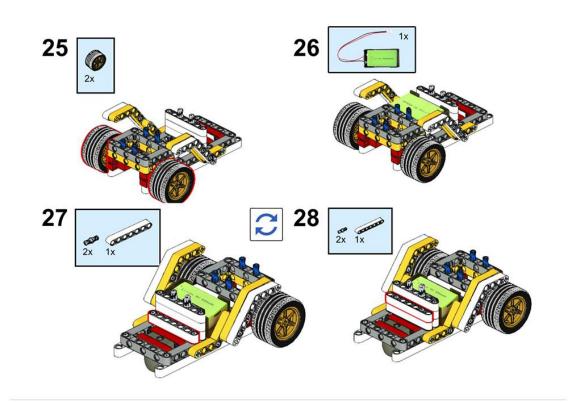


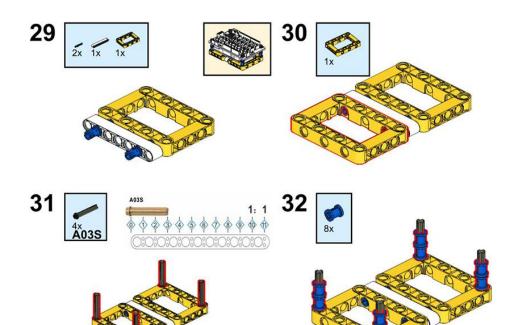


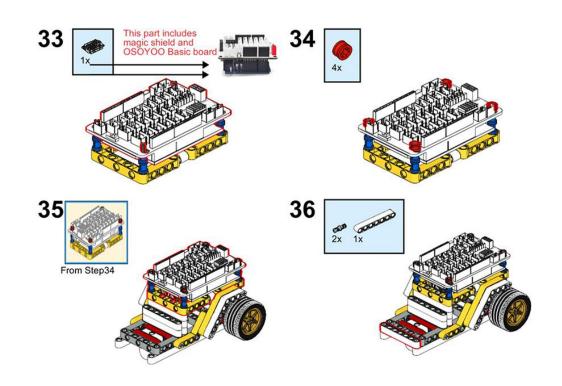


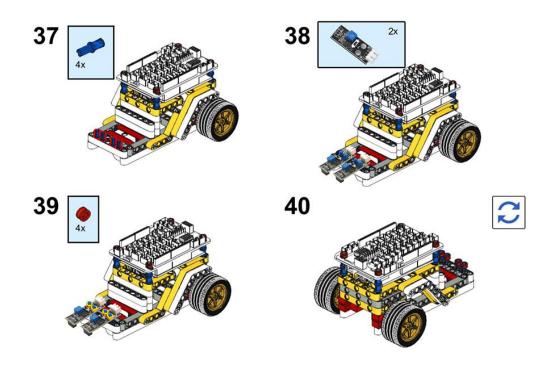






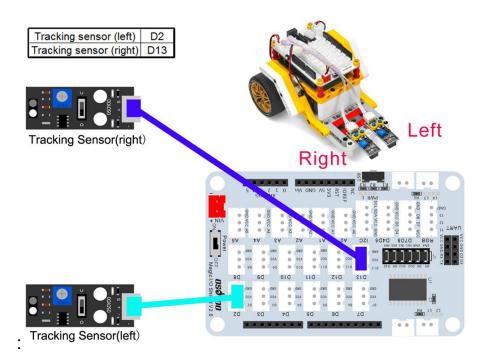






### **CIRCUIT CONNECTION**

Please connect motors and 9V battery case as <u>lesson1</u>. Then connect left tracking sensor to D2 of the Magic I/O shiel, right to D13 port with 3-pin PNP cables as below (Attention please: there are six jumper caps on ENA/ENB/IN1/IN2/IN3/IN4)



## HOW TO CODE

Note: In this kit, we use mblock as programming tool, if you want to learn more about

mblock, please visit preparation before class

1: <u>https://osoyoo.com/2021/12/01/preparation-before-class-1</u>

#### Step 1) Download mBlock PC

version from https://mblock.makeblock.com/en-us/download/, select the download

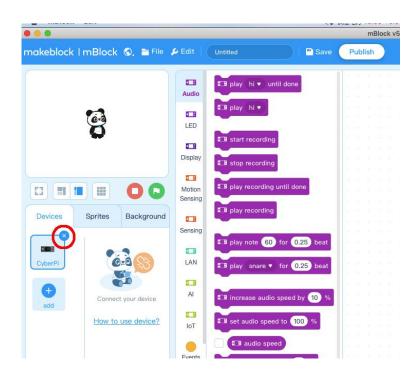
file as per your computer OS type (Please don't use the browser version):

makeblock   mBlo	ck Educator Community	Developer Help Y	Download	
	nowser recommended >>		Code with blocks	Code with Python
mBloc	k PC version			

**Step 2)** Download OSOYOO\_UNO.mext device file

from https://osoyoo.com/driver/mblock/osoyoo\_uno.mext

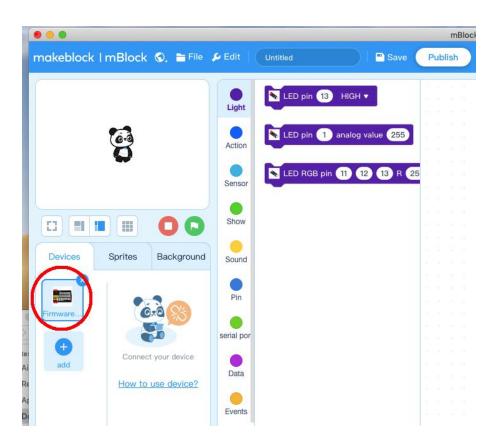
**Step 3)** Run the mBlock PC software by double click the lovely Panda icon. you will see mBlock UI as following picture. Please delete the default device **CyberPi** by click the cross in the red circle.



**Step 4)** Drag and Drop osoyoo\_uno\_mext file(downloaded in Step 2) to mBlock software as following:

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Now you will see a new device firmware in mBlock, see following picture:



Now mBlock software and OSOYOO\_UNO device firmware have been successfully installed in our PC!

Now we will show you how to use blocks to turn above idea into reality.

Step 5: Click Events, add when Arduino Uno starts up block to the top:



Step 6: Click Control, then Drag and drop Forever block to programming area as

following:

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Step 7: Click Control, add an if else block inside forever loop, then add another if

else block inside the else area of first if else block:

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Step 8: Click Sensor, add 2 pcs of IR Tracking Sensor Pin 2 blocks

inside if condition area, change 2nd Pin number from 2 to 13 as following:

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now to use devicer					
	+ 00 timer				

Step 9: Click Action category, add 3 pcs Barkward Left Speed 100 Right Speed
100 block inside if else blocks, change first Right Speed from 100 to 0, change
2nd Left Speed from 100 to 0 :



Now we have completed the block programming. The final blocks look like following:

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### Step 10) Upload the program to OSOYOO basic board

1) Please connect your OSOYOO basic board to your PC with USB cable firstly.

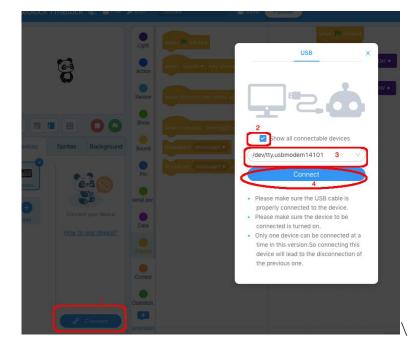
Then click the Connect button in the bottom of the mBlock software, you will see a

USB window pop up,

2) select **Show all connectable device** check box , then a device drop-down menu will show up,

3) select your port from device drop-down menu

4) click **Connect** button to connect your PC to OSOYOO basic board.



5)After you PC is connected to OSOYOO basic board, please click Upload button in

the bottom of your software, then the code will be uploaded to OSOYOO basic board:



PROGRAM EXPLANATION

In Lesson 1, we have learned an Yellow Event Program block and Some Blue Action blocks



In this lesson, we will see some new program blocks from Control Category

#### i) Forever Loop



This block like a crocodile head which has some inside blocks inside its mouse. These inside blocks will be executed in order, after the last inside block is executed, it will go back to the first inside block and repeat the procedure again and again like a loop

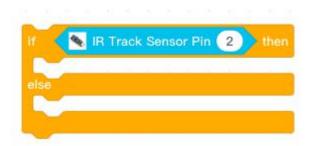
#### ii) A blue IR tracking sensor block from Sensor category



Above block is a hexagon block which means it will return True or False value to Control blocks

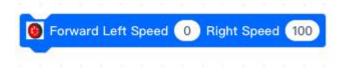
Take above block as example, this block will read tracking sensor in D2 pin(left sensor), if the sensor detects black, it will return TRUE, if detect white, it will return False

### iii) If Else Block in Control category



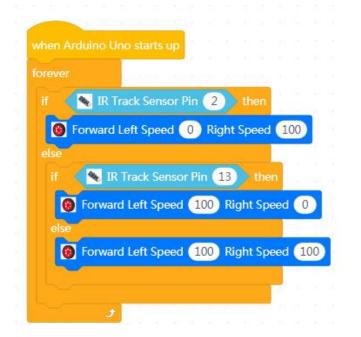
Above block has two mouses, it also has a condition block in the top. When condition block returns True, it will execute the blocks inside the if area(upper mouse), if condition block returns False, it will execute the blocks inside the else area(lower mouse).

#### iv)Another action block which can control the left wheel and right wheel speed



above block can control the left wheel and right wheel running at different speed. In above example, left speed is 0 and right speed is 100. This will make the car make a left turn.

v) Now we can review the whole blocks functionality in this lesson:



Above program blocks are running as a forever loop which means it will never stop unless you turn off the power.

The program will first test left sensor (D2 pin) and see if left sensor detects any black line, if yes, it will make a left turn.

If left sensor detects white , then it will detect right sensor(D13), if right sensor returns

True, it means the black line is in the right side and the car will make a right turn.

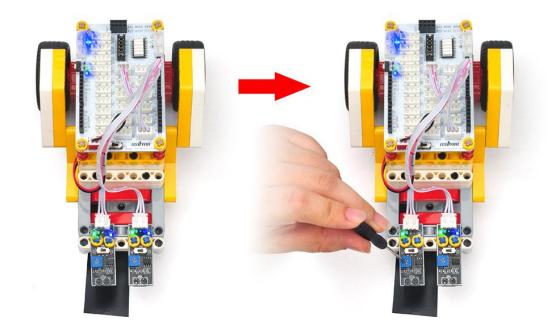
If both sensors don't detect black line, it means the black line is in the middle, the car will move forward.

#### HOW TO PLAY

Disconnect Arduino from PC, put a 9V battery into battery pox(make sure polar direction is correct, otherwise it can destroy your device and cause fire hazard).

### Adjust Tracking Sensor Sensitivity:

Turn on and hold the car and adjust the sensitivity screw on the tracking sensor with a screwdriver until you get the best sensitivity status: the signal indicate LED light will turn on when sensor is above white ground, and the signal LED will turn off when the sensor is above black track.



Prepare a black track (the width of the black track is more than 30mm and less than 60mm) in white ground. Please note, the turning angle((bending curve) of track can't be two sharp(larger than 90 degree). If the turning is too sharp, the car will move out of the track.Turn on the car and put the middle of tracking sensor module facing over black track, and then the car will move along the black track.

# Lesson3 : Light follower

- Objective
- Parts and Devices
- How to make
- <u>Circuit connection</u>
- How to code
- Program explanation
- How to play

### **OBJECTIVE**

In this project, we use two photoresistor sensors to design a simple Light follower Robot car.Using a flashlight to shine on the Photo resistor modules, the robot car will follow the light to move forward, turn light or turn left just like a cute cat play with the light.The Photoresistor modules consist of sensors at the front of the car; you can program it to follow the stronger light.

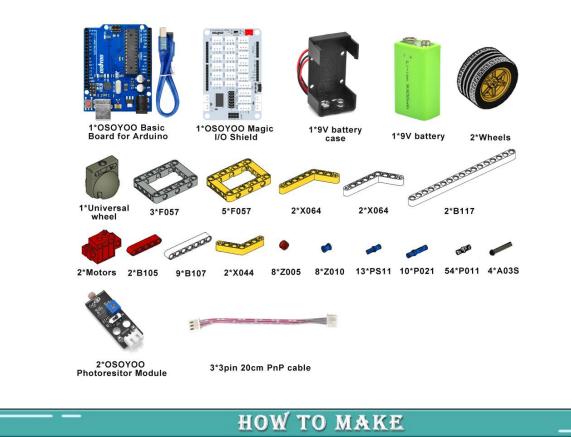
# PARTS & DEVICES

Please prepare the following parts to complete this project

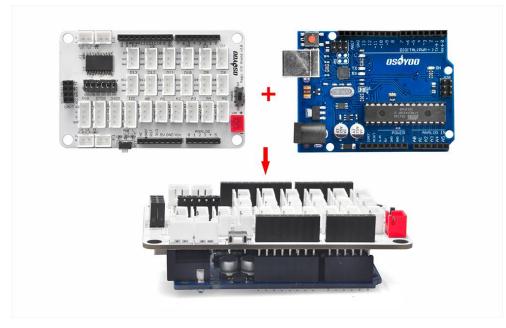
NOTE:

1.the color of the building block is subject to the actual product, which does not affect the use.

2. ALL OSOYOO PRODUCTS FOR ARDUINO ARE THIRD PARTY BOARD WHICH IS FULLY COMPATIBLE WITH ARDUINO

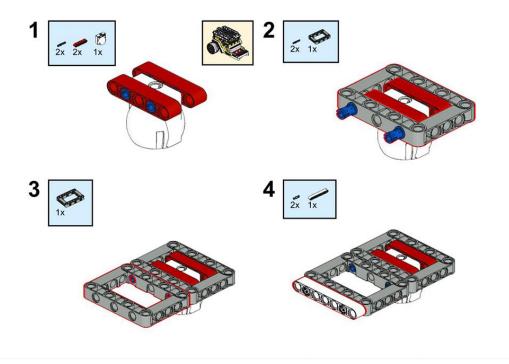


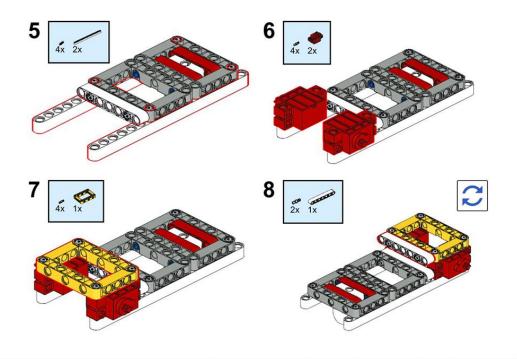
Before you build the robot with blocks, please install OSOYOO basic board for Arduino under OSOYOO Magic I/O shield as following (*Attention please : the pins of I/O shield is* aligned with the port of basic the board firstly, then press the shield tightly on the board).

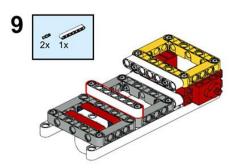


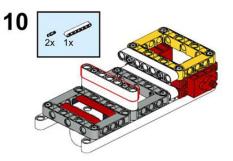
Please follow the building steps to build this robot car, If you want to get clear PDF building steps, please download

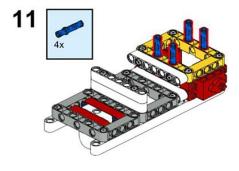
from https://osoyoo.com/picture/Building\_Robot\_Car/lesson3/LESSON3.pdf Note: If you have built <u>the robot car for lesson1</u>, please skip to the step35 in this PDF.

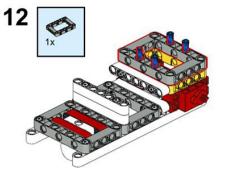


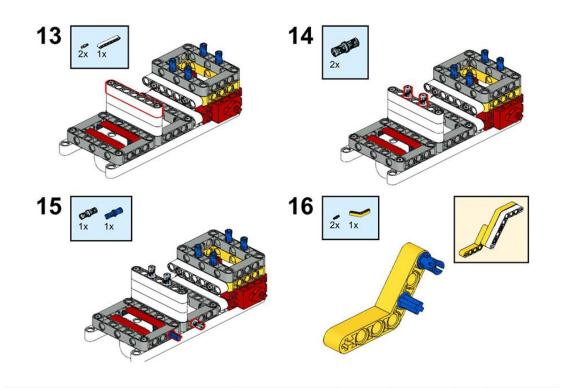


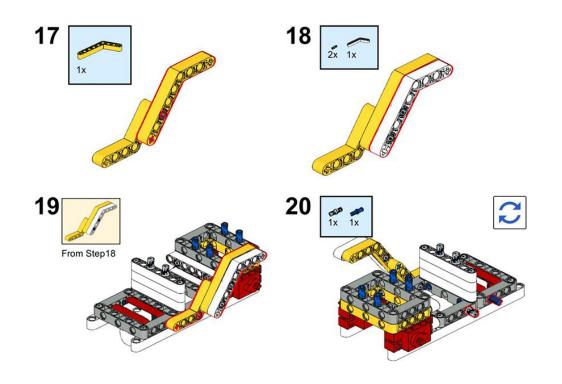


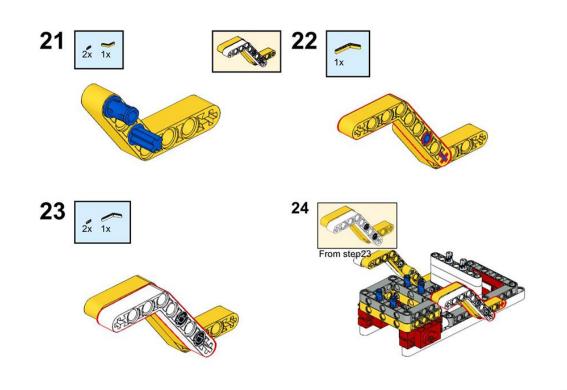


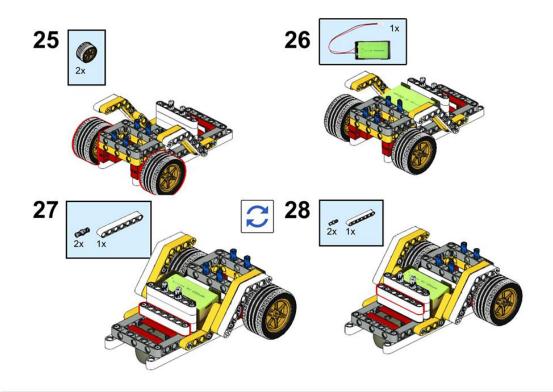


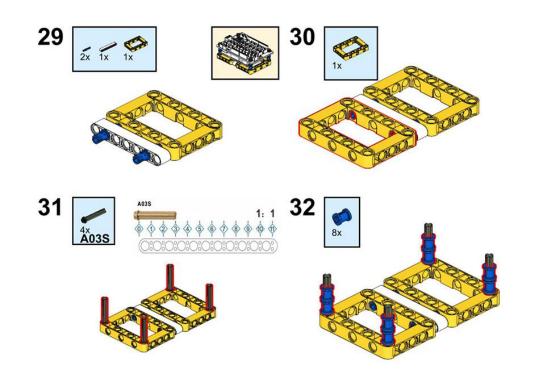


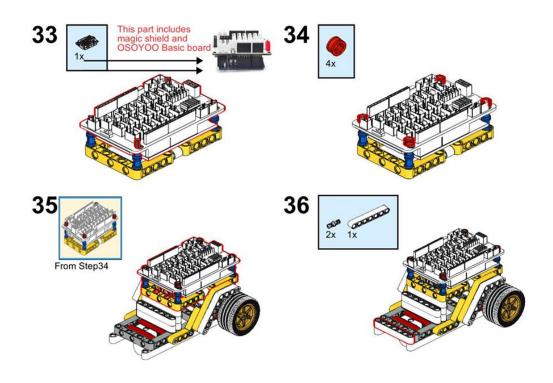


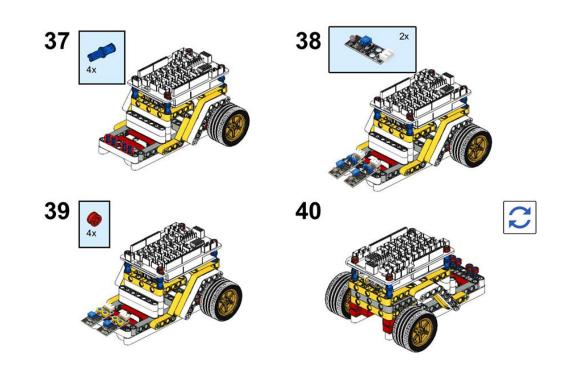










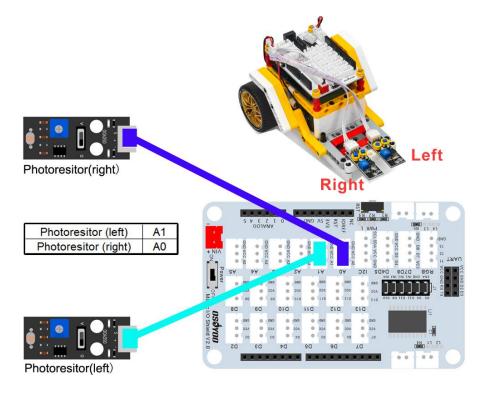


# **CIRCUIT CONNECTION**

Please connect motors and 9V battery case as <u>lesson1</u>. Then connect left

photoresistor to A1 of the Magic I/O shield, right to A0 port with 3-pin PNP cables as

below (Attention please: there are six jumper caps on ENA/ENB/IN1/IN2/IN3/IN4):



# HOW TO CODE

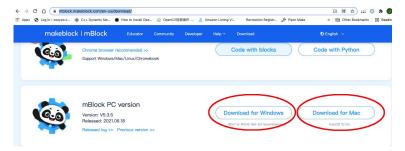
Note: In this kit, we use mblock as programming tool, if you want to learn more about

mblock, please visit preparation before class

- 1: <u>https://osoyoo.com/2021/12/01/preparation-before-class-1</u>
- Step 1) Download mBlock PC

version from https://mblock.makeblock.com/en-us/download/, select the download

file as per your computer OS type (Please don't use the browser version):



### Step 2) Download OSOYOO\_UNO.mext device file

from https://osoyoo.com/driver/mblock/osoyoo\_uno.mext

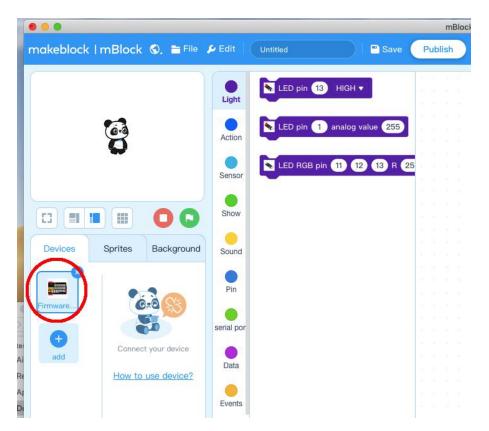
**Step 3)** Run the mBlock PC software by double click the lovely Panda icon. you will see mBlock UI as following picture. Please delete the default device **CyberPi** by click the cross in the red circle.

