Adeept Adeept Adeept Robotic Arm



About Adeept

Adeept is a technical service team of open source software and hardware. Dedicated to applying the Internet and the latest industrial technology in open source area, we strive to provide best hardware support and software service for general makers and electronic enthusiasts around the world. We aim to create infinite possibilities with sharing. No matter what field you are in, we can lead you into the electronic world and bring your ideas into reality.

Technical Support: support@adeept.com Customer Service: service@adeept.com 

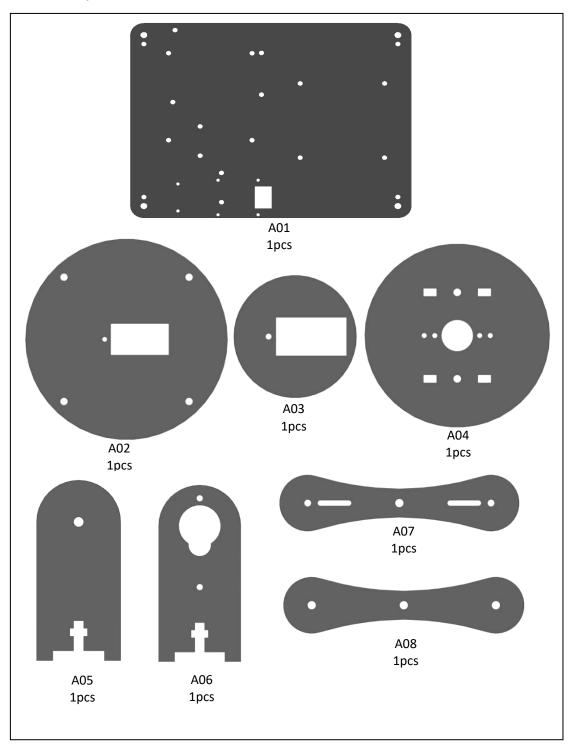
Contents

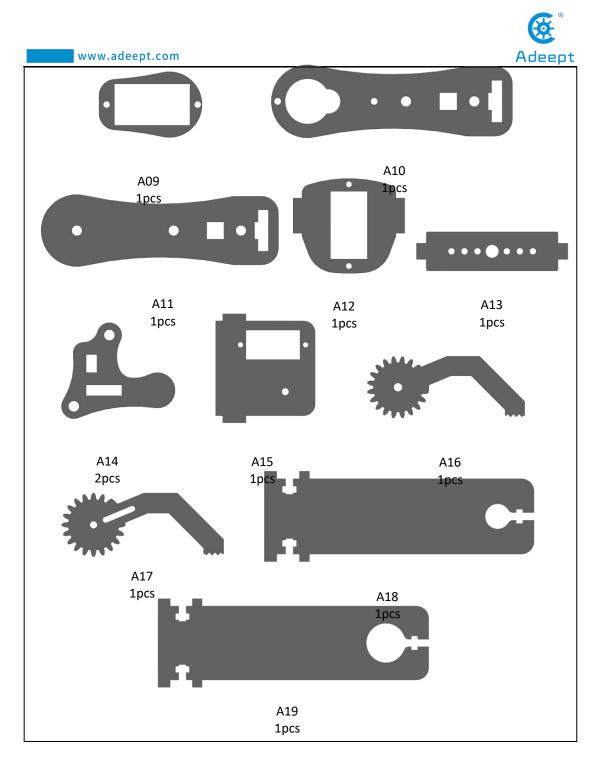
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Components List

1.1 Acrylic Plates





The acrylic plates are fragile, so please be careful when assembling them in case of breaking.

The acrylic plate is covered with a layer of protective film. You need to remove it first.

Some holes in the acrylic may have residues, so you need to clean them before the use.

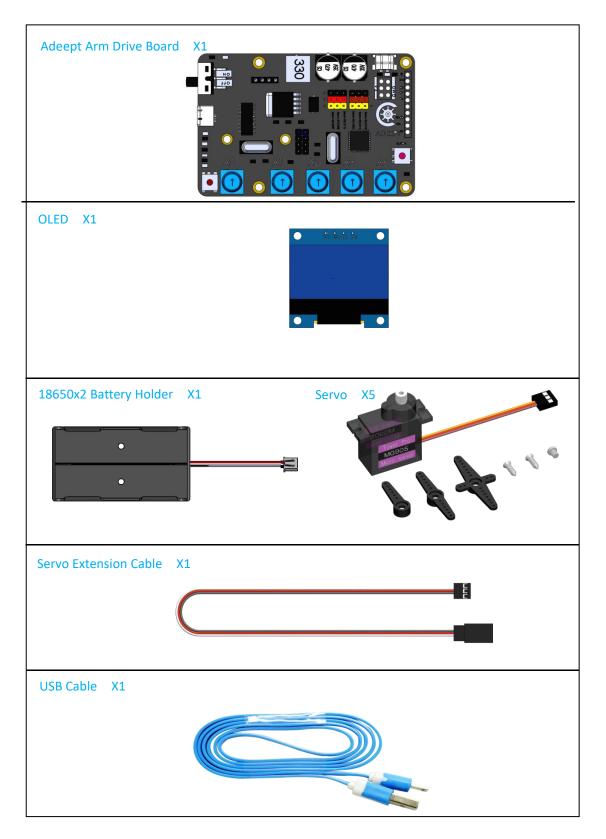


1.2. Machinery Parts



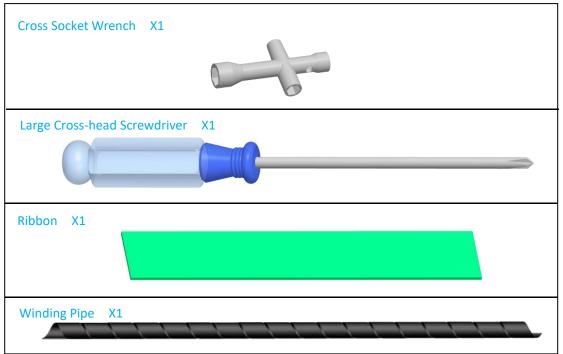


1.3. Electronic Parts

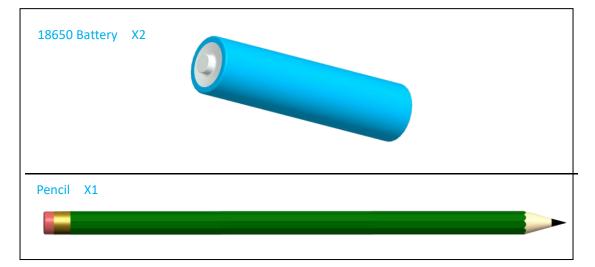




1.4 Tools



1.5. Self-prepared Parts



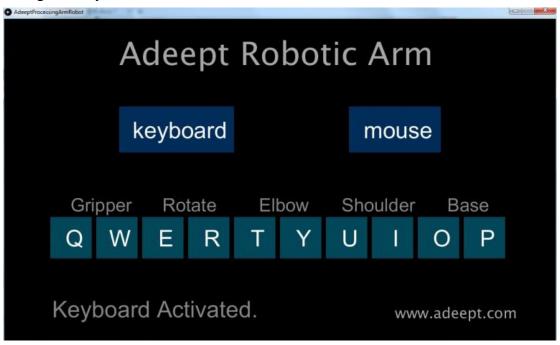


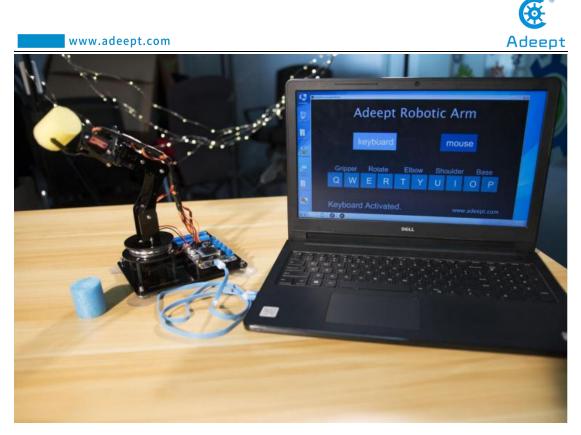
Introduction of Robotic Arm

Nowadays, under the progress of science and technology, the biggest difference between a robotic arm and a human arm lies in flexibility and strength. That is, the biggest advantage of the robotic arm is that normally it can repeat the same motion without feeling tired. Today Adeept recommends a robotic learning kit to learn how to assemble a robotic arm and learn how to write the code to control the robotic arm to perform the specific motions. We provide a completed using method for learning Arduino and Processing write PC software and send motion commands to the robotic arm with Processing; write the motion of the servo of the robotic arm with Arduino.

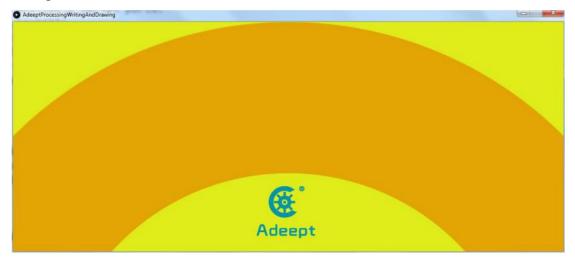
Assemble video address: https://www.adeept.com/video/detail-81.html

The following figure shows that we control the robotic arm to pick up the object through the keyboard with serial communication.

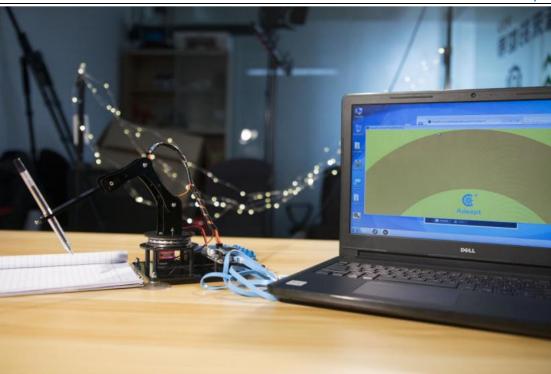




The following figure shows that we control the robotic arm to write and draw through the mouse with serial communication.





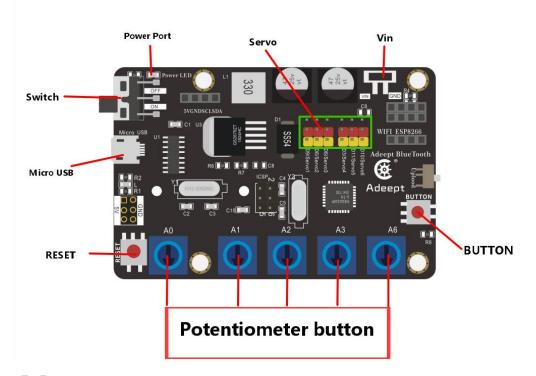


We have added the learning and memory function to the robotic arm. We let the robotic arm to record the manually controlled mechanical movements we made, and the robotic arm can learn repeatedly, such as repeat moving the object, repeat drawing the same graphic, repeat keyboard input and repeat turning book pages.



Introduction of Adeept Arm Drive Board

The Adeept Arm Drive Board development board is the main component of the robotic arm. Similar to the Arduino UNO development board, it is also an easy-to-use open source electronic prototyping platform, including the hardware part and the software part (Arduino IDE). The Adeept Arm Drive Board development board is mainly composed of a microcontroller (MCU), a universal input/output interface, etc. You can understand it as a microcomputer motherboard. We will introduce the Adeept Arm Drive Board development board in detail.



[1] Power LED:

Power LED is used to indicate the power status of the system. The LED is on, indicating that the system is powered on and ready to run; the LED is off, indicating that the system is not powered on.

[2] Servo:

It is the pin interface of Servo.

(3) Vin (6-24V) :



It is the pin interface for external power supply. Use 6-24V external power supply to power the Adeept SmartHub development board.

(4) RESET:

Restarting the Adeept SmartHub development board.

[5] Switch:

When using Vin (6-24V) as an external power supply, Switch can control the OFF and ON of the Adeept SmartHub development board.

[6] Micro USB:

It is used to connect the Micro USB interface of the computer to realize the serial communication, uploading program and serial monitoring between the Adeept SmartHub development board and the computer.

[7] Potentiometer button:

Potentiometer button has five buttons: A0, A1, A2, A3, and A6. By rotating these buttons, you can control the movement of the robotic arm.

In the following courses, we will combine the application of various components to further learn the practical application of the Adeept Arm Drive Board development board.



Lesson 0 Building the Arduino Development Environment

1. Arduino development language

Arduino uses C/C++ to write programs, so before learning Arduino, you need to master the C/C++ language. Although C++ is compatible with the C language, these are two different languages. C is a process-oriented programming language, and C++ is an object-oriented programming language. The early Arduino core library was written in C language. Later, object-oriented ideas were introduced. At present, the latest Arduino core library is written in C and C++.

Generally speaking, the Arduino language refers to a collection of various Application Programming Interfaces (APIs) provided by the Arduino core library files. These APIs are formed by secondary packaging of the lower-level microcontroller support library. For example, the core library of Arduino using AVR microcontroller is the secondary packaging of AVR-Libc (GCC-based AVR support library).

In the traditional development method, multiple registers need to be configured to achieve the corresponding functions. In Arduino, the complicated registers are encapsulated into simple APIs, which can be intuitively controlled, enhancing the readability of the program and improving the development efficiency.

2.Arduino program structure

The Arduino program structure is different from the traditional C/C++ program structure-there is no main() function in the Arduino program. In fact, it is not that there is no main() function in the Arduino program, but that the definition of the main() function is hidden in the core library file of the Arduino. In the development of Arduino, the main function is not directly operated, but the two functions of setup()



and loop() are used instead.

3. The construction of the Arduino development environment

The IDE of the Arduino development environment can be downloaded from the official website. The download address of the Arduino IDE is: https://store.arduino.cc/usa/

(1) Install Arduino IDE under Windows

We will teach you how to download and install:

1.Open Google Chrome and enter the URL in the address bar: https://store.arduino.cc/usa/

After successfully opening the interface as shown below, we click DOWNLOADS under SOFTWARE.



2. After jumping to the following interface, slide the mouse to the middle to find the part marked in the red circle.You can find that the official website provides us with installation files for Windows, Mac OS X, and Linux systems.



3. We click the installation package of Windows ZIP file for non admin install.After the interface jumps, we select JUST DOWNLOAD.And then start the download. The download status will be displayed in the lower left of Google Chrome.Then we wait for the download to complete.

Download the Arduino IDE



ARDUINO 1.8.12 The open-source Arduino Software (IDE) makes it easy to write code and upload it to the board. It runs on Window Mac OS Y and Linux The environment in Windows Installer for Windows 7 and up Windows ZIP file for non admin install

Windows app Requires Win 8.1 or 10



Contribute to the Arduino Software

Consider supporting the Arduino Software by contributing to its development. (US tax payers, please note this contribution is not tax deductible). Learn more on how your contribution will be used.



Contribute to the Arduino Software

Consider supporting the Arduino Software by contributing to its development. (US tax payers, please note this contribution is not tax deductible). Learn more on how your contribution will be used.



4.After the download is complete, open the folder.There are downloaded compressed installation files:

arduino-1.8.12-windows.zip

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^	名称 ^	修改日期	类型	大小			
	🏪 arduino-1.8.12-windows.zip	2020/5/23 11:16	WinRAR ZIP 压缩	197,	325 k	(B	

5. Double-click to open the file and unzip it.

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	ino-1.8.12								文件夹		2020/2/13 1	0

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6. The file arduino-1.8.12 appears after decompression. As shown follows;

~				
名称	修改日期	类型	大小	
arduino-1.8.12	2020/2/13 10:32	文件夹		
arduino-1.8.12-windows.zip	2020/5/23 11:16	WinRAR ZIP 压缩	197,325 KB	

7. Open the arduino-1.8.12 folder and double-click arduino.exe to open the

software.

3称	修改日期	类型	大小
drivers	2020/2/13 10:32	文件夹	
examples	2020/2/13 10:32	文件夹	
hardware	2020/2/13 10:32	文件夹	
, java	2020/2/13 10:32	文件夹	
, lib	2020/2/13 10:32	文件夹	
libraries	2020/2/13 10:32	文件夹	
, reference	2020/2/13 10:32	文件夹	
tools	2020/2/13 10:32	文件夹	
tools builder	2020/2/13 10:32	文件夹	
🧿 arduino.exe	2020/2/13 10:32	应用程序	395 KB
arduino.l4j.ini	2020/2/13 10:32	配置设置	1 KB
arduino_debug.exe	2020/2/13 10:32	应用程序	393 <mark>K</mark> E
👔 arduino_debug.l4j.ini	2020/2/13 10:32	配置设置	1 KB

8. The interface will show as follows after the Arduino software is opened, indicating that our software has been downloaded and installed successfully.



4. Introduction of Arduino software interface

Sketch_may25a | Arduino 1.8 12 2003 × Menu bar File Edit Sketch Tools Help OO DEE Button bar Ø sketch_may25a void setup() { // put your setup code here, to run once: void loop() [
// put your main code here, to run repeatedly: Code editing area Console Arduino Uno on COM1

The following figure is the interface introduction of Arduino software

(1)Menu bar

Menu bar contains File, Edit, Sketch, Tools and Help.

(1) "File" can operate new file, open file, save file, close file, save, etc. For the Examples, you can check the official sample program.

New	Ctrl+N	
Open	Ctrl+O	
Open Recent	>	
Sketchbook	>	
Examples	>	e, to run once:
Close	Ctrl+W	
Save	Ctrl+S	
Save As	Ctrl+Shift+S	
Page Setup	Ctrl+Shift+P	to run repeatedly:
Print	Ctrl+P	
Preferences	Ctrl+Comma	
Quit	Ctrl+Q	

(2) "Edit" has the functions for the program code of editing, copying and pasting,

commenting, indenting, searching, etc.

ido	Ctrl+Z	-		
edo	Ctrl+Y			
Cut	Ctrl+X			
Сору	Ctrl+C	nce:		
opy for Forum	Ctrl+Shift+C			
Copy as HTML	Ctrl+Alt+C			
Paste	Ctrl+V			
Select All	Ctrl+A	peatedly:		
Go to line	Ctrl+L	-		
Comment/Uncomment	Ctrl+Slash			
Increase Indent	Tab			
Decrease Indent	Shift+Tab			
Increase Font Size	Ctrl+Plus			
Decrease Font Size	Ctrl+Minus			
Find	Ctrl+F			
Find Next	Ctrl+G			
Find Previous	Ctrl+Shift+G			

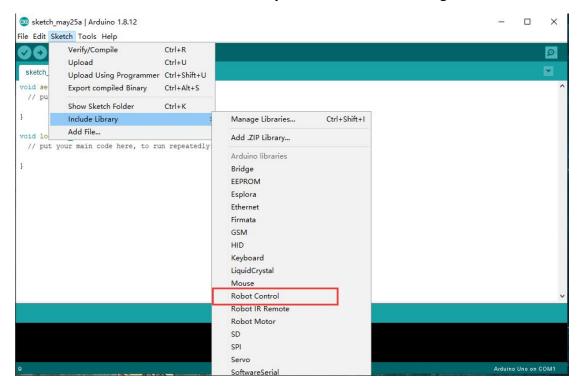
(3) Sketch can perform Verify/Compile, Upload and other operations on the



written project.

Verify/Compile	Ctrl+R	
Upload	Ctrl+U	
Upload Using Programmer	Ctrl+Shift+U	
Export compiled Binary	Ctrl+Alt+S	
Show Sketch Folder	Ctrl+K	
Include Library	>	
Add File		

The Include Library can load the library. After selecting the library file in the list, the relevant header files are automatically added in the code editing area.

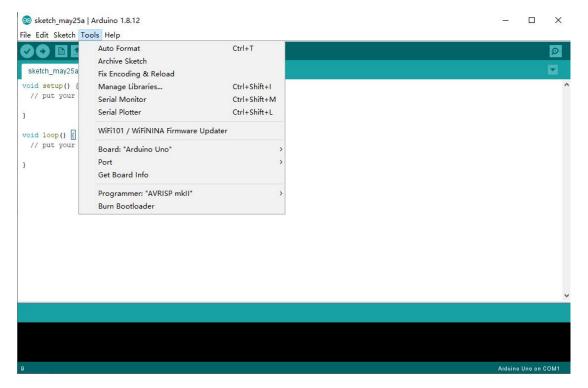




🥺 sketch_may25a | Arduino 1.8.12

sketch_may25a §	
include <arduinorobot.h></arduinorobot.h>	
<pre>#include <arduino_lcd.h></arduino_lcd.h></pre>	
<pre>#include <compass.h></compass.h></pre>	
<pre>#include <easytransfer2.h></easytransfer2.h></pre>	
<pre>#include <eeprom_i2c.h></eeprom_i2c.h></pre>	
<pre>#include <fat16.h></fat16.h></pre>	
<pre>#include <fat16config.h></fat16config.h></pre>	
<pre>#include <fatl6mainpage.h></fatl6mainpage.h></pre>	
<pre>#include <fatl6util.h></fatl6util.h></pre>	
<pre>#include <fatstructs.h></fatstructs.h></pre>	
<pre>#include <multiplexer.h></multiplexer.h></pre>	
<pre>#include <sdcard.h></sdcard.h></pre>	
<pre>#include <sdinfo.h></sdinfo.h></pre>	
<pre>#include <squawk.h></squawk.h></pre>	
<pre>#include <squawksd.h></squawksd.h></pre>	

(4) Board and Port are often used in "Tools".



Board can choose different development boards. Our course uses Arduino Uno development board, so we need to choose Arduino Uno. The list contains many Arduino development board models.We choose the corresponding ones according to the model.



e Edit Sketch To	ols Help			
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include <ardu include <ardu include <comp include <easy include <eepr< td=""><td>Manage Libraries Serial Monitor Serial Plotter</td><td>Ctrl+Shift+I Ctrl+Shift+M Ctrl+Shift+L</td><td></td><td></td></eepr<></easy </comp </ardu </ardu 	Manage Libraries Serial Monitor Serial Plotter	Ctrl+Shift+I Ctrl+Shift+M Ctrl+Shift+L		
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<pre>include <squawk: oid setup() {</squawk: </pre>			Arduino Mega or Mega 2560 Arduino Mega ADK Arduino Leonardo Arduino Leonardo ETH	
oid loop() {			Arduino Micro Arduino Esplora	
			Arduino Mini Arduino Ethernet	
			Arduino Fio Arduino BT	
			LilyPad Arduino USB	
			LilyPad Arduino	Arduino Uno on COI

Port can set the port used by Arduino IDE to download the program, that is, the port number of the development board connected to the computer. The port display of each computer is different. When we use the Arduino Uno to connect to the computer, it displays the COM3 port number.

o de	Auto Format Archive Sketch	Ctrl+T		
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(2)Button bar

Button bar includes functions of Verifying,Uploading,Building New,Opening and Saving.

(1) Verify

Checking and compilation. This button is used to check the correctness of your "syntax" or code. If your code has any syntax errors or undefined variables, an error message will appear at the bottom of the IDE screen. At the same time, the line of error code will be marked with a red background color for easy modification. But if it is correct, you will see the message that the compilation is complete.



Download the program code to the Arduino development board. It is better to click Verify first, and then click Upload.

(3) New

Open a new program editing window to create a new project.

(4) Open

This button can open an existing draft file. You will use it when you need to open a file that you have downloaded or used before.

(5) Save

Save the program file being edited.

(3)Code editing area

The code editing area is where to write program code and code comments.

(4)Console

The debug window will output information showing various compilation and debugging results. For example, if your code is written incorrectly, you will be prompted about what went wrong.



5.Connecting the Adeept Arm Drive Board and the computer

(1)Connecting the Adeept Arm Drive Board and the computer

You need to use USB Cable to connect the Adeept Arm Drive Board to the computer.As shown below:

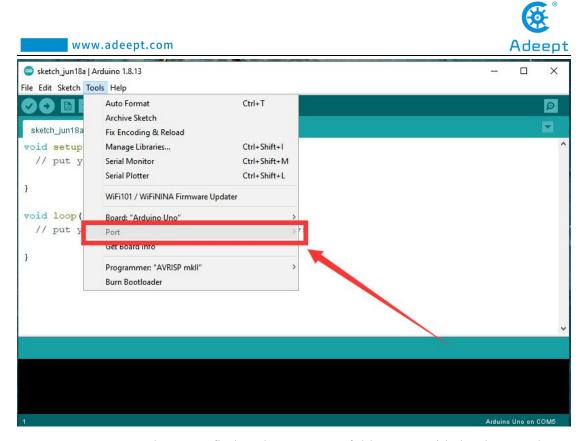
(2) Select the Arduino Uno development board in Tools

Sketch_jun23a ↓ File Edit Sketch To				<u></u>	×
Sketch_jun23a void setu // put }	Auto Format Archive Sketch Fix Encoding & Reload Manage Libraries Serial Monitor Serial Plotter WiFi101 / WiFiNINA Firmware Updater	Ctrl+T Ctrl+Shift+I Ctrl+Shift+M Ctrl+Shift+L			
void loop // put	Board: "Arduino Uno" Port: "COM5" Get Board Info] _	•	Boards Manager Arduino Yún Arduino Uno	
}	Programmer: "AVRISP mkll"			Arduino Duemilanove or Diecimila Arduino Nano Arduino Mega or Mega 2560 Arduino Mega ADK Arduino Leonardo Arduino Leonardo ETH	
				Arduino Micro Arduino Esplora Arduino Mini	v

Open Arduino IDE under Tools->Board.Select Arduino UNO in the list.

(3)Install CH341SER driver

1. Open the Arduino IDE, in the Port on the Tools toolbar, you will see that the serial port cannot be accessed, which means that you have not installed the serial port driver.



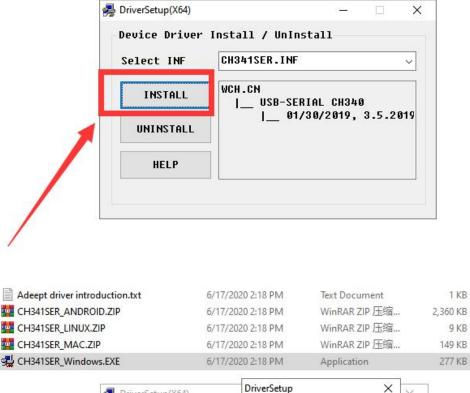
2. You need to find the user folder provided by Adeept: AdeeptRoboticArmforArduinoV3_5, find the 01 Software Package folder, and open the Adeept driver folder. If you are using a Windows system, you can directly double-click to open CH341SER_Windows.EXE, install corresponding driver according to the computer operating system.



3. Click INSTALL. Wait for the installation to succeed. And click OK.



www.adeept.com			Α
Name	Date modified	Туре	Size
Adeept driver introduction.txt	6/17/2020 2:18 PM	Text Document	1 KB
CH341SER_ANDROID.ZIP	6/17/2020 2:18 PM	WinRAR ZIP 压缩	2,360 KB
CH341SER_LINUX.ZIP	6/17/2020 2:18 PM	WinRAR ZIP 压缩	9 KB
CH341SER_MAC.ZIP	6/17/2020 2:18 PM	WinRAR ZIP 压缩	149 KB
覺 CH341SER_Windows.EXE	6/17/2020 2:18 PM	Application	277 KB





4.Now you will find the Arduino serial port is accessible (different computer configuration has different serial port).It means that the Arduino UNO development



board has been successfully connected to the computer. You will need to pay attention to this connection step in the following course.

Sketch_jun18a File Edit Sketch To						_25	×
sketch_jun18a	Auto Format Archive Sketch Fix Encoding & Reload	Ctrl+T					Q •
void setup // put y }	Manage Libraries Serial Monitor Serial Plotter WiFi101 / WiFiNINA Firmware U	Ctrl+Shift+I Ctrl+Shift+M Ctrl+Shift+L Jpdater					^
void loop // put ;	Port: "COM5" Get Board Info Programmer: "AVRISP mkll" Burn Bootloader	C	> > >	COM5			

6.The solution for situation that Arduino IDE cannot be opened

When opening the Arduino IDE, you will suddenly encounter a situation that it cannot be opened.

Ŧ				
H	ARDUINO			
Ŧ	AN OPEN PROJECT WRITTEN, DEBUGGED, AND SUPPORTED BY ARDUINO.CC AND THE ARDUINO COMMUNITY WORLDWIDE	2	0	
=	LEARN MORE ABOUT THE CONTRIBUTORS OF ARDUINO.CC on arduino.cc/credits			_
1				Ŧ
		+ <		•
9 8 A.	ing packages			

[Solution]

ww	w.adeept.o	com					Ad	eept
You	need	to	find	the	Arduino15	folder	in	the
ers\ASU	JS\AppDa	ita\Loca	al\Arduin	o15 direc	ctory of the C d	rive.As show	n belo	w:
ame	0	NS		Date	modified	Туре		Size
cache				5/21/	2020 6:35 PM	File folder		
logs				5/21/	2020 6:34 PM	File folder		
library_ir	ndex.json			6/10/	2020 10:45 AM	JSON File		12
] library_ir	ndex.json.sig	9		6/10/	2020 10:45 AM	SIG File		
] package	_index.json			6/10/	2020 10:45 AM	JSON File		
] package	_index.json.	sig		6/10/	2020 10:45 AM	SIG File		
preferen	ces tyt			6/10/	2020 10:43 AM	Text Docume	ent	

You need to delete the package_index.json file, and then reopen the Arduino IDE.

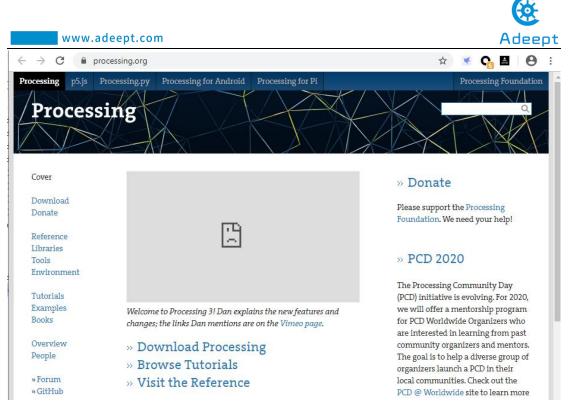
- cache	5/21/2020 6:35 PM	File folder
logs	5/21/2020 6:34 PM	File folder
] library_index.json	6/10/2020 10:58 AM	JSON File
library index ison sig	6/10/2020 10:58 AM	SIG File
] package_index.json	6/10/2020 10:58 AM	JSON File
package_index.json.sig	6/10/2020 10:58 AM	SIG File
package_index.txt	6/10/2020 10:45 AM	Text Document
preferences.txt	6/10/2020 10:58 AM	Text Document

7, Download Processing

Processing is a revolutionary and forward-looking new computer language. Its concept is to introduce programming languages in the environment of electronic art and introduce the concept of electronic art to programmers. It is an extension of the Java language and supports many existing Java language architectures. It is not only much simpler in syntax, but has many intimate and user-friendly designs. Processing can be used on Windows, MAC OS X, MAC OS 9, Linux and other operating systems. The latest version is Processing 3. The work done in Processing can be used on the personal computer side or exported to the Internet in the form of Java Applets.

How to download Processing?

1. Enter this URL with Google Chrome: https://processing.org/



2. Click Download Processing, as shown below:

\leftrightarrow \rightarrow C \square proces	sing.org	🖈 💉 🔓 🖬 🛛 🔂
Processing p5.js Proceed	Processing for Android Processing for Pi	Processing Foundation
Cover		» Donate
Download		
Donate	E C	Please support the Processing Foundation. We need your help!
Reference	12	
Libraries		
Tools		» PCD 2020
Environment		
Tutorials		The Processing Community Day (PCD) initiative is evolving. For 2020,
Examples	Welcome to Processing 3! Dan explains the new features and	we will offer a mentorship program
Books	changes; the links Dan mentions are on the Vimeo page.	for PCD Worldwide Organizers who are interested in learning from past
Overview	» Download Processing	community organizers and mentors.
People		The goal is to help a diverse group of
	» browse rutoriais	organizers launch a PCD in their
»Forum	» Visit the Reference	local communities. Check out the
» GitHub		PCD @ Worldwide site to learn more
» Issues » Wiki	Processing is a flexible software sketchbook and a language for	about starting or attending an event in 2020!

3. The operating system we choose to use here is windows 64-bit, select "Windows 64-bit".





"processing-3.5.4-windows64.zip".

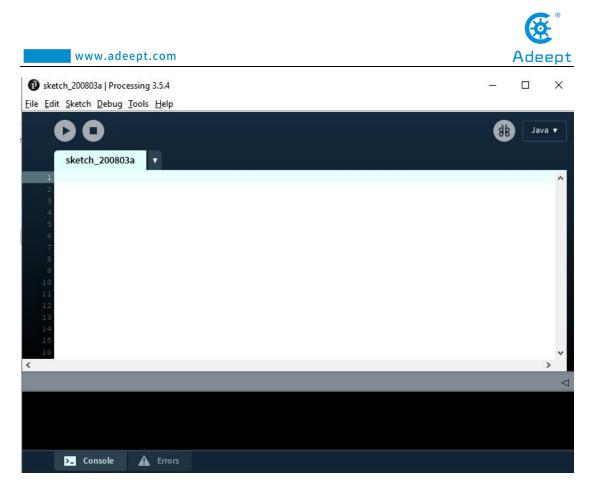


5.After extracting this file, you can get the following file, just click to run processing, it can be run directly without installation.

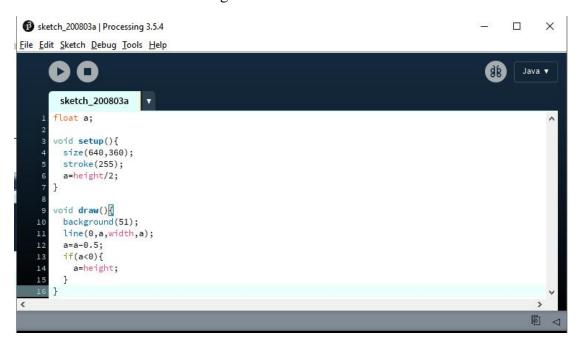
Local Disk (I:) > processing-3.5.4-windows64 > processing-3.5.4

Name	Date modified	Туре	Size
core	1/17/2020 12:16 PM	File folder	
java 🗌	1/17/2020 12:17 PM	File folder	
📙 lib	1/17/2020 12:16 PM	File folder	
modes	1/17/2020 12:16 PM	File folder	
tools	1/17/2020 12:16 PM	File folder	
processing.exe	1/17/2020 12:16 PM	Application	613 KB
📧 processing-java.exe	1/17/2020 12:16 PM	Application	30 KB
revisions.txt	1/17/2020 12:16 PM	Text Document	370 KB

6. The interface is as follows after the Processing runs



7.Let's write a simple code that implements the following functions "Change the variable to create a moving line. When the line moves out of the window edge, the variable becomes 0 and the line goes back to the bottom of the screen



8.Click "Run".



9.Running effect is as follow.

sketch_200803a Processing 3.5.4	-	
<u>File Edit Sketch Debug Tools H</u> elp		
• •	88	Java 🔻
sketch_200803a sketch		
12 13 14 15 16 }		× ₩ √
		-



We need to upload a piece of code to the Adeept Robotic Arm Drive Board before starting to assemble the robotic arm. Find out "00 The servo initialization code of robotic arm assembly" in the documentation we provided and upload the code from the file to

Adeept Robotic Arm Drive Board.

8. Configuring the "libraries" folder of the Arduino IDE

Before using Adeept Robotic Arm, you need to configure the "libraries" folder under the downloaded Arduino IDE directory.

First, you need to find the user folder provided by Adeept: AdeeptRoboticArmforArduinoV3_5, and find the "libraries" folder under the 01 Software Package folder, as shown below:

A	deeptRoboticArmforArduinoV3_5 > 01 S	oftware Package 🛛 🗸 さ	Search 01 🔎	*
^	Name	Date modified	Туре	1
	Adeept driver	8/3/2020 10:43 AM	File folder	،r
۰.	code	8/3/2020 10:43 AM	File folder	_
	libraries	8/4/2020 10:03 AM	File folder	

Open the "libraries" folder, as shown below:

^ lame	Date modified	Туре	Size
Adafruit_GFX_Library	11/3/2020 10:01 AM	File folder	
Adafruit_SSD1306	11/3/2020 10:01 AM	File folder	
ArduinoJson	11/3/2020 10:01 AM	File folder	
Dht11	11/3/2020 10:44 AM	File folder	
IRremote	11/3/2020 10:45 AM	File folder	
Keypad	11/3/2020 10:45 AM	File folder	
LiquidCrystal_I2C	11/3/2020 10:30 AM	File folder	
U8glib	11/3/2020 10:01 AM	File folder	



You need to copy all files to the "libraries" under the Arduino IDE installation directory, as shown in the figure below:

lame	Date modified	Туре	Size
drivers	6/16/2020 11:44 AM	File folder	
examples	6/16/2020 11:44 AM	File folder	
hardware	6/16/2020 11:44 AM	File folder	
java	6/16/2020 11:44 AM	File folder	
lib	6/16/2020 11:44 AM	File folder	
libraries	6/16/2020 11:44 AM	File folder	
reference	6/16/2020 11:44 AM	File folder	
tools	6/16/2020 11:44 AM	File folder	
tools-builder	6/16/2020 11:44 AM	File folder	
arduino.exe	6/16/2020 11:44 AM	Application	72 Ki
👔 arduino.l4j.ini	6/16/2020 11:44 AM	Configuration sett	1 KE
arduino_debug.exe	6/16/2020 11:44 AM	Application	69 KE
arduino_debug.14j.ini	6/16/2020 11:44 AM	Configuration sett	1 KE
			111201202012

Paste the three folders in "libraries". As shown below:

Name	Date modified	Туре	^
Adafruit_Circuit_Playground	7/1/2020 6:11 PM	File folder	
Adafruit_GFX_Library	8/4/2020 10:11 AM	File folder	
Adafruit_NeoPixel	7/1/2020 6:14 PM	File folder	
Adafruit_SSD1306	8/4/2020 10:11 AM	File folder	
ArduinoJson	7/7/2020 3:23 PM	File folder	
	7/1/2020 6:11 PM	File folder	
Dht11	7/7/2020 3:23 PM	File folder	



Lesson 1 How to Read the Data of the Potentiometer

In this lesson, we will learn how to read the data of the potentiometer and convert the data into an angle.

1.1 Components used in this course

Components	Quantity	Picture
Adeept Arm Drive Board	1	
Micro USB Cable	1	

1.2 Introduction of Potentiometer

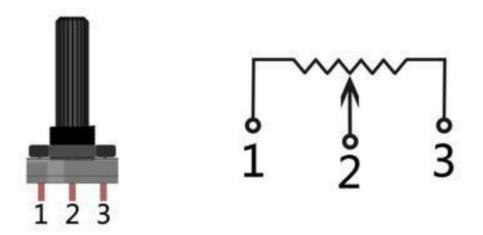
(1) Potentiometer

The potentiometer is a resistance element with three terminals and the resistance value can be adjusted according to a certain change law, which is equivalent to a variable resistor. Because its role in the circuit is to obtain a certain relationship with the input voltage (external voltage) to output Voltage, so called potentiometer. Potentiometers can be divided into rotary potentiometers, push-pull potentiometers, straight slide potentiometers, etc. according to the adjustment method. Our course experiment uses a rotary potentiometer. Its three pins are showed as below:

The rotary potentiometer is an adjustable resistance element. It is composed of a resistor and a rotating system. When a voltage is applied between the two fixed contacts of the resistive body, the position of the contact on the resistive body is changed by the rotating system, and a voltage that has a certain relationship with the position of the moving contact can be achieved between the moving contact and the

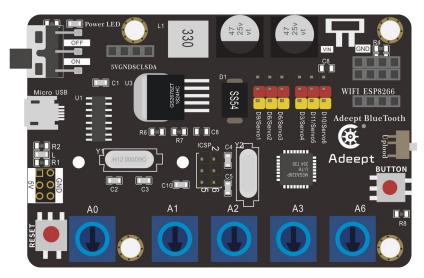
fixed contact. Potentiometer can be used to adjust the voltage and current.

Our course uses a rotary potentiometer. Its structure is as shown in the figure below. By rotating the knob, the position of pin 2 is changed, thereby changing the resistance value from pin 2 to both ends. In the experiment. Connect pin 1 and pin 3 to the GND and 5V of the development board respectively. And then read the voltage divided by the pin 2 of the potentiometer through the analog input pin A0. The range is between 0V and 5V. The analog input function of Arduino has 10-bit precision, that is, it can convert the voltage signal of 0 to 5V into an integer form of 0 to 1024.



1.3 Wiring diagram (Circuit diagram)

Figure as below:





1.4 Reading the value of the potentiometer and converting it into an angle

1.4.1Compile and run the code program of this course

1.Open the Arduino IDE software, as shown below:



2. In the Tools toolbar, find Board and select Arduino Uno, as shown below:

File Edit Sketch To	ols Help			
potentiometer	Auto Format Archive Sketch Fix Encoding & Reload	Ctrl+T		Ø.
<u>+</u>	Manage Libraries	Ctrl+Shift+I		^
val1	Serial Monitor	Ctrl+Shift+M	180);	
val2	Serial Plotter	Ctrl+Shift+L	180);	
val3 val4	WiFi101 / WiFiNINA Firmware U	Ipdater	180) • Boards Manager	
val5	Board: "Arduino Uno"		Arduino Yún	
Seria	Port: "COM5"		Arduino Uno	
Seria	Get Board Info		Arduino Duemilanove or Diecimila	
Seria	Programmer: "AVRISP mkll"		Arduino Nano	
Seria	Burn Bootloader		Arduino Mega or Mega 2560	
Serial.	<pre>print("A6:");Seria</pre>	l.printin(va		
Serial.	println("********	***");	Arduino Leonardo	

3.In the Tools toolbar, find "Port" and Select the port number of The Adeept Arm Drive Board , as shown below:



Ser	• 🗈 : vo90	Auto Format Archive Sketch Fix Encoding & Reload	Ctrl+T	
1	/***	Manage Libraries	Ctrl+Shift+I	*****
2	File	Serial Monitor Serial Plotter	Ctrl+Shift+M Ctrl+Shift+L	tionCode.ino
3	Desci			vo rotates 90
4	Webs:	WiFi101 / WiFiNINA Firmware U	Jpdater	-
5	E-ma:	Port: "COM4"	1 .	> Carial reads
6	Auth	Get Board Info	-	COM4
7	Date	Programmer: "AVRISP mkll"		>

4. Click Open in the File drop-down menu:

New	Ctrl+N			Į
Open	Ctrl+O			
Open Recen	t >			1
Sketchbook				
Examples	>	e, to run once:		
Close	Ctrl+W			
Save	Ctrl+S			
Save As	Ctrl+Shift+S	, to run repeatedly:		
Page Setup	Ctrl+Shift+P	, so fan fepenseaf.		
Print	Ctrl+P			
Destaura	Ctrl+Comma			

5.Find the folder AdeeptRoboticArmforArduinoV3_5 that we provide to the user. Open the folder 02 Course Code in it. Enter the Lesson 1 potentiometer directory. Select potentiometer.ino. This file is the code program we need in this course. Then click Open.

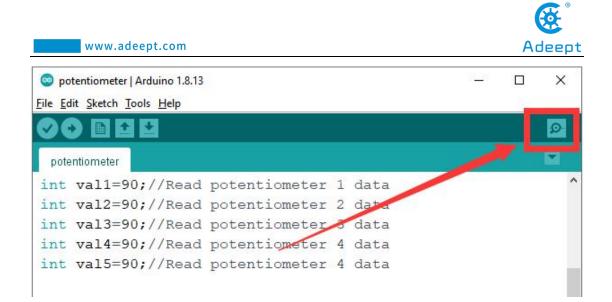
www.a	deept.com				Adee
Open an Ar	duino sketch				>
Look in:	Lesson 1 pot	tentiometer	~	3 🕫 📂 🖽 -	
a.	Name	^		Date modified	Туре
Quick access	potentiome	eter.ino		7/20/2020 9:23 AM	INO Fil
Libraries	<				
Network	Object <u>n</u> ame:	potentiometer.ino		~	<u>O</u> pen
	Objects of type:	All Files (*.*)		~	Cancel

66-

6.After opening, click to upload the code program to the Arduino UNO. If there is no error warning in the console below, it means that the Upload is successful.

Done uploading.	
Sketch uses 924 bytes (2%) of program storage space. Maximum is 32256 bytes. Global variables use 9 bytes (0%) of dynamic memory, leaving 2039 bytes for local variables. Maxi	mum is 2048 bytes.
1	Arduino Uno on COM4

7. After successfully running the program, we need to observe the value of the potentiometer by opening the serial monitor and click as shown in the figure below:



Then open the serial monitor, you need to modify the displayed bit rate and the bit rate set in the code to 115200, so that the display will not appear garbled. You can observe the data changes corresponding to each button by rotating the buttons of A0, A1, A2, A3, and A6. When the buttons of A0, A1, A2, and A3 are rotated, the data change range is from 0 to 180. The data becomes smaller when rotating clockwise, and the data becomes larger when rotating counterclockwise. When the A6 button is rotated, the data change range is 35~90. When it is rotated clockwise, the data becomes smaller, and when it is rotated counterclockwise, the data becomes larger.

💿 СОМ5		<u>_</u> %		×
1				Send
A0.55				^

A0:82				
A1:127				
A2:79				
A3:26				
A6:55				
* * * * * * * * * * *				
A0:82				
A1:127				
A2:79				
A3:26				
A6:55				

				~
Autoscroll 🗌 Show timestamp	Newline v 115200 b	aud 🗸	Clear	output



1.4.2 Learning the code program of this lesson

Initialize potentiometers A0, A1, A2, A3, A6.

```
int val1=90;//Read potentiometer 0 data
int val2=90;//Read potentiometer 1 data
int val3=90;//Read potentiometer 2 data
int val4=90;//Read potentiometer 3 data
int val5=90;//Read potentiometer 6 data
```

Initialize the serial monitor.

```
void setup()
{
   Serial.begin(115200);
}
```

Convert the value of 1023 to 180 proportionally, and then print out the converted data to the serial monitor.

```
void loop()
{
    val1 = map(analogRead(0), 0, 1023, 0, 180);
    val2 = map(analogRead(1), 0, 1023, 0, 180);
    val3 = map(analogRead(2), 0, 1023, 0, 180);
    val4 = map(analogRead(3), 0, 1023, 0, 180);
    val5 = map(analogRead(6), 0, 1023, 35, 90);
    Serial.print("A0:");Serial.println(val1);
    Serial.print("A1:");Serial.println(val2);
    Serial.print("A2:");Serial.println(val3);
    Serial.print("A3:");Serial.println(val4);
    Serial.print("A6:");Serial.println(val5);
    Serial.println("*********");
    delay(2000);
}
```



Lesson 2 Controlling the Servo

In this lesson, we will learn how to control the Servo.

2.1Components used in this course

Components	Quantity	Picture
Adeept Arm Drive Board	1	
Micro USB Cable	1	
Servo	1	Litter.

2.2 The introduction of the Servo

2.2.1 Servo

Servo motor refers to the engine that controls mechanical component operation in the servo system. It is a kind of auxiliary motor indirect transmission device. The servo motor is a gear motor that can rotate only 180 degrees. It is controlled by sending pulses from the microcontroller. These pulses tell the server where to move. The servo motor system includes housing, circuit board, non-core motor, gearing and position detection. Servo motor is shown in the figure:

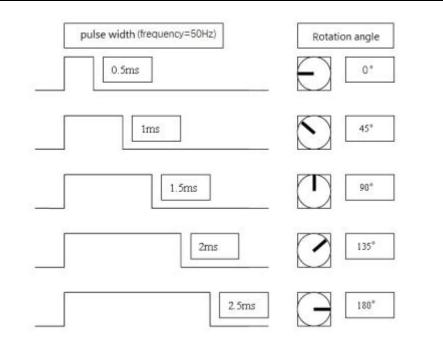




2.2.2 The working principle of the Servo

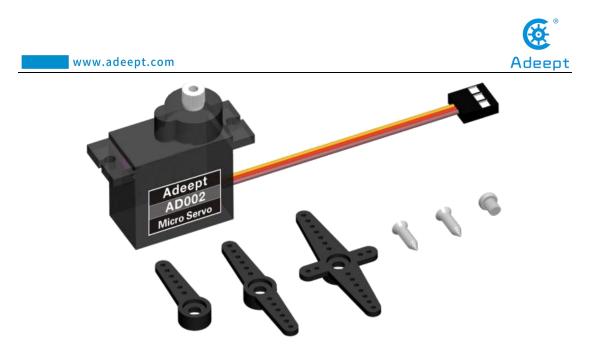
The servo mechanism is an automatic control system that enables the object's position, orientation, state and other output controlled quantities to follow arbitrary changes in the input target (or given value). The servo mainly depends on Pulsefor location. Basically, it can be understood that the servo motor receives an impulse and rotates the angle corresponding to the impulse to realize displacement. Because the servo motor itself has the function of sending out pulses, the servo motor rotates every time at an angle, and a corresponding number of pulses will be sent out. In this way, the pulses received by the servo motor form a response, or a closed loop. In this way, the system will know how many pulses are sent to the servo motor and how many pulses are received. In this way, it is possible to precisely control the rotation of the motor, thereby achieving precise positioning.

Adeept Arm Drive Board sends a PWM signal to a servomotor, which is then processed by an IC on the circuit board to calculate the rotation direction of the drive motor, which is then transmitted through a reduction gear to the swing arm. At the same time, the position detector returns a position signal to determine whether the set position has been reached or not.



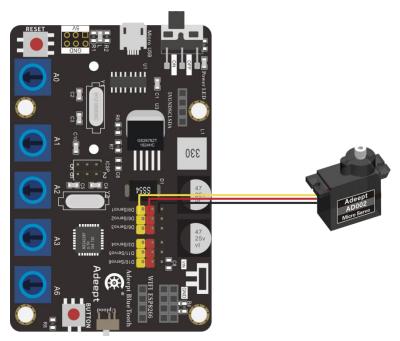
2.2.3 The principle of write () function

In the program, we use the write() function to control the rotation of the servo. For standard servos, the write() function will rotate the servo axis to the corresponding angular position. For the continuous rotation type of servo, the write() function can set the rotation speed of the servo (0 indicates that the servo rotates at full speed in one direction, 180 indicates that the servo rotates at full speed in another direction, and 90 indicates that the servo is stationary. The servo which is used this time is a standard servo.



2.3Wiring diagram (Circuit diagram)

Connect Servo to the servo port on the Adeept Arm Drive Board, as shown below:

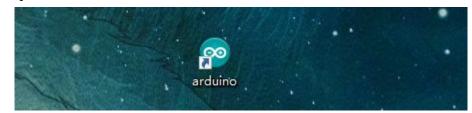


2.4 How to control Servo

2.4.1Compile and run the code program of this course



1.Open the Arduino IDE software, as shown below:



2. In the Tools toolbar, find Board and select Arduino Uno, as shown below:

potentiometer File Edit Sketch	Arduino 1.8.13 Tools Help			×
potentiometer	Auto Format Archive Sketch Fix Encoding & Reload	Ctrl+T		@ •
{ val1 val2	Manage Libraries Serial Monitor Serial Plotter	Ctrl+Shift+I Ctrl+Shift+M Ctrl+Shift+L	180); 180);	^
val3 val4	WiFi101 / WiFiNINA Firmware U Board: "Arduino Uno"	pdater	Boards Manager Arduino Yún	
val5 Seria Seria	Port: "COM5" Get Board Info	C	Arduino Uno Arduino Duemilanove or Diecimila	
	Programmer: "AVRISP mkll" Burn Bootloader .print ("A6:"); Seria			
Serial	.println("********	***");	Arduino Leonardo	

3.In the Tools toolbar, find "Port" and Select the port number of The Adeept Arm Drive Board , as shown below:

Ser	9 🗈 : vo90	Auto Format Archive Sketch Fix Encoding & Reload	Ctrl+T	
1	/***	Manage Libraries	Ctrl+Shift+I	*****
2	File	Serial Monitor Serial Plotter	Ctrl+Shift+M Ctrl+Shift+L	tionCode.ino
3	Desci	WiFi101 / WiFiNINA Firmware U		vo rotates 9
4	Webs:	Board: "Arduino Uno"		>
5	E-ma:	Port: "COM4"		Coniclination
6	Auth	Get Board Info		COM4
7	Date	Programmer: "AVRISP mkll"		>

4. Click Open in the File drop-down menu:

				e	
www	.adeept.com			Ade	2ept
sketch_jun06a	Arduino 1.8.12		<u>101</u> 7		×
Edit Sketch	Tools Help				
New	Ctrl+N				ø
Open	Ctrl+O				
Open Recen	t >				
Sketchbook					^
Examples	;	e, to run once:			
Close	Ctrl+W				
Save	Ctrl+S				
Save As	Ctrl+Shift+S				
Page Setup	Ctrl+Shift+P	, to run repeatedly:			
Print	Ctrl+P				
Plint	Cultr				
Preferences	Ctrl+Comma				
Quit	Ctrl+Q				

5.Find the folder AdeeptRoboticArmforArduinoV3_5 that we provide to the user. Open the folder 02 Course Code in it. Enter the Lesson 2 servo directory. Select servo.ino. This file is the code program we need in this course. Then click Open.