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**Step 4)** Drag and Drop osoyoo\_uno\_mext file(downloaded in Step 2) to mBlock software as following:

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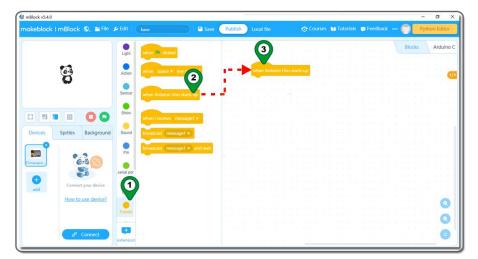
Now you will see a new device firmware in mBlock, see following picture:



Now mBlock software and OSOYOO\_UNO device firmware have been successfully installed in our PC!

Now we will show you how to use blocks to turn above idea into reality.

Step 5)Click Events, add when Arduino Uno starts up block to the top:



Step 6: Click Control, then Drag and drop Forever block to programming area as

following:

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Step7: Click Variable , then click Make a Variable , A new dialog will pop

up,write left\_speed ,than click OK,you will have a new variable left\_speed;Use the

same method to create a **right\_speed** variable;



**Step 8:** Click **Variable** again, then Drag and drop **set left\_speed to** block to programming area as following:

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bba	How to use device	Variabler								G
		My Block:								9
	o <sup>o</sup> Connect	extension								

Step 9:Click Operation , then Drag and drop 0-0 block to programming

area ,write 250 to the first area as following;

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		ength of apple				
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Step 10: Click Sensor, then Drag and drop Read Light Sensor Analog Pin block to

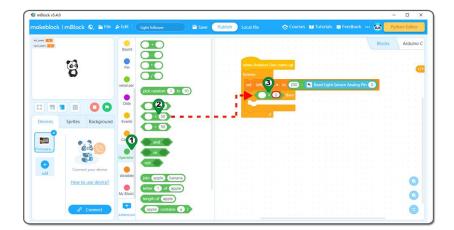
programming area as following;

nakeblock i mBlock 🕲 🖀 File 🖌	🕫 Edit 🕴 Light follower	Bave Publi	sh Local file	🕤 Courses 🖬 Tutorials	📪 Feedback \cdots 🐼	Python Editor
et, sawe 💼	Read Butto	n Pin 🧐 ?		a da a cada	Bloc	cks Arduing
•	Button Pres	ssed Pin (9) ?				
Q	A Tread ultraso	nic sensor trig pin 1	when Arduino Uno forever	starts up	3	
		11 • Sensor Pin (1)	set left_speed	💶o 🜓 - 💽 Read Light S	iensor Analog Pin 0	
	•		· · · ·			
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	Pin Read Light S	Sensor Analog Pin 🕚 💻 💻				
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add How to use device?	Data 💊 set Relay pin	13 HIGH •				Q
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Step 11:Click Control, add an if then block inside forever loop as following :

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	•		repeat 10			-					
	Ö	Pin				forever	no Uno starts up				
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		Data	· · · · ·				then				
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•	00	Operators									
add	Connect your device	Variables	wait until 🔵								
	How to use device?	•	repeat until								111
		My Block:	-								
	& Connect	extension									

**Step 12:** Click **Operation**, then Drag and drop **0<0** block to programming area ,write 0 to the second area as following;



Step 13: Click Variable , then Drag and drop left\_speed block to programming

area as following:

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	Ö	Pin		-	<b>.</b> .	rever	starts op				
		serial por	set left_speed * t	• 0			3 250 -	Read Light Se	nsor Analog Pin		
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			hide variable left sp								
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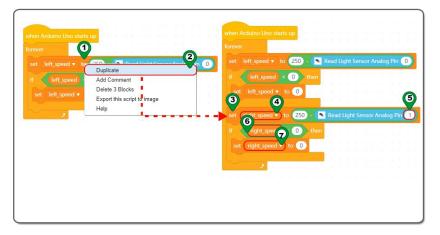
Step 14: Click Variable again, then Drag and drop set left\_speed to block to

programming area as following:

nakeblock i mBlock 🛇,	🖀 File 👂 Edit 🕴	Light follower	Save	Publish			es 🔰 Tutoria		* 🀼	Python	Edito
NULTONE		Make a Variable							Blo	cks A	Arduin
	Sound	left speed									
10.3	Pin	right speed			when Ardu	ino Uno starts up					
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		set left_speed + to	0		Destruction	speed + to 250	( Deserved to	nt Sensor Analo			
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	•	-			3	left_speed < 0	then				
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HOW TO USE OF											~
	My Block:										0
0.000											6
d <sup>o</sup> Conne	extension										E

Step 15: Right Click set left\_speed to block , then Drag and drop these block





Step 16: Click Action again, then Drag and drop Forward Left Speed 100 Right

**Speed 100** block to programming area as following:

A, 1994	0	Turn Right at Speed 100	(		Blocks Ardui
9	Action	Tum Left at Speed 100	when Arduino I	Ino starts up	
	Sensor	Move Forward at Speed		ed 🔹 to 🛛 250) - 💽 Read Light Sena	or Analog Pin 🕕
	Show	Move Backward at Speed	100 for 1 sec	ced • to 0	
Devices Sprites Background	Sound	Turn Right at Speed 100	for 1 sec set right sp	eed • to 250 - 💌 Reed Light Se	nsor Analog Pin 1
	Pin	Turn Left at Speed 100 fo	or 1 sec	speed < 0 then	
Firmware_	senal por	Stop Moving	3	eft Speed 100 Right Speed 100	
add Connect your device How to use device?	Data	set servo pin 9 angle as	<b>1</b>		
	Events	Forward Left Speed 100	Right Speed 100 🗕 🕳 📕		

Step17:Click Variable , then left\_speed block and right\_speed block to

programming area as following:

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C2 EI I Devices	Sprites	O D Background	serial por Data	change left_speed show variable left hide variable left Make a List	speed *		set left_spe	eed < 0 then ed • to 0	Read Light Sensor A		
Firmware		our device	Control Oper				if (right)	peed < 0 then wed + to 0 3	Right Speed	5	
		se device? onnect	My Block								

Now we have completed the block programming. ]The final blocks look like following:

😪 mBlock v5.4.0											-	
makeblock	mBlock	🛇, 🚞 File	🔑 Edit	Light follower	Save	Publish		The Courses	🖬 Tutorials 🛛 🕅 F	eedback 🚥 🔘	Pyth	on Editor
WULDERS CON			Light	LED pin 1	HIGH •					Blo	icks	Arduino
	6		Action		analog value 255		hen Arduino Uno starts u rever set left speed * to	250) - 💽 Read Light	Sensor Analog Pin 📀	( ) (		4
		00	Sensor Show				set right_speed * to set right_speed * to if right_speed < to	0 250 - 💌 Read Ligt	st Sensor Analog Pin 🚺	1		
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Firmware	Connect	your device	serial por									
add	How to I	use device?	Data Events									0
	e (	Connect	extension									0

Now all the programming blocks have been completed! From above picture, the logic is pretty straight forward:

When Arduino is started, computer will enter a dead loop which will check the button status, when button is not pressed, the servo will stop at original position (in my servo 0 degree ) and elevator is in the ground , when button is pressed, the servo arm will rotate from 0 degree position to 180 degree position and the elevator is lifted to the air.

## Step 18) Upload the program to OSOYOO basic board

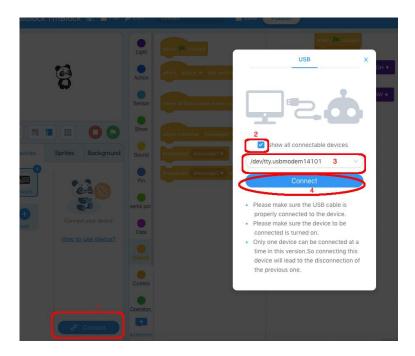
1) Please connect your OSOYOO basic board to your PC with USB cable firstly.

Then click the Connect button in the bottom of the mBlock software, you will see a USB window pop up,

2) select **Show all connectable device** check box , then a device drop-down menu will show up,

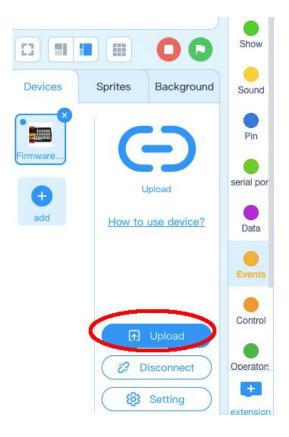
3) select your port from device drop-down menu

4) click **Connect** button to connect your PC to OSOYOO basic board.



5)After you PC is connected to OSOYOO basic board, please click Upload button in

the bottom of your software, then the code will be uploaded to OSOYOO basic board:



PROGRAM EXPLANATION

In previous Lesson 1 and Lesson 2, we have learned some basic control and action program blocks. In this lesson, we will learn some new program blocks:

i)Read Light Sensor from Analog Pin Block from Sensor category

💽 Read Light Sensor Analog Pin 🕕

This block is an oval shape block which means it returns numeric value between 0 to

255. The number zero in the right side means the sensor will read light value from A0

pin(left light sensor).

ii)Minus calculation block from Operator category



Above block calculates the result of 250 minus the value from A0 sensor .

iii)Variable Block and Set Variable to Block in Variable Category:

Variable Block is often defined to save a calculation result for later use.



Above block defined a variable block "left\_speed", then set its value to the calculation of 250 minus A0 light sensor return value. The light value is higher, the left\_speed is smaller, so the car will make left turn.

Here is full program block explanation:

	t_speed • to 250 -	Read Light Sensor	Analog Pin 0	Calculate left motor speed based on left sensor result ,the higher
if set	left_speed < 0 t	hen and a start of the		light value ,the slower left motor speed .
	ht_speed • to 250	- 💽 Read Light Senso	r Analog Pin 1	Calculate right motor speed base
	right_speed < 0	then		on right sensor result ,the higher light value ,the slower right motor speed .
Sorv	vard Left Speed	reed Right Speed right	t_speed	зреец .

The working principle of Photoresistor is that the stronger light of the Photoresistor detecting, the lower value of Photoresistor reading. The value of the Photoresistor reading are more than 0.

In the program we set left motor speed as a variable of left\_speed, right motor speed as a variable of right\_speed. Speed motor is between 0-255.

The variable of left\_speed equals to 250 minus the value of left Photoresistor(A0) reading, and the variable of right\_speed equals to 250 minus the value of right Photoresistor(A1) reading. If the variables are less than 0, the program sets these variables equal to  $0_{\circ}$ 

If the value of left sensor(A0) reading is less than 250, left motor will move forward;

If the value of left sensor(A0) reading is more than 250, left motor will stop;

If the value of right sensor(A1) reading is less than 250, right motor will move forward;

If the value of right sensor(A1) reading is more than 250, right motor will stop;

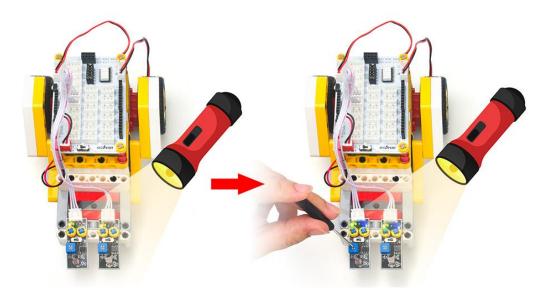
If the value of both sensor reading are less than 250, both motors move forward.

## HOW TO PLAY

### Upload followlight.ino sketch code to Arduino. Turn on the car.

Illuminate the front photoresistor sensor with a flashlight. Then the car will follow the flashlight to make movement.

If the torch shines on the photoresistor sensor, but the car does not move. Please adjust the adjuster as shown in the picture. Under normal circumstances, the yellow light and the blue light will be on at the same time when the torch is illuminated.



# Lesson 4: Obstacle Avoidance Car

- Objective
- Parts and Devices
- How to make
- <u>Circuit connection</u>
- How to code
- Program explanation
- How to play

## **OBJECTIVE**

In this project, we will use obstacle sensor(ultrasonic distance detector) to detect obstacles ,avoid collision and auto-drive.

## PARTS & DEVICES

Please prepare the following parts to complete this project

#### NOTE:

1.the color of the building block is subject to the actual product, which does not affect the use.

2. ALL OSOYOO PRODUCTS FOR ARDUINO ARE THIRD PARTY BOARD WHICH IS FULLY COMPATIBLE WITH ARDUINO



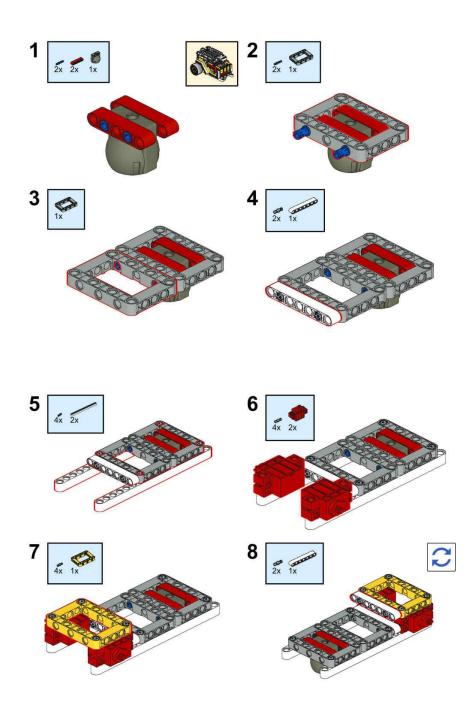
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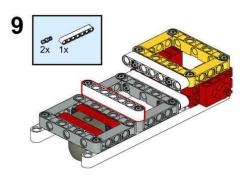
Before you build this robot car with blocks, please install OSOYOO basic board for Arduino under OSOYOO Magic I/O shield as following *(Attention please : the pins of I/O shield is* aligned with the port of basic the board firstly, then press the shield tightly on the board).

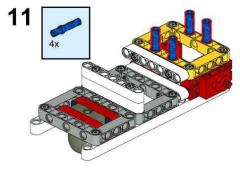


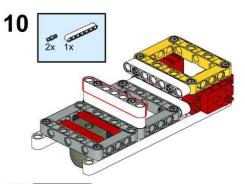
Please follow the building steps to build this robot car, If you want to get clear PDF building steps, please download

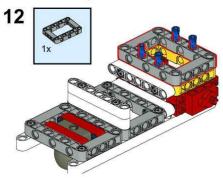
from https://osoyoo.com/picture/Building\_Robot\_Car/lesson4/LESSON4.pdf Note: If you have built<u>the robot car for lesson1</u>, please skip to the step35 in this PDF.