-	duino sketch				×
Look in:	Lesson 2 ser	vo	~	🎯 🦸 📂 🛄 🗸	
4	Name	^		Date modified	Туре
Quick access	servo.ino			7/20/2020 9:23 AM	INO File
Desktop					
Libraries					
Libraries					
This PC					
Network	<)
NELWOIK	Object <u>n</u> ame:	servo.ino		~	<u>O</u> pen
	Objects of type:	All Files (*.*)		~	Cancel

6.After opening, click to upload the code program to the Arduino UNO. If there is no error warning in the console below, it means that the Upload is successful.



Done uploading. Sketch uses 924 bytes (2%) of program storage space. Maximum is 32256 bytes. Global variables use 9 bytes (0%) of dynamic memory, leaving 2039 bytes for local variables. Maximum is 2048 bytes. 1 Arduino Uno on COM4

7. After successfully running the program, you will observe the movement of the servo.

2.4.2 Learning the code program of this lesson

Create servo object to control a servo.

```
Servo myservo;//create servo object to control a servo
```

In the setup() function, attach the servo on pin 9 to servo object; back to 0 degrees;

wait for a second.

```
void setup()
{
    myservo.attach(9);//attachs the servo on pin 9 to servo object
    myservo.write(0);//back to 0 degrees
    delay(1000);//wait for a second
}
```

In the loop() function, respectively control Servo to turn to different angles.

```
void loop()
{
  myservo.write(180);//goes to 180 degrees
  delay(2000);//wait for a second

  myservo.write(90);//goes to 90 degrees
  delay(2000);//wait for a second.33

  myservo.write(0);//goes to 0 degrees
  delay(2000);//wait for a second.33
}
```



Lesson 3 Displaying Text on the OLED Screen

In this lesson, we will learn how to display text on the OLED screen.

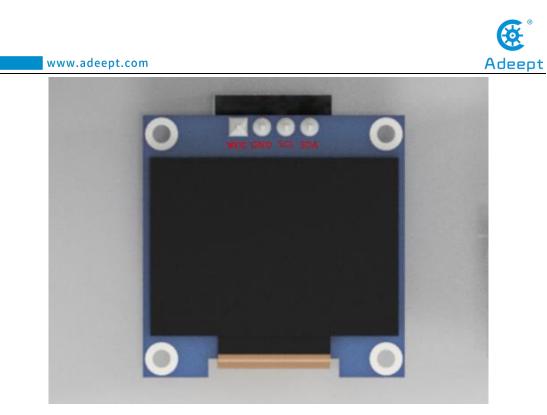
3.1 Components used in this course

Components	Quantity	Picture
Adeept Arm Drive Board	1	
Micro USB Cable	1	
OLED screen	1	

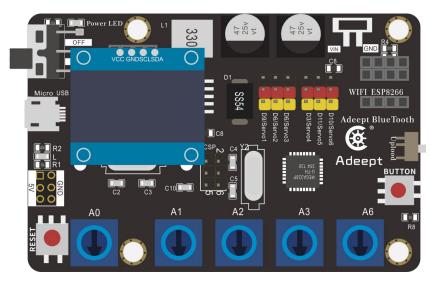
3.2 Introduction of OLED Screen

OLED (Organic Light-Emitting Diode), also known as organic electric laser display, organic light emitting semiconductor (Organic Electroluminesence Display, OLED). OLED is a kind of current-type organic light-emitting device, which produces light by the injection and recombination of carriers, and the luminous intensity is proportional to the injected current. The Alter robot uses an OLED screen to display the expressions or some parameters of the robot. OLED Screen is a commonly used module on robot products. Due to the black non-luminous feature of OLED Screen, this type of screen has extremely high contrast. Even if the ambient light is strong, you can see the information on the OLED Screen clearly, and the power consumption is relatively low.

When using the OLED Screen, you need to connect it to the OLED interface on the Adeept Arm Drive Board.



3.3 Wiring diagram (Circuit diagram)



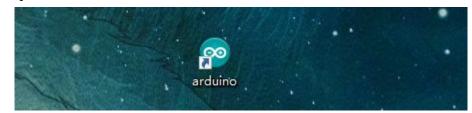
You need to connect it to the OLED interface on the Adeept Arm Drive Board.As shown below:

3.4 How to display text on the OLED screen

3.4.1 Compile and run the code program of this course



1.Open the Arduino IDE software, as shown below:



2. In the Tools toolbar, find Board and select Arduino Uno, as shown below:

💿 potentiomete	r Arduino 1.8.13				×
File Edit Sketch	Tools Help				
00 🖬	Auto Format	Ctrl+T			ø
potentiometer	Archive Sketch Fix Encoding & Reload				
{	Manage Libraries	Ctrl+Shift+I			^
val1	Serial Monitor	Ctrl+Shift+M	180);		
val2	Serial Plotter	Ctrl+Shift+L	180);		
val3	WiFi101 / WiFiNINA Firmware Up	adator	1801 •	ĩ	
val4	WITTOT / WITTANA FIITTWATE OF	Juater	Boards Manager		
val5	Board: "Arduino Uno"		Arduino Yún		
Seria	Port: "COM5"	2	Arduino Uno		
Seria	Get Board Info		Arduino Duemilanove or Diecimila		_
Seria	Programmer: "AVRISP mkll"		Arduino Nano		
Seria	Burn Bootloader	Ĩ	Arduino Mega or Mega 2560		
Seria	<pre>L.print("A6:");Serial</pre>	.printin(va	Arduino Mega ADK		
	l.println("*********	-	Arduino Leonardo		

3.In the Tools toolbar, find "Port" and Select the port number of The Adeept Arm Drive Board , as shown below:

Ser	• • •	Auto Format Archive Sketch Fix Encoding & Reload	Ctrl+T	
1	/***	Manage Libraries	Ctrl+Shift+I	*****
2	File	Serial Monitor Serial Plotter	Ctrl+Shift+M Ctrl+Shift+L	tionCode.ino
3	Desci	WiFi101 / WiFiNINA Firmware U		vo rotates 9
4	Webs:	Board: "Arduine Une"		
5	E-ma:	Port: "COM4"		Carial and a
6	Auth	Get Board Info		COM4
7	Date	Programmer: "AVRISP mkll"		>

4. Click Open in the File drop-down menu:

				Ø	E
www	.adeept.com			Ade	ept
🥺 sketch jun06a	a Arduino 1.8.12		<u>101</u> 21		×
File Edit Sketch	Tools Help				
New	Ctrl+N				ø
Open	Ctrl+O				
Open Recen	t >				
Sketchbook					^
Examples	>	e, to run once:			
Close	Ctrl+W				
Save	Ctrl+S				
Save As	Ctrl+Shift+S				
Page Setup	Ctrl+Shift+P	, to run repeatedly:			
Print	Ctrl+P				
FILL	Cultr				
Preferences	Ctrl+Comma				
Quit	Ctrl+Q				

5.Find the folder AdeeptRoboticArmforArduinoV3_5 that we provide to the user. Open the folder 02 Course Code in it. Enter the Lesson 3 OLED directory. Select OLED.ino. This file is the code program we need in this course. Then click Open.

6.After opening, click to upload the code program to the Arduino UNO. If there is no error warning in the console below, it means that the Upload is successful.

Done uploading.
Sketch uses 924 bytes (2%) of program storage space. Maximum is 32256 bytes. Global variables use 9 bytes (0%) of dynamic memory, leaving 2039 bytes for local variables. Maximum is 2048 bytes.
1 Arduino Uno en COM4

7. After successfully running the program, you will observe that text will be displayed on the OLED screen.

3.4.2 Learning the code program of this lesson

After the above practical operation, you must be very curious to know how we use C language to program on the Adeept Arm Drive Board to display text on the OLED screen. Below we will introduce how the main code program is implemented.

First, in the setup() function, set the display color of the font to white.



```
void setup() {
    display.begin(SSD1306_SWITCHCAPVCC, 0x3C);
    display.setTextColor(WHITE);//Sets the font display color
    display.clearDisplay();//cls
}
```

In the loop() function, set the display font size with setTextSize(1); setCursor(30,30) sets the position of the text displayed on the OLED screen, and print("TEST") prints out the text information that needs to be displayed.

```
void loop() {
    //Set the font size
    display.setTextSize(1);
    //Set the display location
    display.setCursor(50,50);
    //String displayed
    display.print("TEST");
    //Began to show
    display.display();
}
```



Lesson 4 Saving Data with EEPROM

In this lesson, we will learn how to save data with EEPROM.

4.1 Components used in this course

Components	Quantity	Picture
Adeept Arm Drive Board	1	
Micro USB Cable	1	

4.2 About EEPROM

EEPROM (Electrically Erasable Programmable Read Only Memory) refers to electrically erasable programmable read only memory. It is a memory chip that does not lose data after power failure. EEPROM can erase existing information on a computer or special equipment and reprogram it. It is generally used in plug and play.

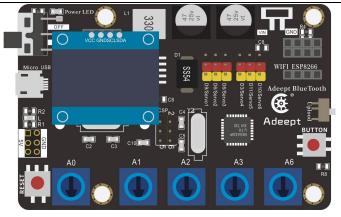
The Adeept Arm Drive Board has its own EEPROM, and its memory size is 1K.

Arduino IDE comes with EEPROM usage method. The Arduino library has prepared EEPROM library for us.You can directly call EEPROM.h in the code when you are using the EEPROM library.And then use the write() and read() methods to operate the EEPROM.

4.3 Wiring diagram (Circuit diagram)

You need to connect it to the OLED interface on the Adeept Arm Drive Board.As shown below:





4.4 How to use EEPROM to save data

4.4.1 Compile and run the code program of this course

1.Open the Arduino IDE software, as shown below:



2. In the Tools toolbar, find Board and select Arduino Uno, as shown below:

potentiometer File Edit Sketch T	Arduino 1.8.13 ools Help		17-	×
potentiometer	Auto Format Archive Sketch Fix Encoding & Reload	Ctrl+T		₽ ▼
{ val1 val2	Manage Libraries Serial Monitor Serial Plotter	Ctrl+Shift+I Ctrl+Shift+M Ctrl+Shift+L	180); 180);	^
val3 val4	WiFi101 / WiFiNINA Firmware	Updater	Boards Manager	
val5 Seria	Board: "Arduino Uno" Port: "COM5"		Arduino Yún Arduino Uno 	
Seria Seria	Get Board Info		Arduino Duemilanove or Diecimila Arduino Nano	
Seria	Flogrammen. Avision misi		Arduino Mega or Mega 2560 Arduino Mega ADK	
	.println("********		Arduino Leonardo	

3.In the Tools toolbar, find "Port" and Select the port number of The Adeept Arm Drive Board , as shown below:



Ser	• • • •	Auto Format Archive Sketch Fix Encoding & Reload	Ctrl+T	
1	/****	Manage Libraries	Ctrl+Shift+I	*****
2	File	Serial Monitor Serial Plotter	Ctrl+Shift+M Ctrl+Shift+L	tionCode.ino
3	Desci			vo rotates 90
4	Webs:	WiFi101 / WiFiNINA Firmware U	Jpdater	-
5	E-ma:	Board: "Ardwine Une" Port: "COM4"	1 -	> Conictione de
6	Auth	Get Board Info	- 1	COM4
7	Date	Programmer: "AVRISP mkll"		>

4. Click Open in the File drop-down menu:

sketch jun06a Edit Sketch	Arduino 1.8.12		<u>201</u> 8	
New	Ctrl+N			19
Open	Ctrl+O			L.
Open Recent	: >			
Sketchbook Examples	>	e, to run once:		
Close	Ctrl+W			
Save	Ctrl+S			
Save As	Ctrl+Shift+S	, to run repeatedly:		
Page Setup	Ctrl+Shift+P			
Print	Ctrl+P			
Preferences	Ctrl+Comma			
Quit	Ctrl+Q			

5.Find the folder AdeeptRoboticArmforArduinoV3_5 that we provide to the user. Open the folder 02 Course Code in it. Enter the Lesson 4 EEPROM directory. Select EEPROM.ino. This file is the code program we need in this course. Then click Open.

www	.adeept.com				Adeept
🎒 Open an Ar	duino sketch				×
Look in	: Lesson 4 EE	PROM	~	G 🜶 😕 🗔 -	
A	Name			Date modified	Туре
Quick access	EEPROM.in	0		7/20/2020 9:23 AM	INO File
Desktop					
Libraries					
This PC					
1					
Network	<	- Million - 1			
	Object <u>n</u> ame:	EEPROM.ino		~	<u>O</u> pen
	Objects of type:	All Files (*.*)		~	Cancel

6.After opening, click to upload the code program to the Arduino UNO. If there is no error warning in the console below, it means that the Upload is successful.

Done uploading.	
Sketch uses 924 bytes (2%) of program storage space. Global variables use 9 bytes (0%) of dynamic memory,	Maximum is 32256 bytes. leaving 2039 bytes for local variables. Maximum is 2048 bytes.
1	Arduino Uno on COM4

7. After successfully running the program, we need to observe the value of the potentiometer by opening the serial monitor and click as shown in the figure below:

www.adeept.com	Adeep
💿 EEPROM Arduino 1.8.13	– 🗆 X
<u>F</u> ile <u>E</u> dit <u>S</u> ketch <u>T</u> ools <u>H</u> elp	
EEPROM	
Date: 2020/05/22	^
* * * * * * * * * * * * * * * * * * * *	******
<pre>#include <eeprom.h></eeprom.h></pre>	
int a = 0;	/
void setup()	
{	
<pre>Serial.begin(115200);</pre>	
a = EEPROM .read(5);	
	ţ

You will see the returned information in the serial monitor: Read Succes, indicating that the data has been saved successfully.

COM5		2_2		(
			Send	
Read Succes				*
Autoscroll 🗌 Show timestamp	Newline 1152	00 baud 🗸	Clear outp	v

4.4.2 Learning the code program of this lesson

After the above practical operation, you must be very curious to know how we use C language to program on the Adeept Arm Drive Board to save data with



EEPROM. Below we will introduce how the main code program is implemented.

In the setup() function, first initialize the serial monitor, EEPROM.read(5) reads the data, and judges by if, if the read data is 2, then it is saved successfully.

```
void setup()
{
   Serial.begin(115200);
   a = EEPROM.read(5);
   if(a == 2)
   {
      Serial.println("Read Succes");
   }
   else
   {
   Serial.println("Read Failed");
   EEPROM.write(5,2);
  }
}
```



Lesson 5 Servo 90 degree adjustment

Before assembling the robotic arm, we first need to adjust the 5 servos of the robotic arm by 90 degrees.

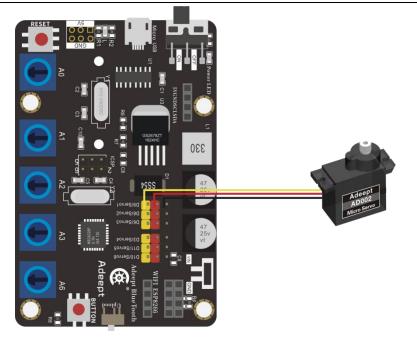
5.1 Components used in this course

Components	Quantity	Picture
Adeept Arm Drive Board	1	
Micro USB Cable	1	
Servo	5	bit to a

5.2 Wiring diagram (Circuit diagram)

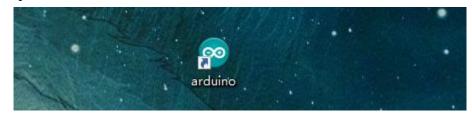
Connect 5 servos to the Servo1, Servo2, Servo3, Servo4, Servo5 ports on the Adeept Arm Drive Board:



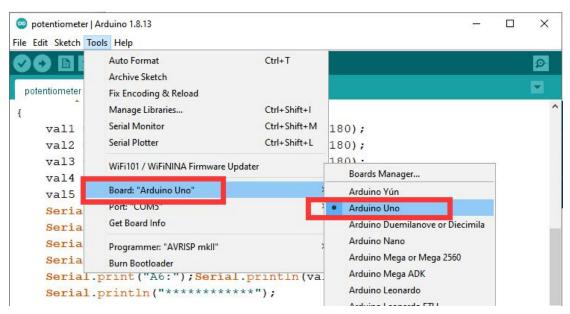


5.3 Upload the Servo90.ino

1.Open the Arduino IDE software, as shown below:



2. In the Tools toolbar, find Board and select Arduino Uno, as shown below:

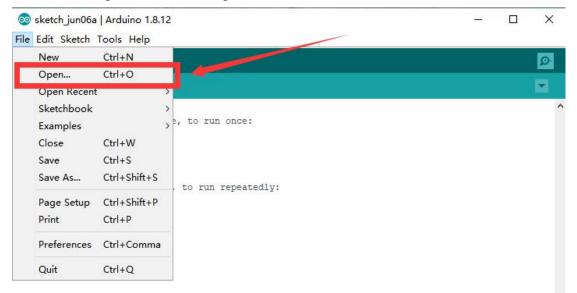




3.In the Tools toolbar, find "Port" and Select the port number of The Adeept Arm Drive Board , as shown below:

10000	ervo90 Arduin dit Sketch To	Sector Contraction		
Ser	••••••	Auto Format Archive Sketch Fix Encoding & Reload	Ctrl+T	
1	/***	Manage Libraries	Ctrl+Shift+I	*****
2	File	Serial Monitor Serial Plotter	Ctrl+Shift+M Ctrl+Shift+L	tionCode.ino
	Desci	WiFi101 / WiFiNINA Firmware U		vo rotates 90
	Webs:	Board: "Arduino Uno"		>
5	E-ma:	Port: "COM4"		Carial anda
6	Auth	Get Board Info		✓ COM4
7	Date	Programmer: "AVRISP mkll"	-	>

4.Click Open in the File drop-down menu:



5.Find the folder AdeeptRoboticArmforArduinoV3_5 that we provide to the user. Open the folder 02 Course Code in it. Enter the Lesson 5 Servo90 directory. Select Servo90.ino. This file is the code program we need in this course. Then click Open.

02 Course Code	🖂 🧿 🤌 🗁 🔜		
Name	Date modified	Туре	s
Lesson 1 potentiometer	11/3/2020 10:51 AM	File folder	
Lesson 2 servo	11/3/2020 10:51 AM	File folder	
Lesson 3 OLED	11/3/2020 10:51 AM	File folder	
Lesson 4 EEPROM	11/3/2020 10:51 AM	File folder	
Lesson 5 Servo90	1/12/2021 2:13 PM	File folder	
Lesson o block	11/3/2020 10:51 AM	File folder	
bject <u>n</u> ame:			Open

6.After opening, click to upload the code program to the Arduino UNO. If there is no error warning in the console below, it means that the Upload is successful.

Done uploading.	
Sketch uses 924 bytes (2%) of program storage space. Maximum is 32256 bytes. Global variables use 9 bytes (0%) of dynamic memory, leaving 2039 bytes for local variables. Max	ximum is 2048 bytes.
1	Arduino Uno on COM4

7.After successfully running the program, You will see that all the servos will turn to 90 degrees.

[Note] :

For the adjusted servos, it is forbidden to rotate them when assembling the robotic arm, otherwise it will cause errors in the assembly of the robotic arm.

8.Now you can proceed to the assembly operation of Lesson 6

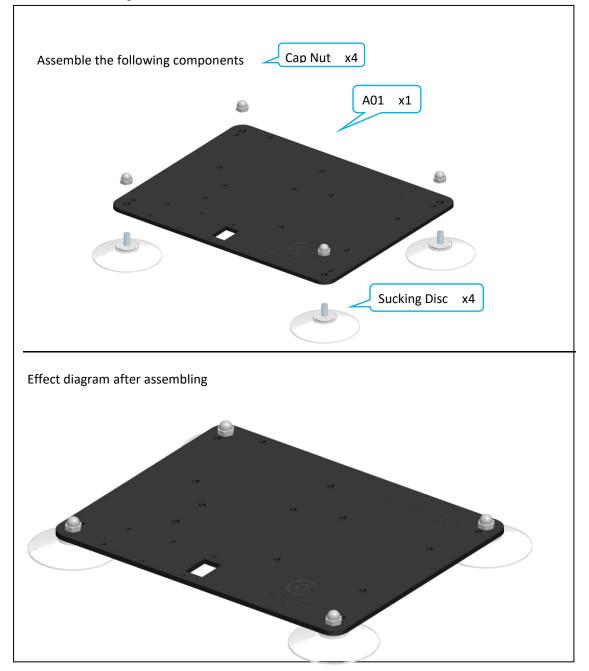




Lesson 6 How to Assemble the Robotic Arm

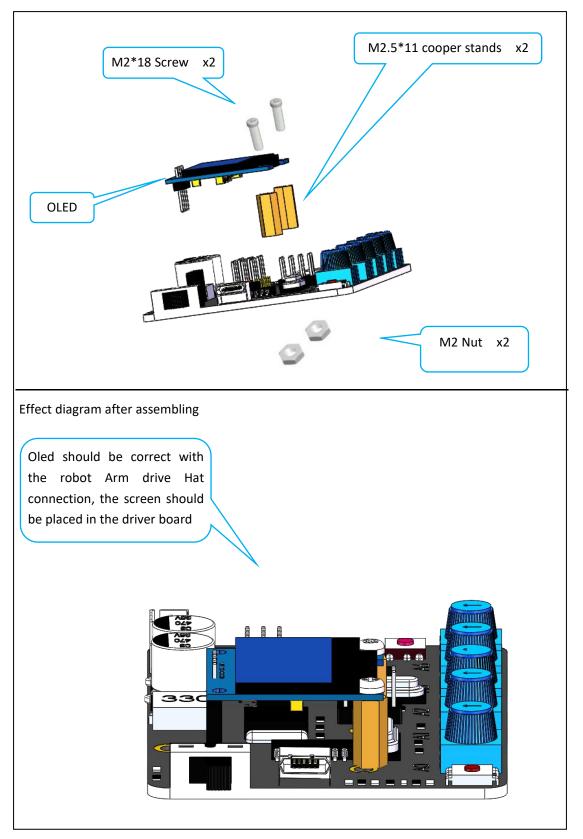
6.1 Pedestal Assembly

1.Fix four Sucking Discs on the four corners of A01.

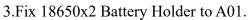


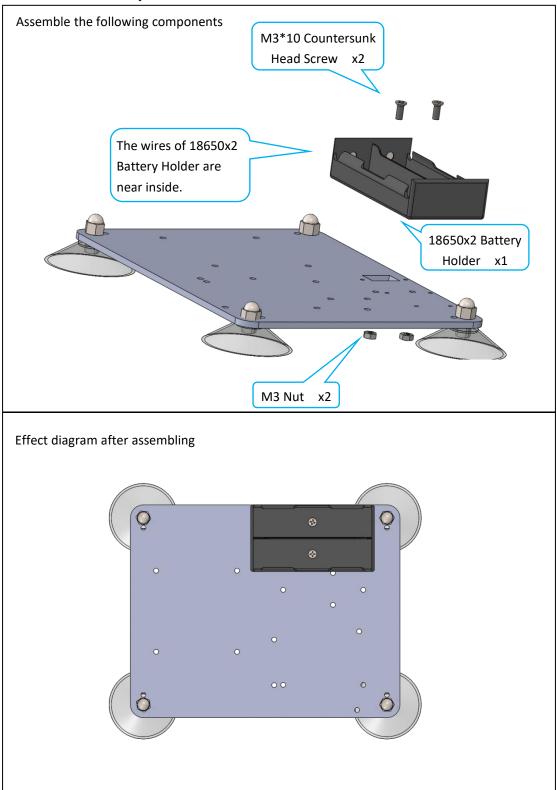


2.Fix OLED to drive

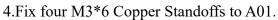


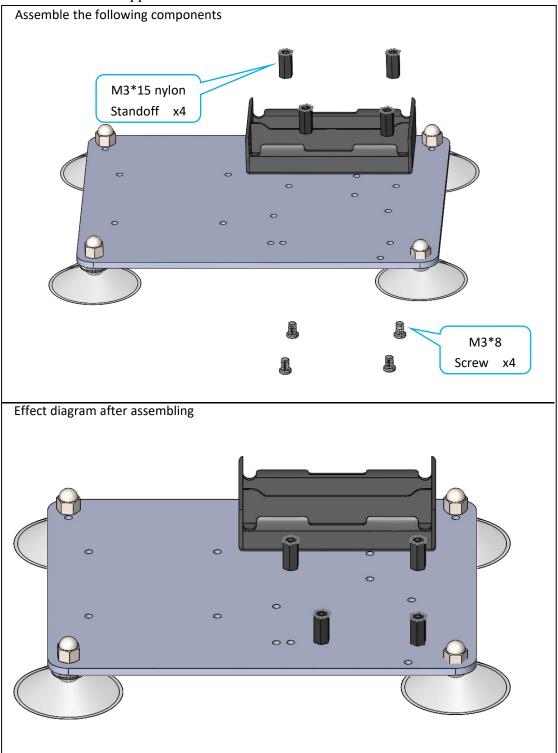






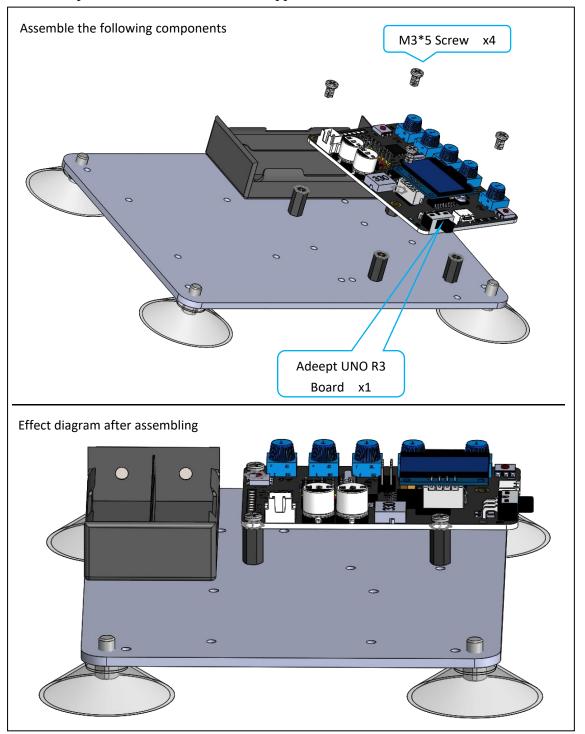






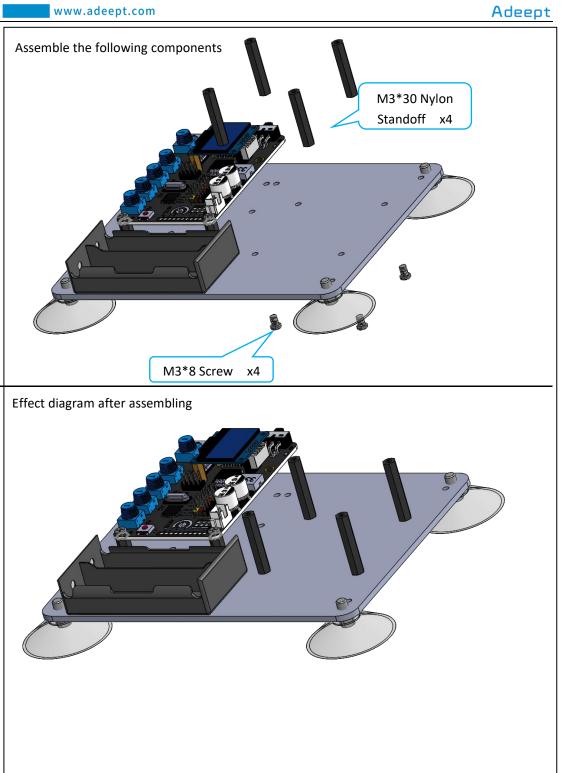


5.Fix Adeept UNO R3 Board to M3*6 Copper Standoff.

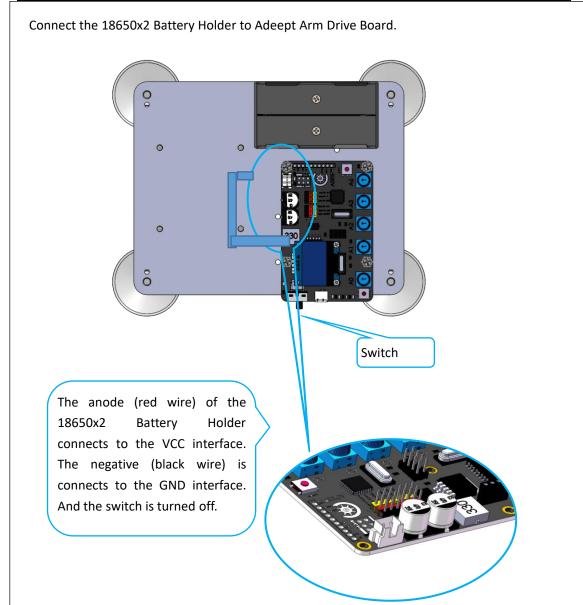


6. Fix four M3*30 Nylon Standoffs to A01.







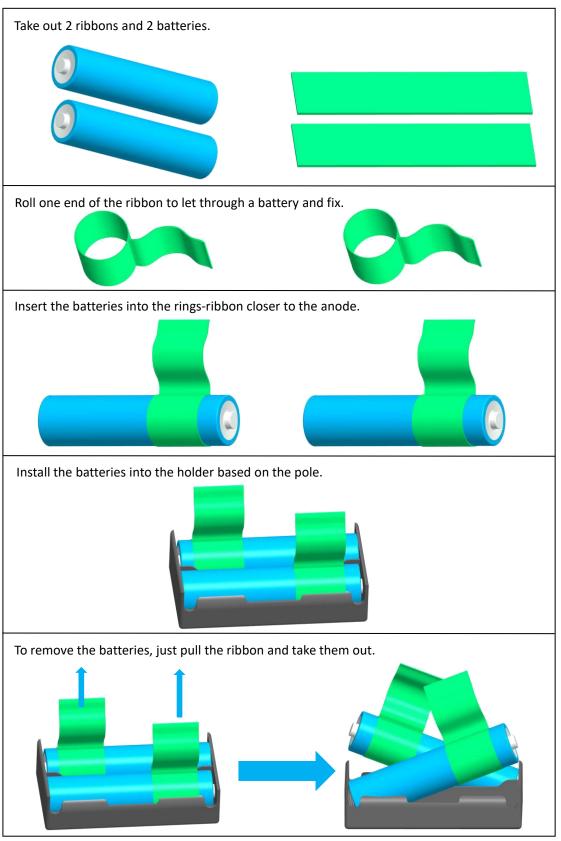


Once the circuit is connected, load your 18650 battery into 18650x2 Battery Holder and turn on the switch on the Adeept Arm Drive Board. At this point, the servo will automatically rotate to the initial state, then turn off the power and remove each servo.

In the subsequent installation processes, before fixing the servo to the rocker arm with screws, do not rotate the rotary shaft of the servo. Otherwise, you need to follow this step again to debug the servo.



6.1.2 Install and Remove Batterries

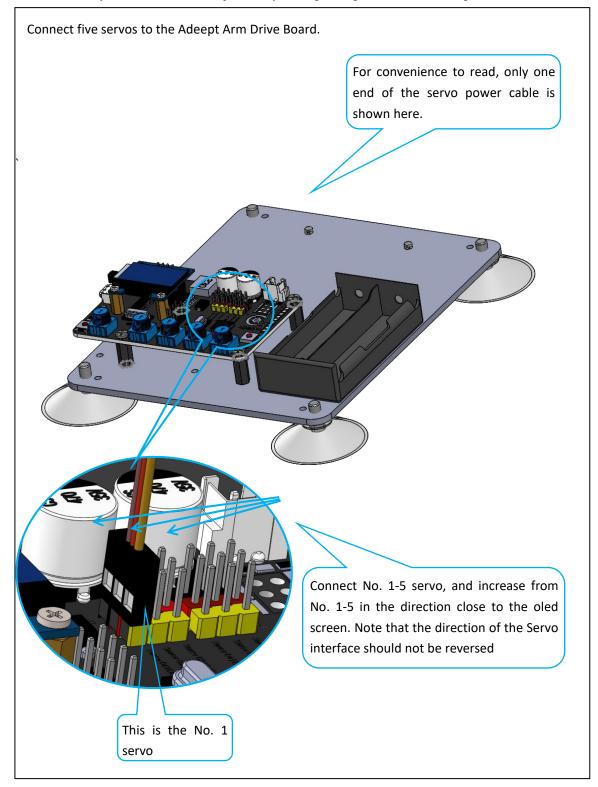




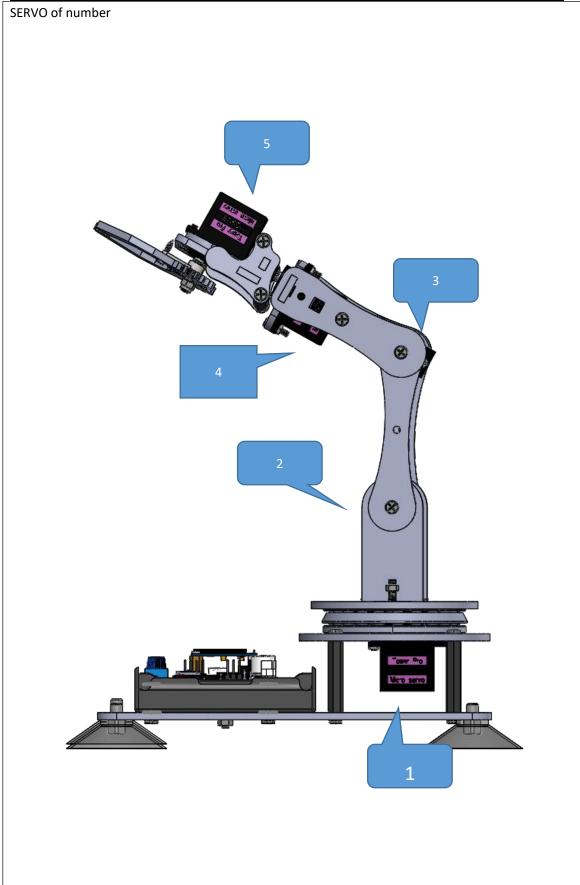
6.1.3 Turnplate and Rocker Arm Assembly

Servo debugging (If you have already adjusted the steering gear to 90 degrees according to

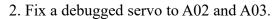
Lesson 5, then you don't need to adjust it anymore, please proceed to the next part)

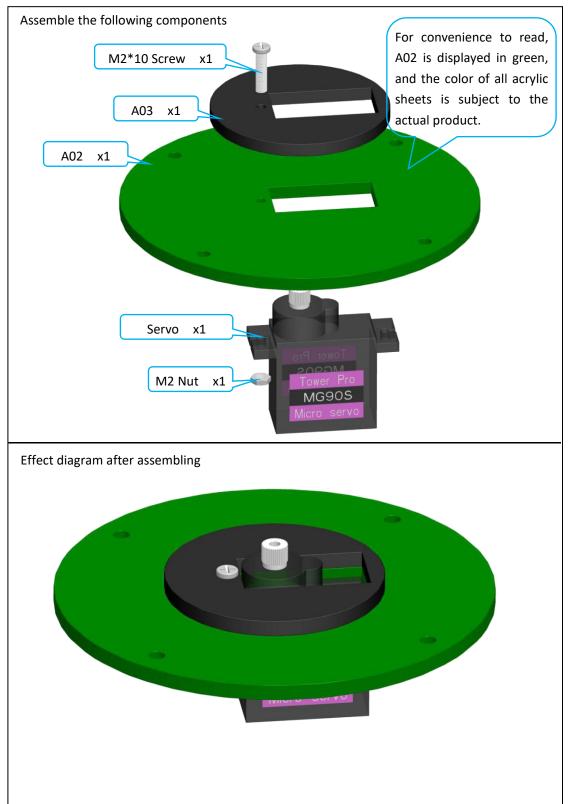




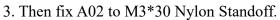


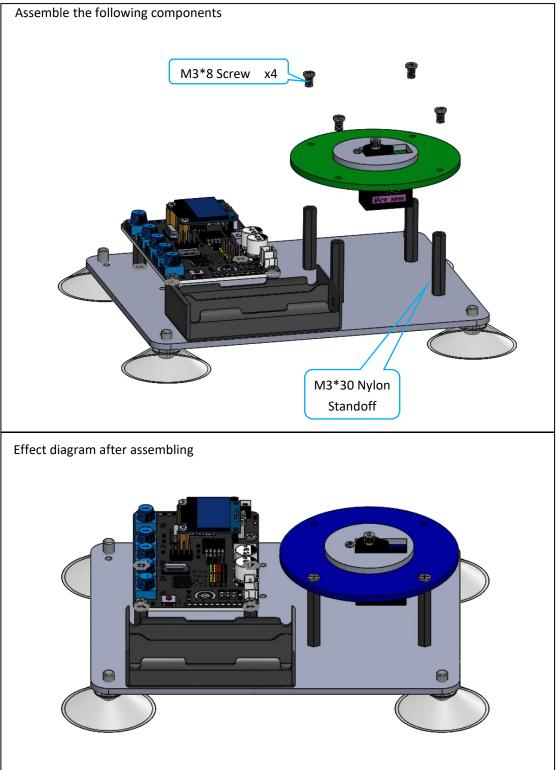






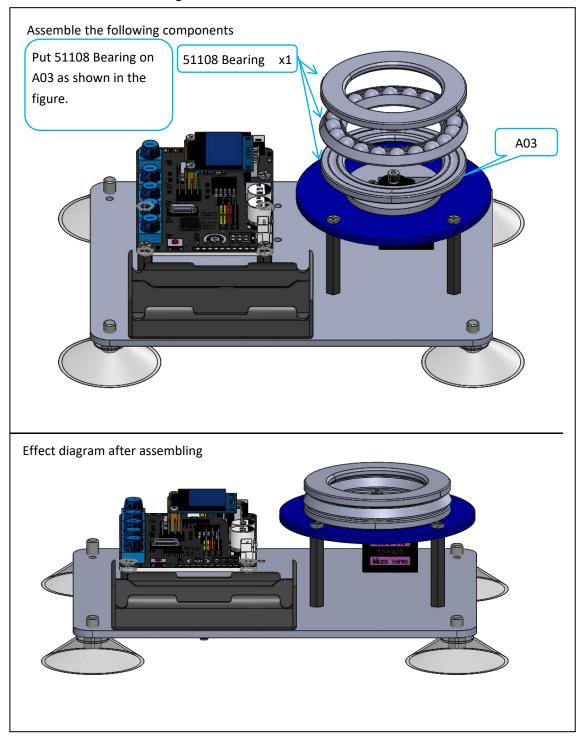






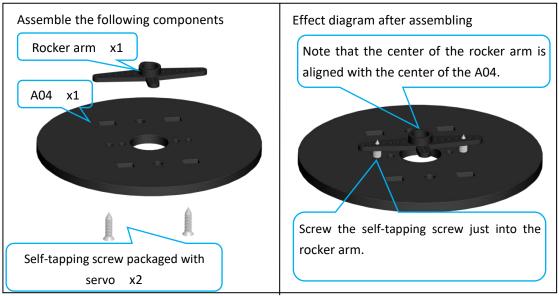


4.Assemble 51108 Bearing.

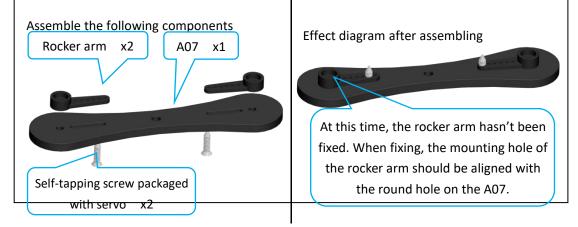




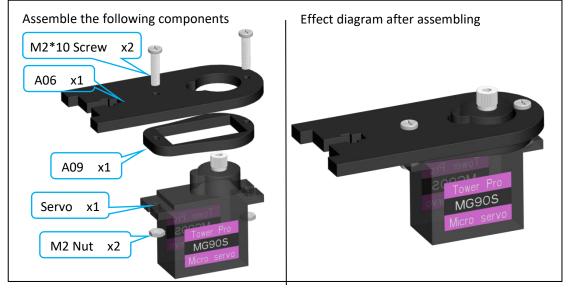
5. Take a rocker arm as in the illustration and connect it to A04.



6. Take two rocker arm as in the illustration and connect them to A07.

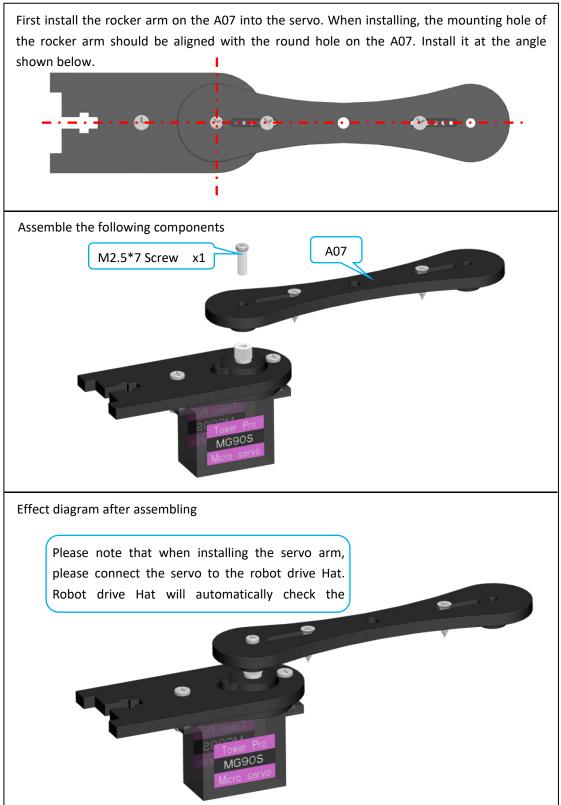






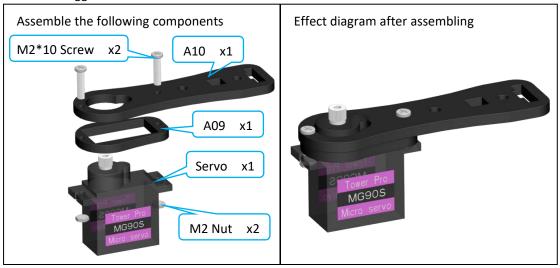


8. Then fix one end of A07 to the servo on A06.

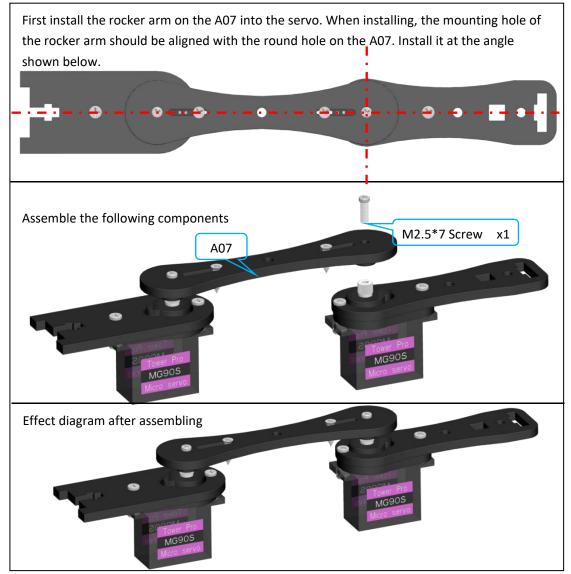




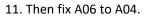
9. Fix a debugged servo to A10.

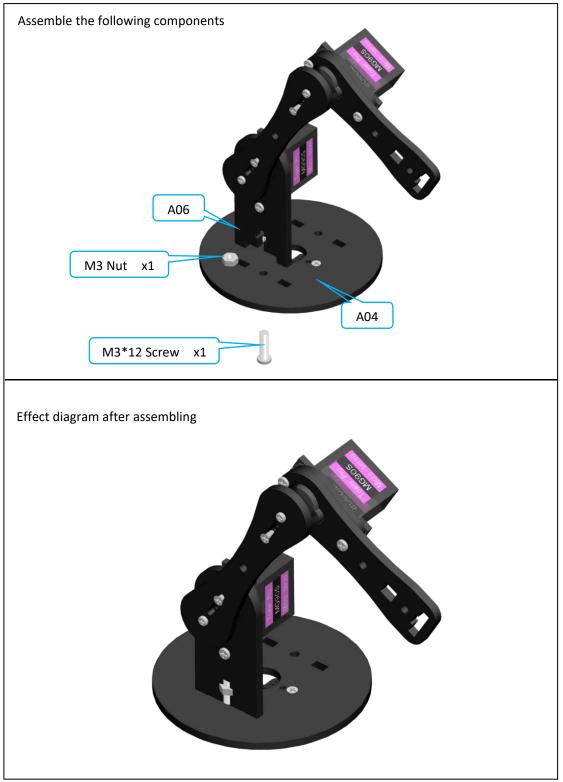


10. Then fix the other end of the A07 to the servo on the A10.

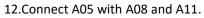


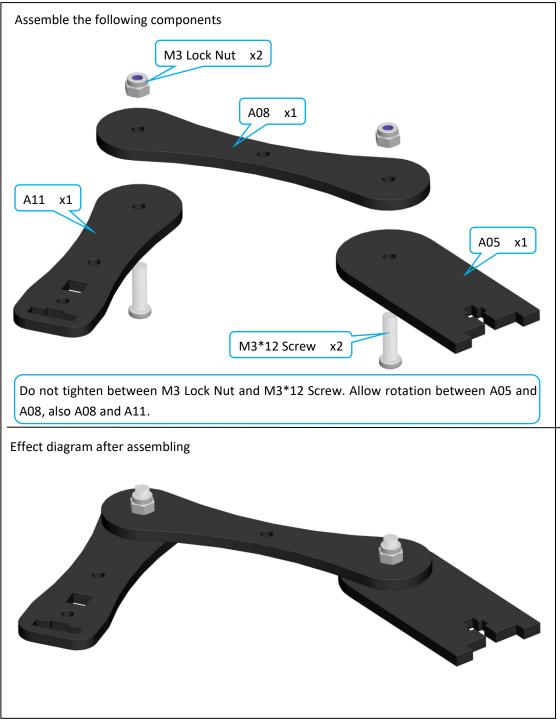




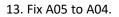








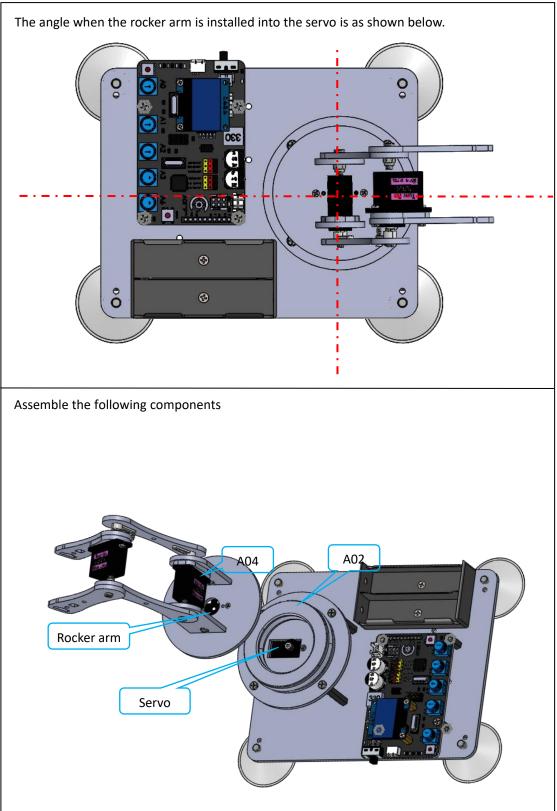






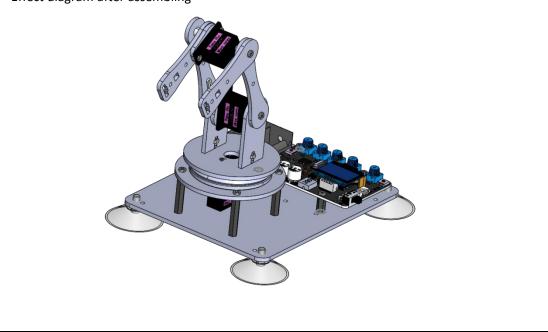


14. Fix the rocker arm under A04 with the servo on A02.

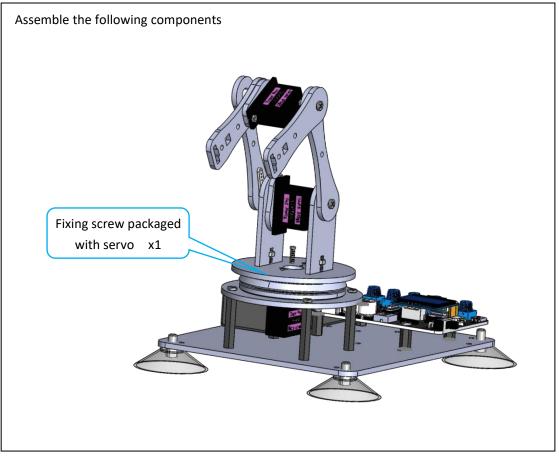




Effect diagram after assembling

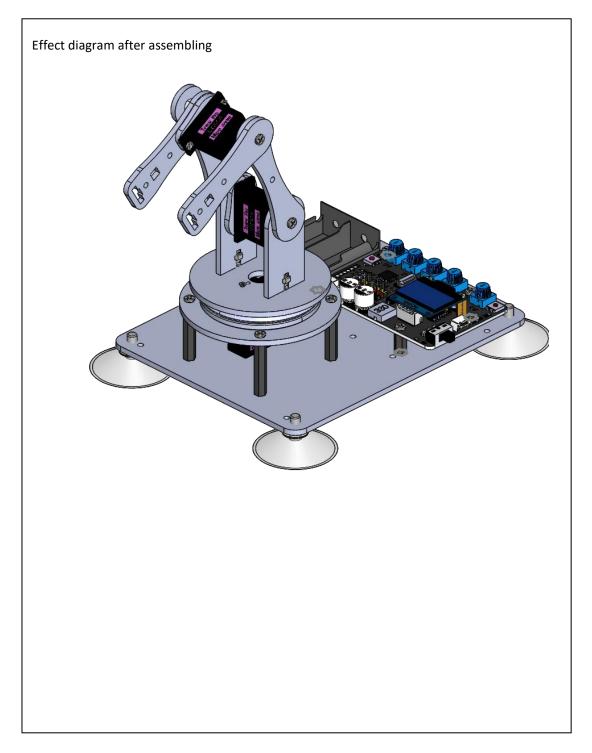


Then fix the rocker arm to the servo with the fixing screw packaged with servo.





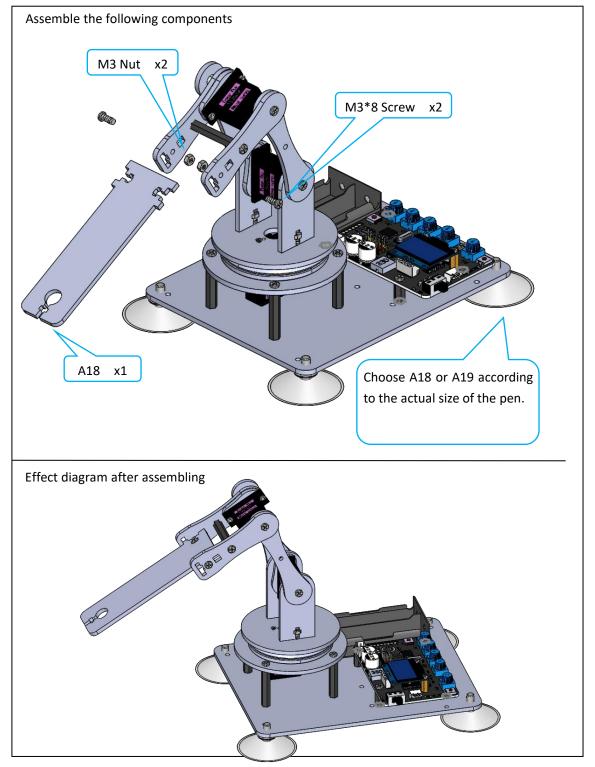






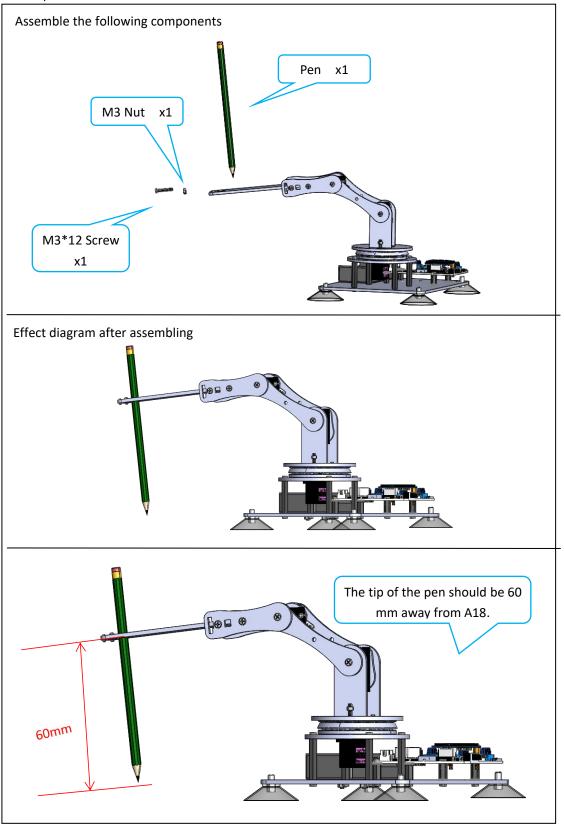
6.2 Play 1

Fix A18 between A10 and A11.