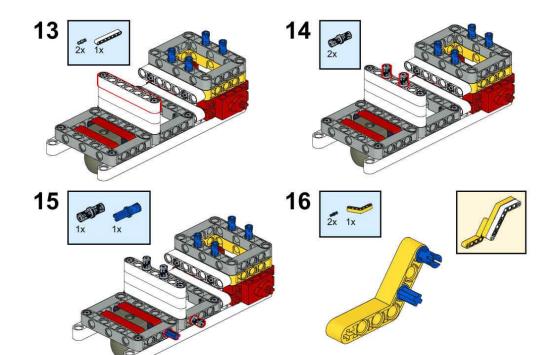


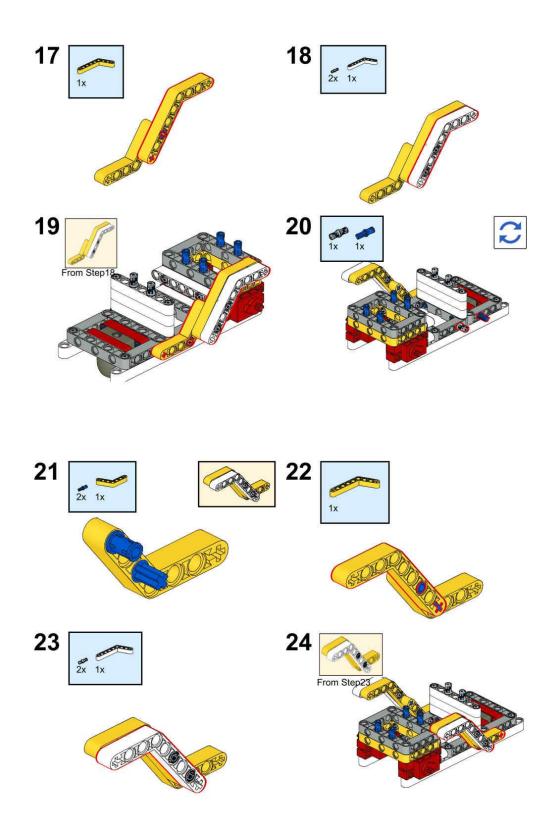


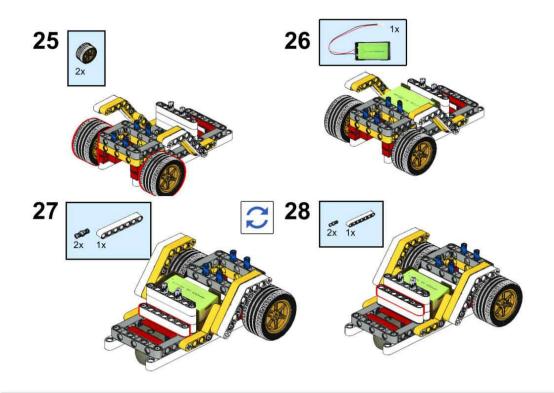


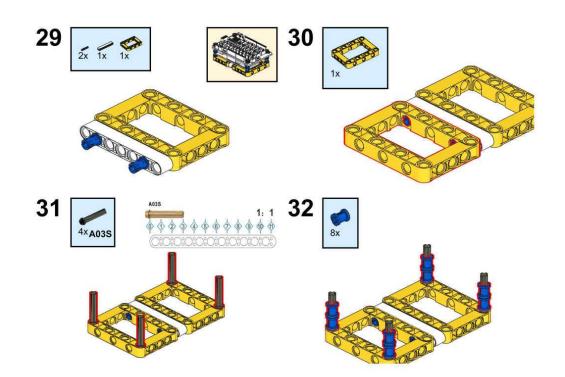


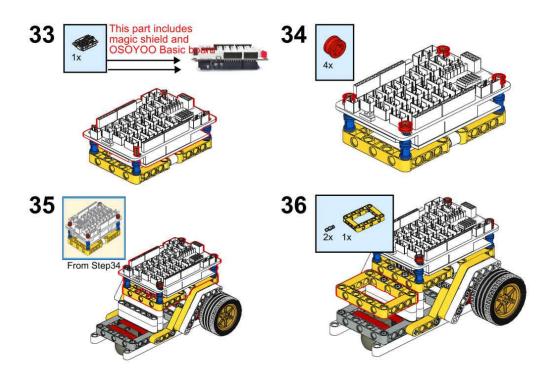


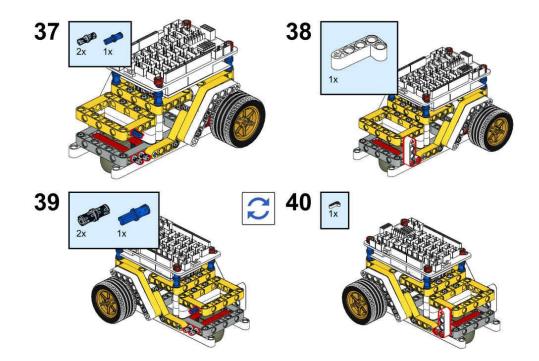


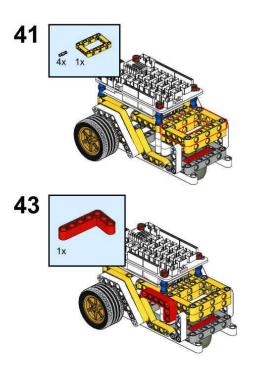


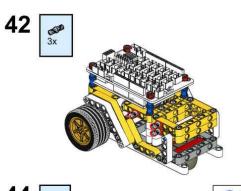


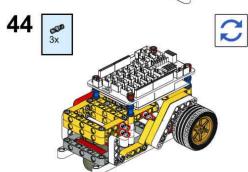


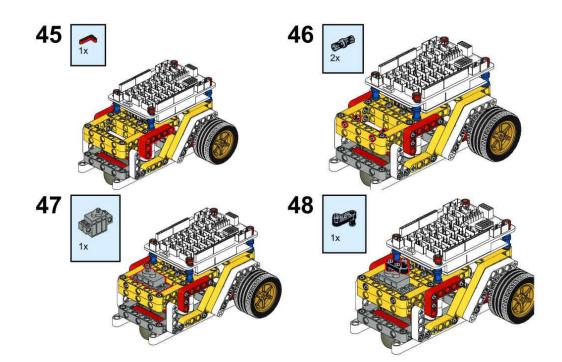


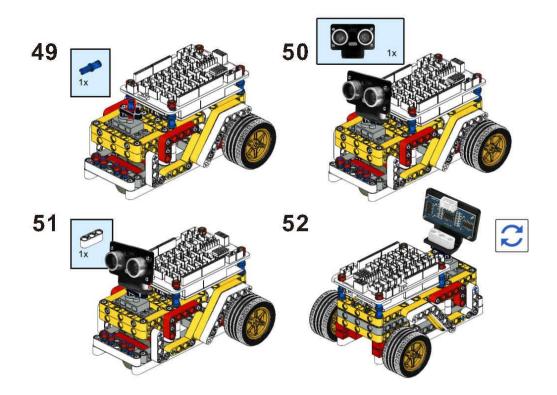












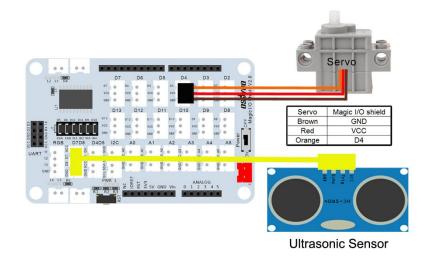
# **CIRCUIT CONNECTION**

Please connect motors and 9V battery case as lesson1.

Then Connect SG90 servo motor to D4 port of OSOYOO Magic I/O shield, Ultrasonic

module sensor to the D7D8 port of the Magic I/O shield with a 4-pin PNP cable as

below:



## HOW TO CODE

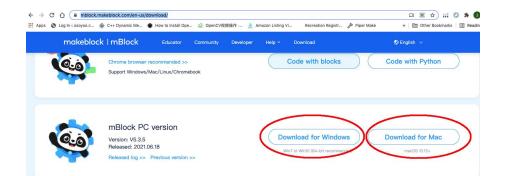
Note: In this kit, we use mblock as programming tool, if you want to learn more about

mblock, please visit preparation before class

- 1: <u>https://osoyoo.com/2021/12/01/preparation-before-class-1</u>
- Step 1) Download mBlock PC

version from https://mblock.makeblock.com/en-us/download/, select the download

file as per your computer OS type (Please don't use the browser version):



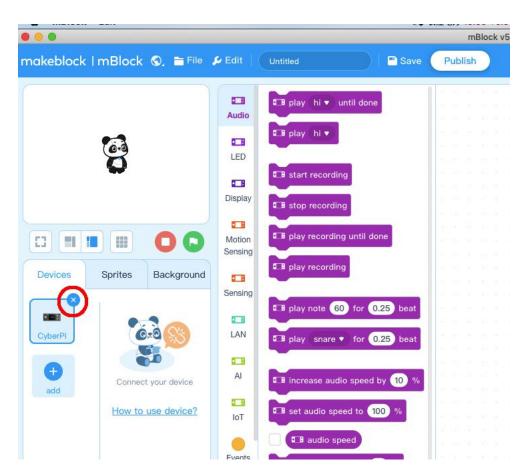
## Step 2) Download OSOYOO\_UNO.mext device file

from https://osoyoo.com/driver/mblock/osoyoo\_uno.mext

Step 3) Run the mBlock PC software by double click the lovely Panda icon.

you will see mBlock UI as following picture. Please delete the default

device **CyberPi** by click the cross in the red circle.

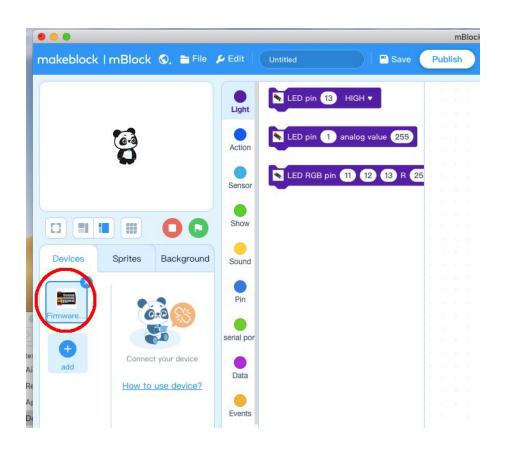


Step 4) Drag and Drop osoyoo\_uno\_mext file(downloaded in Step 2) to

mBlock software as following:

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Now you will see a new device firmware in mBlock, see following picture:



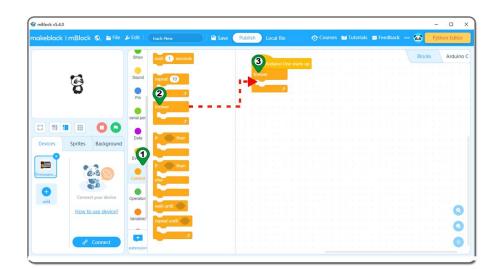
Now mBlock software and OSOYOO\_UNO device firmware have been successfully installed in our PC!

Now we will show you how to use blocks to turn above idea into reality.

Step 5: Click Events, add when Arduino Uno starts up block to the top:

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10	•	space * key r			duíno Uno st	arts un					
8	Action	2	100								
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C 🗏 📕 🔠 🛛 🖸 🖸		receive message1 +									
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	Pin										
imware											
<b>A</b>	serial por										
Connect your device											
How to use device?											
	Events										
	-										

**Step 6:** Click **Control**, then Drag and drop **Forever** block to programming area as following:



Step 7: Click Action, then Drag and drop set servo pin angle as block to

programming area as following

ikeblock I r	nBlock ©, ≡ F	le 🏓 Edit   🌔	ultrasonic	📄 🖹 🖻 Save 🔍 Pu	blish Local file	📀 Courses 🛛	🖬 Tutorials 🛛	Feedback	·· 🐼 📒	Python Edit
- 63		1	Turn Right at S	peed 100					Blocks	Ardui
	3	Action	Turn Left at Spo	ed 100	3	o Uno starts up				
		Sensor	Move Forward	at Speed 100 for 1		pin 👍 angle as 👍	1			
3 [ 11 ] 10		Show	Move Backward	l at Speed 100 for 1	sec					
Devices	Sprites Backgrou	nd Sound	Turn Right at S	peed 100 for 1 sec						
	6.00	Pin	Turn Left at Spe	eed 100 for 1 sec						
•	Connect your device	serial por	<ul><li>Stop Moving</li><li>(2)</li></ul>							
add	How to use device	Data	🖹 set servo pin 🌘	9) angle as 90 <mark>-</mark> -	-					(
		Events	Forward Left Sp	eed 100 Right Speed (	100					(
	Connect	extension	Backward Left S	speed 100 Right Speed	100					

Step 8: Click Control, then Drag and drop wait seconds block to

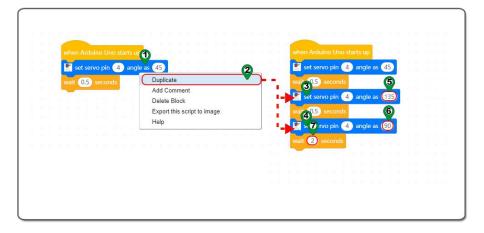
programming area ,writed 0.5 seconds as following:

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44		Sound								Bloe	:ks	Arduino
	13	Pin	repeat 10		100							
	8	Pin			1.1	when Ardulno Un	io starts up					
		senal por	-		1.1	3 Jet servo pin	4 angle as 45					
			forever		1.1	wait 0.5 secon	ds	1.1.1				
c) = :		Data										
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Ð	Connect your device	-	and the second se									
add		Variables	wait until 🌑									0
	How to use device?	•	repeat until									-
		My Block:										. 0
	d <sup>o</sup> Connect		-									0
		extension										-

Step 9: Right click set servo pin angle as block ,Click duplicate from the digital write

pin to block over . You will get a duplicated block ,and place it behind the wait

**seconds** block .set the 45 to 135 and 90 value as following figure.



Step 10: Click Control, then Drag and drop forever block to programming

area as following:

mBlock v5.4.0									-	- 0
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	63	Pin	repeat 10							
	Ø		2			when Arduino Un				
		serial por	forever -			wait 0.5 second	4 angle as 45			
C2 [11 ]		Data					4 angle as 135			
Devices	Sprites Background	<b>0</b>	if 💮 then		1	wait 0.5 second	4 angle as 90			
<b>5</b>		Control	If then			3 2 second				
Firmware	6.000		else		· ·-)					
edd	Connect your device	Operators				201000				
add	How to use device?	Variables	wait until							C
		My Block:	repeat until							e
	& Connect	extension	2							e

**Step 11:** Click **Action**, then Drag and drop **set servo pin angle as** block to programming area, change the 90 to 45 value as following;

nya ana		Tum Right at Speed	100			Blo	Ardui
3	Action	Turn Left at Speed	100	1.0.1.14.0.1.1			
Ö	Action			when Arduino Uno starts			
	Sensor	Move Forward at Sp	eed 100 for 1 sec	set servo pin 👍 an wait 0.5 seconds	gle as (45)		
co (m 💼 (m)	O O Show	Move Backward at S	peed 100 for 1 sec	walt 0.5 seconds	gle as 135		
Devices Sprites	Background Sound	Turn Right at Speed	100 for 1 soc	set servo pin 👍 an	gle as 90		
		Tum Left at Speed	100 for 1 sec	3			
Firmware	serial por			🖬 set servo pin 👍 a	ingle as 🚳		
	t your device	2 op Moving		-			
	Data Data	set servo pin 🧐 a	ngle as 🧐 🖷 🔳 🖬				
	Events	Forward Left Speed	100 Right Speed 100				0

Step 12: Click Control, then Drag and drop wait seconds block to

programming area ,writed 0.5 seconds as following:

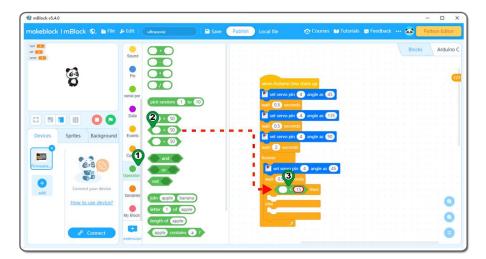
Se mBlock v5.4.0						- 🗆 ×
makeblock   mBlock 🔇, 🖀 File	¢ Edit   ultrasonic	Save Publish	Local file 📀	Courses 📷 Tutorials	🗊 Feedback 🚥	Python Editor
right (1)	Sound war 1 seconds					Blocks Arduino C
	Pro serial por Data		when Arduino Uno start in set servo pin (1) a wait (1) seconds in set servo pin (1) a wait (1) seconds	ngle as 45		63
Devices Sprites Background	Control Operation Variables Wat unit	,	set servo pin (2) a wit (2) seconds (3) by set servo pin (2) wait (10) seconds 3			0
e <sup>9</sup> Connect	My Block extension					0

Step 13: Click Control, then Drag and drop if then else block to programming

area as following:

🕼 mBlock v5.4.0	I Dissela	0 m Hz	A 540			Dublich	1	Courses	Bell Transfords	- Foodback		- D
nakeblock	I mBlock	<ul> <li>File</li> <li>File</li> <li>Background</li> </ul>	Sound Pin Data	utrasonic	Save	Publish	wait 0.5 secon	no stants up 4 angle as 4 nd4 angle as 1 nd4 angle as 1 nd5 1 4 angle as 9	5	Feedback •	Blocks	Python Editor
Firmware	Connect How to	your device use device?	Control Operator Variables My Block Etension	if their ekso weit until repeat until			forever		45			0

**Step 14:** Click **Operation**, then Drag and drop **0<0** block to programming area ,change the 0 to 15 as following:



Step 15: Click Sensor, then Drag and drop read ultrasonic sensor trig pin echo

pin block to programming area ,writed pin 7 and pin 8 as following;



Step 16: Click Variable , then click the make a Variable block , writed right in

the dialog box blank as following. Create left and center variables in the same way;

makeblock	l mBlock 🛇	, 😁 File	👂 Edit 🕴	ultrasonic	Save Pub	lish Local file	📀 Courses 🛽	🛿 Tutorials 🛛 📖 Fee	Iback 🦝	Python Editor
Devices Primark add	Sprites Bi Connect you How to use	ar device device?	Sound Pin esenat por Data Events Control Ope	Make a List		New v right • For	And Artificio Lino starts up start serve prin ( ) orgin start serve prin ( ) orgin start serve prin ( ) orgin Startsweep of ( ) orgin New Variable ariable name: ( ) all sprites this sprite only Cancel ( )	×	Block	s Arduino

Step 17: Click Variable, then Drag and drop set center to block to programming

area ,change the center to right ,writed 0 to 1 value , as following:



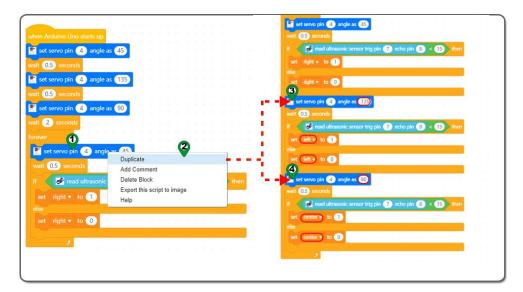
**Step 18:** Repeat the previous step, change the **1** to **0** as following:

rmBlock v5.4.0												- 0
nakeblock		🛇, 🚞 File		ultrasonic	Save	Publish	Local file		🔰 Tutorials		<b>6</b>	Python Edito
nen E	6		Sound Pin	Make a Variable Conter Kett Gright				n Arduino Uno starts u set servo pin ④ ang 0.5 seconds set servo pin ④ ang	lo as (45)		Block	s Arduir
C3 III II Devices	Sprites	O D	serial por Data Events	set center • to change center • t show variable center hide variable center	y 1		wait	0,5) seconds set servo pin 4 ang 2) seconds ver set servo pin 4 an				
Eirmware_	Connect	your device?	Control Op 1 Variable:	Make a List			ti i i	t CS seconds	nic sensor trig p	in 7 echo pin 🔇	< 15	then
		Connect	My Block extension									0

**Step 19**: Right click **set servo pin angle as** block ,Click duplicate from the digital write pin to block over . You will get a duplicated block ,and place it behind the **wait** 

seconds block .set the 45 to 135 and 90 value,change

the **right** to **left** and **center** as following figure.



Step 20: Click Control, then Drag and drop if then else block to programming

area as following:

😪 mBlock v5.4.0								- 0
makeblock	I mBlock	🕤, 🚞 File		ultrasonic	Save	Publish Local file	📀 Courses 📷 Tutorials 👼 Feedbar	ck 🚥 🐼 🛛 Python Editor
nen CI Ini CI Ini CI Ini CI	6		Sound Pin	wait 1 seconds		set setvo pri wait 0,5 seconds if read u set left • to	itrasonic sensor trig pin 7 echo pin 🛞 <	Blocks Arduino
(22) (22)	0		serial por	J forever J		else set ieft • to	0	
Devices	Sprites	Background		1 0 then		set center + t	titrasonic sensor trig pin (7) echo pin (8) < ( o (1)	5) then
Eirmware		t your device	Control Operator:	if then		else Center • t n then	0	-
		ouse device? Connect	My Block	voit until				0

**Step 21:** Click **Operation**, then Drag and drop **0=0** block to programming area ,change the 50 to 0 as following:



Step 22: Click Variable, then Drag and drop center block to programming area as

following:

Image: Concernent your refere	mBlock v5.4.0	r fan 'n Ref Et	tas telefisis (w			Con and			- 0
Image: contert + In 0         Image: contert + In 0 <td< th=""><th>akeblock I</th><th>mBlock ©, 🗎</th><th>File 👂 Edit</th><th>ultrasonic</th><th>Save Publish</th><th>Local file</th><th>💮 Courses 📑 Tutor</th><th>als 🖶 Feedback 🚥</th><th>Python Edit</th></td<>	akeblock I	mBlock ©, 🗎	File 👂 Edit	ultrasonic	Save Publish	Local file	💮 Courses 📑 Tutor	als 🖶 Feedback 🚥	Python Edit
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Step 23: Click Action, then Drag and drop Move forward at speed for block to

programming area, change the **1 sec** to **0.5 sec** as following;

S mBlock v5.4.0			
makeblock   mBlock 🛇, 🖀 File 🦂	Edit ultrasonic	Save Publish	Local file 💿 Courses 🖬 Tutorials 🗰 Feedback 🚥 🐼 Python Editor
an Co		rd at Speed 100	else Blocks Arduino
6	Action Move Backw	ward at Speed 100	set servo pin (4) angle as (5) wat (0.5) seconds
	Sensor Tum Right a	at Speed 100	If read ultrasonic sensor trig pin 7 echo pin 8 < 15 then
	Show	Speed 100	set center • to 1
C II II II C C	4	rd at Speed 100 for 1 sec = =	set center + to 🕐
		ward at Speed 100 for 1 sec	3 center = 0 then Move Forward at Speed 100 for 0.5 sec
Firmware_	serial por	it Speed 100 for 1 sec	
add Connect your device	Data Tum Left at	Speed 100 for 1 sec	
	Events Stop Moving		•
6 <sup>o</sup> Connect	extension	n 9 angle as 90	•

**Step 24:** Click **Action** again, then Drag and drop **Stop Moving** block to programming area as following;

en <b>200</b>	<b>1</b>	ve Forward at Speed 100	wat 0.5 seconds	Blocks Ardu
3		ve Backward at Speed 100	at lath * to	pin (3) < (5) then
	Sensor (@Tun	n Right at Speed 100	ost lieft * to 💿	
	Show Otur	n Left at Speed 100	wait 3 seconds # Trad Ultraiceic sensor log pin 7 echo set center * to 1	en 🖸 < 🚯 🚥
Devices Sprites Backg	round Sound	ve Forward at Speed 100 for	ntia set canter * to 💿	
imware.	Pin	ve Backward at Speed 100 for	Conter = (2) then Love Forward at Speed (00) for (0.5) sec	
Connect your de	senal por	n Right at Speed 100 for 1	Stop Moving	
add How to use dev	Data Data	n Left at Speed 100 for 1 s		
	Events 05to	p Moving 🖷 🖷 🖷 🖷		

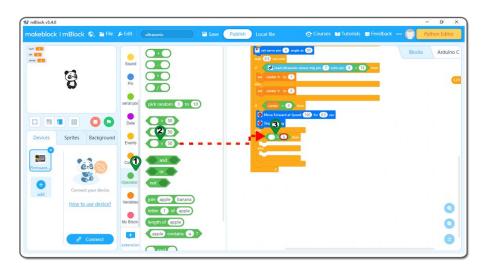
Step 25: Click Control, then Drag and drop if then else block to programming

area as following.