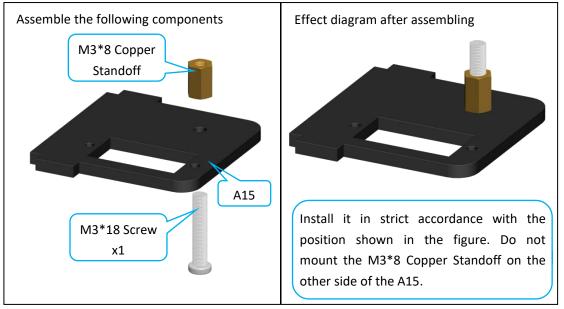
Fix the pen with A18.



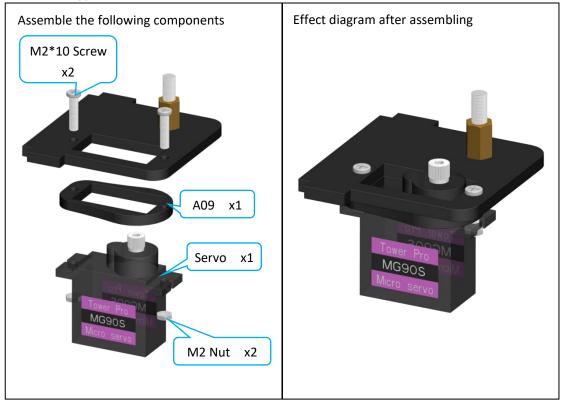


6.3 Play 2

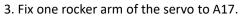
1. Fix one M3*8 Copper Standoff to A15.

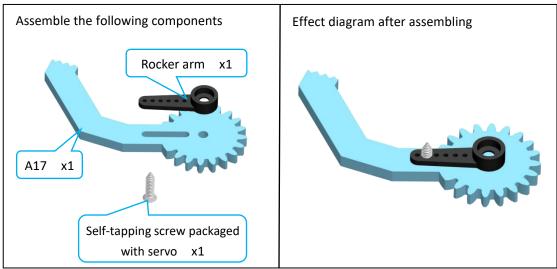


2. Fix a debugged servo to A15.

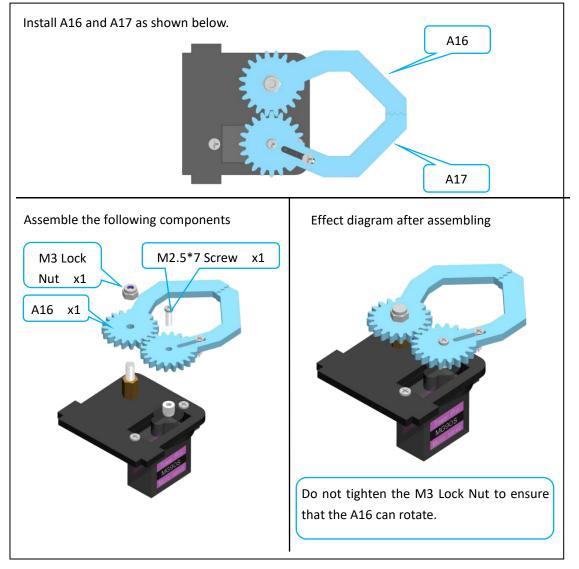




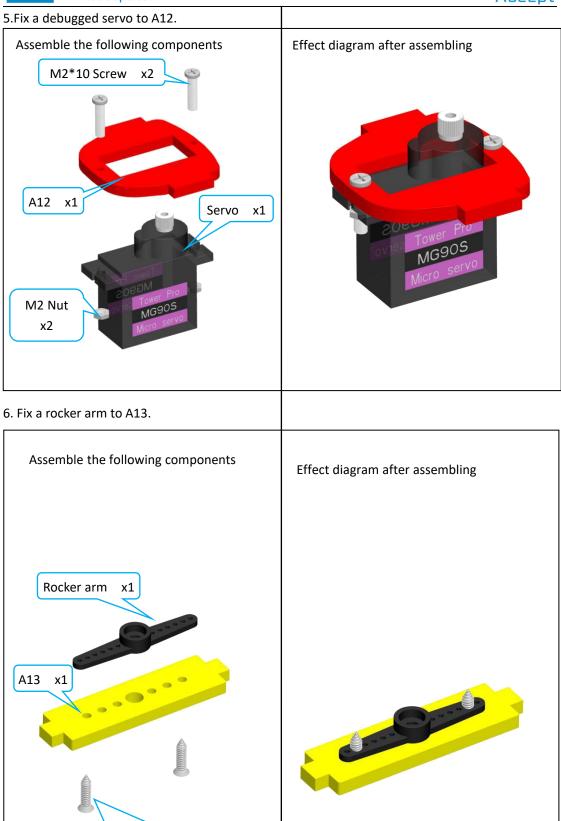




4. Assemble A16 and A17.





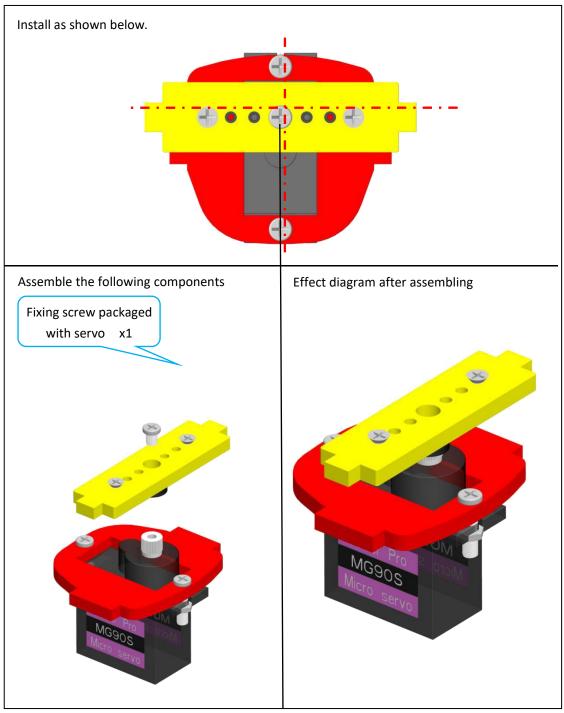


Self-tapping screw packaged with servo

x2

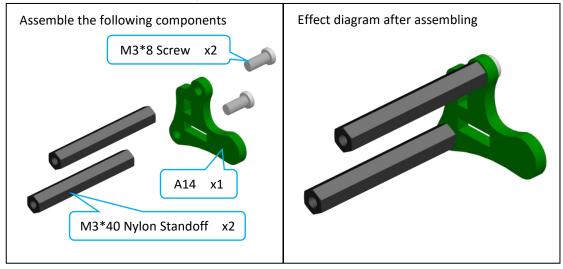


7. Fix the rocker arm on the A13 to the servo on the A12.

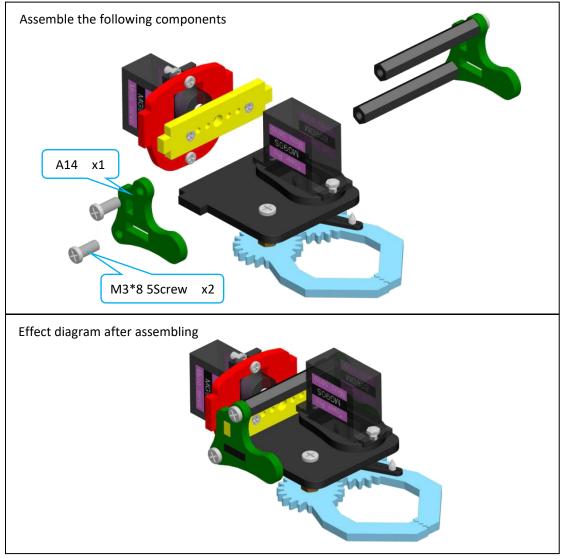




8. Fix one A14 with two M3*40 Nylon Standoffs.



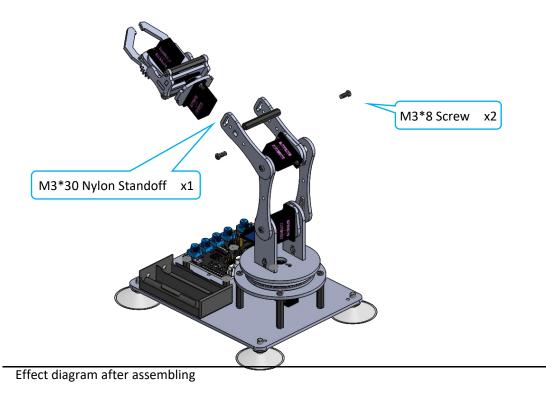
9. Complete assembly of the clamp section.

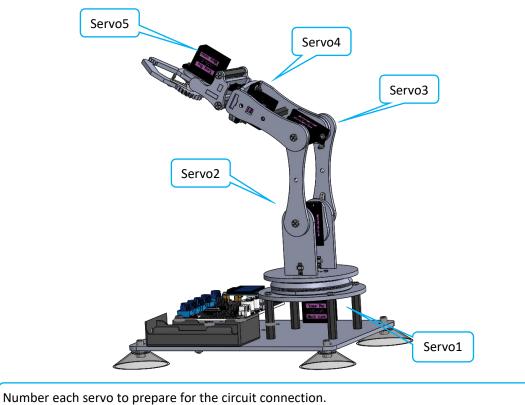




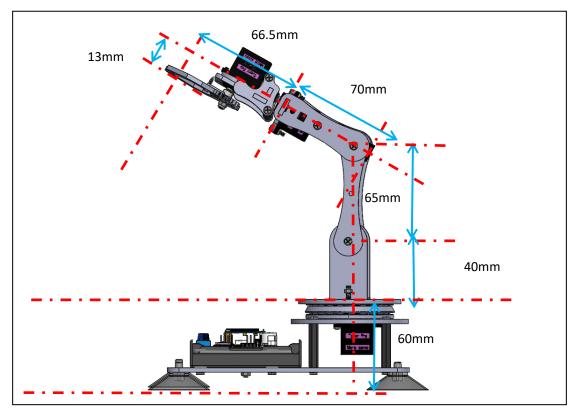
Install the clamp section on the robotic arm.

Assemble the following components



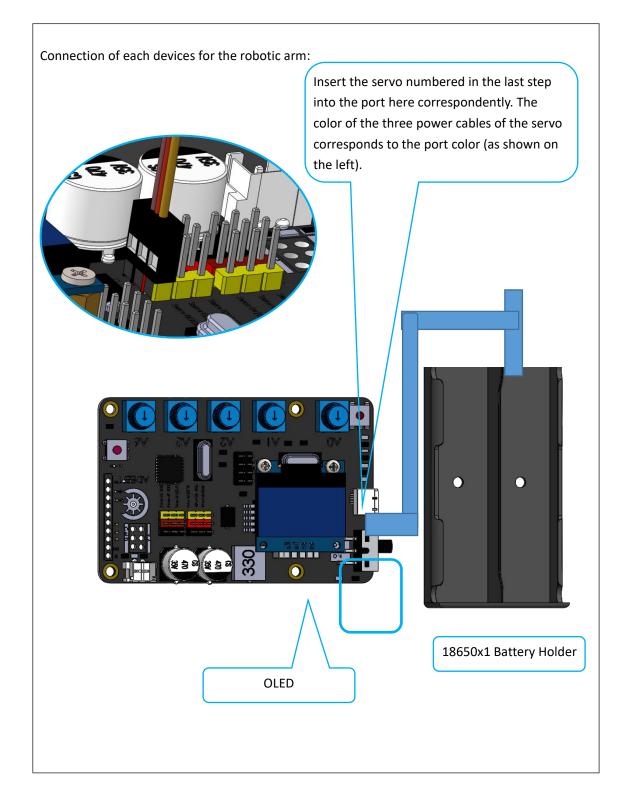








6.4 Circuit Connection





6.5 Combinations of the robotic arm

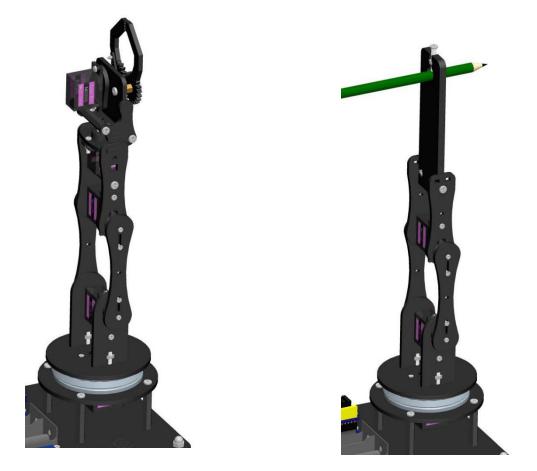
Assemble method (except the front part of the robotic arm).



6.6 Adjustment of the robot arm

Before starting to exert the function, we need to test whether there are problems with the assembly of the robotic arm. When you connect all the servos mounted on the robot arm to the Adeept Arm Drive Board correctly and turn on the power switch (using battery power), the attitude of the robot arm is perpendicular to the ground as follows ((it may not be able to achieve the effect shown in the picture when powered on, a little error is allowed to exist).



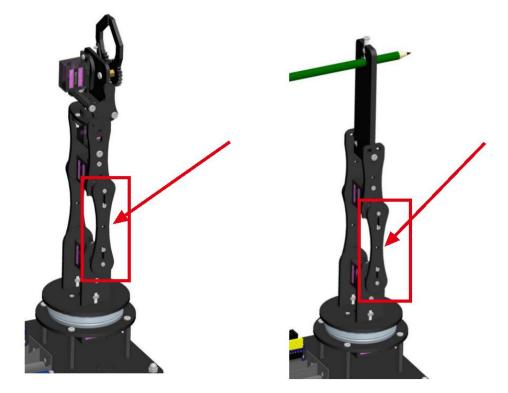


(If your robot arm is assembled and turned on, it is not what it looks like in the picture above, then how do you adjust it? **)**

1.First, you need to re-download the code used in lesson 5: Servo90.ino. Observe if the robot arm is close to the one in the picture above.

2.If it does not work, then you need to manually disassemble the robot arm for adjustment, is to operate with the power on, generally you just need to manually adjust the A07 section in the figure below, remove it, and then connect the upper and lower sections of the robot arm vertical ground, and then install the A07 on to fix them.







Lesson 7 GUI application control mode

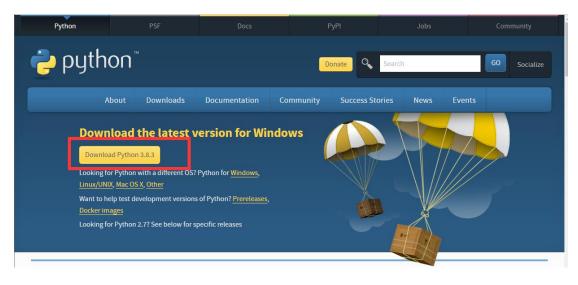
In this lesson, you will learn how to control the movement of the robotic arm with the GUI application.

7.1 Downloading and installing Python

(1) Log in to the official website by browser: https://www.python.org/downloads/



(2) Click the "Download Python 3.8.3" button to download and wait for the download to complete:



(3) Open the downloaded file, double-click to open it to install:



python-3.8.3.exe

www.adeept.com

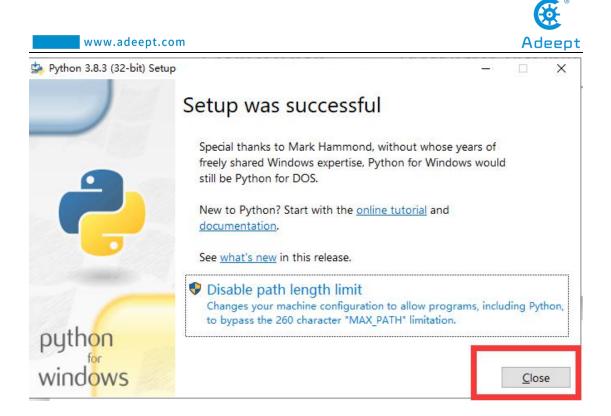
(4) Select the "Add Python 3.8 to PATH" option:



(5) Then click "Install Now" to install.

	Install Python 3.8.3 (32-bit) Select Install Now to install Python with default settin Customize to enable or disable features.	gs, or <mark>c</mark> ho	ose	
2	Install Now C:\Users\ASUS\AppData\Local\Programs\Python\Py Includes IDLE, pip and documentation Creates shortcuts and file associations	ython38-32	2	
	→ C <u>u</u> stomize installation Choose location and features			
python windows	☑ Install <u>l</u> auncher for all users (recommended) ☑ Add <u>P</u> ython 3.8 to PATH		<u>C</u> ano	cel

(6) Wait for the Python installation to complete and click "Close" to close.



7.2 Installing pySerial

pySerial encapsulates the serial communication module, supporting Linux, Windows, BSD (may support all operating systems that support POSIX), Jython (Java) and IconPython (.NET and Mono). The pyserial module encapsulates access to the serial port. The port number starts from 0 by default. There is no need to know the port name in the program. APIs like file reading and writing, read and write (readline, etc. are also supported), support binary transmission, no null elimination, no cr-lf conversion. All programs are completed by Python In addition to the standard library, it does not depend on other packages, except pywin32 (windows), JavaComm (Jython). POSIX (Linux, BSD) only depends on the Python standard library. APIs like file read and write, read, write (readline, etc. are also supported), support binary transmission, no null elimination, no cr-lf conversion, all programs are all done by Python, and do not depend on other packages except the standard library, except pywin32 (windows), JavaComm (Jython). POSIX (Linux, BSD) only depends on the Python standard library.



Before downloading and installing, you need to connect the Adeept Arm Drive Board development board to your computer.

(1) Press Win+R shortcut key to open CMD under Windows 10:

		pen it for you.	and Windows w	Type the resource,	
Open: cmd	~			pen: cmd	<u>O</u> pen:

(2) Click "OK":

🖪 Run				×
Ø			am, folder, docum vill open it for you.	
<u>O</u> pen:	cmd			Ŷ
		ОК	Cancel	<u>B</u> rowse

(3) Enter the command in the window:

pip install pyserial

Press the Enter and wait for the installation to complete.

C:\Windows\system32\cmd.exe			×
Microsoft Windows [版本 10.0.18362.836] (c) 2019 Microsoft Corporation。保留所有权利。			
C:\Users\ASUS>pip install pyserial Collecting pyserial Downloading https://files.pythonhosted.org/packages/0d/e4/2a744dd9e3be04a0c0907414e2a01a7c88bb3915cb /pyserial-3.4-py2.py3-none-any.whl (193kb)	e3c8cc06	e209f5	i9c30
Installing collected packages: pyserial Successfully installed pyserial-3.4 WARNING: You are using pip version 19.2.3, however version 20.1.1 is available. You should consider upgrading via the 'python -m pip installupgrade pip' command.			
C:\Users\ASUS>_			



7.3 Opening the GUI interface

(1) Enter the folder "AdeeptRoboticArmforArduinoV3_5" \rightarrow "01 Software Package" \rightarrow "block_py" provided by Adeept for users, and find this file: "block_py.ino".

lame	Date modified	Туре
Adeept driver	8/3/2020 10:43 AM	File folder
block_py	8/3/2020 10:43 AM	File folder
il libraries	8/4/2020 10:03 AM	File folder
websocket	8/3/2020 10:43 AM	File folder
名称	修改日期	类型
block_py.ino	2020/5/25 17:55	INO 文件

(2) Then right-click the file: "block_py.ino". Select "Open with" \rightarrow "Choose another app".

Name	Open Edit Arduino file		Туре		Size
💿 block_py.iı	使用美图秀秀编辑和美化		Ardui	ino file	28 KB
	 ☑ Edit with Notepad++ 2 格式工厂 	>			
	i 打开LazyWifi ঔ Share				
	Open with	>	💿 Arduino	IDE	
	 ↓ 上传到 "WPS云文档" 通过 "WPS云文档" 分享和协作 		Internet E Notepad		NU) source code editor
	 使用 360杀毒 扫描 		Choose a	ne Microsoft S another app	tore
	請 添加到压缩文件(Δ)	- 164			

(3) Click "More apps", and then click "OK".

www.ade	eept.com		Adeept
Date modified	lype		
6/13/2020 5:27 PM	Arduino file	How do you want to open this file?	
		Keep using this app	
		Arduino IDE	
		Other options	<i>.</i>
		Internet Explorer	
		Notepad++ : a free (GNU) source code editor	
	_	Look for an app in the Microsoft Store	
		More apps ↓	
		Always use this app to open .ino files	
		ОК	

(4) Use the mouse to slide down, click "Look for annother app on this PC", and then click"OK".

6/13/2020 5:27 PM	Arduino file	How do you want to open this file?
0211415563620054154343463		VMware Workstation
		Windows Media Player
		WordPad
		WPS Office
		wps 图片
		WPS表格
		Look for another app on this PC
		Always use this app to open .ino files
		ок

(5) Find the Arduino software on the Desktop or where you installed the Arduino software, select it, and finally click "Open".



3D Objects							
	ΘO	M4	Ae			•	\odot
Downloads							
Music	Arduino	python	КК	HBy	230360988	V N	arduino.exe
Pictures	8						
📑 Videos				>.			
🏪 系统 (C:)		P					
🕳 Local Disk (D:)				7		5	
🕳 Local Disk (E:)	360软件管家	360安全卫士	搜狗高速浏览器	MobaXterm.exe -	海矽数显宝.exe	迅雷	vmware.exe - 快
USB Drive (F:)				快捷方式			捷方式
🕳 Local Disk (H:)		A			C		
🕳 Local Disk (l:)	$\nabla / 7$	Con l		(\mathbf{K})			
🔒 Libraries		C bjepad#					
	WIDE OVE			THYLE T	10 1 Att	三十三日	

(6) At this time, the Arduino software opens the file "block_py.ino".



(7) First select the Arduino development board as UNO version with Tools.

www.	adeept.com			Adee
block_py_l_Ardui			10 <u>-</u>	
block_py	Auto Format Archive Sketch Fix Encoding & Reload	Ctrl+T		2
KEY4x4 and When BUZZER	Manage Libraries Serial Monitor Serial Plotter	Ctrl+Shift+I Ctrl+Shift+M Ctrl+Shift+L	sufficient capacity will be in BUZZER can be used	dicated.
When BUZZER	WiFi101 / WiFiNINA Firmware Updater		Boards Manager	
lefine KEY4x	Board: "Arduino Uno"		Arduino AVR Boards Arduino Yún	i i i i i i i i i i i i i i i i i i i
lefine MPU605 lefine BUZZER	Port Get Board Info		Arduino Uno Arduino Duemilanove or Diecim	ila
nclude <ardu f !BUZZER nclude <irremor< td=""><td>Programmer: "AVRISP mkII" Burn Bootloader</td><td></td><td>Arduino Nano Arduino Mega or Mega 2560</td><td></td></irremor<></ardu 	Programmer: "AVRISP mkII" Burn Bootloader		Arduino Nano Arduino Mega or Mega 2560	
endif include <servo.< td=""><td></td><td></td><td>Arduino Mega ADK Arduino Leonardo</td><td></td></servo.<>			Arduino Mega ADK Arduino Leonardo	

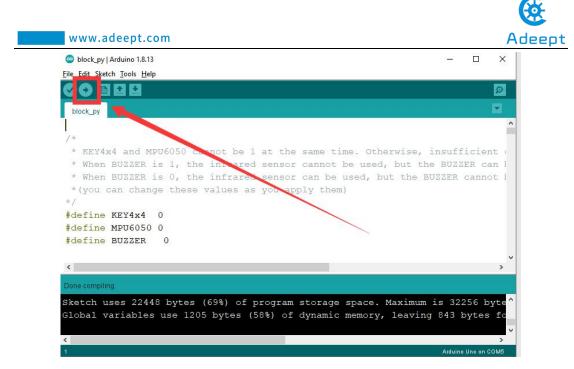
®

(8) Then continue to use Tools to select the port "Port" of the Adeept Arm Drive

Board connected to the computer.

💿 block_py Ardui	ino 1.8.12			1000	
File Edit Sketh To	ools Heip				
block_py	Auto Format Archive Sketch Fix Encoding & Reload	Ctrl+T			
my_cmp(root) memset(line, 0	Manage Libraries Serial Monitor Serial Plotter	Ctrl+Shift+I Ctrl+Shift+M Ctrl+Shift+L			
} void my cmp(Js	WiFi101 / WiFiNINA Firmware Updater Board: "Arduino Uno"	>			
{	Port: "COM4 (Arduino Uno)"	-	Serial ports		
/* parses th	Get Board Into	×	COM4 (Arduino Uno)		

(9) Click the Upload button to download the code program to the Arduino development board.



(10) Find the folder AdeeptRoboticArmforArduinoV3_5" \rightarrow "01 Software

Package"→"websocket", find this file: "servosGUI.py".

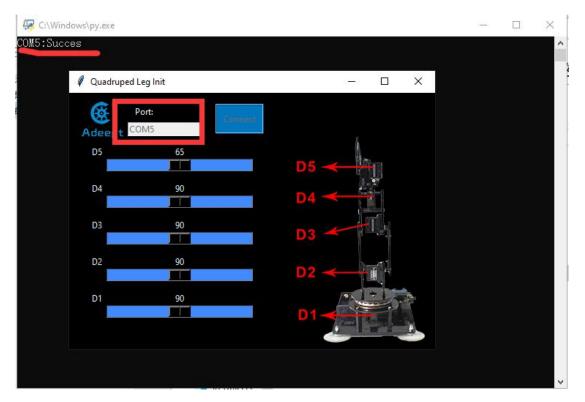
Name	Date modified	Туре
Adeept driver	8/3/2020 10:43 AM	File folder
block_py	8/3/2020 10:43 AM	File folder
librarior	8/4/2020 10:03 AM	File folder
websocket	8/3/2020 10:43 AM	File folder

(11) Double-click to open this file: servosGUI.py



www.adeept.com			Adeept
AdeeptRoboticArmforArduinoV3_5 > 0)1 Software Package 🔸 websocket	ري م م	Search we 🔎
Name	Date modified	Туре	Size
pycache	8/4/2020 5:29 PM	File folder	
📴 Adeept.py	8/4/2020 5:25 PM	Python File	4 KB
🛃 GUI info v1.0.py	8/4/2020 5:25 PM	Python File	10 KB
IP.txt	8/4/2020 5:25 PM	Text Document	1 KB
iogo.png	8/4/2020 5:25 PM	PNG 图片文件	62 KB
and logol ppg	8/4/2020 5:25 PM	PNG 图片文件	8 KB
🕞 servosGUI.py	8/4/2020 5:25 PM	Python File	32 KB
🛃 test.py	8/4/2020 5:25 PM	Python File	1 KB

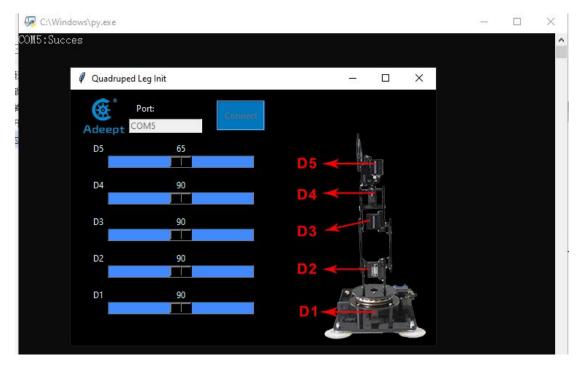
(12) After the GUI is opened, as shown in the figure below, you need to fill in the Port in the Arduino IDE in the Port input field. For example, the Port connected to the Arduino IDE is COM5, then you enter COM5, and then click Connect. After successfully connecting, there will be a prompt message in the upper left corner: "COM5: Succes".



7.4 Controlling the robotic arm with the GUI interface

Note that the arm is still connected to the computer with the USB cable.

1. In the opened GUI interface, the left area is to control the movement of the servo D1~D5, and the right area is the structure diagram of the servo of the robotic arm.



2. When you need to control the robotic arm, you can slide the slider corresponding to the servo in the left area to control the movement of the robotic arm. When a certain position is slipped, a data will be displayed on the slider, this data represents the angle.



www.adeept.com C:\Windows\py.exe -× COM5:Succes ^ Quadruped Leg Init 8= × œ Port: Adeept COM5 64 D4 144 D2 95 D1



Lesson 8 GwBlock graphical control mode

We creatively provide users with Arduino graphical programming tools-GwBlock. Using graphical program instruction blocks to achieve control of Arduino with the Web page. Compared with the traditional pure character interface code programming platform, graphical programming is more conducive to learners who have not mastered C/C++. If you have studied Scratch, then you will be able to easily master the graphical programming of Arduino. Next we will teach you how to build graphical programming of Arduino.

8.1 Downloading and installing Python

(1) Log in to the official website by browser:

https://www.python.org/downloads/

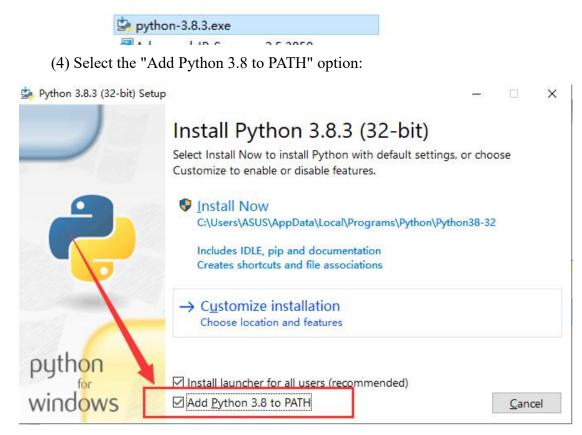


(2) Click the "Download Python 3.8.3" button to download and wait for the download to complete:

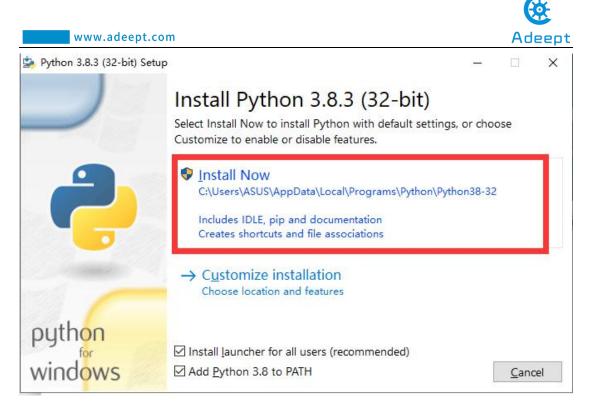


www.adee	ot.com					Adeept
Python	PSF	Docs		РуРІ	Jobs	Community
🍦 python				Donate Sea	rch	GO Socialize
About	Downloads	Documentation	Community	Success Stories	News	Events
Download Pyth Looking for Pytho Linux/UNIX, Mac C Want to help test Docker images	on 3.8.3 n with a different OS3 DS X, <u>Other</u>	version for Win Python for <u>Windows,</u> s of Python? <u>Prereleases</u> pecific releases				

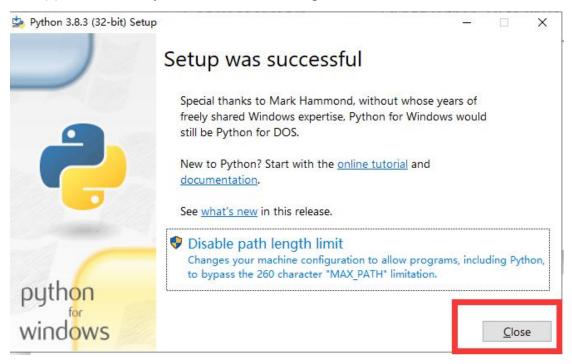
(3) Open the downloaded file, double-click to open it to install:



(5) Then click "Install Now" to install.



(6) Wait for the Python installation to complete and click "Close" to close.



8.2 Installing pySerial and connecting GwBlock graphical editor



pySerial encapsulates the serial communication module, supporting Linux, Windows, BSD (may support all operating systems that support POSIX), Jython (Java) and IconPython (.NET and Mono). The pyserial module encapsulates access to the serial port. The port number starts from 0 by default. There is no need to know the port name in the program. APIs like file reading and writing, read and write (readline, etc. are also supported), support binary transmission, no null elimination, no cr-lf conversion. All programs are completed by Python In addition to the standard library, it does not depend on other packages, except pywin32 (windows), JavaComm (Jython). POSIX (Linux, BSD) only depends on the Python standard library.APIs like file read and write, read, write (readline, etc. are also supported), support binary transmission, no null elimination, no cr-lf conversion, all programs are all done by Python, and do not depend on other packages except the standard library, except pywin32 (windows), JavaComm (Jython). POSIX (Linux, BSD) only depends on the Python standard library.

Before downloading and installing, you need to connect the Adeept Arm Drive Board development board to your computer.

(1) Press Win+R shortcut key to open CMD under Windows 10:

		am, folder, docum vill open it for you.	
	icource, a	in open in jeu	
<u>O</u> pen:	cmd		,

(2) Click "OK":

💷 Run		×
	program, folder, document, or Inte ows will open it for you.	ternet
Open: cmd		~

(3)Enter the command in the window:

pip install pyserial

Press the Enter and wait for the installation to complete.



(4) Open the folder "AdeeptRoboticArmforArduinoV3_5" provided by Adeept to

ame	Date modified	Туре
Adeept driver	8/3/2020 10:43 AM	File folder
block_py	8/3/2020 10:43 AM	File folder
indraries	8/4/2020 10:03 AM	File folder
websocket	8/3/2020 10:43 AM	File folder
	修改日期	类型
block py.ino	2020/5/25 17:55	INO 文件

the user \rightarrow "01 Software Package" \rightarrow "block_py" and find this file: "block_py.ino".

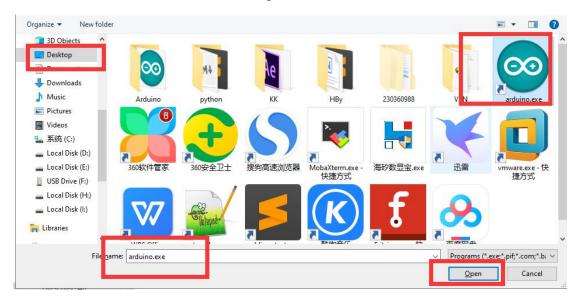
(5) Then right-click the file: "block_py.ino". Select "Open with" \rightarrow "Choose another app".

www.ade	ept.com						Adeept
Name O)pen dit Arduino file 吏用美图秀秀编辑和	美化		Type Arduino file	Size	28 KB	, locept
and the second se	dit with Notepad++ 备式工厂	>					
ार्ट S	N						
• 1	open with 上传到 "WPS云文档" 通过 "WPS云文档"分	> 享和协作	Ø Int ☑ No	duino IDE ternet Explorer tepad++ : a free (I		code edito	r
	使用 360杀毒 扫描	[arch the Microsoft 100se another app	Store		
	™副压缩文件(Δ) Iore apps", th	en click "OK	".		1.0		
Date modified 6/13/2020 5:27 PM	lype Arduino file	How do you		to open th	is file?		
		Keep using the Arduino					
	8	Other options					
		Internet	Explore	r			
		Notepad editor	d++:a1	free (GNU) sou	rce code		
		Look for	r an app	in the Microso	ft Store		
		More apps \downarrow					
		Always use	this app	to open .ino fi	iles		
				OK	5 5		

(7) Slide the mouse down, click "Look for annother app on this PC", and then click "OK".

www.adeept	.com		Adeept
6/13/2020 5:27 PM	Arduino file	How do you want to open this file?	
		VMware Workstation	~
		Windows Media Player	
		WordPad	
		WPS Office	
		WPS 图片	
		WPS表格	
	E	Look for another app on this PC	~
		Always use this app to open .ino files	
		ОК	

(8) Find the Arduino software on Desktop or the place where you installed the Arduino software, select it and click "Open".



(9) Then the Arduino software opens the file "block_py.ino".



(10) First select the Arduino development board as UNO version with Tools.

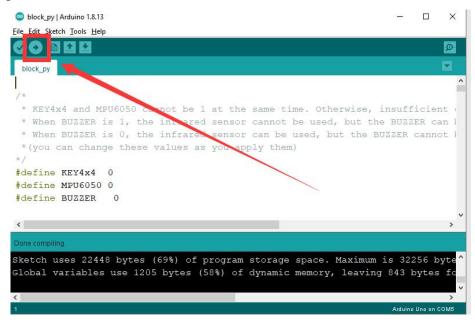
lock_py	Auto Format Archive Sketch Fix Encoding & Reload	Ctrl+T		9
KEY4x4 and When BUZZER	Manage Libraries Serial Monitor	Ctrl+Shift+I Ctrl+Shift+ <mark>M</mark> Ctrl+Shift+L	sufficient capacity will be indicated. BUZZER can be used	
When BUZZER you can cha	WiFi101 / WiFiNINA Firmware Updater		Boards Manager	
fine KEY4x	Board: "Arduino Uno"		Arduino AVR Boards	
fine MPU605 fine BUZZER	Port Get Board Info	E	Arduino Yún Arduino Uno Arduino Duemilanove or Diecimila	
clude <ardu !BUZZER</ardu 	Programmer: "AVRISP mkll" Burn Bootloader	1	Arduino Nano Arduino Mega or Mega 2560	
nclude <irremo ndif nclude <<mark>Servo</mark>.1</irremo 			Arduino Mega ADK Arduino Leonardo	

(11) Then continue to select the "Port" of the Adeept Arm Drive Board connected to the computer with Tools.

www.a	adeept.com			Adeep
🔊 block py Ardui				- 0
ile Edit Ske <mark>ch To</mark>	pols He p			
Diock_py	Auto Format Archive Sketch Fix Encoding & Reload	Ctrl+T		
my_cmp(root)	Manage Libraries Serial Monitor Serial Plotter	Ctrl+Shift+I Ctrl+Shift+M Ctrl+Shift+L		
	WiFi101 / WiFiNINA Firmware Upda	iter		
void my_cmp(Js	Board: "Arduino Uno" Port: "COM4 (Arduino Uno)"	>	Serial ports	
/* parses th	Get Board Into		COM4 (Arduino Uno)	

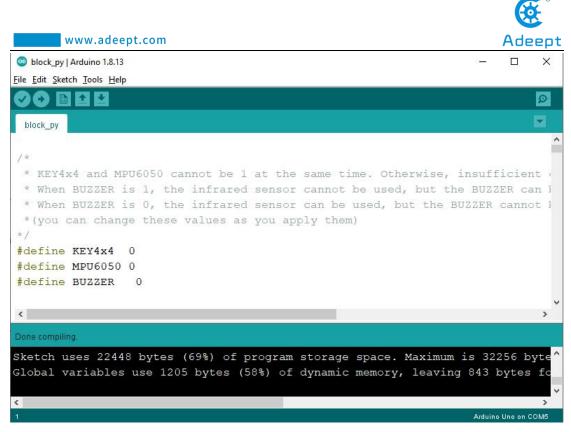
(12) Click the Upload button to download the code program to the Arduino

development board.



(13) We re-use the Arduino software to open the "block_py.ino" file, and then

click the Upload button again to download the code program to the Adeept Arm Drive Board development board. After the download is successful, the following picture is shown:



(14) Find the folder AdeeptRoboticArmforArduinoV3_5" \rightarrow "01 Software Package" \rightarrow "websocket", find this file: "GUI info v1.0.py".

Name	Date modified	Туре
Adeept driver	8/3/2020 10:43 AM	File folder
block_py	8/3/2020 10:43 AM	File folder
libereior	8/4/2020 10:03 AM	File folder
websocket	8/3/2020 10:43 AM	File folder
- 1.12		3

(15) Double-click to open this file: GUI info v1.0.py

名称 人	修改日期	类型	大小
🛃 Adeept.py	2020/5/25 17:55	Python File	4 KB
🗟 GUI info v1.0.py	2020/5/25 17:55	Python File	8 KB



(16) After opening the file, the following interface will appear. We need to record this IP address, which will be used later: 192.168.3.69

🐙 C:\Windows\py.exe			
192. 168. 3. 69			
🧳 Adeept Arduino Robot	100	×	
	Connect		

(17) In the input box, enter the port we set in step (11).Everyone's port is different.The port of my Adeept Arm Drive Board development board is: COM4. After entering, click the Connect button.

C:\Windows\py.exe		
2. 168. 3. 69		
🖉 Adeept Arduino Robot		×
COM4	Connect	

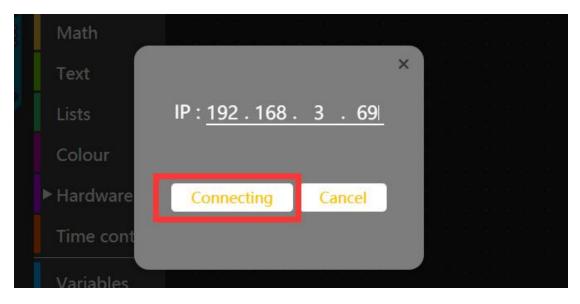
(18)Enter the URL of the GwBlock graphical editor in the browser:

http://www.adeept.com/gwblock/?hd_mo=uno_r3

After successfully entering the website, the interface is as follows:

www.adeept.c	om				Adeept
		Blocks	Python	Connecting device	→ → ≡
	Logic				ter er er er er er
	Loops				1997 A. A. A. A. A. A. 1963 A. A. A. A. A. A. A.
Adeept	Math				
	Text		Setup		
	Lists				1942 - 42 - 44 - 44 - 44 - 44 - 44 - 44 -
$\textcircled{\textbf{0}}$	Colour				an a a a a a a
8	► Hardware				31 1 1 1 1 1 1 1 1 1 31 1 1 1 1 1 1 1 1
	Time control				
	Variables				
	Functions				
Device IP Empty [<mark>Not connected</mark>] ళ	Š X	* * * * * *		an	

(19) Click the "Connecting device" button in the upper right corner. In the pop-up box, enter the IP address we recorded in step (16), as shown below, and then click the Connecting button.



(20) After the connection is successful, a green "connected" will appear in the lower left corner of the interface, indicating that the connection with the Adeept Arm Drive Board is successful.

www.adeept.c	om			Adeept
		Blocks	Python Connecting device	► → ► ≡
	Logic			
	Loops			lan an an sa san nas a lan an an sa san san a
Adeept	Math		Setup	
	Text			
	Lists			
۲	Colour			※ ※ ※ ※ ※ ※ ※※ ※ ※ ※ ※ ※
8	► Hardware			
	Time control			
	Variables			
	Functions			· · · · · · · · · · · · · · · · · · ·
Device IP 192.168.3.69 [connected]	<u>ତ</u>	9 (d. 189 (d) 8)		t t t t y lo d t

8.3 The method of reconnecting the GwBlock graphical editor

In the following cases, you need to reconnect to the GwBlock graphical editor:

- [1] When you close the GwBlock editor.
- [2] When you close the Adeept Arduino Robot window.
- [3] When you restart the computer.
- [4] When you log in to the GwBlock website again.
- [5] When you close the Arduino IDE.

(1) Before doing the experiment, you must first connect the Arduino development board to the computer.

(2) First, open the folder we provide to the user: AdeeptRoboticArmforArduinoV3_5, after opening, as shown below:



AdeeptRoboticArmforArduinoV3_5 >	01 Software Package > V	ට Search 01)
Name	Date modified	Туре
Adeept driver	8/3/2020 10:43 AM	File folder
block_py	8/3/2020 10:43 AM	File folder
libraries	8/4/2020 10:03 AM	File folder
websocket	8/3/2020 10:43 AM	File folder

(3)Open this folder: block_py again, and find a block_py.ino file inside, as shown below:

名称	修改日期	类型	大小	
💿 block_py.ino	2020/5/25 17:55	INO 文件	2	

(4) Double-click to open this block_py.ino file (use Arduino to open!), as shown

below:

www.adeept.com

File Edit Sketch Tools Help		0
<pre>/* * KEY4x4 and MPU6050 cannot be 1 at the same time. Otherwise, insuff * When BUZZER is 1, the infrared sensor cannot be used, but the BUZZ * When BUZZER is 0, the infrared sensor can be used, but the BUZZER *(you can change these values as you apply them) */ #define KEY4x4 0 #define MPU6050 0</pre>		0.
<pre>/* * KEY4x4 and MPU6050 cannot be 1 at the same time. Otherwise, insuff * When BUZZER is 1, the infrared sensor cannot be used, but the BUZZ * When BUZZER is 0, the infrared sensor can be used, but the BUZZER *(you can change these values as you apply them) */ #define KEY4x4 0 #define MPU6050 0</pre>		
<pre>' * KEY4x4 and MPU6050 cannot be 1 at the same time. Otherwise, insuff * When BUZZER is 1, the infrared sensor cannot be used, but the BUZZ * When BUZZER is 0, the infrared sensor can be used, but the BUZZER *(you can change these values as you apply them) */ #define KEY4x4 0 #define MPU6050 0</pre>		1
<pre>' * KEY4x4 and MPU6050 cannot be 1 at the same time. Otherwise, insuff * When BUZZER is 1, the infrared sensor cannot be used, but the BUZZ * When BUZZER is 0, the infrared sensor can be used, but the BUZZER *(you can change these values as you apply them) */ #define KEY4x4 0 #define MPU6050 0</pre>		^
<pre>* When BUZZER is 1, the infrared sensor cannot be used, but the BUZZ * When BUZZER is 0, the infrared sensor can be used, but the BUZZER *(you can change these values as you apply them) */ #define KEY4x4 0 #define MPU6050 0</pre>	U6050 cannot be 1 at the same time. Otherwise, insufficient	
<pre>*(you can change these values as you apply them) */ #define KEY4x4 0 #define MPU6050 0</pre>		
*/ #define KEY4x4 0 #define MPU6050 0		
#define KEY4x4 0 #define MPU6050 0	e these values as you apply them)	
#define MPU6050 0		
	0	
#define BUZZER 0	0	
	0	
<		× ×
		-
Done compiling.		

(5) Select COM4 as the port of Adeept Arm Drive Board in Tools in the toolbar of

Arduino IDE, and click the icon in the upper left corner to download the program to the Arduino development board. After successful download, it will prompt



as follows:

Done uploading.	
Global variables use 1205 bytes (58%) o Invalid library found in C:\Program Fil	
<	>
1	Arduino Uno on COM5

(6)Next, open the folder we provide to the user:

 $AdeeptRoboticArmforArduinoV3_5$

Then open 01 Software Package.As shown below:

deeptRoboticArmforArduinoV3_5	> 01 Software Package > 🛛 💊	් Search 01 🖍
Name	Date modified	Туре
Adeept driver	8/3/2020 10:43 AM	File folder
block_py	8/3/2020 10:43 AM	File folder
libraries	8/4/2020 10:03 AM	File folder
websocket	8/3/2020 10:43 AM	File folder

(7) Open the websocket folder. There is a file inside: GUI info v1.0.py.

名称	修改日期	类型	大小
🛃 Adeept.py	2020/5/25 17:55	Python File	
🛃 GUI info v1.0.py	2020/5/25 17:55	Python File	

(8) Double-click to open the GUI info v1.0.py file, and the following picture will appear after opening:

🧖 C:\\	Windows\py.exe				×
192.16					^
	🖉 Adeept Arduino Robot	—	×		
1					
		Connect			

(9) After opening the file, the following interface will appear. We need to record this IP address, which will be used later: 192.168.3.69

www.adeept.com			Adeept
C:\Windows\py.exe			Aueept
192. 168. 3. 69			
🖉 Adeept Arduino Robot		×	
	Connect		

(10) Enter the Arduino software download program in the input box of Adeept Arduino Robot.The connected port number: COM4. Click the Connect button.As shown below:

0	ndows\py.exe			
192.168. COM4	3. 69			
	🖉 Adeept Arduino Robot	6. 	×	
	COM4	Connect		

(11)Enter the URL of the GwBlock graphical editor in the browser:

http://www.adeept.com/gwblock/?hd_mo=uno_r3.

After successfully entering the website, the interface is as follows:

GwBlack	Blocks	Python	Connecting device	
Logic				
Adeept Math				
Text		Setup		
Lists				
Colour				
► Hardware				
Time contro				
Variables				
Functions				
Device IP 192.168.3.6 [Lost connection] 🔿 🛛 🗙	193 F 4 8 8 1			



(12)Click the "Connecting device" button in the upper right corner. It will show as below:

5willnck		Blocks	Python	Connecting device	ĭ <
	Logic		- les les les les l <mark>e</mark> - les les les les les les	a la latitat al a la la la La la latitat al a la la la la	a can na an a
	Loops				
Adeept	Math				. 7 (b) 3 7 8 8 8 8 8 9 - 11 - 11 - 11 - 11 - 11 - 11 - 11 -
	Text		Setup		
	Lists				
Q	Colour				
<u> </u>	► Hardware				
	Time control				\oplus
	Variables				Ğ
	Functions				
Device IP 192.168.3.6 [Lost connection]	on] 산 🛛				

(13) In the pop-up box, enter the IP address in step (9): 192.168.3.69. And then click the Connecting button, as shown below:

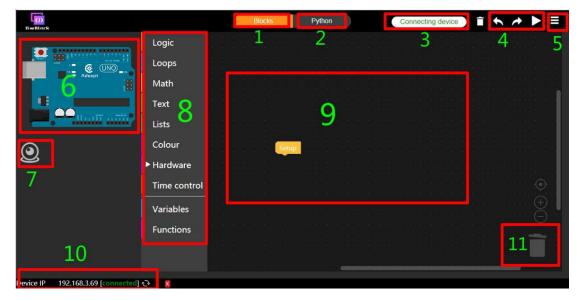
n					
			×		
	IP: <u>192.168</u> .	3.69			
			6 (L		
bur					
dware	Connecting	Cancel			
	connecting	Curreet			
e cont					
ablas					

(14) After a successful connection, as shown below, a green connected prompt will appear in the lower left corner. It means that we have successfully connected to the GwBlock graphical editor, with which we can realize the graphical programming of Arduino. Later I will teach you how to use GwBlock graphical editor.

www.adeept.co	om				Adeept
5wBlock		Blocks	Python	Connecting device	► → ► ≡
	Logic				
	Loops				
Adeept	Math				inan na an an an an Tao na an an an an
	Text		Setup		
	Lists				
()	Colour				- Sector en en en sector Sectores en en en sector
5	► Hardware				, narrair ar ar ar ar ar ar - Arrista ar ar ar ar ar ar - Arr
	Time control				
	Variables				
	Functions				a de la la Xila. Carla de la en a
Device IP 192.168.3.69 [connected]	2 🛛				

8.4 Get to know about Arduino's graphical editor GwBlock

The functions of the buttons on the main interface of the GwBlock editor will be described in detail below according to the function numbers in the picture. As shown below:



[1] Blocks: Click this button to switch to the programming mode of the graphical code block.

[2] Python: Click this button to display the edited graphical code block in the form of Python code.

【 3 】 Connecting device: Click this button to connect to the Arduino development board, which requires you to enter the IP address.

(4)

(1) is the cancel button.Click it to return to the state of the previous operation (cancel this operation).

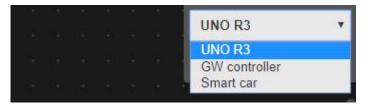
(2) is the forward button.Click it to advance to the state of the next operation.

(3) is the button to run the program. Click it to run the correct program we have compiled.

[5] **E**is a drop-down menu button:



Under the drop-down menu button, you can "Import project file" and "Save project file". In addition, by the drop-down button on the right of UNO R3, you can switch to the programming mode of different controllers. We are using Arduino UNO R3 version of the development board in the current course, so we choose UNO R3 mode to programmatically control Arduino.



You can also switch the language display mode of the editor by the drop-down



button to the right of English. Currently, we only support English and Simplified Chinese.



(6**)** is the icon of the Arduino UNO development board, indicating that it is currently in the Arduino programming mode.