Step 26:Click Operation, then Drag and drop 0=0 block to programming

area ,change the **50** to **0** as following;



Step 27: Click Variable, then Drag and drop left block to programming area as

following:

mBlock v5.4.0									-	ø >
makeblock	I mBlock	🕲, 🚞 Fil		ultrasonic	🛛 🖻 Save 🖉 Put	lish Local file	🕤 Courses 🛯 🖬 1	utorials 🛛 👼 Feedback	··· 🔘 Pyt	hon Editor
	60		Saund Pin	Make a Variable		et servo pin () wat () seconds d set center + to etsu set center + to	ssonic sensor trig pin 🕐 echo pie D	8 < (15) then	Blocks	Arduino
C3 III I Devices	Sprites	Backgroun		set center • to 0 change center • by show variable center • hide variable center •	1	f center = C More Foreard a S 3 3 ing etc with a co	A Speed 100 for 05 sec			
Firmware_		your device	Control Operation	Make a List						
		use devicei Connect	Variabler My Block extension							0

Step 28: Click Action, then Drag and drop Turn Left at speed for block to

programming area, change the **1 sec** to **0.5 sec** as following;

😪 mBlock v5.4.0 makeblock	l mBlock	🛇, 🖀 File	👂 Edit 🕴 🌘	ultrasonic	Save	Publish	Local file	📀 Courses 📲 Tu	torials 👼 Feedback	() Py	rthon Editor
nye II In III Anto III	-1		2		d at Speed 100		est servo pin 🍙 angle weit 05 seconds 1 💕 read Ultrasonic	9 as (50) Sensor Inig pin (7) echo pin (	8) < 13) then	Blocks	Arduino C
	0		Action	Turn Right at	ard at Speed 100		set center + to 1				Ø
C)		00	Show	Tum Left at S		1	Center + C + Move Forward at Spee Stop Moving				
Devices		Background	Sound Pin		d at Speed 100 fo ard at Speed 100 f		S left = O th L. Turn Left at Speed ( also	100 for 3 sec			
Firmware		your device	serial por	(1)	Speed 100 for						
800	How to	use device?	Data Events	<ul> <li>Turn Left at S</li> <li>Stop Moving</li> </ul>	opeed 100 for 1	sec -					0
	e 0	Connect	extension	📓 set servo pin	9 angle as 90						0

**Step 29:** Click **Action** again, then Drag and drop **Stop Moving** block to programming area as following;

		rward at Speed 100	wait 03 seconds		Blocks Ard
ē	Action Move Ba	ckward at Speed 100	ef center * to 1	echopin 🔞 < 🚯 then	
0	Sensor	ht at Speed 100	tet canter + to 💿		
	Show	at Speed 100	Move Forward at Speed 100 for @S	sec.	
Devices Sprites Background	Sound Move Fo	rward at Speed 100 for	der () for an Left at Speed (10) for (15) sec () Spee Marine		
	Pin Move Ba	ckward at Speed 100 for	Stop Moving		
0	serial por	ht at Speed 100 for 1			
add Connect your device How to use device?	Data	at Speed 100 for 1 s			
	Events Stop Mor	ving <b>e e e e e</b>			

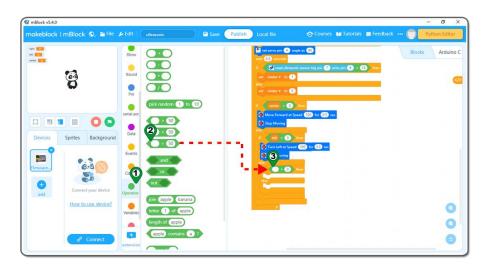
Step 30: Click Control, then Drag and drop if then else block to programming

area as following.



Step 31:Click Operation, then Drag and drop 0=0 block to programming

area ,change the **50** to **0** as following;



Step 32: Click Variable, then Drag and drop right block to programming area as

following:



Step 33: Click Action, then Drag and drop Turn Right at speed for block to

programming area, change the **1 sec** to **0.5 sec** as following;



**Step 34:** Click **Action** again, then Drag and drop **Stop Moving** block to programming area as following;



Step 35: In Action, then Drag and drop Turn Right at speed for block to

programming area, change the **1 sec** to **1.5 sec** as following;

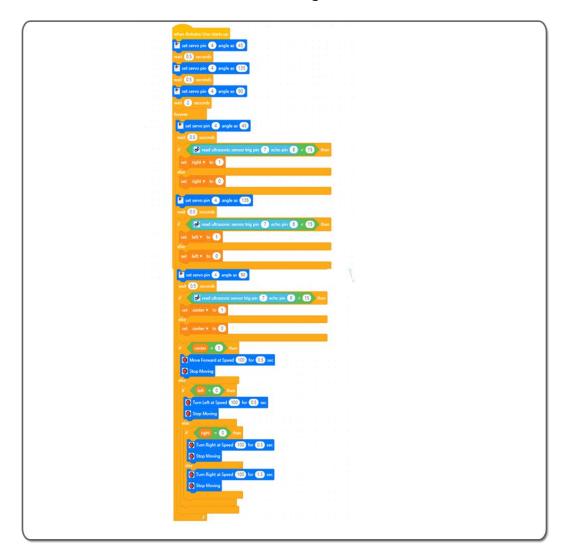
24 (28) 5 (28) 26 (28)	Move For	ward at Speed 100	set servo pin 🗳 angle as 👀	Blocks Ard
6		kward at Speed 100	et center + to	s pin 🛞 < 🚯 steen
0	Sensor	t at Speed 100	set canter + to O	
	Show	at Speed 100	Move Forward at Speed (100) for (0.5) sec. Stop Moving	
Devices Sprites Background	Sound Move For	ward at Speed 100 for 1 s	C Add a Contract of the contra	
imware	Pin (2)	kward at Speed 100 for 1	Stop Moving elia # right = ① then	
	senal por	t at Speed 100 for 1 sec	Tum Right at Speed 100 for 0.5 sec	
add How to use device?	Dela	-	Turn Right at Speed 100 for 13 sec	8
et add Connect your device	Senal por	at Speed 100 for 1 sec	Tum Kight at Speed 100 for 05 sec	

Step 36: In Action, then Drag and drop Stop Moving block to programming

area as following;

27 <b>23</b> 2 <b>23</b>	<b>1</b>	Forward at Speed 100	est servo prin 🗳 angle as 🚱 weit 🚯 seconds		Blocks Arc
6	Action Move I	Backward at Speed 100	ef enad ultrasonic sensor trig pin set center + to	acho pin 🚷 < 🚯 been	
0	Sensor OTum R	ight at Speed 100	at centers to 💽		
		oft at Speed 100	<ul> <li>Center = <ul> <li>then</li> <li>Move Forward at Speed 100 for 03</li> <li>Stop Moving</li> </ul> </li></ul>	sec	
Devices Sprites Backgrour		Forward at Speed 100 for	alar a left - O thur		
	Pin Ø Move I	Backward at Speed 100 for	Turn Left at Speed 100 for 65 se     Stop Moving		
	serial por	ight at Speed 100 for 1	Turn Right at Speed 100 for 03	sec	
add Connect your device How to use device?	Data	oft at Speed 100 for 1 s	Stop Moving um Right at Speed 100 for 113	) sec.	
LIGHT IS MAN MATRIX	Events Stop M	loving = = = = = =	Stop Moving	-	

Now we have completed the block programming. The final blocks look like



following:

Now all the programming blocks have been completed! From above picture, the logic is pretty straight forward:

When Arduino is started, computer will enter a dead loop which will check the button status, when button is not pressed, the servo will stop at original position (in my servo 0 degree ) and elevator is in the ground , when button is pressed, the servo arm will rotate from 0 degree position to 180 degree position and the elevator is lifted to the air.

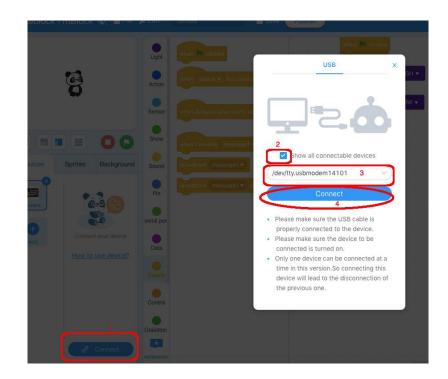
### Step 37 Upload the program to OSOYOO basic board

 Please connect your OSOYOO basic board to your PC with USB cable firstly.
 Then click the Connect button in the bottom of the mBlock software, you will see a USB window pop up,

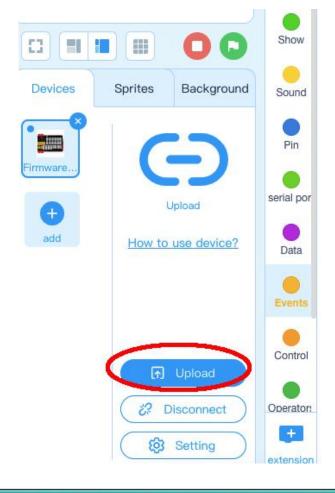
2) select **Show all connectable device** check box , then a device drop-down menu will show up,

3) select your port from device drop-down menu

4) click **Connect** button to connect your PC to OSOYOO basic board.



5)After you PC is connected to OSOYOO basic board, please click Upload button in the bottom of your software, then the code will be uploaded to OSOYOO basic board:



PROGRAM EXPLANATION

In this lesson, we will learn some new program block as following:

i)Set Servo angle block in Action category:

This block will control a servo in specific Digital port to a specific angle.



Take Above block as example, it will rotate servo in D4 pin to the angle of 90 degree which will make the Ultrasonic sensor facing front. In this case, the sensor will detect if the front side has obstacle.

If you change the angle value from 90 to 45, the sensor will rotate 45 degree to the

left and ultrasonic sensor will test left side obstacles.

If you change the angle value from 90 to 135, the sensor will rotate 45 degree to the right and ultrasonic sensor will test right side obstacles.

ii)Yellow Wait Block from Control Category

This block will keep current status for a specific time period before execute next

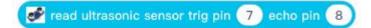
#### program block



In above example, servo in D4 rotates to 90 degree direction, then stops there for 2 seconds.

iii)Read Ultrasonic Sensor Block from Sensor Section

This block will read distance value from Ultrasonic Sensor



In the above example, the block will read obstacle distance value to an ultrasonic

sensor whose trig pin in D7 and echo pin in D8.

If ultrasonic sensor detects obstacle, it will return distance value (integer).

iv)Compare block in Operator category

Compare block will return True or False based on compare value

🛃 read ultrasonic sensor trig pin 🕜 echo pin 8 < 15

In the above example, when Ultrasonic Sensor distance value less than the 15

(threshold value), it will return True which means obstacle is detected

Otherwise it will return false which means no obstacle in this direction. You can

change the threshold to other value. The bigger the value, the more sensitive your car will act.

#### The whole programming logic :

First, program will make ultrasonic sensor to rotate from 45 degree to 135 degree and then stop at 90 degree for 2 seconds. This will give you a chance to make servo direction alignment. If sensor doesn't face front during the 2 seconds at 90 degree, you need to adjust the sensor location in servo and make it face to 90 degree. Then the sensor enter into a forever loop which make the car run in obstacle avoidance mode.

The program rotate the servo to 45 degree, if sensor detect an obstacle within 15cm, it will set a variable **right** to 1, this means right side has obstacle. Otherwise variable **right** will be set to 0.

Then program rotates the servo to 135 degree and 90 degree to test left side obstacle and center direction obstacle. If left side has obstacle within 15 cm, variable **left** will sent to 1, If center direction has obstacle within 15 cm, variable **center** will sent to 1. If no obstacle, then these valables are set to 0. Now we have known the obstacle status in three

variables **left**, **right** and **center**. The program will decide car movement based on these values.

If center direction has NO obstacle (**center**=0), then car move forward.

If center direction has obstacle but left side has NO obstacle (**center**=1 but **left**=0), then car turn left.

If center direction, left side all have obstacle but right side has NO obstacle

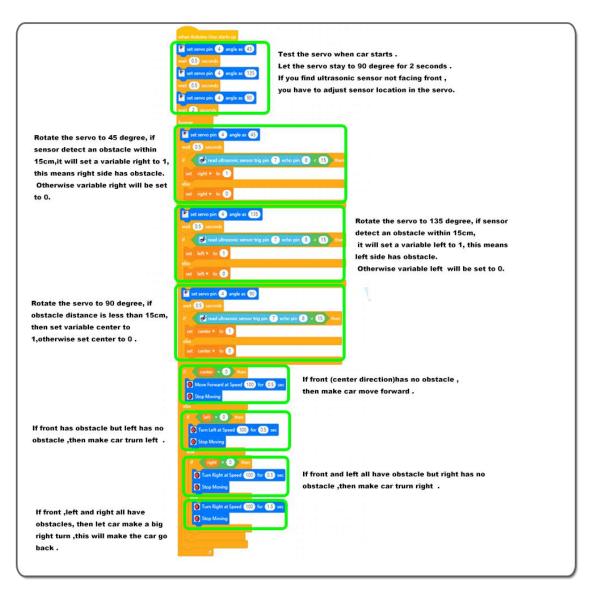
114

(center=1 and left=1 but right=0 ), then car turn right.

If center direction, left and right side all have obstacle (center=1

and **left**=1 **right**=1 ), then car turn right for long time, this will make the car turn back.

Following picture shows above programming logic in the program blocks.

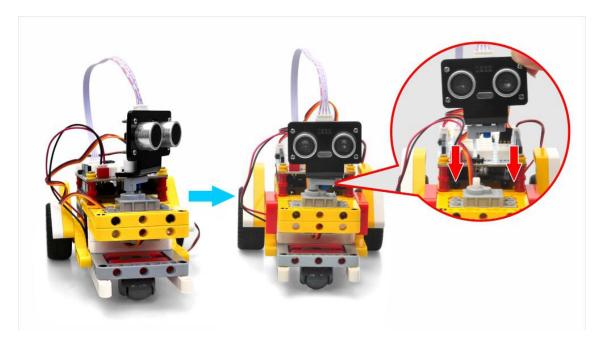


### HOW TO PLAY

### Adjust the Ultrasonic Sensor direction:

After the code is loaded into robot car, unplug the USB cable from the UNO board

and turn on the power switch on the Magic I/O board. Then the ultrasonic sensor will rotate to face the straight forward direction for 5 seconds. If the Ultrasonic sensor is not facing the front position, please turn off the power. Please use a screw driver to adjust the ultrasonic sensor direction and make it facing straight ahead , then turn on the power again and during the early 5 seconds, the sensor should be facing front direction.



After the 5 seconds, the robot car will start to drive and change direction to avoid obstacles automatically.

### Lesson 5: Auto transporter

- Objective
- Parts and Devices
- How to make
- <u>Circuit connection</u>
- How to code
- Program explanation
- How to play

## **OBJECTIVE**

In this project, we will make a smart robot finger and use it to transfer a pingpong ball to another place. We will use obstacle sensor(ultrasonic distance detector) to detect the coming ball. When a ball is detected, the finger will pickup the ball and the car will drop it to another place, then the car will go back to original place to wait for another ball.

# PARTS & DEVICES

Please prepare the following parts to complete this project

NOTE:

1.the color of the building block is subject to the actual product, which does not affect the use.

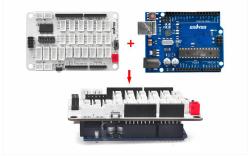
### 2. ALL OSOYOO PRODUCTS FOR ARDUINO ARE THIRD PARTY BOARD WHICH

### IS FULLY COMPATIBLE WITH ARDUINO



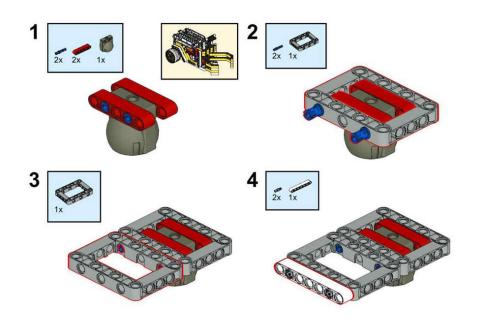
#### НО₩ ТО МАКЕ

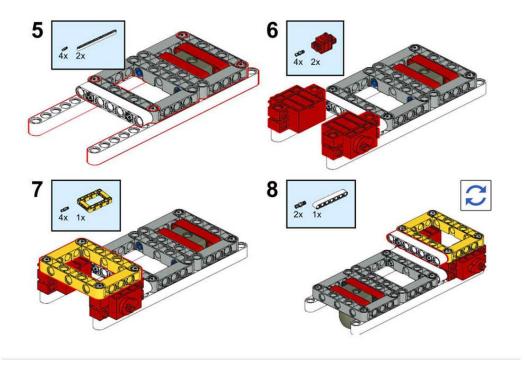
Before you build the robot with blocks, please install OSOYOO basic board for Arduino under OSOYOO Magic I/O shield as following (Attention please : the pins of I/O shield is aligned with the port of basic the board firstly, then press the shield tightly on the board).

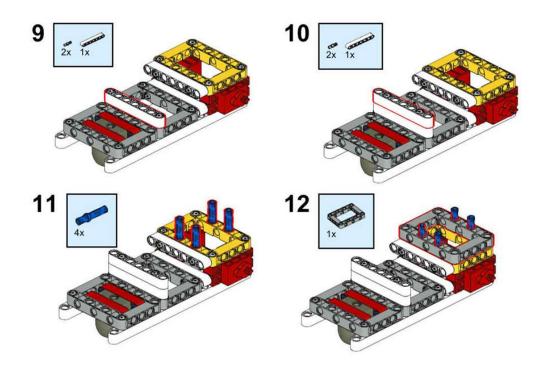


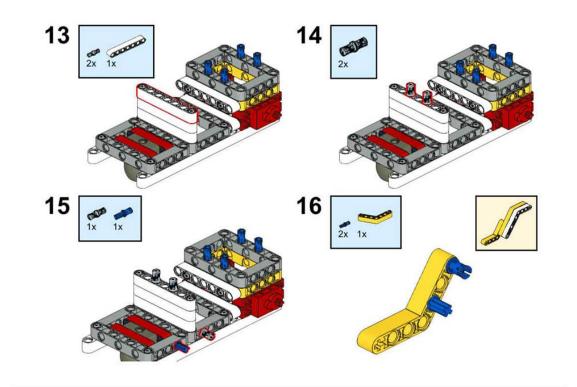
Please follow the building steps to build this robot car, If you want to get clear PDF building steps, please download

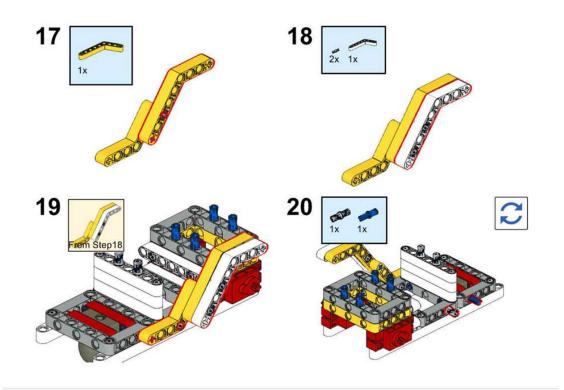
from https://osoyoo.com/picture/Building\_Robot\_Car/lesson5/LESSON5.pdf Note: If you have <u>built the robot car for lesson1</u>, please skip to the step35 in this PDF.