[7] is the camera button, which is gray in the initial off state: When you click it,

the camera will turn red: indicating that the camera is on. At this time, a screen window will appear in the editing area on the right. As shown below:



[8] is the code instruction module toolbar. You can select the code instruction block you need here.

Ŧ		If ha	ardw	/are	mo	dule	- 1	< •	va	lue	4			
8		exec	ute					Ś		•	1			
4														



[9] is the editing area (code area or work area), where we edit the code instruction

block. Each code instruction block must be placed below

[10**]** is the connection status of the device. There are two states:

(1) The following is displayed when the device is not connected:

Device IP Empty [Not connected] 🔿 🛛 🛛

(2) After the device is successfully connected, the display is as follows:



[11] is a code trash, you can drag and drop the code instruction block to delete it.

8.5 Controlling the movement of the robotic arm with GwBlock graphical programming

8.5.1 Run the program for this lesson

1. After successfully connecting to the GwBlock graphical editor, you need to click the drop-down button in the upper right corner, as shown below:

W	ww.a	adee	ept.c	om							Ade	
	y 9		Cor	nne	ctin	g d	evic	e		K	h 🏕 🕨 🔳	
- 199											Import project file	
											Save project file	
											UNO R3 🔻	
1.66											English •	
											· · · · · · · · · · · · · · · · · · ·	

2. Then click Import project file to import the external project file. After opening it, a blank page will appear. You need to make a modification in the lower right corner and select All Files, as shown below:



3. Then the folder will be displayed. As shown below:

This PC > Local Disk (H:) > Adeept > A	deeptRoboticArmforArduinoV:	3_5 →	
Name	Date modified	Туре	Size
01 Software Package	8/4/2020 3:07 PM	File folder	
02 Course Code	8/4/2020 4:07 PM	File folder	

4. Find the user folder AdeeptRoboticArmforArduinoV3_5 \rightarrow 02 Course Code \rightarrow Lesson 8 block of Adeept, as shown below:

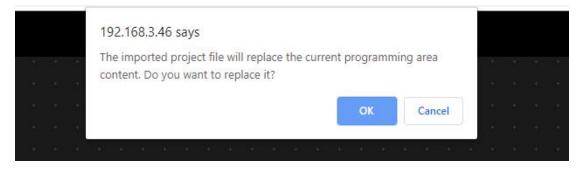


www.adeept.com			Adeep [.]
Name	Date modified	Туре	
Lesson 1 potentiometer	11/3/2020 10:51 AM	File folder	
Lesson 2 servo	11/3/2020 10:51 AM	File folder	
Lesson 3 OLED	11/3/2020 10:51 AM	File folder	
Lesson 4 EEPROM	11/3/2020 10:51 AM	File folder	
Lesson 6 Servo90	1/12/2021 2:08 PM	File folder	
Lesson 8 block	11/3/2020 10:51 AM	File folder	

5. Open the Lesson 8 block folder and select the "main.gwblock" file. This file is our graphical code program for this lesson. Click "Open" in the lower right corner, as shown below:

Name	Date modified	Туре	Size
📄 main.gwblock	7/20/2020 9:23 AM	GWBLOCK File	
📄 roboti.gwblock	7/20/2020 9:23 AM	GWBLOCK File	
Servo.gwblock	7/20/2020 9:23 AM	GWBLOCK File	
< ame: main.gwblock	~ All File	c (* *)	,

6. Click OK, as shown below:



7. Click the button **D** in the upper right corner, after successfully running the

program, you can control the movement of the robotic arm by rotating the potentiometer button on the Adeept Arm Drive Board.

When you rotate the A0 button, by controlling the rotation of the D1 servo, you can make the robotic arm rotate left and right, and the rotation range is $0\sim180^{\circ}$;

When you rotate the A1 button, by controlling the rotation of the D2 servo, you can control the robot arm to swing up and down, with a swing range of $0\sim180^\circ$;

When you rotate the A2 button, by controlling the rotation of the D3 servo, you can control the forearm part of the robotic arm to swing up and down, with a swing range of $0\sim180^{\circ}$;

When you rotate the A3 button, you can control the rotation of the foremost part of the robotic arm by controlling the rotation of the D4 servo, and the rotation range is $0\sim180^{\circ}$;

When you rotate the A6 button, by controlling the rotation of the D5 servo, you can control the opening and retraction of the clip structure of the robotic arm, ranging from 30 to 100° ;



8.5.2 Learning the code program for this lesson



In the GwBlock graphical editor, all code programs are executed from Setup

Initialize the servo.

		Setup
		Initialize Servo Motor : ID 🚺 💼 , PIN 🗧 🥊
		Initialize Servo Motor : ID 💶 -, PIN 😝 6
		Initialize Servo Motor : ID 2 , PIN 5
		Initialize Servo Motor : ID 💷 , PIN 👌 3
		Initialize Servo Motor : ID 💶 , PIN 🕴 11

Read the data of the potentiometer button.

repe	at (while -) T	rue
do	set A0 • to	Read Analog Value : PIN 0
	set A1 to	Read Analog Value : PIN 1
	set A2 to	Read Analog Value : PIN 12
	set A3 T to	Read Analog Value : PIN C 3
	set A6 🔹 to	Read Analog Value : PIN 6

Convert the read potentiometer analog data.

	set A0 to	A0 × 180 ÷ 1024	Ĩ.				
	set A1 to	A1 × 180 ÷ 1024					
	set 🗚 💽 to 🏮	A2: × 180 ÷ 1024					
	set A3 to	A3 × 180 ÷ 1024					
1.5	set A6 🔹 to 🗧	A6 × 60 ÷ 1024					
	set A6 • to	A6 + 50					

Control the movement of each servo respectively.



$\mathbf{x}_{i} = \mathbf{x}_{i} + \mathbf{x}_{i}$	Servo Motor Control : ID 💽 , Angle 📢	0 - 1			÷.	11			18
	Servo Motor Control : ID 1 . , Angle								
	Servo Motor Control : ID 2 , Angle								
	Servo Motor Control : ID 3 , Angle								
	Servo Motor Control : ID 4 , Angle								
18 10 St.			1000						



Lesson 9 Potentiometer control mode

In this lesson, we will introduce how to control the movement of the arm through the potentiometers on the Adeept Arm Drive Board.

9.1 Upload the Potentiometer_control.ino

1.Open the Arduino IDE software, as shown below:



2. In the Tools toolbar, find Board and select Arduino Uno, as shown below:

File Edit Sketch	Tools Help			
potentiometer	Auto Format Archive Sketch Fix Encoding & Reload	Ctrl+T		Ø.
{ val1 val2	Manage Libraries Serial Monitor Serial Plotter	Ctrl+Shift+I Ctrl+Shift+M Ctrl+Shift+L	180); 180);	^
val3 val4 val5	WiFi101 / WiFiNINA Firmware Upd Board: "Arduino Uno"	later	Boards Manager Arduino Yún	
Seria Seria	Port: "COM5" Get Board Info	E	Arduino Uno Arduino Duemilanove or Diecimila	
Seria Seria Seria	Programmer: "AVRISP mkll" Burn Bootloader 1.print ("A6:") ; Serial .	printin (va	Arduino Nano Arduino Mega or Mega 2560 Arduino Mega ADK	
Serial	l.println("**********	**");	Arduino Leonardo	

3.In the Tools toolbar, find "Port" and Select the port number of The Adeept Arm Drive Board , as shown below:



Ser	• 🗈 : vo90	Auto Format Archive Sketch Fix Encoding & Reload	Ctrl+T	
1	/***	Manage Libraries	Ctrl+Shift+I	*****
2	File	Serial Monitor	Ctrl+Shift+M	tionCode.ino
2	FITE	Serial Plotter	Ctrl+Shift+L	ictoncode. 110
3	Desci	WiFi101 / WiFiNINA Firmware U	ndator	vo rotates 90
4	Webs:	WITTOT / WITTNINA FITTIWATE O	puatei	
5	E-mai	Board: "Arduino Uno"		>
0	L-IIIa.	Port: "COM4"		Carial parts
6	Auth	Get Board Info		COM4
7	Date	Programmer: "AVRISP mkli"		N N

4. Click Open in the File drop-down menu:

	06a Arduino 1.8.1	2	<u> </u>	
Second second	th Tools Help			
New	Ctrl+N			4
Open	Ctrl+O			
Open Rec	ent			
Sketchbo				
Examples		e, to run once:		
Close	Ctrl+W			
Save	Ctrl+S			
Save As	Ctrl+Shift+S	, to run repeatedly:		
Page Setu	p Ctrl+Shift+P	, to full repeatedry.		
Print	Ctrl+P			
Preference	es Ctrl+Comma			
Quit	Ctrl+Q			

5.Find the folder AdeeptRoboticArmforArduinoV3_5 that we provide to the user. Open the folder 02 Course Code in it. Enter the Lesson 9 Potentiometer_control directory. Select Potentiometer_control.ino. This file is the code program we need in this course. Then click Open.

02 Course Code			
Vame Lesson 1 potentiometer Lesson 2 servo Lesson 3 OLED Lesson 4 EEPROM Lesson 5 Servo90	Date modified 11/3/2020 10:51 AM 11/3/2020 10:51 AM 11/3/2020 10:51 AM 11/3/2020 10:51 AM 11/3/2020 10:51 AM 1/12/2021 2:13 PM	Type File folder File folder File folder File folder File folder	Siz
Lesson 9 Potentiometer_control	1/ 3/2020 10:51 AM 1/ 2/2021 5:00 PM	File folder File folder	

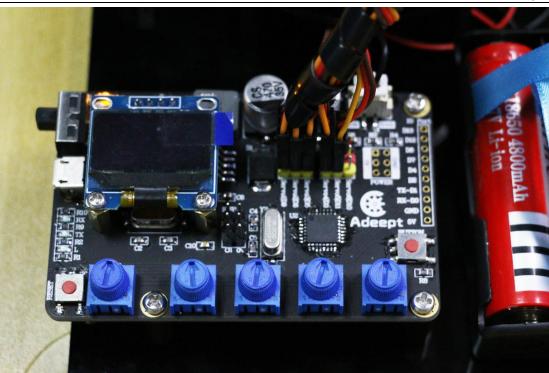
A

6.After opening, click to upload the code program to the Adeept Arm Drive Board. If there is no error warning in the console below, it means that the Upload is successful.

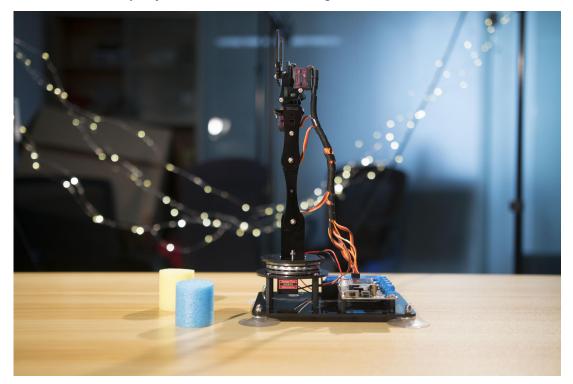
Done uploading.
Sketch uses 924 bytes (2%) of program storage space. Maximum is 32256 bytes. Global variables use 9 bytes (0%) of dynamic memory, leaving 2039 bytes for local variables. Maximum is 2048 bytes.
1 Arduino Uno on COM4

7.Next, unplug the USB cable connected to the robotic arm. Note: Do not turn on the power of the arm after downloading the program. Adjust the four potentiometers on the driver board to the center first, as shown below:





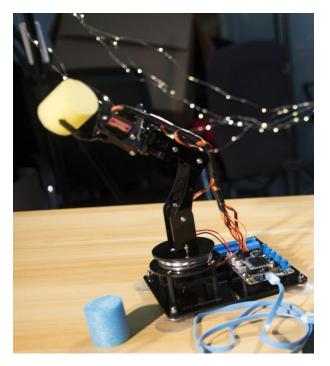
8.hen manually adjust the robotic arm to the position shown below:



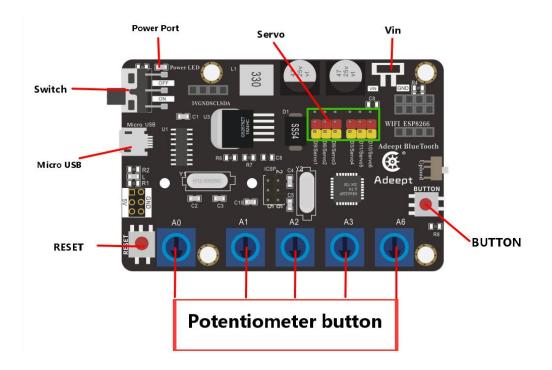
Gently support the robotic arm with your hand to prevent swinging arm. Turn on the power, and then rotate the four potentiometers on the driver board to control the

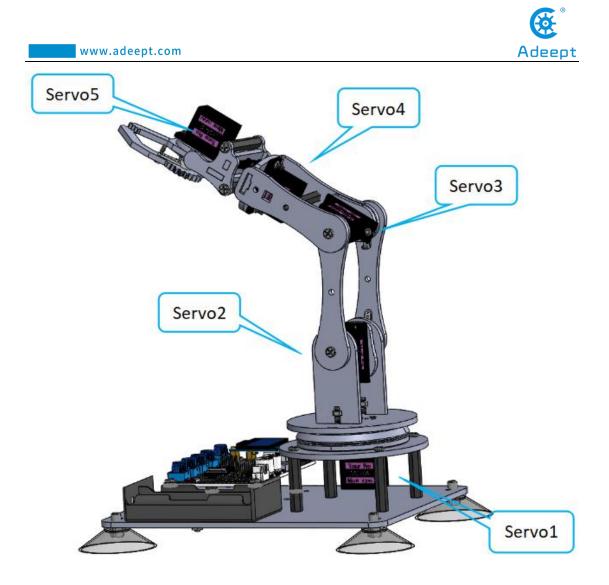


arm to clamp and carry objects. The rotation angle of Servo5 is set in the code.



9.2 How to control the robot arm by potentiometer





[Specific function descriptions]:

▲ The potentiometer A0 on the driver board controls the movement of servo 1, range from 0 to 180 degrees.

▲ The potentiometer A1 on the driver board controls the movement of servo 2, range from 0 to 180 degrees.

▲ The potentiometer A2 on the driver board controls the movement of servo 3, range from 0 to 180 degrees.

▲ The potentiometer A3 on the driver board controls the movement of servo 4, range from 0 to 180 degrees.



▲ The potentiometer A6 on the driver board controls the movement of servo 5, range from 35 to 90 degrees.

[Note] :

1.Potentiometer control mode is not very precise, there will be some delay, so it is best to turn the potentiometer button slowly when using.

2. The power of the tiller is very small, and can only clamp and carry relatively light objects.

3.Robotic arm works better with a fully charged battery.



Lesson 10 Learning mode

In this lesson, we will introduce the learning mode of the robot arm.

10.1 Upload the Learning.ino

1.Open the Arduino IDE software, as shown below:



2. In the Tools toolbar, find Board and select Arduino Uno, as shown below:

potentiometer File Edit Sketch 1	Arduino 1.8.13			×
potentiometer	Auto Format Archive Sketch Fix Encoding & Reload	Ctrl+T		₽ ▼
{ val1 val2 val3	Manage Libraries Serial Monitor Serial Plotter	Ctrl+Shift+I Ctrl+Shift+M Ctrl+Shift+L	180); 180); 180).	^
val4 val5 <mark>Seria</mark>	WiFi101 / WiFiNINA Firmware U Board: "Arduino Uno" Port: "COM5"	pdater 3	Boards Manager Arduino Yún Arduino Uno	
Sector Sector	Seria Get Board Info Seria Programmer: "AVRISP mkll"		Arduino Duemilanove or Diecimila Arduino Nano Arduino Mega or Mega 2560 Arduino Mega ADK Arduino Leonardo	

3.In the Tools toolbar, find "Port" and Select the port number of The Adeept Arm Drive Board , as shown below:



Ser	• 🗈 : vo90	Auto Format Archive Sketch Fix Encoding & Reload	Ctrl+T	
1	/***	Manage Libraries	Ctrl+Shift+I	*****
2	File	Serial Monitor Serial Plotter	Ctrl+Shift+M Ctrl+Shift+L	tionCode.ino
3	Desci			vo rotates 9
4	Webs:	WiFi101 / WiFiNINA Firmware U	pdater	
5	E-ma:	Port: "COM4"		> Casial and a
6	Auth	Get Board Info	-	🗸 СОМ4
7	Date	Programmer: "AVRISP mkli"		>

4. Click Open in the File drop-down menu:

sketch_jun06a	a Arduino 1.8.12 Tools Help		_	>
New	Ctrl+N			ø
Open	Ctrl+O			
Open Recen	t >			
Sketchbook				
Examples	>	e, to run once:		
Close	Ctrl+W			
Save	Ctrl+S			
Save As	Ctrl+Shift+S			
Page Setup	Ctrl+Shift+P	, to run repeatedly:		
Print	Ctrl+P			
Preferences	Ctrl+Comma			
Quit	Ctrl+Q			

5.Find the folder AdeeptRoboticArmforArduinoV3_5 that we provide to the user. Open the folder 02 Course Code in it. Enter the Lesson 10 Learning directory. Select Learning.ino. This file is the code program we need in this course. Then click Open.



02 Course Code	 Image: Second sec	
ame	Date modified	Туре
Lesson 1 potentiometer	11/3/2020 10:51 AM	File folder
Lesson 2 servo	11/3/2020 10:51 AM	File folder
Lesson 3 OLED	11/3/2020 10:51 AM	File folder
Lesson 4 EEPROM	11/3/2020 10:51 AM	File folder
Lesson 5 Servo90	1/12/2021 2:13 PM	File folder
Lesson 8 block	11/3/2020 10:51 AM	File folder
Lesson 9 Potentiometer, control	1/12/2021 5:00 PM	File folder
Lesson 10 Learning	1/12/2021 5:53 PM	File folder

6.After opening, click to upload the code program to the Adeept Arm Drive Board. If there is no error warning in the console below, it means that the Upload is successful.

Done uploading.	
Sketch uses 924 bytes (2%) of program storage space. Global variables use 9 bytes (0%) of dynamic memory,	Maximum is 32256 bytes. leaving 2039 bytes for local variables. Maximum is 2048 bytes.
1	Arduino Uno on COM4

7.Next, unplug the USB cable connected to the robotic arm.Powered by a fully charged battery.

8.After completing the above preparations, gently support the robotic arm and then turn on the power. You will see the working status of the current situation and the number of the remaining motions the robotic arm needs to be record display on the OLED.At this point, the robot arm goes into learning mode.

Note :

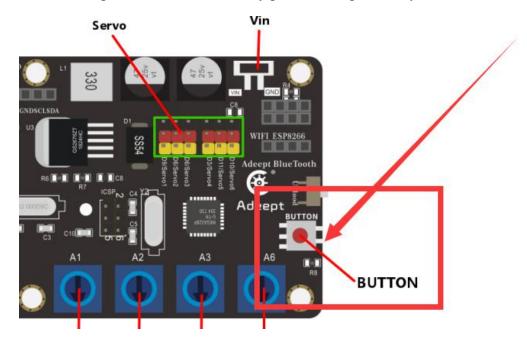
When learning this lesson, you must first do some configuration according to part 8 of lesson 0, otherwise you will encounter many errors when you download the program to the Adeept Arm Drive Board.



10.2 How to start the learning mode of robotic arm

10.2.1 Introduction to Learning Mode

In the learning mode, the robot arm can record different motion states or actions (up to 200 can be recorded, the recorded actions can be written into EEPROM), After re-powering, press the "BUTTON" for more than 8 seconds to enter the sport mode. In the motion mode, the working status of each servo will be displayed on the OLED, and the manipulator will automatically perform the previously recorded actions.



The specific operation method is as follows:

(1) Rotate the potentiometer on the drive board to control the mechanical arm in the X state of motion (clamping, straightening, bending, a certain position, etc.), press the "BUTTON" button on the drive board for about 2-3 seconds and release it. , The number of "remaining steps: 10" on the OLED screen will decrease by 1, which means that the robot arm successfully recorded the movement state in X.

(2) Continue to rotate the potentiometer on the drive board to control the robotic



arm in the Y motion state, press the "BUTTON" button on the drive board for about 2-3 seconds to release it, at this time, the "remaining steps: 9" item on the OLED screen The number will decrease by 1, indicating that the robot arm has successfully recorded the movement state in Y.

(3) Repeat the operation of step 1 until the number of "remaining steps: 9" on the OLED screen will be reduced to 0, and the robotic arm will complete the recording and automatically run all the motion states just recorded.

(4) Press the "RESET" button on the Adeept Arm Drive Board to restart the robotic arm to exit the automatic motion mode. At this time, the robotic arm is in the learning mode, so you can continue to repeat step 1 to re-record other motion states or actions.

(5). After the robotic arm is re-powered or restarted, press the "BUTTON" button for more than 8 seconds to enter the automatic motion mode, and the robotic arm will automatically run the motion state or action recorded last time.

Note :

1. The robotic arm product we provide is used for learning and experimentation. It cannot complete difficult imitation actions. It is recommended that you use it to complete some simple imitations, such as drawing triangles and line segments. Because everyone's abilities are different, errors will occur during operation. You often practice it. After you are familiar with it, you will find it very interesting. The important thing is that you can get other inspirations through the features of this product.

2.Please use a fully charged battery.

3.If you turn any of the potentiometers, the corresponding servo does not work, then you need to restart the robotic arm.



10.2.2 How to modify the number of recorded exercise states

1.Use the Arduino IDE to open the program "Learning.ino" of this lesson (in the folder "Lesson 10 Learning"):

<u>Eile</u> Edit	ning Arduino 1.8.13 <u>S</u> ketch <u>T</u> ools <u>H</u> elp
Learn) 🛅 🔝 📩 Save
1	/**************************************
2	File name: Learning.ino
3	Description: The robotic arm performs the r
4	the button itself.
5	Website: <u>www.adeept.com</u>
6	E-mail: support@adeept.com
7	Author. Tom

2.Find the 37th line of code, where "number = 10" means that the robotic arm can record up to 10 motion states or actions. You can modify the number to the number you want to record, and the maximum should not exceed 200.

```
35 int val4=90;//Read potentiometer 4 data
36 int val5=90://Read potentiometer 4 data
37 int number = 10;//Record the number of actions
38 int oranumber=0;
39 char string[4];//OLED display string
40 char string1[4];//OLED display string
```

3.Save the modified program, and then upload it to the Adeept Arm Drive Board again.



Lesson 11 Processing controls robotic arm

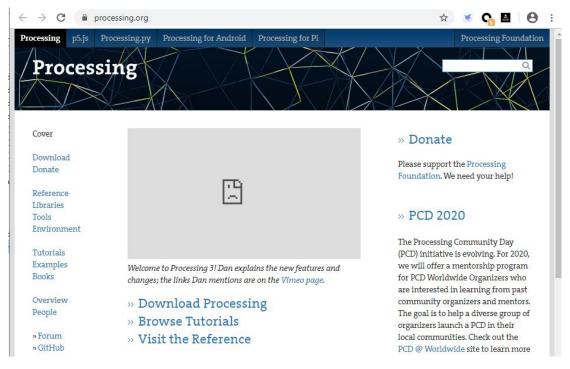
In this course, we will learn how to use Processing software to control robotic arms.

11.1 Download Processing

Processing is a revolutionary and forward-looking new computer language. Its concept is to introduce programming languages in the environment of electronic art and introduce the concept of electronic art to programmers. It is an extension of the Java language and supports many existing Java language architectures. It is not only much simpler in syntax, but has many intimate and user-friendly designs. Processing can be used on Windows, MAC OS X, MAC OS 9, Linux and other operating systems. The latest version is Processing 3. The work done in Processing can be used on the personal computer side or exported to the Internet in the form of Java Applets.

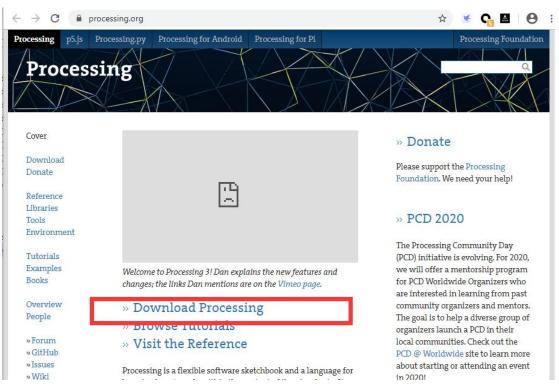
How to download Processing?

1. Enter this URL with Google Chrome: https://processing.org/





2. Click Download Processing, as shown below:



3. The operating system we choose to use here is windows 64-bit, select

"Windows 64-bit".



"processing-3.5.4-windows64.zip".



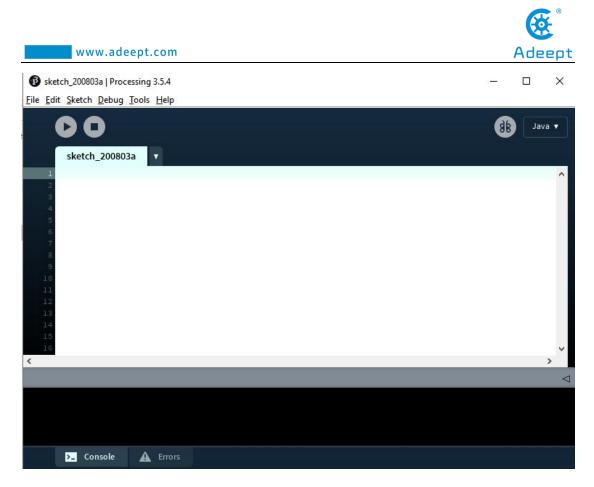


5.After extracting this file, you can get the following file, just click to run processing, it can be run directly without installation.

Local Disk (I:) > processing-3.5.4-windows64 > processing-3.5.4

Name	Date modified	Туре	Size
core	1/17/2020 12:16 PM	File folder	
java	1/17/2020 12:17 PM	File folder	
📙 lib	1/17/2020 12:16 PM	File folder	
modes	1/17/2020 12:16 PM	File folder	
tools	1/17/2020 12:16 PM	File folder	
processing.exe	1/17/2020 12:16 PM	Application	613 KB
📧 processing-java.exe	1/17/2020 12:16 PM	Application	30 KB
revisions.txt	1/17/2020 12:16 PM	Text Document	370 KB

6. The interface is as follows after the Processing runs



7.the library file controlP5 needs to be added.