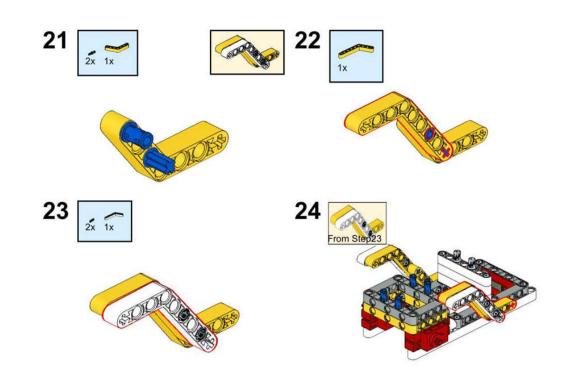


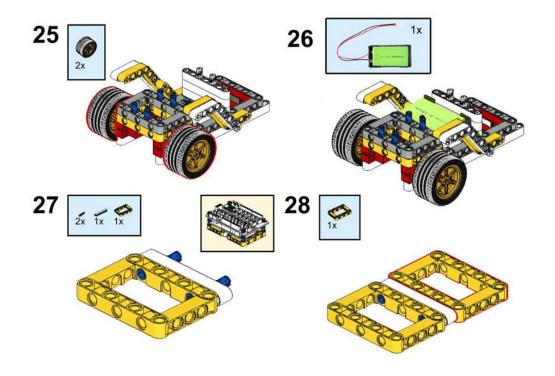


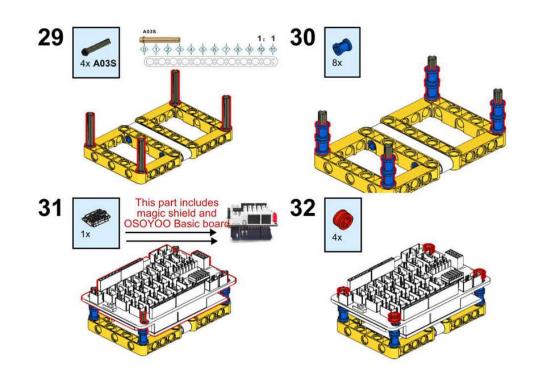


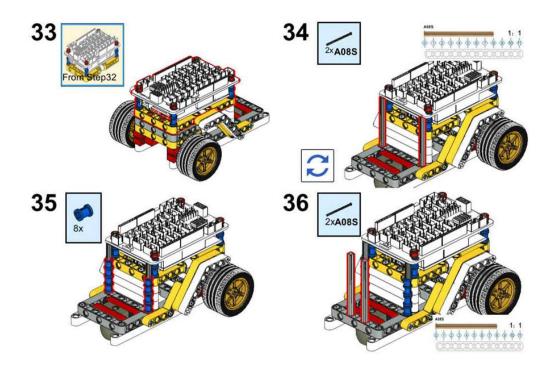


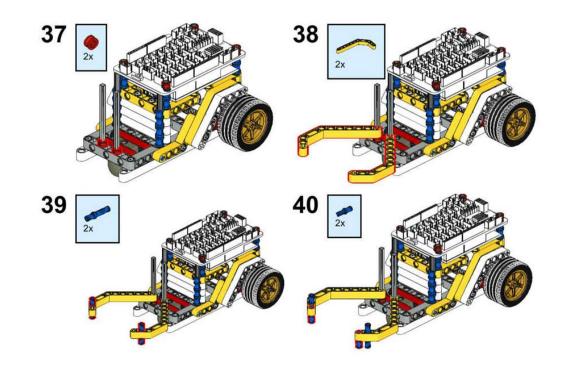


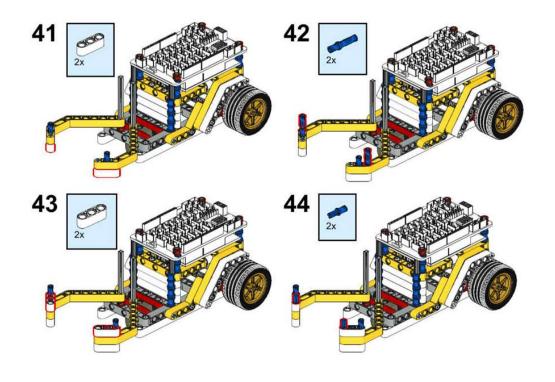


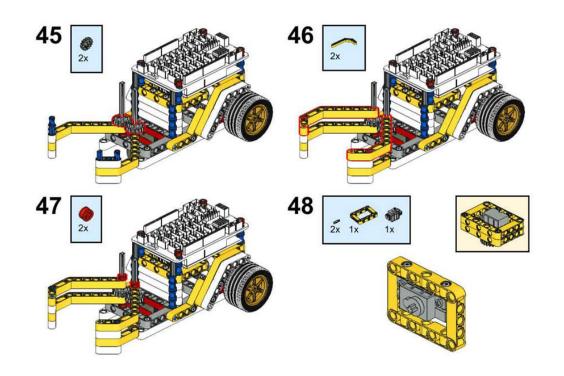


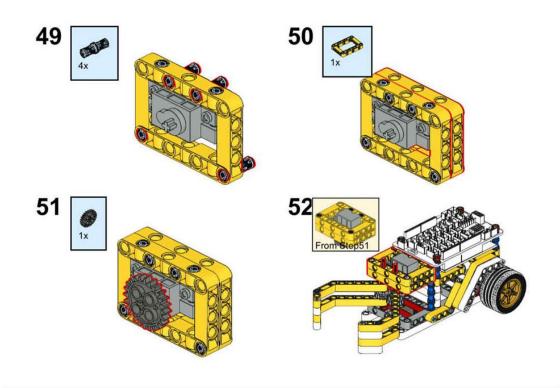


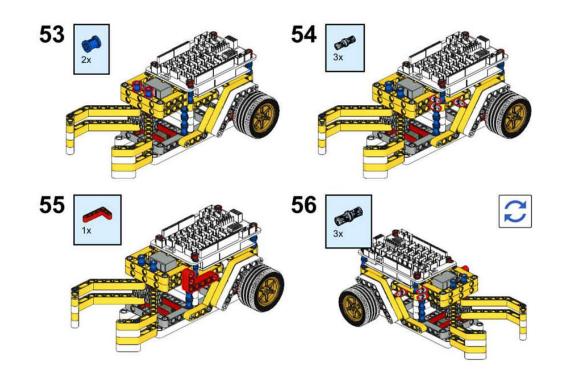


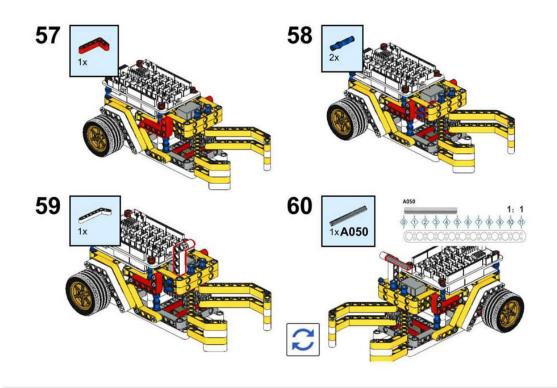


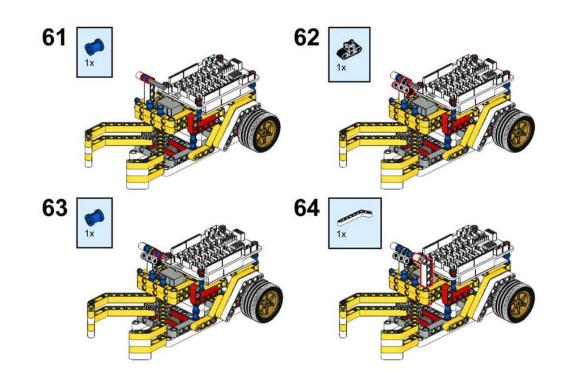


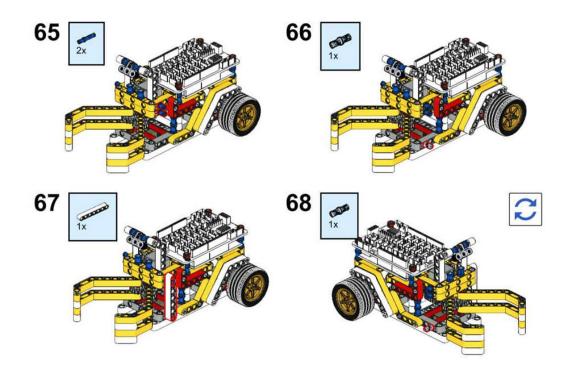


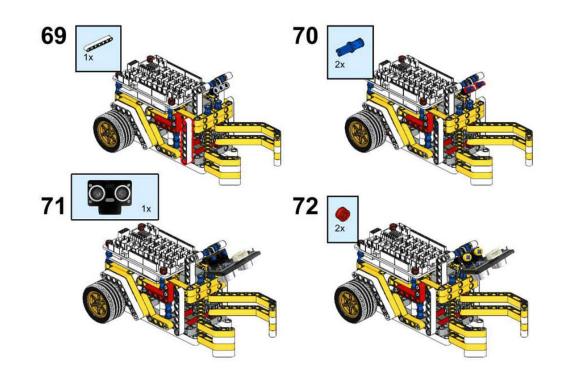


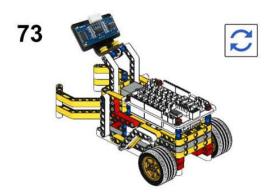








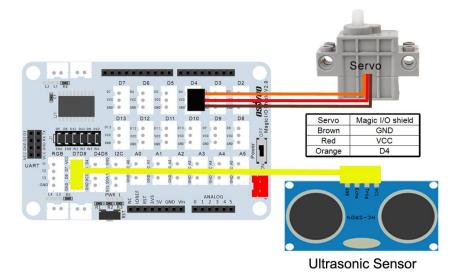




## **CIRCUIT CONNECTION**

Please connect motors and 9V battery case as lesson1.

Then Connect SG90 servo motor to D4 port of OSOYOO Magic I/O shield, Ultrasonic module sensor to the D7D8 port of the Magic I/O shield with a 4-pin PNP cable as below:



## HOW TO CODE

Note: In this kit, we use mblock as programming tool, if you want to learn more about

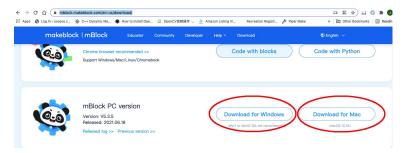
mblock, please visit preparation before class

1: https://osoyoo.com/2021/12/01/preparation-before-class-1

#### Step 1) Download mBlock PC

version from https://mblock.makeblock.com/en-us/download/, select the download

file as per your computer OS type (Please don't use the browser version):



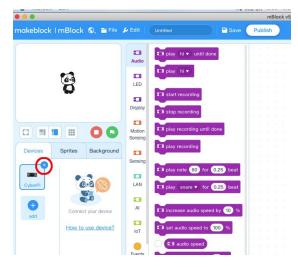
Step 2) Download OSOYOO\_UNO.mext device file

from https://osoyoo.com/driver/mblock/osoyoo\_uno.mext

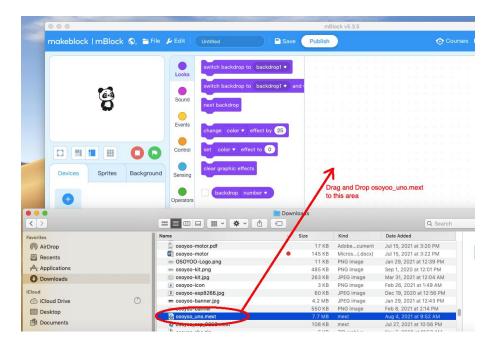
Step 3) Run the mBlock PC software by double click the lovely Panda icon.

you will see mBlock UI as following picture. Please delete the default

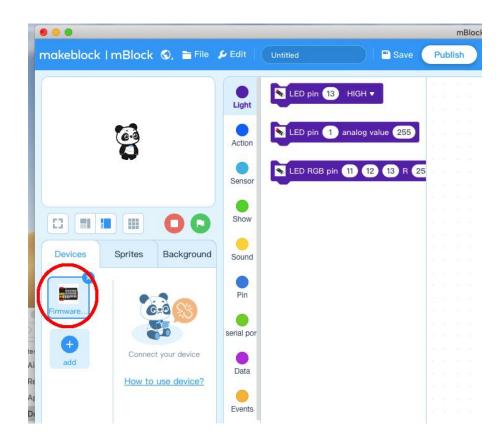
device **CyberPi** by click the cross in the red circle.



**Step 4)** Drag and Drop osoyoo\_uno\_mext file(downloaded in Step 2) to mBlock software as following:



Now you will see a new device firmware in mBlock, see following picture:



Now mBlock software and OSOYOO\_UNO device firmware have been successfully installed in our PC!

Now we will show you how to use blocks to turn above idea into reality.

Step 5: Click Events, add when Arduino Uno starts up block to the top:



Step 6: Click Action, then Drag and drop set servo pin angle as block to

programming area ,change the pin 9 to 4 ,90 to 30 as following;

	10	Blocks Ards
	Turn Left at Speed 100	3 Andwers Time Starts up
C <sup>ee</sup> O	Action Move Forward at Speed 100 for 1 sec	ar serva pir 🙆 angle as 🛞
	Sentor	
	Move Backward at Speed 100 for 1 sec	
	Show Turn Right at Speed 100 for 1 sec	
Devices Sprites Background	Sound Turn Left at Speed 100 for 1 sec	
	Pin	
rmware	Stop Moving	
	serial por	
edd Connect your device	Data	
How to use device?	Forward Left Speed 100 Right Speed 100	
d <sup>o</sup> Connect	etension	

**Step 7:** Click **Control**, then Drag and drop **wait seconds** block to programming area ,writed 0.5 seconds as following:

non	Show wat 1 seco		0000		Blocks Arduino
andar 💼	Show wat 1 bed	and the second second			
3	Sound repeat 10			no Uno starts up no pin 🚯 angle as 🚳	
Ø		2	· · · · · · · · · · · · · · · · · · ·	aconds	•
	Pin				
	serial por				
Devices Sprites Backgroun	d Data I the				
	.0				
Firmware_	the second secon				
Firmware	Control else				
<b>(</b>	Operator				0
add	operator: wait until				0
How to use device?					

Step 8: Click Action again, then Drag and drop set servo pin angle as block to

programming area ,30 to 0 as following;

mBlock v5.4.0				- 0
nakeblock i mBlock 🛇, 🕯	File 👂 Edit 📔 🔒 auto-test	Save Publish Local fil	le 💿 Courses 📦 Tutorials 👜 Fee	dback 🚥 🐼 🛛 Python Editor
ran (113) an (113)	0			Blocks Arduino
		at Speed 100	when Arsluino Uno starts up	
Ö	Action Ø Move For	ward at Speed 100 for 1 sec	3 seconds	(
	Sensor	ckward at Speed 100 for 1 sec	ar set servo pin 🕢 angle as 🌒	
	Show			
	Tum Rigt	it at Speed 100 for 1 sec		
Devices Sprites Backg	ground Sound	at Speed 100 for 1 sec	t de la companya de la	
imware	Pin Stop Mo	ing		
	serial por	pin (9) angle as (90) = = = = = =		
Connect your de	evice	pm (s) angle as (s)		0
How to use de	vice2	left Speed 100 Right Speed 100		0
& Connec	ct extension Backward	Left Speed 100 Right Speed 100		

Step 9: Repeat the Step7 as following:

mBlock v5.4.0				- 0
nakeblock i mBlock 🛇, 🗎 🕅		Save Publish Loc	al file 💿 Courses 🖬 Tutorial	🗧 🗰 Feedback 🚥 🚳 🛛 Python Editor
ngat CT	show 2	conds	The second line starts as	Blocks Arduing
6	Sound repeat 10	2 2	🔛 set servo pin 🌖 angle as 🛞	
	Pin forever		3 at serve pin 3 angle as 0	
Devices Sprites Backgrou	E Data If the th	en		
<b>=</b>	0	en		
Connect your device	Control			
add Connect your device	operator: wait until			G
6 <sup>9</sup> Connect	extension	2		9

Step 10:Click Action, then Drag and drop set servo pin angle as block to

programming area ,0 to 30 as following;

nga Calana at Calana artar Calana	Tum Left a			Blocks Arduin
63	Action		when Arduino Lino starts up	
0	Sansar	rard at Speed 100 for 1 sec	vent 63 seconds Ve servo pin 🕐 angle as 💿 3 🔊 seconds	3
		ward at Speed 100 for 1 sec	set servo pin 🕜 angle as	
Devices Sprites Backgrou	Tum Right	at Speed 100 for 1 sec		
		t Speed 100 for 1 sec		
Firmware_	Pin Stop Movin	ng		
Connect your device	serial por	in 🧐 angle as 90 = = = = =	4	
add	Data	ft Speed 100 Right Speed 100		

Step 11:Click Control, then Drag and drop wait seconds block to programming

area ,writed **1** seconds as following:

mBlock v5.4.0						- 0
nakeblock	l mBlock 🔕 🚞 File		Save Pu	blish Local file	📀 Courses 🔡 Tutorials 😁 Feed	back ···· 🐼 Python Editor
nuni CCO anti CCO cantar CCO		show 2	onds <mark></mark> -			Blocks Arduine
	3	Sound repeat 10			when Ankien Uno starts up. if set servo pin (4) angle as (30) wait (0) seconds	
	•	Pin			📓 set servo pin 🕘 angle as 💿	
			2	1 <b>-</b>	(3) seconds (3) It serve pin (4) angle as (3) well (1) seconds	
Devices	Sprites Backgroun					
Eirmware_	6.	ev 🚺	en			
•	Connect your device	Control else				
add	How to use device?	Operator" wait until				G
	& Connect	extension				C

Step 12: Click Control, then Drag and drop forever block to programming area as

following:

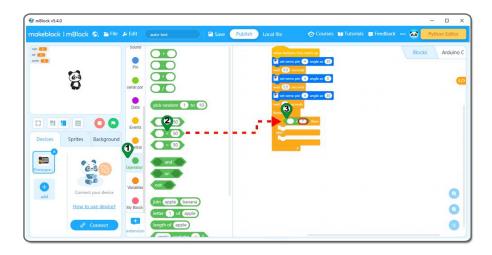
mBlock v5.4.0								- 0
nakeblock I	mBlock 🛇, 🗎 File		auto-test	Save	Publish Local file	📀 Courses 🛛 🖬 Tutorials	📼 Feedback \cdots 🐼	Python Edito
içis (CC) afi (CC) antar (CC)		Show	wait 1 seconds				Block	ks Arduin
	1	Sound	repeat 10			when Arduino Uno starts up set servo pin 🙆 angle as 🚳		
	Ø	Pin	2			wet OS seconds		
			forever			wet 05 seconds		
0 1 1		serial por				3,		
Devices	Sprites Background		if then			·		
		EI 1	if then					
Firmware		Control	olso					
et add	Connect your device	Operator	wait until					0
	How to use device?	•	repeat until					C
	& Connect	extension	-					e

**Step 13:** Click **Control** again, then Drag and drop **if then else** block to programming area as following:



Step 14: Click Operation, then Drag and drop 0<0 block to programming

area ,change the 0 to 7 as following:



Step 15: Click Sensor, then Drag and drop read ultrasonic sensor trig pin echo

pin block to programming area ,writed pin 7 and pin 8 as following;

44 <b>100</b> 1 <b>100</b>	Light Read B	lutton Pin 9 ?	when Arduino (/no starts up	Blocks Arduir
3		Pressed Pin 9 ?	wait 0.3 seconds	
0	read ult	rasonic sensor trig pin 🕦 echo pin ( DHT11 🔹 Sensor Pin (1) Temperat	🛃 set servo pin 👍 angle as 🔞	
		k Sensor Pin 2	une *	also pe 🚯 < 😧 Street
Devices Sprites Backg	round Sound Read Po	otentiometer Sensor Analog Pin 0	ale	
Eimware.	Pin Read Li	ght Sensor Analog Pin 0		
	serial por	ound Sensor Analog Pin 0		
add Connect your de	Data	1R Sensor Pin 9 ?		•

Step 16: Click Action , then Drag and drop Stop Mowing block to programming

area as following;

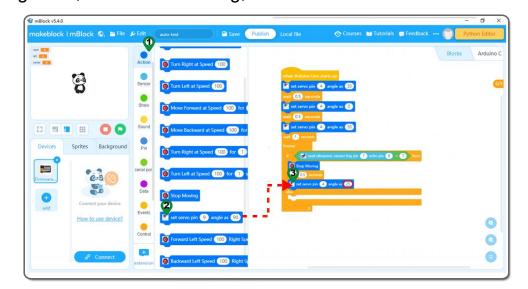
SmBlock v5.4.0								-	σ×
makeblock   mi	Block 🛇, 🚞		auto-test	📄 🗎 🖻 Save (	Publish Local file	📀 Courses 📲 Tuto	rials 🧔 Feedback 🔸	- 🕜 Pyth	on Editor
rum CCC Ini CCC Antor CCC		6	Move Forwa	ard at Speed 100	which reduced the	and the second se		Blocks	Arduino C
Ç		Action	Move Backy	ward at Speed 100	i set serva pin l mait 05 second				Ø
		Sensor	Turn Right a	at Speed 100	wait 🔕 second	angle as 🔞			
	. 0	Show	Turn Left at	Speed 100	3 🛃 rea Stop Mov	d ultrasonic sensor trig pin 👩 echo pir ng	C) < O) 544		
Devices Sp	rites Backgro	und Sound		and at Speed 100 for					
Firmware	600	Pin		ward at Speed 100 for 1					
et al	Connect your device								
	How to use devic	e? Events	2 Stop Movin	Speed 100 for 1 se	13				0
	e <sup>o</sup> Connect		set servo pi	n 🧐 angle as 🧐					0
		extension							

Step 17:Click Control, then Drag and drop wait seconds block to programming

area ,writed **0.5** seconds as following:

S mBlock v5.4.0							- a ×
makeblock   m	Block ©, 🖿		i 📄 Sa	ve Publish Local file	📀 Courses 🛯	Tutorials 👼 Feedback 🚥	Python Editor
	3	Sound repeat	1) seconds	e et serv var CS s	o pin 🔞 angle as 🚯		Blocks Arduino C
			e	3	read ultrasonic sensor trig pin 🕐 ec	ha pin 🚺 < 🕢 Baas	
Devices S	prites Backgr		then		J sacends		
add	Connect your dev	ice Operator: Ke?					0
	o <sup>o</sup> Connect		J				0

**Step 18:**Click **Action**, then Drag and drop **set servo pin angle as** block to programming area ,**0** to **25** as following;



**Step 19:**Right click **Wait seconds** block ,Click duplicate from the digital write pin to block over . You will get a duplicated block ,and place it behind **Set servo pin angle as** block .Change the angle value as following figure.

when Arduino Uno sta	and the second		when Arduino Uno starts up	
			wait 0.5 seconds	
🟋 set servo pin 👍	angle as 30		set servo pin 🕘 angle as 💿	
wait 0.5 seconds			wait 0.5 seconds	
🟋 set servo pin 👍	angle as 0		set servo pin 4 angle as 30	
wait 0.5 seconds			wait 1 seconds	
🖹 set servo pin (4)	angle as 30		forever	
wait 1 seconds			🗃 🖉 read ultrasonic sensor trig	sin 7 echo pin 🔕 < 7) then
forever			Stop Moving	
	rasonic sensor trig pin (7) echo pin (8) < (7) the	1.1	wait 0.5 seconds	
	rasonic sensor trig pin 7 ecno pin 8 < 7 mer		(3) et servo pin (4) angle as (25)	
Top Moving	CONTRACTOR CONTRACTOR	)	wait 0.5 seconds	
wait 0.5 second	2	e. e. e	et servo pin 4 angle as 20	
🍸 set servo pir	Duplicate		wait 0.5 seconds	
else	Add Comment	1	(5) et servo pin (4) angle as (15)	
	Delete Block	· · · ·	wait 0.5 seconds	
•	Export this script to image	1	🕞 æt servo pin 👍 angle as 10	
	Help		wait 0.5 seconds	
			📓 set servo pin 👍 angle as 🕕	

**Step 20:**Click **Control**, then Drag and drop **wait seconds** block to programming area ,writed **0.5** seconds as following:

nakeblock   mBlock 🔍 🗎 Elle == 🚥	2	Nds	Local file Transformer Courses	🖬 Tutorials 👼 Feedback 🚥 🌍 Blo	Python Editor
	Action Sensor		ant serve pin 4 angle as 30 well (05 seconds ant serve pin 4 angle as 0 well (05 seconds well (05 seconds ant serve pin 4 angle as 30		
CI II II II O O	Sound If then		enti in accordo former i in accordo former i former trig pin (1) Steg Moving	echo pin 💽 4 🕑 Barr	
Emmare.	serial por H then Data		veri (3 vecnos) i ut servo pin (2 vecio) veri (3 vecnos) i ut servo pin (2 vecio) i ut servo pin (2 vecio) i ut servo pin (2 vecio)		
Connect your device add How to use device?	E wait until		and serve pin a seque as (5) with (3) seconds and serve pin (2) angle as (5) angle		9

Step 21:Click Action, then Drag and drop Turn Left Speed for block to

programming area ,change the 1 sec to **0.4 sec** as following;

ଙ୍ଗ mBlock v5.40 makeblock   mBlock ା©, 🖀 File ଜ	Cedit auto-test	Publish Local file	📀 Courses 🛯 🗤 Tutorials	- a X
744 000 14 000 14 000	Move Forward		na Line starts up	Blocks Arduino (
63	Action Move Backwar	d at Speed 100	no pin 🕜 angle as 🚳 records no pin 省 angle as 📀	0
v	Sensor	peed (100)		
	Show			
Devices Sprites Background	Sound Move Forward	at Speed 100 for 1 sec 0 stop	🖗 read ultrasonic sensor trig pin 🕜 echo pin 🛞 < 5 Moving Seconds	C Reen
Freemanne.	Pin Move Backwar	d at Speed 100 for 1 sec	varvo pin 🕜 angle as 23 3 seconds	
	serial por	peed 100 for 1 sec	servo pin 😮 angle as 20 Seconds servo pin 🗳 angle as 15	
add Connect your device How to use device?		eed (100) for (1) sec = 💻 🖉 🚥 🔍	ervo pin 🕑 angle as 🕕	
	Events Stop Moving		3 seconds servo pin (3 angle 21 (3) 3 seconds	0
් Connect	extension		seconds	

Step 22: Click Action , then Drag and drop Stop Mowing block to programming

area as following;

ne (128) 1 (128) nier (128)		0	Move Forward a	at Speed 100	wait 03 seconds		Blo	cks Arduin
1	3	Action	Move Backward	at Speed 100	set servo pin wat 1 seconds	angle as 🛞		
	~	Sensor	Turn Right at Sp	eed 100	Section and and and and and and and and and an	Rrasonic sensor trīg pin 77 echo pi	• 🕄 < 🕜 Den	
		Show	Tum Left at Spe	ed (100)		4 angle as 25		
Devices S	prites Background	Sound	Move Forward a	at Speed 100 for	wait 03 secon in set servo pin wait 03 secon	🕝 angle as 📀		
	<b>6</b>	Pin	Move Backward	at Speed 100 for		🙆 angle as 🕦		
(H)		serial por	Turn Right at Sp	eed 100 for 1	wait 03 secon	4 angle as 10		
add	Connect your device	Data	2 Turn Left at Spe	ed 100 for 1 s	(3 <sup>3</sup> -	and the second se		
		Events	Stop Moving		Stop Moving		_	9
	e <sup>®</sup> Connect	extension	🖹 set servo pin 🥵	angle as 90				e

**Step 23:**Click **Action** again, then Drag and drop **set servo pin angle as** block to programming area ,**90** to **0** as following;

mBlock v5.4.0 nakeblock   mBlock	©, ■ File 🖋 Edit   (	auto-test	Save Publi	h Local file	📀 Courses 🛯 😫 Tuto	rials 👼 Feedback 🚥	- 0 Python Editor
upi <b></b> et <b></b>	1	Move Forward a	t Speed 100	vait 03 seconds			Blocks Arduing
3	Action	Move Backward	at Speed 100	vait seconds	angle as 30		
	Sensor	Tum Right at Sp	eed 100	Stop Moving	asonic sensor trig pin 🕜 echo pin	C < D then	
	O O Show	Turn Left at Spee	ed 100	wart 05 seconds	angle as 🚯		
Devices Sprites	Background Sound		t Speed 100 for 1 sec	wait 0.5 seconds			
			at Speed 100 for 1 se	C set servo pin wait 03 seconds			
<b>(†)</b>	your device		eed 100 for 1 sec	wait 05 seconds	🕽 angle as 💿		
	Use device?	Stop Moving			eed 100 for (0.4) sec		0
	Events	2 Set servo pin 9	angle as (90) = = •	a 🚥 🕒 🔤 set servo pin 🖉	4) angle 24 🛞		0
GU	Connect extension						9

Step 24:Click Control, then Drag and drop wait seconds block to programming

area ,writed **0.5** seconds as following:

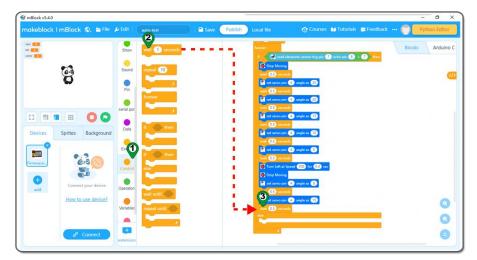
ngni (123) Mil (123)	show 2		est servo prin Cangle as Cangle as	Blocks Arc
			🔛 set servo pin 🕢 angle as 💿	
6.3	Sound repeat 10		wait 1 seconds	
	Pin	-	🛃 med ultrasonic sensor trig pin 🌘	🕽 echo pin 🕄 < 🕤 🕬
	senal por		Stop Moving	
0	C senal por	2	🖬 set serve pin 🚳 angle as 🥸	
Devices Sprites Back	Data P	en	veal 03 seconds	
0	0	-	wait (13) securely	
Firmware Cara		en l	set servo pin 😂 angle as 🚯	
Firmware	Control etse		set servo pin 🕝 angle az 🔟	
Connect your d			🔛 set servo pin 🔇 angle as 🕥	
add How to use de	operator: wait until		Turn Left at Speed 100 for 0.4 sec	
How to use or	Variables repeat until		3 Top Moving	
			set servo pin 🖪 angle as 🚳	

Step 25: Repeat the Step 23, change the 90 to 15 as following:

rgit (11) Hr (13) Hr (13)		1	Move Forwar	d at Speed 100	former a California	itrasonic sensor trig pin 7 echo pin 🔱	Blocks	s Arduir
	30	Action	Move Backwa	ard at Speed 100	Stop Moving wat (0.5) second	4) angle as 23		
CI III I	Sprites Backgroun	Show	Turn Left at S	opeed 100	wait 03 secon	🕘 angle as 🚯		
Firmware	<b>63</b> 00	O Sound		ard at Speed (100) for (1	SEC West 0.5 second	angle as ()		
et add	Connect your device	serial por		Speed 100 for 1 sec	Stop Moving			
		Events	2 Stop Moving					

Step 26: Click Control, then Drag and drop wait seconds block to programming

area ,writed  $\boldsymbol{0.5}$  seconds as following:



Step 27:Click Action again, then Drag and drop set servo pin angle as block to

programming area ,90 to 30 as following;

	Action	ward at Speed 100	<ul> <li>Freed Ultrascovic sensor trip pin (7) echo pin (8)</li> <li>Stop Moving</li> <li>seconds</li> </ul>	
Ö	Action		wait 0.5 seconds	
			🖬 set servo pin 🕒 angle as 😕	13 - 13 - 14 - 15 - 15 - 15 - 15 - 15 - 15 - 15
	Um rum rught	at Speed 100	wait 0.5 seconds	
	Sensor		📓 set servo pin 🕑 angle as 🚳	
-	Show O Turn Left a	t Speed 100	wat (0.5) seconds	
	•		wait @3 seconds	
Devices Sprites Backg	round Sound Move Forv	ard at Speed 100 for	🔛 set servo pin 🚳 angle as 🔞	
-0		ward at Speed 100 for	wait 05 seconds	
Firmware	Pin	ward at speed 100 for	wait 0.5 seconds	
Firmware	🔊 💿 🚺 Turn Right	at Speed 100 for 1	Turn Left at Speed 100 for @4 sec	
<b>()</b>	senai por		Stop Moving	
add Connect your de	vice O Turn Left a	t Speed 100 for 1 s	wat 0.5 seconds	
How to use dev	rice?		Tot servo pin 🕐 angle as 🚯	0
	Events Stop Movi	9	La set servo pin 🕜 angle as 🚳	
	2	in (9) angle as (90) = 💻	aller alle	

Step 28:Click Action , then Drag and drop Move Backward at speed for sec block

to programming area ,change the speed **100** to **50** as following;

ngan ang			Move Forward at Speed 100	forever 21 🖉 🛃 read ultra	xonic sensor trig pin 🕐 echo pin 🔕 < 🔇	Blocks	Arduin
	63	Action	Move Backward at Speed 100	Stop Moving wat OS seconds			
	0	Sensor	Turn Right at Speed 100	wat 05 seconds	angle as 25		
		•	Turn Left at Speed (100)	wat OS seconds	angle as 20		
C)		Show		wait 0.5 seconds	angle as 15		
Devices	Sprites Background	Sound	Move Forward at Speed 100 for	1 Sec	angle as 10		
	<b>100</b>	Pin	Move Backward at Speed 100 fo	r 1 soc - · · · · · · · · · · · · · · · · · ·	angle as		
Firmware	6:0	serial por	Turn Right at Speed 100 for 1	The Labor Labor	d 100 for 0.4 sec		
edd	Connect your device	•	Turn Left at Speed 100 for 1	📑 set servo pin 🧃	angle as 8		
	How to use device?	Data	Tum cert at speed 100 for 1	📔 set servo pin 🤇	angle as 15		Q
		Events	Stop Moving	C.S seconds at servic pin @	angle as 🚳		0
	e <sup>o</sup> Connect		set servo pin (9) angle as (90)	Move Backward a	et Speed 🙆 for 🕦 sec	_	

Step 29: Also in Action , then Drag and drop Turn Right at speed for sec block to

programming area ,change the speed **100** to **50**,the **1 sec** to **0.5 sec** as following;

211		1	Move Forward	at Speed 100	forever at	🖉 read ultrasonic sensor trig pin	7) echo pie 🕄 < 7	Block	ks Arduin
e		Action	Move Backwar	d at Speed 100		op Moving 25 seconds t servo pin (4) angle as (25)			15
	•	Sensor	Tum Right at S	peed 100		servo pin (4) angle as (2) seconds t servo pin (4) angle as (20)			
	00	Show	1 Turn Left at Sp	eed 100	2	3 seconds I servio pin 3 angle as 15			
Devices Spr	ites Background	Sound	Move Forward	at Speed 100 for	1) sec	t servo pin 🗳 angle as 🕕			
imware	630	Pin	Move Backwar	d at Speed 100 for		t servo pin 👍 angle as 🕕			
0	Connect your device	serial por	C Turn Right at S	peed 100 for 1	sec	m Left at Speed 1000 for 0(4) op Moving I servo pin (4) angle as (8)	Her.		
add	low to use device?	Data	Tum Left at Sp	oed 100 for 1 :		15 seconds t servo pin 4 angle as 15			6
		Events	Stop Moving			<ul> <li>seconds</li> <li>tservo pin (4) angle as (30)</li> <li>rve Backward at Speed (50) for</li> </ul>	Ber		e
	& Connect	extension	🟋 set servo pin	9) angle as (90)	-	m Right at Speed 💿 for 🚳	445	_	C

Step 30: Drag and drop Move Forward at speed for sec block to programming

area ,change the speed 100 to 50 as following;

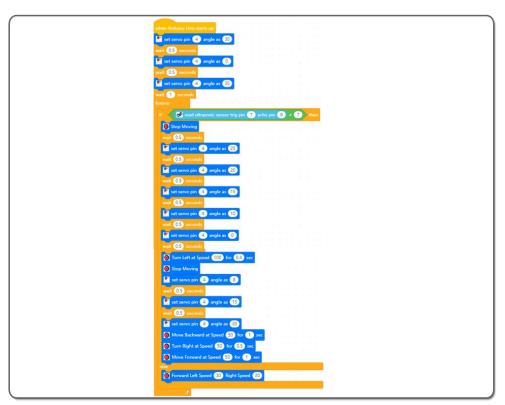
😪 mBlock v5.4.0 makeblock 1	mBlock ©, 🖀 File	🖋 Edit 🕴 (	auto-test	Save	Publish	Local file	📀 Courses	🔰 Tutorials	😨 Feedback	🗊	- 0 ×
		1	Move For	vard at Speed 100		set servo pin weit 03 secon	4 angle as 25			Block	s Arduino C
	6	Action	Move Back	cward at Speed 100		set servo pin wat 05 secon	🕢 angle as 📀				Ø
	0	Sensor	Turn Right	at Speed 100		wait (05 secon	4 angle as 15				
		Show	2 m Left a	at Speed 100		wat 0.5 secon	angle as 🕥				
Devices	Sprites Background	Sound	Move For	vard at Speed 100 fo	r 1 sec	viet 05 second Turn Left at S Stop Moving	peed (100) for (0.4) sec				
Firmware	6.00	Pin	Move Bac	cward at Speed 100 1	for 1 sec	wait @3 10000					
•	Connect your device	serial por		at Speed 100 for	Li	wat 05 secon	<ul> <li>angle as (15)</li> <li>angle as (30)</li> </ul>				
add	How to use device?	Data		at Speed 100 for 1	Ti	furn Right at	erd at Speed 50 for 1 Speed 50 for 0.5 sec d at Speed 60 for 1				0
		Events	Stop Movi	ng bin (9) angle as (90)	1.1	- O Move Forwar					0
	6 <sup>9</sup> Connect	extension	En ser servo p	An S angle as SU							- 0

Step 31: Drag and drop Forward Left speed Right speed block to programming

area ,change the speed **100** to **30** as following;

mBlock v5.4.0 nakeblock	mBlock	🕤, 💼 File 🖌	6 Edit	auto-test	Save	Publish Lo	cal file	📀 Courses 📲	Tutorials 👳 Feed	Iback 🚥 💼	- Ø Python Editor
nari 💷 ari 🚥				-			🛃 set servo pin 🖪 e	unale as 🚳		Blog	cks Arduing
cartar			1	Turn Right at	Speed 100		wait 05 seconds				
	9		Action	Turn Left at S	(01) here		set servo pin 4	angle as 🛞			
	Q						📓 set servo pin 🍊 e	angle as 15			
			Sensor	Move Forward	at Speed 100 for	1 sec	weit 05 seconds	angle as 10			
- 1 Carlos			Show				wait 05 seconds				
		00		Move Backwa	rd at Speed 100 fo	r 🕦 sec	viait 03 seconds	angle as 🕐			
Devices	Sprites	Background	Sound	🔞 Turn Right at	Speed 100 for 1	sec	Turn Left at Speed	100 for 0.4 sec			
2			Pin				Stop Moving Stop Moving set servo pin (4) :	angle as 🐻			
mware	Č.		Pin	Turn Left at S	beed 100 for 1		wait 05 seconds				
-		5	serial por	Stop Moving			wait 05 seconds	angte as			
add	Connect	your device	•				🛃 set servo pin 🧉 :	angle as ③			
	How to u	use device?	Data	2 set servo pin	9 angle as 90		Turn Right at Speed				0
			Events		peed 100 Right S	reed 100	3 we Forward at Sp			1111	~
							Forward Left Speed	C Right Speed			0
	80	Connect	extension	Backward Left	Speed 100 Right	Speed 100	9				e

Now we have completed the block programming. The final blocks look like following:



Now all the programming blocks have been completed! From above picture, the logic is pretty straight forward:

When Arduino is started, computer will enter a dead loop which will check the button status, when button is not pressed, the servo will stop at original position (in my servo 0 degree ) and elevator is in the ground , when button is pressed, the servo arm will

rotate from 0 degree position to 180 degree position and the elevator is lifted to the air.

## Step 32 Upload the program to OSOYOO basic board

1) Please connect your OSOYOO basic board to your PC with USB cable firstly.

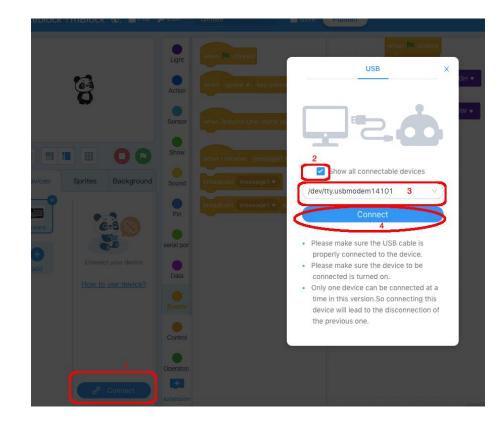
Then click the Connect button in the bottom of the mBlock software, you will see a

USB window pop up,

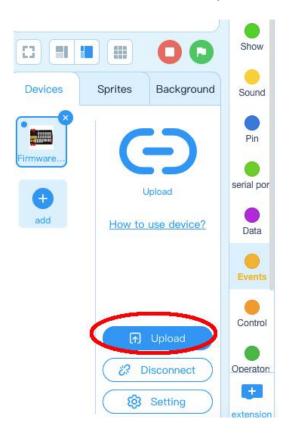
2) select **Show all connectable device** check box , then a device drop-down menu will show up,

3) select your port from device drop-down menu

4) click **Connect** button to connect your PC to OSOYOO basic board.



5)After you PC is connected to OSOYOO basic board, please click Upload button in the bottom of your software, then the code will be uploaded to OSOYOO basic board:



# PROGRAM EXPLANATION

This lesson does not use any new program blocks. If you don't understand the block meaning, please review previous lessons.

#### The programming logic explanation is in following graph:

First, program will make servo to rotate from 30 degree to 0 degree and then stop at 30 degree. This will make the finger from opening status to closing status. then opening status. If the finger doesn't work as this, you need to adjust the finger firstly. Then ultrasonic sensor enter into a forever loop which check whether there is obstacle or not on the car's way

If ultrasonic sensor detect an obstacle within 7cm, the car will stop moving for 0.5 second. The servo will rotate slowly from opened status to closed status to make the finger catch the obstacle, then the robot car turn left at speed 100 for 0.4 second, then stop. The servo will rotate slowly from closed status to opened status to make the finger put down the obstacle, then the robot car move backward at speed 50 for 1 second, then turn right at speed 50 for 0.5 second, then move forward at speed 50 for 1 second.