AdeeptProcessingArmRobot	Processing 3.4		
File Edit Sketch Debug Tools	Help		
Run Present Tweak Stop	Ctrl+R Ctrl+Shift+R Ctrl+Shift+T	***	B Java 🔻
2 F Import Library		Add Library	E
1 / 2 F 3 D 4 Add File 7 A ✓ AddeptProcessin	der Ctrl+K	DXF Export Network	
7 A 🗸 AdeeptProcessin	gArmRobot (Java)	PDF Export	
import controlP5.*;	*****	Serial SVG Export	
11 import processing.se	rial.*;	Contributed	_
13 ControlP5 cp5; 14		ControlP5	
15 controlP5.Button b1; 16 controlP5.Button b2; 17 controlP5.Button m1; 18 controlP5.Button m2;			
<pre>19 controlP5.Button m3;</pre>			•
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Sa Console	Errors		



Then search controlP5 (If you do not find it in the list, please close this window, reopen it, and search again). Finally click Install

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Andreas Schlegel	
↓ Install 2.2.6 in: © Update	stalled
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8.Let's write a simple code that implements the following functions "Change the variable to create a moving line. When the line moves out of the window edge, the variable becomes 0 and the line goes back to the bottom of the screen

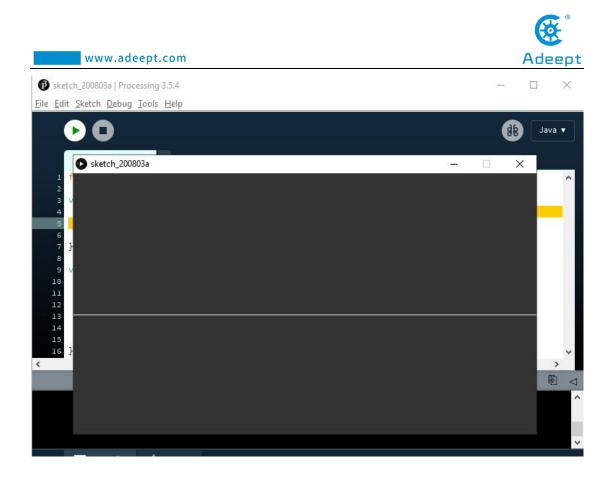


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	Java 🔻
sketch_200803a	
1 float a;	^
<pre>2 3 void setup(){ 4 size(640,360); 5 stroke(255); 6 a=height/2; 7 } </pre>	
<pre>8 9 void draw(){ 10 background(51); 11 line(0,a,width,a); 12 a=a-0.5; 13 if(a<0){ 14 a=height; </pre>	
15 } 16 }	
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9.Click "Run".

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15 } 16 }		~
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	E.	2 <

10.Running effect is as follow.



11.2 Upload the AdeeptArmRobot.ino

The AdeeptArmRobot.ino is a program to control the robotic arm servo.

1.Open the Arduino IDE software, as shown below:



2. In the Tools toolbar, find Board and select Arduino Uno, as shown below:



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potentiometer File Edit Sketch To					×
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val3 val4	WiFi101 / WiFiNINA Firmware U	Jpdater	Boards Manager	1	
val5	Board: "Arduino Uno"		Arduino Yún		
Seria Seria	Port: "COM5" Get Board Info		Arduino Uno Arduino Duemilanove or Diecimila		
Seria Seria	Programmer: "AVRISP mkll" Burn Bootloader	:	Arduino Nano Arduino Mega or Mega 2560		
the second second	.print("A6:");Seria .println("********		Arduino Mega ADK Arduino Leonardo		

3.In the Tools toolbar, find "Port" and Select the port number of The Adeept Arm Drive Board , as shown below:

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3	Desci	WiFi101 / WiFiNINA Firmware U	Indator	vo rotates 90
4	Webs:	WIFIIUT / WIFININA FIIMWare 0	puater	-
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5	E-ma:	Port: "COM4"		Carial parts
6	Auth	Get Board Info		🖌 СОМ4
7	Date	Programmer: "AVRISP mkll"	3	>

4. Click Open in the File drop-down menu:

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Print	Ctrl+P						
Preferences	Ctrl+Comma						
Quit	Ctrl+Q						

5.Find the folder AdeeptRoboticArmforArduinoV3_5 that we provide to the user. Open the folder 02 Course Code in it. Enter the Lesson 11 Processing \rightarrow AdeeptArmRobot directory. Select AdeeptArmRobot.ino. This file is the code program we need in this course. Then click Open.

Lesson 11 Processing	G Ø 📂 🖽 -		
ame A	Date modified	Туре	
AdeeptArmRobot	1/13/2021 11:52 AM	File folder	
ProcessingArmKobot	1/13/2021 11:50 AM	File folder	

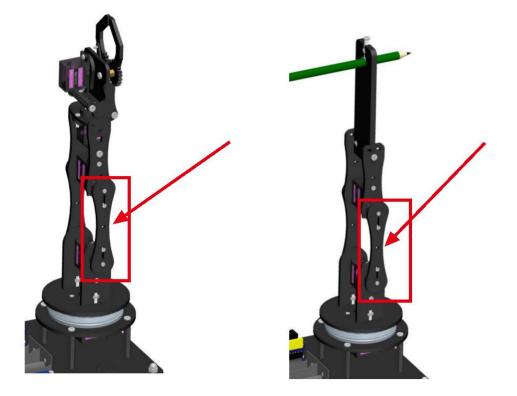
6.After opening, click to upload the code program to the Adeept Arm Drive Board. If there is no error warning in the console below, it means that the Upload is successful.



Done uploading. Sketch uses 924 bytes (2%) of program storage space. Maximum is 32256 bytes. Global variables use 9 bytes (0%) of dynamic memory, leaving 2039 bytes for local variables. Maximum is 2048 bytes. Arduino Uno on COM4

7. After downloading, close AdeeptArmRobot.ino

8.Note that the arm is still connected to the computer with the USB cable. Rotate the arm to the position as shown in the figure below(Manually remove and adjust without power supply)



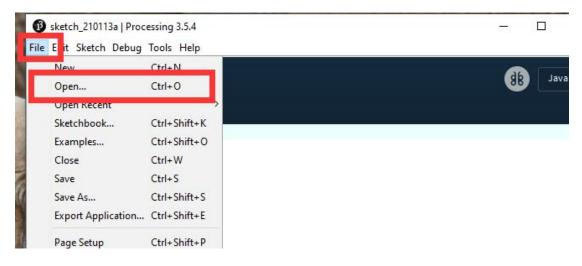
11.3 Run the ProcessingArmRobot.pde

Note that the arm is still connected to the computer with the USB cable.

1.Open the Processing software, as shown below:



2. Click Open in the File drop-down menu::



3.Find the folder AdeeptRoboticArmforArduinoV3_5 that we provide to the user. Open the folder 02 Course Code in it. Enter Lesson the 11 Processing→ProcessingArmRobot directory. Select ProcessingArmRobot.pde. This file is the code program we need in this course. Then click Open.

Name	Date modified	Туре
AdeeptArmRobot	1/13/2021 11:52 AM	File folder
ProcessingArmRobot	1/13/2021 11:50 AM	File folder



5.The interface of successful running is as below, Provides two ways to control the robotic arm:keyboard and mouse.

ProcessingArmRobot		- 🗆 X
Adeept Roboti	c Arm	
keyboard	mouse	

6.Click "keyboard" the following interface will appear. Next, press the corresponding button on the keyboard to control the arm.

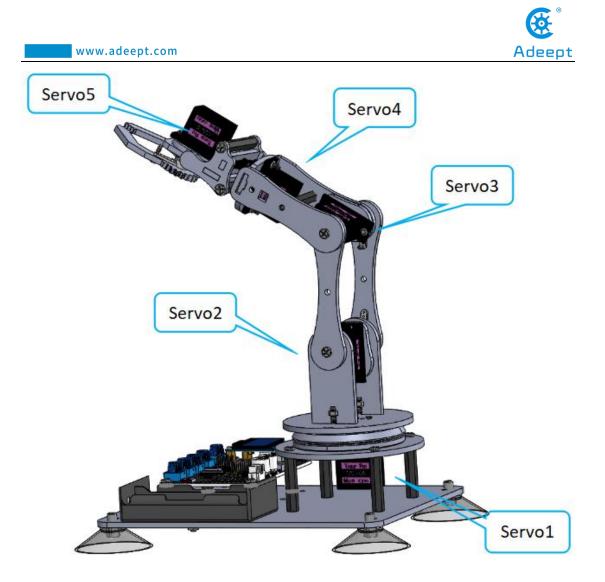
1."Q" and "W" control servo5 (Gripper), The "Q" button is to control the gripper to open, the "W" button is to control the gripper to close.

2."E" and "R" control servo4 (Rotate),"E" button is to turn to the left,"R" button is to turn to the right.

3."T" and "Y" control servo3 (Elbow).

4."U" and "I" control servo2 (Shoulder).

5."O" and "P" control servol (Base).



7.Click "mouse" and the following interface will appear.click the corresponding button, the robotic arm will make the corresponding movement.

- 1."Gripper+" and "Gripper-" control the servo5,
- 2."Rotate+" and "Rotate-" control the servo4,
- 3."Elbow+" and "Elbow-" control the servo3,
- 4."Shoulder+" and "Shoulder-" control the servo2,
- 5." Base+" and "Base-" control the servol.



				Косср
Adeept	Ro	boti	ic Arm	
keyboard			mouse	
	Gripper+ Rotate+ Elbow+	Gripper- Rotate- Elbow-		
	Shoulder+	Shoulder-		
Mouse Activated.	Base+	Base-	www.ade	ept.com



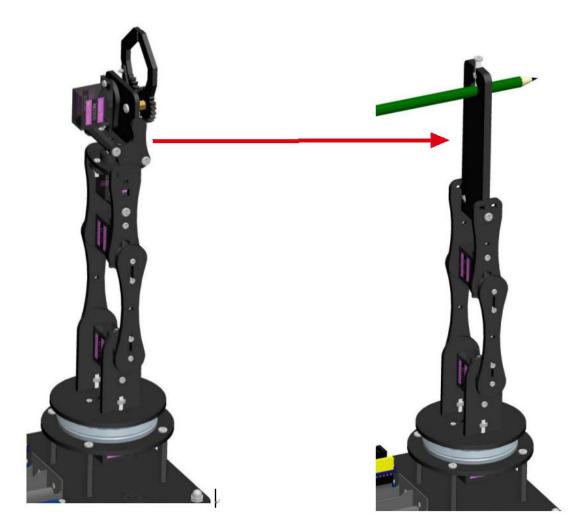
Lesson 12 Imitation function(Pen)

In this lesson, we will introduce the Imitation function mode of the robot arm.

12.1 Prepare

[Refit] :

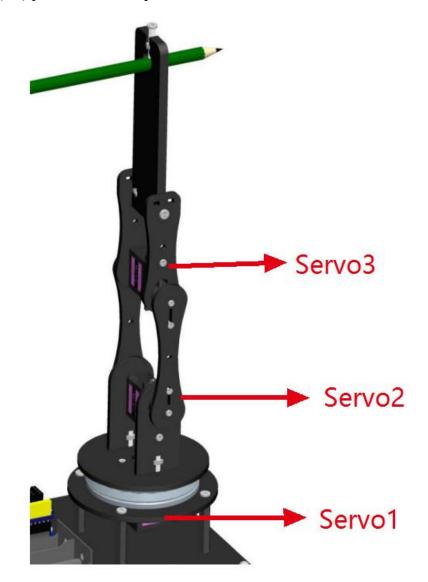
You need to transform the robotic arm into the structure of the picture on the right: Replace the claws of the robotic arm with pens.



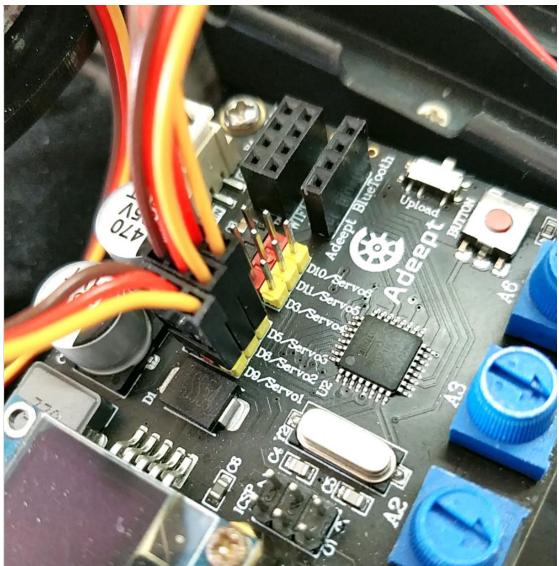
[Circuit] :



Connect Servo1, Servo2 and Servo3 on the robotic arm to Servo1 (D9), Servo2 (D6) and Servo3 (D5) ports on the Adeept Arm Drive Board.







12.2 Upload the AdeeptSimulation.ino

1. Open the Arduino IDE software, as shown below:



2. In the Tools toolbar, find Board and select Arduino Uno, as shown below:



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potentiometer File Edit Sketch To			-		×
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val3 val4	WiFi101 / WiFiNINA Firmware	Jpdater	Boards Manager		
val5	Board: "Arduino Uno"		Arduino Yún		
Seria Seria	Port: "COM5" Get Board Info		Arduino Uno Arduino Duemilanove or Diecimila		
Seria Seria	Programmer: "AVRISP mkll" Burn Bootloader		Arduino Nano Arduino Mega or Mega 2560		
	.print("A6:"); Seria .println("********		Arduino Mega ADK Arduino Leonardo		

3.In the Tools toolbar, find "Port" and Select the port number of The Adeept Arm Drive Board , as shown below:

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2	File	Serial Monitor	Ctrl+Shift+M	tionCode.ino
2	CITE.	Serial Plotter	Ctrl+Shift+L	croncode. Ino
3	Desci	WiFi101 / WiFiNINA Firmware U	Indator	vo rotates 90
4	Webs:	WIFIIUT / WIFININA FIIMWare 0	puater	-
E	17	Board: "Arduine Une"		>
5	E-ma:	Port: "COM4"		Carial parts
6	Auth	Get Board Info		🖌 СОМ4
7	Date	Programmer: "AVRISP mkll"	3	>

4. Click Open in the File drop-down menu:

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Quit	Ctrl+Q						

5.Find the folder AdeeptRoboticArmforArduinoV3_5 that we provide to the user. Open the folder 02 Course Code in it. Enter the Lesson 12 Imitation_function directory. Select AdeeptSimulation.ino. This file is the code program we need in this course. Then click Open.

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	11/3/2020 10:51 AM 1/12/2021 2:13 PM 11/3/2020 10:51 AM 1/12/2021 5:00 PM 1/12/2021 5:53 PM 1/13/2021 11:50 AM	11/3/2020 10:51 AM File folder 1/12/2021 2:13 PM File folder 11/3/2020 10:51 AM File folder 1/12/2021 5:00 PM File folder 1/12/2021 5:53 PM File folder 1/12/2021 11:50 AM File folder

6.After opening, click to upload the code program to the Adeept Arm Drive Board. If there is no error warning in the console below, it means that the Upload is successful.



Done uploading. Sketch uses 924 bytes (2%) of program storage space. Maximum is 32256 bytes. Global variables use 9 bytes (0%) of dynamic memory, leaving 2039 bytes for local variables. Maximum is 2048 bytes.

7.Next, unplug the USB cable connected to the robotic arm.Powered by a fully charged battery.

8.After completing the above preparations, gently support the robotic arm and then turn on the power. You will see the working status of the current situation and the number of the remaining motions the robotic arm needs to be record display on the OLED.At this point, the robot arm goes into imitation mode.

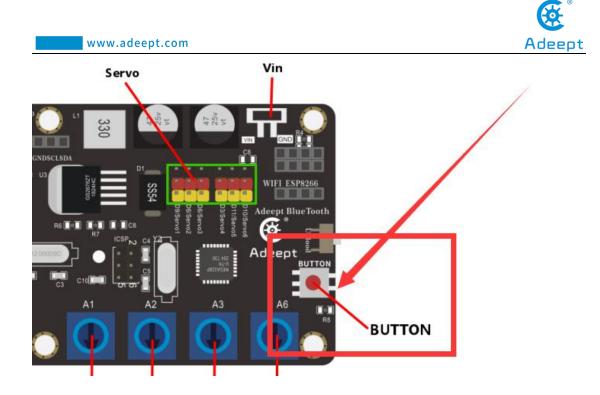
[Note] :

When learning this lesson, you must first do some configuration according to part 8 of lesson 0, otherwise you will encounter many errors when you download the program to the Adeept Arm Drive Board.

12.3 How to start the imitation mode of robotic arm

12.3.1 Introduction to imitation Mode

In the imitation mode, the robot arm can record different motion track or actions (up to 333 can be recorded, the recorded can be written into EEPROM), After re-powering, press the "BUTTON" for more than 8 seconds to enter the sport mode. In the motion mode, the working status of each servo will be displayed on the OLED, and the manipulator will automatically perform the previously recorded motion track or actions.



The specific operation method is as follows:

(1) Rotate the potentiometer (A0, A1, A2) on the drive board to control the mechanical arm in the X track of motion, press the "BUTTON" button on the drive board for about 2-3 seconds and release it., The number of "remaining steps: 3" on the OLED screen will decrease by 1, which means that the robot arm successfully recorded the motion track in X.

(2) Continue to rotate the potentiometer (A0, A1, A2) on the drive board to control the robotic arm in the Y track of motion, press the "BUTTON" button on the drive board for about 2-3 seconds to release it, at this time, the "remaining steps: 2" item on the OLED screen The number will decrease by 1, indicating that the robot arm has successfully recorded the motion track in Y.

(3) Repeat the operation of step 1 until the number of "remaining steps: 1" on the OLED screen will be reduced to 0, and the robotic arm will complete the recording and automatically run all the motion track just recorded.

(4) Press the "RESET" button on the Adeept Arm Drive Board to restart the robotic arm to exit the automatic motion mode. At this time, the robotic arm is in the



imitation mode, so you can continue to repeat step 1 to re-record other motion track or actions.

(5). After the robotic arm is re-powered or restarted, press the "BUTTON" button for more than 8 seconds to enter the automatic motion mode, and the robotic arm will automatically run the motion track or action recorded last time.

[Note] :

1. The robotic arm product we provide is used for learning and experimentation. It cannot complete difficult imitation actions. It is recommended that you use it to complete some simple imitations, such as drawing triangles and line segments. Because everyone's abilities are different, errors will occur during operation. You often practice it. After you are familiar with it, you will find it very interesting. The important thing is that you can get other inspirations through the features of this product.

2.Please use a fully charged battery.

3.If you turn any of the potentiometers, the corresponding servo does not work, then you need to restart the robotic arm

12.3.2 How to modify the number of recorded exercise states

1.Use the Arduino IDE to open the program "AdeeptSimulation.ino" of this lesson (in the folder "Lesson 12 Imitation function"):



2.Find the 15th line of code, where "number = 3" means that the robotic arm can record up to 3 motion track or actions. You can modify the number to the number you want to record, and the maximum should not exceed 333.

3.Save the modified program, and then upload it to the Adeept Arm Drive Board again.



Lesson 13 Processing controls robotic arm to write

and draw

In this course, we will learn how to use Processing software to control robotic arms write and draw.

13.1 Upload the WritingAndDrawing.ino

1.Open the Arduino IDE software, as shown below:



2. In the Tools toolbar, find Board and select Arduino Uno, as shown below:

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val3 val4 val5	WiFi101 / WiFiNINA Firmware Up Board: "Arduino Uno"	dater	Boards Manager Arduino Yún	
Seria Seria	Get Board Info		Arduino Uno Arduino Duemilanove or Diecimila Arduino Nano	
	Flogrammer. Avhise mki	-	Arduino Mega or Mega 2560	

3.In the Tools toolbar, find "Port" and Select the port number of The Adeept Arm Drive Board , as shown below:

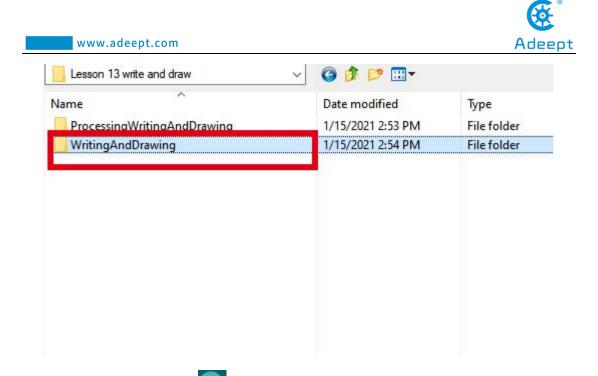


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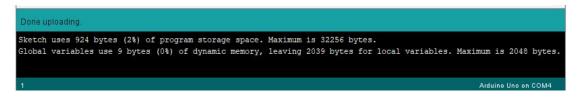
4. Click Open in the File drop-down menu:

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Examples	>	e, to run once:		
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Save As	Ctrl+Shift+S	, to run repeatedly:		
Page Setup	Ctrl+Shift+P	, to full repeatedry.		
Print	Ctrl+P			
Preferences	Ctrl+Comma			
Quit	Ctrl+Q			

5.Find the folder AdeeptRoboticArmforArduinoV3_5 that we provide to the user. Open the folder 02 Course Code in it. Enter the Lesson 13 write and draw \rightarrow WritingAndDrawing directory. Select WritingAndDrawing.ino. This file is the code program we need in this course. Then click Open.



6.After opening, click to upload the code program to the Adeept Arm Drive Board. If there is no error warning in the console below, it means that the Upload is successful.



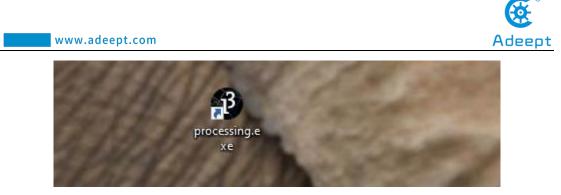
7. After downloading, close WritingAndDrawing.ino

8.Note that the arm is still connected to the computer with the USB cable.Turn on the power supply.

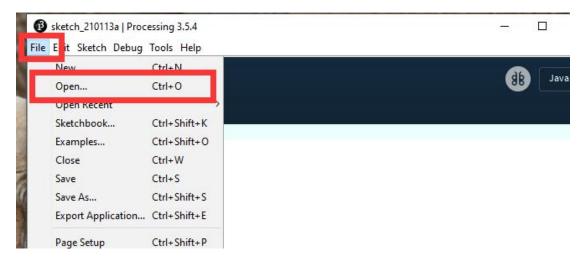
13.2 Run the ProcessingWritingAndDrawing.pde

Note that the arm is still connected to the computer with the USB cable.Turn on the power supply.

1.Open the Processing software, as shown below:



2. Click Open in the File drop-down menu::

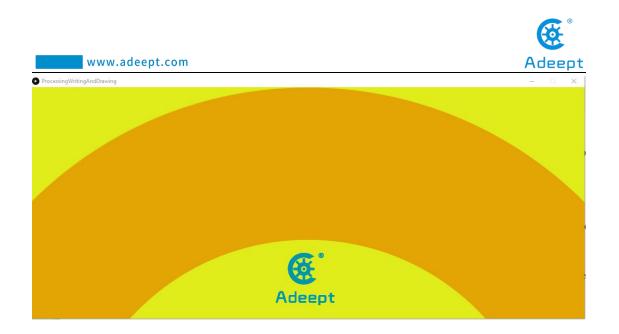


3.Find the folder AdeeptRoboticArmforArduinoV3_5 that we provide to the user. Open the folder 02 Course Code in it. Enter the Lesson 13 write and draw→WritingAndDrawing directory. Select ProcessingWritingAndDrawing.pde. This file is the code program we need in this course. Then click Open.

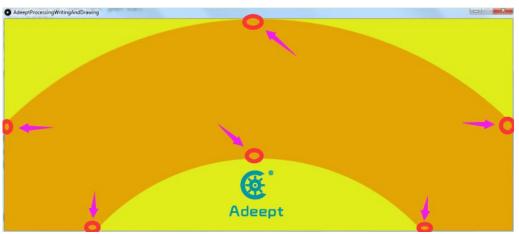


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1 /**********************************	*****	*****	*		,
 File name: AdeeptProcessingWr Description: Control the robo 			ugh the upper		
		en by Processing.	ugn the upper		
5 Website: www.adeept.com					
6 E-mail: support@adeept.com 7 Author: Tom					

5. Then click "Run" to run the control panel program, the following control interface will appear:



7.Draw or write in the yellow area with the mouse, you will see that the robotic arm paints what we depict on the control panel on the paper. Note that due to errors in the servo, etc., the content depicted by the arm will be slightly biased.

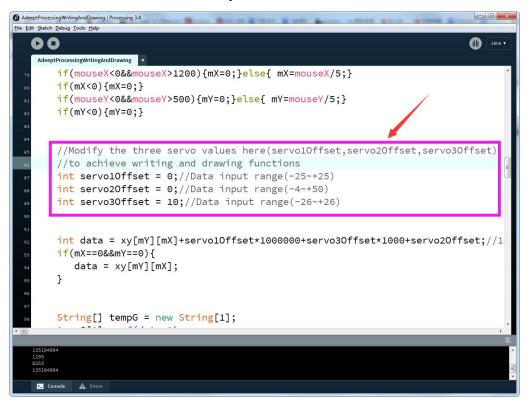


8.Click the dots as shown below:

9.Click on each point to see if the pen tip falls on the paper. If it is not or is suspended in the air, three parameters need to be modified. These three parameters are to fine-tune the offset of the servo. In this experiment, three servo systems need to be adjusted initially. Otherwise, the pen may not be able to write and draw, or produce bad fonts (note that there is a certain error, these three parameters do not need to be precise). In the process of debugging, you will find that there are several sets of data

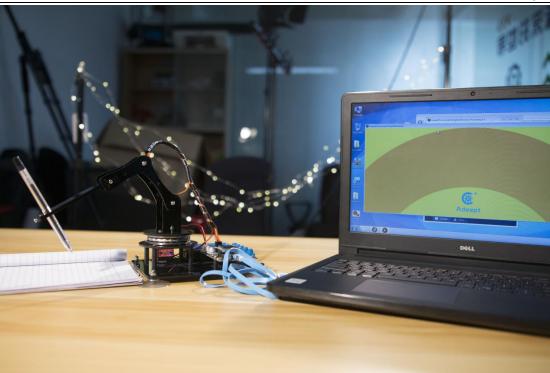


that can make the robot work normally.



10.After modifying the three parameters to make the tip of the pen reach to the paper (do not make the tip press against the paper), click "Run" to run the control panel program. The robotic arm will paint as you write or draw in the dark yellow area with the mouse.







Sharing Perfects Innovation

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