If ultrasonic sensor doesn't detect an obstacle, the car will move forward at speed 30. Above program blocks are running as a forever loop unless you turn off the power.

when Arduino Uno starts up	
🖬 set servo pin 🖪 angle as 👀	
wait (0.3) seconds	
	Test claw servo ,make the claw open and close
wait 0.5 seconds	
🔚 set servo pin 🕢 angle as 🔞	
wait 1 seconds	Detect if there is any obstacle ahead
forever	
🧃 🛃 🛃 read ultrasonic sensor trig pin (	7) echo pin 8 < 7) then
Stop Moving	
wait (0.5) seconds	
📓 set servo pin 🖪 angle as 😆	
wait 0.5 seconds	
🛃 set servo pin 🚯 angle as 💈	
wait 0.5 seconds	
🛃 set servo pin 👍 angle as 15	When obstacle is detected ,slowly close
wait 0.5 seconds	the claw from 25 degree to 0 degree
Set servo pin (4) angle as (10)	
wait 0.5 seconds	
Set servo pin (4) angle as (0)	
wait (0.5) seconds	Hold the object in claw and turn left
Turn Left at Speed 100 for 0.4 s	
Stop Moving	
set servo pin (4) angle as (8)	_
wat 0.5 seconds	
	Slowly release the claw from 0 degree to 20 degree
	Slowly release the claw from 0 degree to 30 degree
wait 05 seconds	
🖬 set servo pin 🕢 angle as 🔞	
Move Backward at Speed 50 for	
Turn Right at Speed 50 for 0.5 s	
Move Forward at Speed 50 for 1	Sec.
ela I D	
Forward Left Speed 30 Right Speed	If no obstacle is defected ,keep moving forward

HOW TO PLAY

Adjust the finger position:

#### By manual:

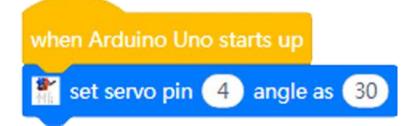
After turning on the power, the finger will open, then close and then open again and stay in open position for about 1 second. If the finger does not stop at open position, please turn off the power, then take out the servo gear and put it to a position where both fingers are in open position.

After you have adjusted finger to right position, please turn on the power again. Then put a ball into the open finger. Once the ultrasonic sensor detected the ball, it will catch the ball and move it to left hand location. After transferring the ball, then the car will turn back to its original position.

#### By Code:

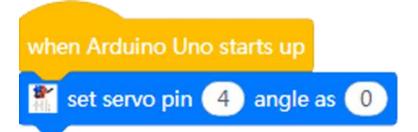
Please upload the following code to your Arduino. Turning on the power and check whether the finger is in opened position or not.

If not, please adjust "30" to other degree and repeat the step till you get the correct value.



Please upload the following code to your Arduino. Turning on the power and check whether the finger is in closed position or not.

If not, please adjust "0" to other degree and repeat the step till you get the correct value.



Please record degrees for your robot finger, and replace the degrees of the sample code with your correct value. so that the code will work perfect.

#### Working Result:

When you turn on the power and put the car on the ground, the car will go forward, when there is an obstacle( please select the suitable obstacle according the finger size) on its way, the finger will catch it, and put it away) then move on forward.

# Lesson 6: WIFI APP control Robot Car and Front Claw

- Objective
- Parts and Devices
- How to build
- <u>Circuit connection</u>
- How to code
- How to play

### **OBJECTIVE**

This lesson will use the programming tool —— IDE for Arduino to complete the robot car control by WIFI APP. In this lesson, the car is controlled by phone APP to move forward, backward, turn right and left and open finger servo to catch object and unload object.



## PARTS & DEVICES

Please prepare the following parts to complete this project

NOTE:

1.the color of the building block is subject to the actual product, which does not affect the use.

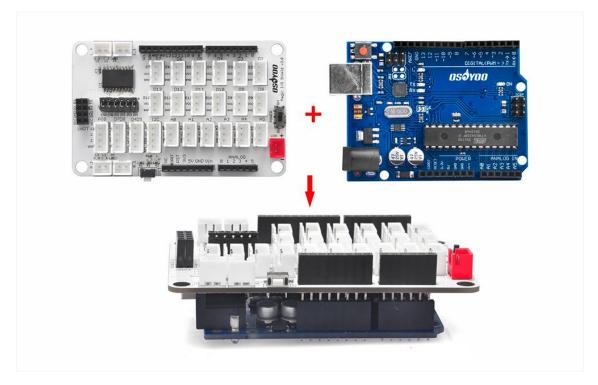
2. ALL OSOYOO PRODUCTS FOR ARDUINO ARE THIRD PARTY BOARD WHICH

IS FULLY COMPATITABLE WITH ARDUINO



#### ном то маке

Before you build the robot with blocks, please install OSOYOO basic board for Arduino under OSOYOO Magic I/O shield as following (Attention please : the pins of I/O shield is aligned with the port of basic the board firstly, then press the shield tightly on the board).

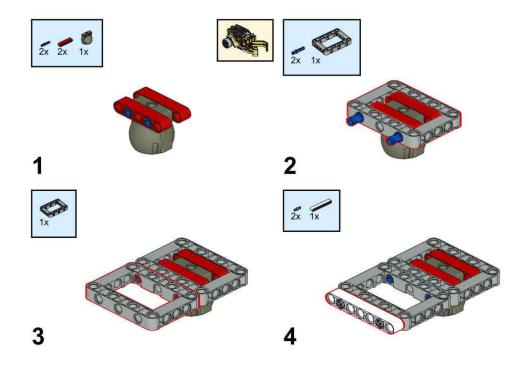


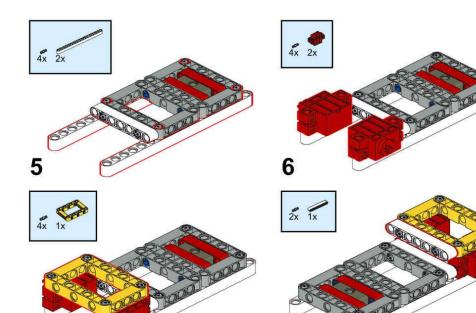
Please follow the building steps to build this robot car, If you want to get clear PDF

building steps, please download

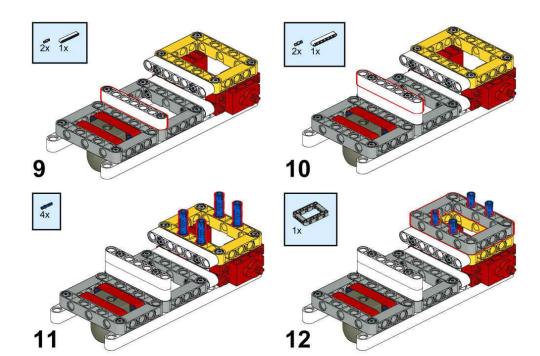
from https://osoyoo.com/picture/Building\_Robot\_Car/lesson6/lesson6.pdf

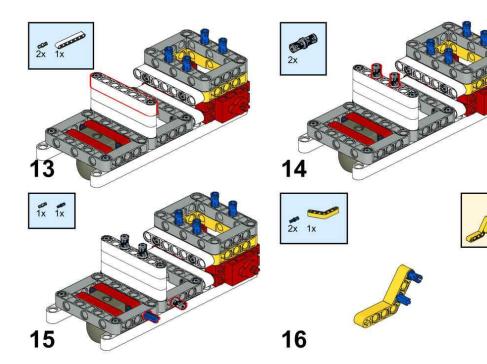
Note: If you have built the robot car for lesson1, please skip to the step35 in this PDF.

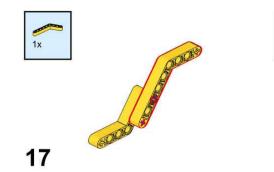


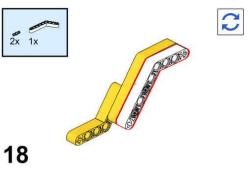


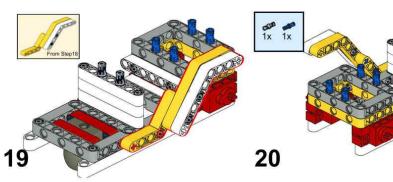
C

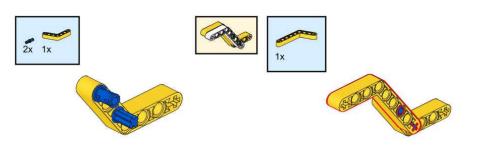


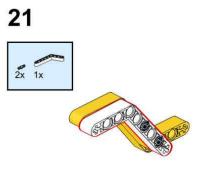


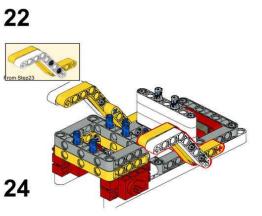


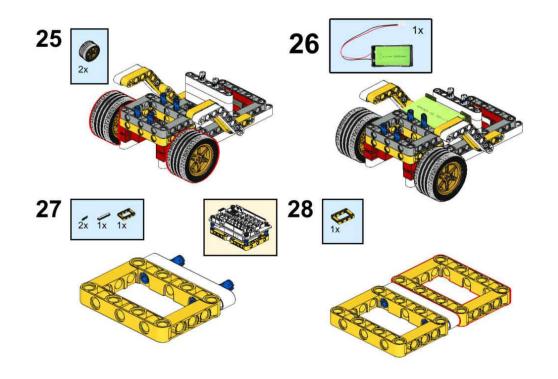


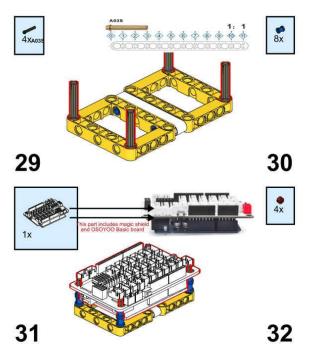


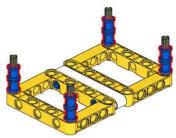


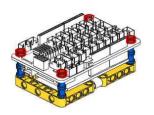


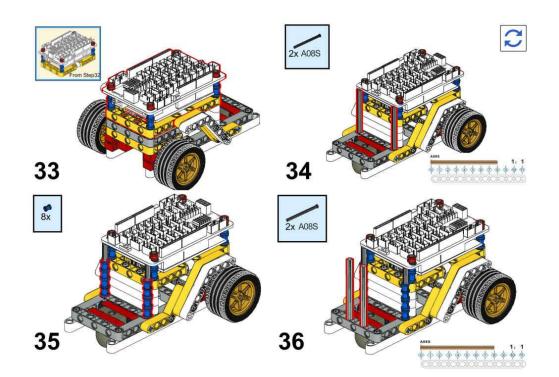


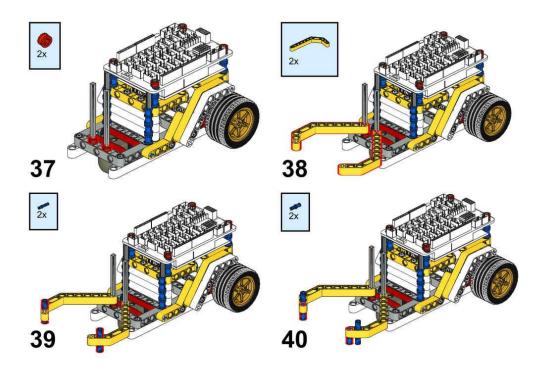


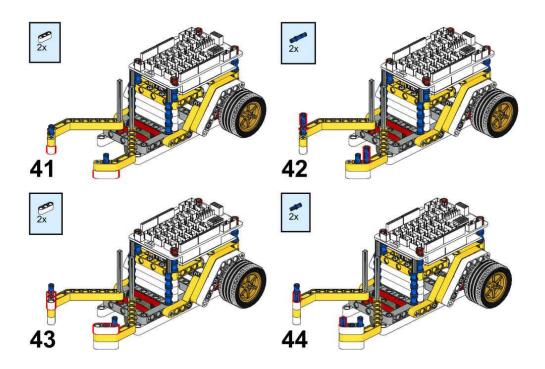


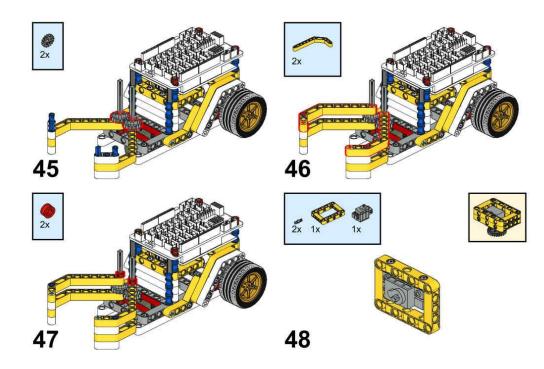


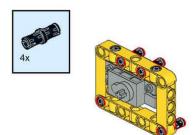






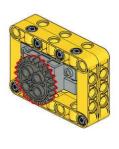


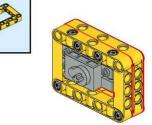




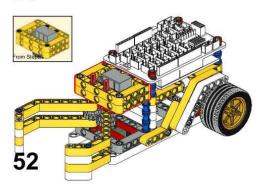


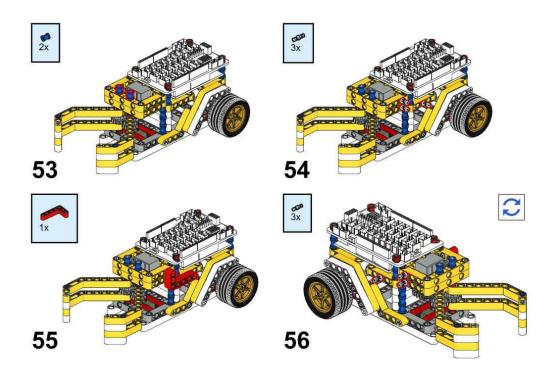


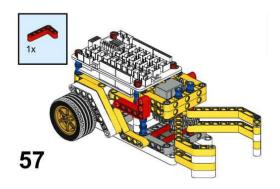




1>







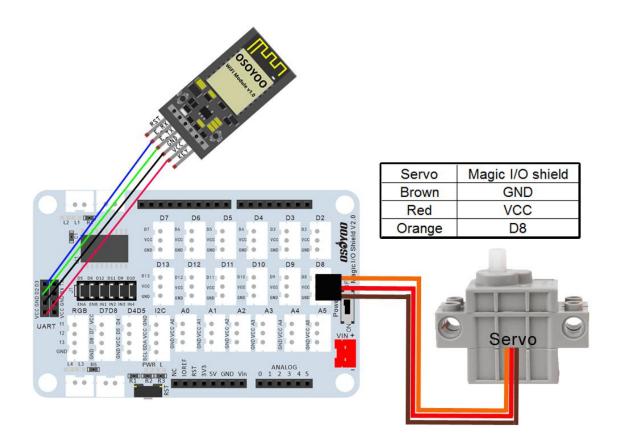
#### **CIRCUIT CONNECTION**

Please connect motors and 9V battery case as lesson1.

Then connect the middle four pins of OSOYOO WIFI Module connect to

VCC/GDN/D2/D3 slot of Magic I/O shield, connect servo motor to D8 port as

following (Attention please: there are six jumper caps on ENA/ENB/IN1/IN2/IN3/IN4)



#### HOW TO CODE

Note: This lesson use Arduino IDE as programming tool.

Step 1: Install Arduino IDE. Download Arduino IDE

from https://www.arduino.cc/en/Main/Software?setlang=en , then install the software.

If you have install Arduino IDE, please skip this step.



Step 2: Install WifiEsp-master library into IDE (If you have already installed

WifiEsp-master library, please skip this step)

#### Download WifiEsp-master

library from https://osoyoo.com/driver/WiFiEsp-master.zip, then import the library

		Δ	
Verify/Compile Upload	Ctrl+R Ctrl+U	Manage Libraries Ctrl+Shift+I	
Upload Using Programme	and the second	Add .ZIP Library	
Export compiled Binary	Ctrl+Alt+S	Arduino libraries	
Show Sketch Folder	Ctrl+K	Bridge	
Include Library		EEPROM	
Add File		Esplora	
		Ethernet	
		Firmata	
loop() {		GSM	
put your main	code he	HID dly	7:
r j - dr marin		Keyboard	
		LiquidCrystal	
		LiquidCrystal Mouse	
		Mouse	
		Mouse Robot Control	
		Mouse Robot Control Robot IR Remote	
		Mouse Robot Control Robot IR Remote Robot Motor	
		Mouse Robot Control Robot IR Remote Robot Motor SD	
		Mouse Robot Control Robot IR Remote Robot Motor SD SPI	
		Mouse Robot Control Robot IR Remote Robot Motor SD SPI Servo	
		Mouse Robot Control Robot IR Remote Robot Motor SD SPI Servo SoftwareSerial	
		Mouse Robot Control Robot IR Remote Robot Motor SD SPI Servo SoftwareSerial SpacebrewYun	Arduine Uno

into IDE(Open IDE-> click Sketch->Include Library->Add .Zip Library)

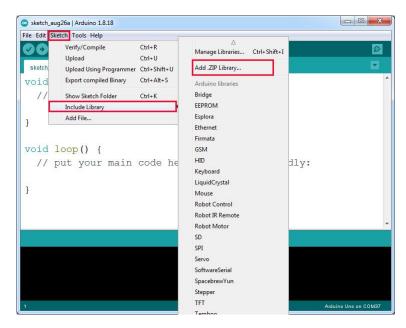
Step 3: Install OsoyoolOT Library into IDE (If you have already installed

OsoyoolOT Library, please skip this step)

#### Download OsoyoolOT

Library from https://osoyoo.com/driver/wifi-iot/OsoyooIOT.zip, then import the library

into IDE(Open IDE-> click Sketch->Include Library->Add .Zip Library)



#### Step 4: Download sample code

from https://osoyoo.com/picture/Building\_Robot\_Car/lesson6/robot-arm-car.zip,

unzip the download zip file **robot-arm-car.zip**, you will see a folder

#### called robot-arm-car.

Step 5: Connect OSOYOO basic board for Arduino to PC with USB cable, Open

Arduino IDE -> click file -> click Open -> choose code "robot-arm-car.ino"

in robot-arm-car folder, load the code into arduino. (Notice: Please turn off power

when your Robot is connected to Personal Computer or Laptop via USB cable)

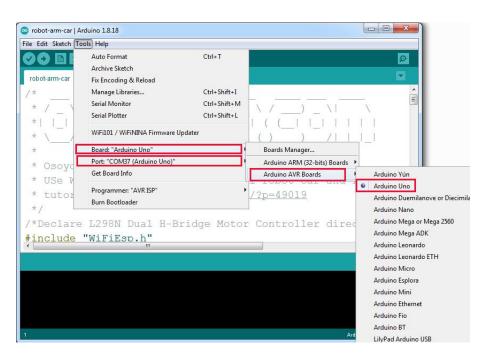
New	Ctrl+N		
Open	Ctrl+O		
Open Recent	t	•	
Sketchbook		•	
Examples		tup code here, to run once:	
Close	Ctrl+W	cup obuc here, to run once.	
Save	Ctrl+S		
Save As	Ctrl+Shift+S		
Page Setup	Ctrl+Shift+P		
Print	Ctrl+P		
Preferences	Ctrl+Comma	in code here, to run repeatedly:	
Quit	Ctrl+Q		

**Step 6:** You need change the code Line 35 and Line 36 as your router wifi ssid name and password :

char ssid[] = "\*\*\*"; // replace \*\*\* with your router wifi SSID (name)

char pass[] = "\*\*\*"; // replace \*\*\* with your router wifi SSID (password)

**Step 7:** Choose corresponding board and port for your project, upload the sketch to the board.



Step 8: click the Serial monitor window in upper right corner of IDE, you will see

following result (Note: your PC and the robot are connected with the same LAN

network):

💿 robot-arm-car   Arduino 1.8.18		
File Edit Sketch Tools Help		
		itor 👰
robot-arm-car		
/*		E
	_	x-
© COM37	-	
		Se
[WiFiEsp] Initializing ESP module		Â
[WiFiEsp] Initilization successful - 1.5.4		22
Attempting to connect to WPA SSID:		
[WiFiEsp] Connected to		
You're connected to the network		
IP Address: 192.168.0.8		E
To see this page in action, connect to TP-LINK_DAFD ar	nd open a	browser
Listening on port 8888		

#### TIPS:

If you find the speed for the car is slow or fast, please open the code and change the value of line31 to line33 as the following:

#define FAST\_SPEED 50

#define MID\_SPEED 50

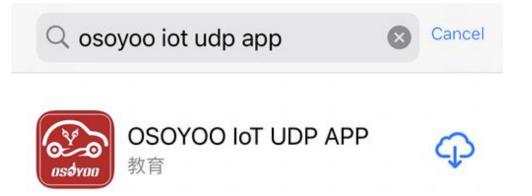
#define SPEED 50

# HOW TO PLAY

### APP Installation and Setting:

### Step 1) Download OSOYOO lot udp APP by searching OSOYOO lot udp

**APP** from Apple Store(iPhone/iPad) or Google Play Store(Android device).



Step 2): Install the OSOYOO lot udp APP in your Phone and make sure your Cell

phone is connected with the same LAN Network of your robot car for Arduino.

#### Step 3): Set IP Address in APP

- 1)Open APP, click Setting button in upper right corner
- 2)Use the IP address you get in serial monitor window (For our robot is 192.168.0.8)
- to replace default IP 192.168.1.255
- 3)keep default port number 8888 without changing
- 4)Click **Save** button to save the changes you just made
- 5)Click Back Arrow to go back APP front UI

F2 F3		< 5	05070	O IOT AP	P
F2 F3	F4		ionse Text D	isplay	0
F6 F7	F8	UDP Inco 8888	ming Port		
	- 100	2 IP addres 192.16		] 3	Port 8888
-	18				
		Video Tar	get		
$\langle \Box \rangle$		rideo rui			
$\langle \Box \rangle$		URL		75-8800/22	ction=stre
	0	URL		75:8899/?a	ction=stre
, in the second		URL	192.168.1.7	75:8899/?a	ction=stre
		URL http://*	192.168.1.7	75:8899/?a F3 H	ction=stre
		URL http:// Function I	192.168.1.7 Keys	F3 H	F4
· • • • • • • • • • • • • • • • • • • •		URL http://*	192.168.1.7 Keys	F3	F4
		URL http://'	192.168.1.7 Keys F2 G F6	F3 H F7	F4 1 F8

You can use the Arrow keys to control the car movement. APP Button Action

	Move Forward
▼	Move Backward
◀	Left Turn
	Right Turn
[]	Stop
F1	Open Finger
F2	Close Finger

# Lesson 7: WIFI APP control Robot Car

- Objective
- Parts and Devices
- How to build
- <u>Circuit connection</u>
- How to code
- How to play

## **OBJECTIVE**

In this project we will connect Robot Car to WIFI and Use an APP to control the car through Internet. This is a typical Internet of Things(IoT) Application. Phone APP controls the car movement, and temperature & humidity sensor module sends temperature and humidity to your phone.



## PARTS & DEVICES

Please prepare the following parts to complete this project

NOTE:

1. the color of the building block is subject to the actual product, which does not affect

the use.

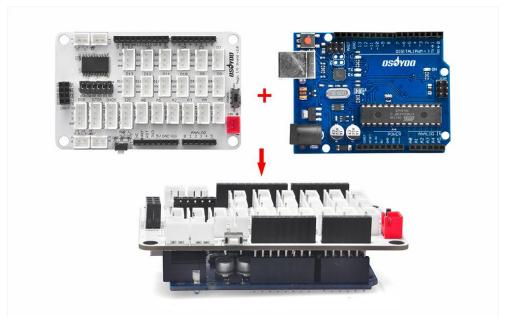
2. ALL OSOYOO PRODUCTS FOR ARDUINO ARE THIRD PARTY BOARD WHICH

IS FULLY COMPATITABLE WITH ARDUINO



ноч то маке

Before you build the robot with blocks, please install OSOYOO basic board for Arduino under OSOYOO Magic I/O shield as following (Attention please : the pins of I/O shield is aligned with the port of basic the board firstly, then press the shield tightly on the board).

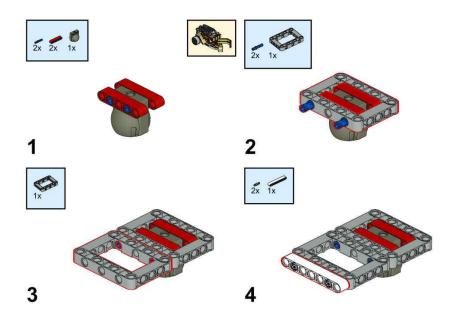


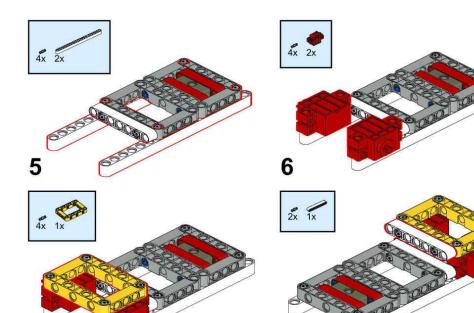
Please follow the building steps to build this robot car, If you want to get clear PDF

building steps, please download

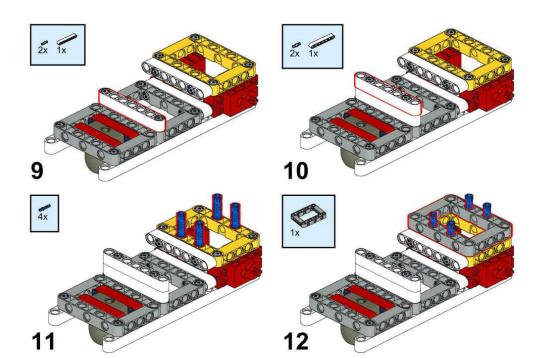
from https://osoyoo.com/picture/Building\_Robot\_Car/lesson7/lesson7.pdf

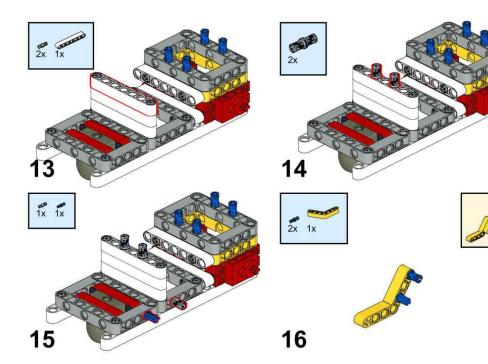
Note: If you have built the robot car for lesson6, please skip to the step58 in this PDF.

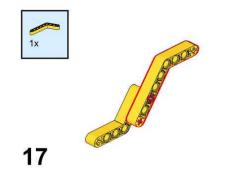


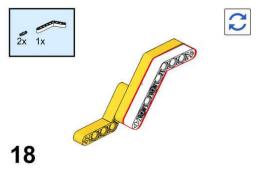


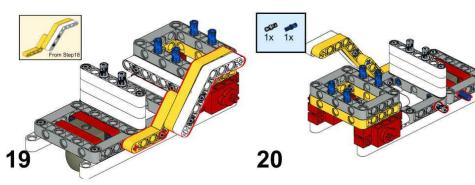
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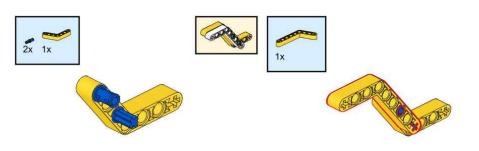


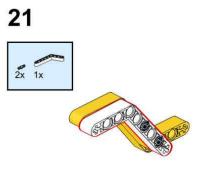


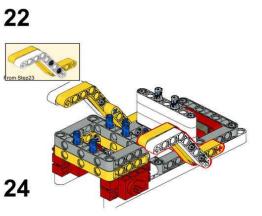


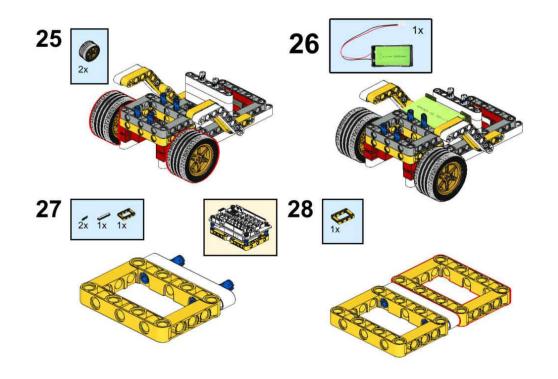


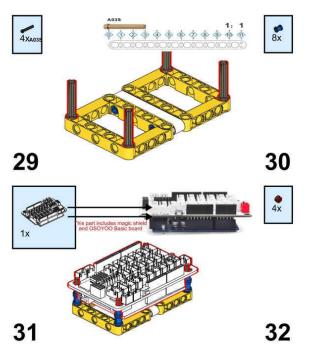


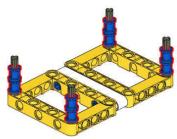


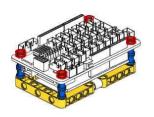


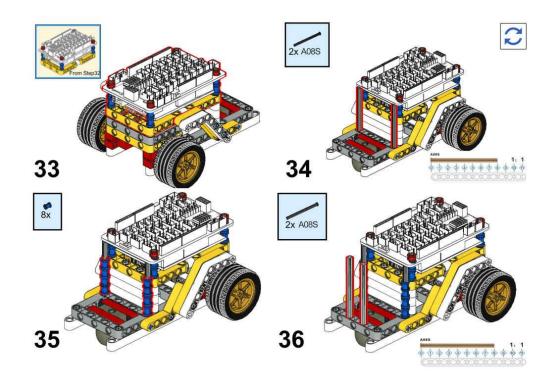


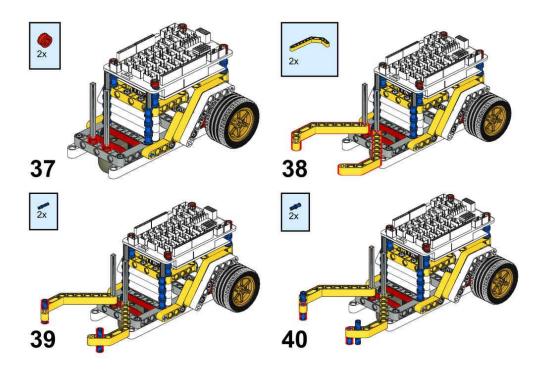


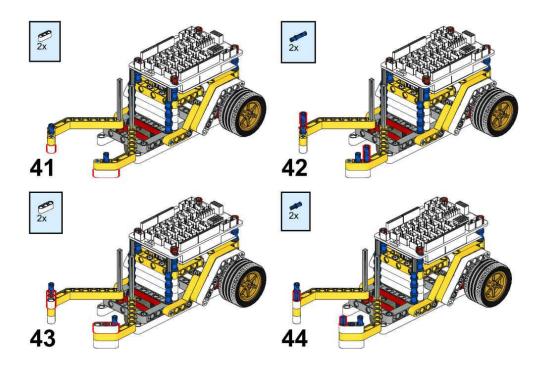


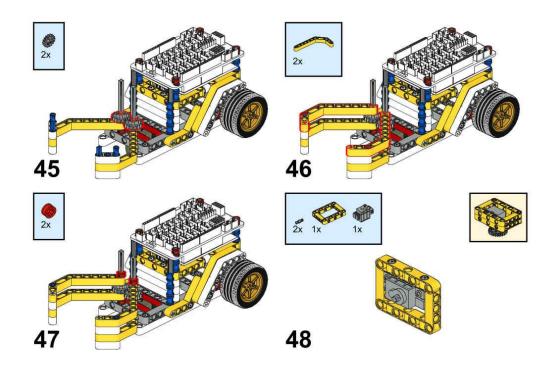


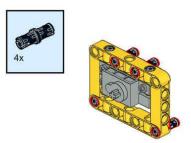






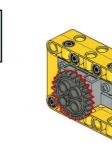


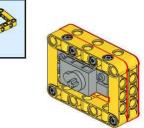


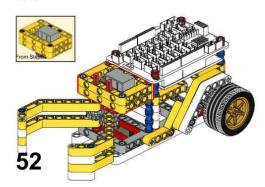


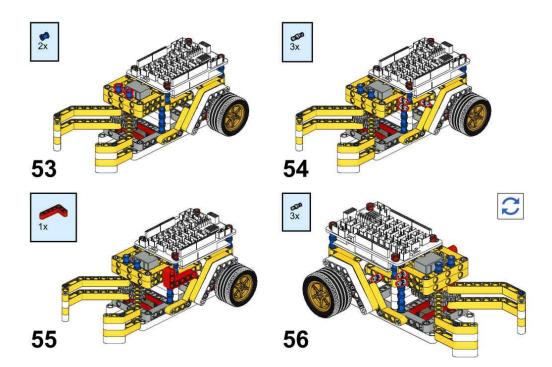


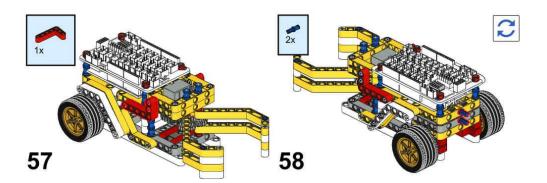
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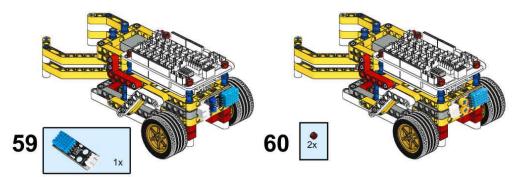








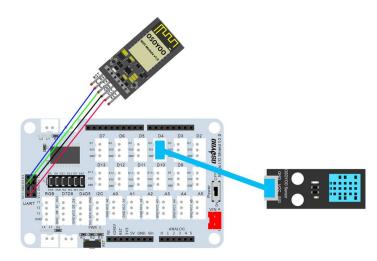




# **CIRCUIT CONNECTION**

Please connect motors and 9V battery case as lesson1.

Then connect the **middle four pins** of OSOYOO WIFI Module connect to VCC/GDN/D2/D3 slot of Magic I/O shield, connect servo motor to D4 port as following (Attention please: there are six jumper caps on ENA/ENB/IN1/IN2/IN3/IN4)



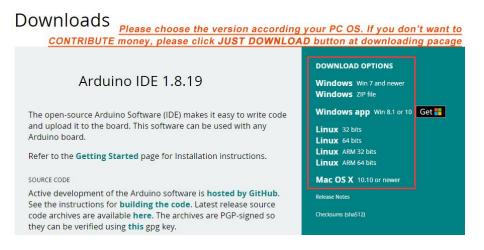
### HOW TO CODE

Note: This lesson use Arduino IDE as programming tool.

Step 1: Install Arduino IDE. Download Arduino IDE

from https://www.arduino.cc/en/Main/Software?setlang=en , then install the software.

If you have install Arduino IDE, please skip this step.



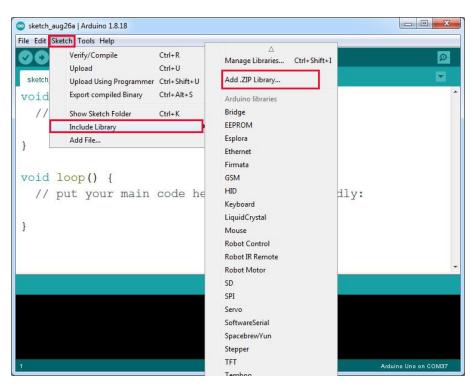
Step 2: Install WifiEsp-master library into IDE (If you have already installed

WifiEsp-master library, please skip this step)

### Download WifiEsp-master

library from https://osoyoo.com/driver/WiFiEsp-master.zip, then import the library

into IDE (Open IDE-> click Sketch->Include Library->Add .Zip Library)



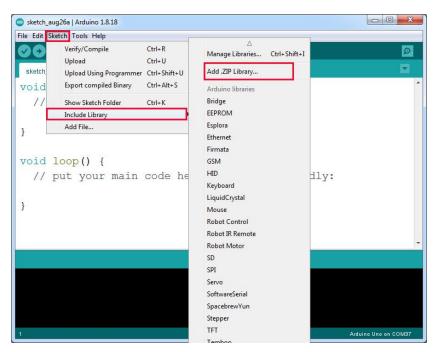
Step 3: Install OsoyoolOT Library into IDE (If you have already installed

OsoyoolOT Library, please skip this step)

### Download OsoyoolOT

Library from https://osoyoo.com/driver/wifi-iot/OsoyooIOT.zip, then import the library

into IDE (Open IDE-> click Sketch->Include Library->Add .Zip Library)



Step 4: Install DHT Sensor Library into IDE (If you have already installed DHT

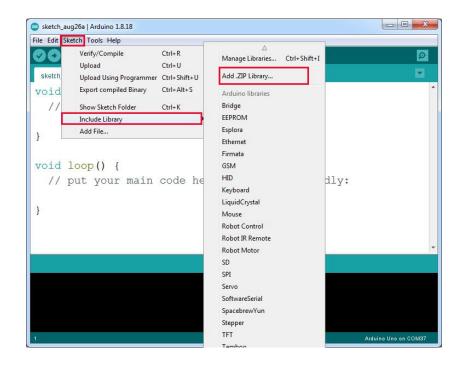
Sensor Library, please skip this step)

Download DHT Sensor

Library from https://osoyoo.com/wp-content/uploads/samplecode/DHT.zip then

import the library into IDE (Open IDE-> click Sketch->Include Library->Add .Zip

Library)



#### Step 5: Download sample code

from https://osoyoo.com/picture/Building\_Robot\_Car/lesson7/wifi-block-car.zip, and

unzip the downloaded zip file wifi-block-car.zip, you will see a folder

#### called wifi-block-car.

Step 6: Connect OSOYOO basic board for Arduino to PC with USB cable, Open

Arduino IDE -> click file -> click Open -> choose code "wifi-block-car.ino"

in wifi-block-car folder, load the code into Arduino. (Notice: Please turn off power

when your Robot is connected to Personal Computer or Laptop via USB cable)

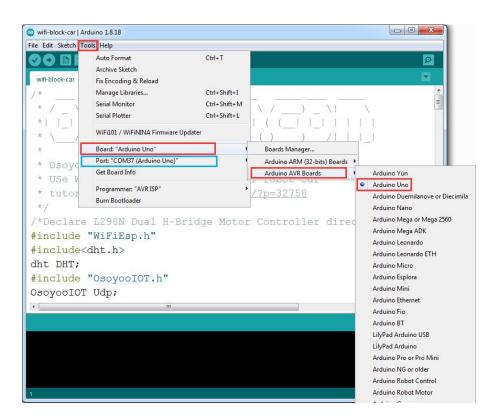
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Quit	Ctrl+Q		

**Step 7:** You need change the code Line 38 and Line 39 as your router wifi ssid name and password :

char ssid[] = "\*\*\*"; // replace \*\*\* with your router wifi SSID (name)

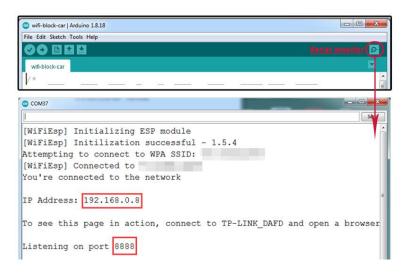
char pass[] = "\*\*\*"; // replace \*\*\* with your router wifi SSID (password)

**Step 8:** Choose corresponding board and port for your project, upload the sketch to the board.



**Step 9:** click the Serial monitor window in upper right corner of IDE, you will see following result (Note: your PC and the robot are connected with the same LAN

network):



TIPS:

If you find the speed for the car is slow or fast, please open the code and change the value of line33 to line35 as the following:

#define FAST\_SPEED 180

#define MID\_SPEED 130

#define SPEED 120

# HOW TO PLAY

### APP Installation and Setting:

## Step 1) Download OSOYOO lot udp APP by searching OSOYOO lot udp

**APP** from Apple Store(iPhone/iPad) or Google Play Store(Android device).



Step 2): Install the OSOYOO lot udp APP in your Phone and make sure your Cell

phone is connected with the same LAN Network of your robot car for Arduino.

### Step 3): Set IP Address in APP

1)Open APP, click Setting button in upper right corner

2)Use the IP address you get in serial monitor window (For our robot is 192.168.0.8)

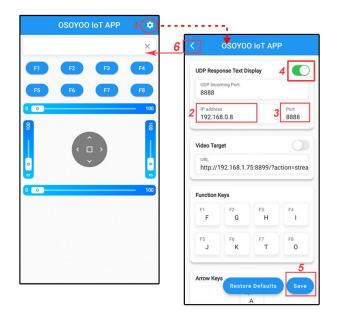
to replace default IP 192.168.1.255

3)keep default port number 8888 without changing

4)turn on the switch of UDP Response Text Display

5)Click Save button to save the changes you just made

6)Click Back Arrow to go back APP front UI



#### Control the robot car:

You can use the Arrow keys to control the car movement and see the temperature

and humidity detected by the DHT11 sensor in your car when you click any button.

	Move Forward
▼	Move Backward
◀	Left Turn
	Right Turn
[]	Stop