



Introduction to Robotics

Manipulation and Programming

Unit 1: Introduction

ASSEMBLE AND OPERATING XARM

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Objective

The study of Robotics including:

- Applications of Robots
- Manipulation of Robots
- Design of Robots
- Fundamental research of Robotics

A robot arm can help the study of the manipulation of robot, the sensor-servo architecture, and the study of the robotics kinematics.



Disclaimer

- All robotics information are obtained from the robot manufacturer directly with their consent to use them for educational purpose.
- The course designer has no personal connection with the manufacturer, nor will we promote the sale of the product. The robot arm is chosen mainly because of the budget, ease of use, and the robot's features.

XARM

SECTION 1





XARM

- xArm is a programmable mechanical arm with feedback, it contains six serial servos. Each servo can display temperature, position, voltage. Each servo has RGB indicator to present the status of the servo. It supports computer programming control, mobile app and joystick control, and can also be manually programmed offline.
- This XARM is accompanied by a second development kit, which contains more than a dozen electronic modules and structural components.





Dry Lab

- This course may be broadcast or delivered online. In an online environment, the lab work is harder to be conducted.
- A robotics with proper programming interface and easy manipulation can enable remote robot operation demonstration. The programming software (Arduino) can also enable dry lab practice or robot simulation.



XARM Features

- A. Powerful power: Using serial bus servo LX-15D as a power source for robotic arms. Full metal gear, high precision imported potentiometer. Torsional force, precise angle. Servo support angle read back, voltage feedback, temperature feedback, alarm indicator and servo protecting .
- B. Powerful master control system: Robotic controller uses **ARM** core CPU, built-in **Bluetooth** module and **16M** Storage memory, single action group can hold 510 actions. Better experience programming fun.
- C. Simple wiring scheme: Direct connection 7.5V DC power adapter, no need for any voltage regulator module. The handle receiver uses terminal design, plug and play, so greatly reduces the difficulty of wiring and saves time.



XARM Features

- D. Suction cup design: Using the vacuum chuck, the robot arm can be stably fixed on the table to prevent the robot arm from slipping due to movement.
- E. Various programming and controlling methods: Support mobile programming, computer programming and offline manual programming and support mouse, mobile phone, handle, computer control.
- F. Extensive development: Support for secondary development of Scratch/Arduino, providing rich tutorials



 4pcs M4*32 Copper Column	 4pcs M4*20 Screw	 4pcs M3*8 Nylon Column	 4pcs M4*16 Screw	 4pcs M4*8 Screw	 43pcs M3*6 Screw (M3*5 Screw)	 16pcs M2.5*6 Screw
		 4pcs M4 Screw Nut	 4pcs M2 Screw Nut	 4pcs Flat gasket	 3pcs M3*6 Assistant screw	 4pcs Spring washer

XARM Assembly

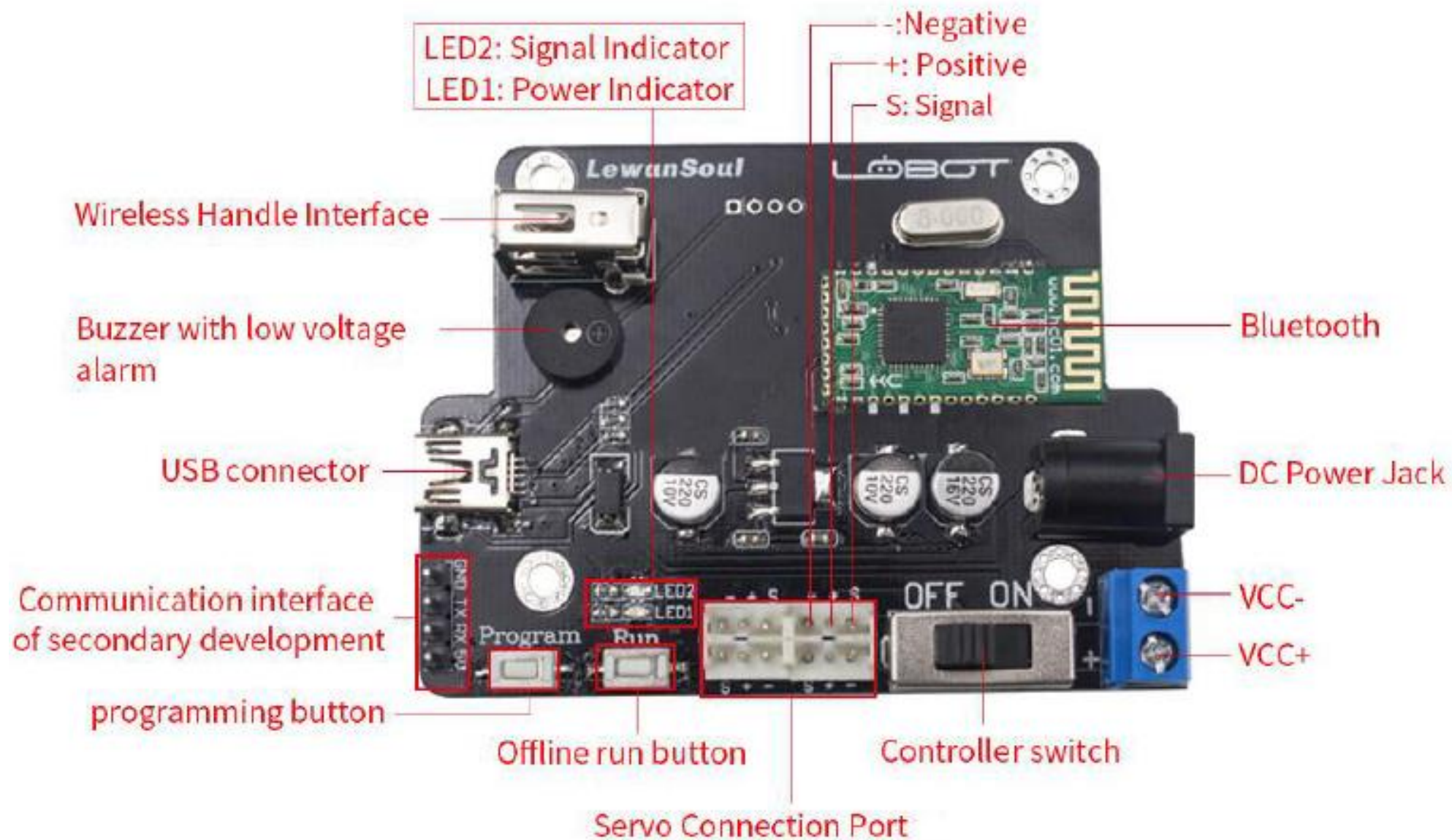
SECTION 2

XARM Wiring

SECTION 3

Controller

SECTION 4





Serial Bus Servo



Servo LX-15D(Essential parameter)

Product name: LX-15D Serial Bus Intelligent Servo

Product weight: 43.3g

Product size: 44.02mm*22.92mm*27.00mm

Rotation speed: 0.18sec/60degree(4.8v)

0.15sec/60degree(6v)

Servo accuracy: 0.24degree

Corner range: 0-240degree(deviation30 degree)

Stall torque: 15kg.cm(6v) 17kg.cm(7.4v)

Servo ID: 0-253(user settings)

Storage: Power down and save user settings

Work voltage:5-8.4V

Length of wire:10cm, other

Feedback features: Support

Control style: Serial

Communication baud rate: 115200

Motor type: Carbon (310:1)

Gear type: Metal

Parameter feedback: Temperature, Voltage, Position

Software and Manipulation Modes

SECTION 5



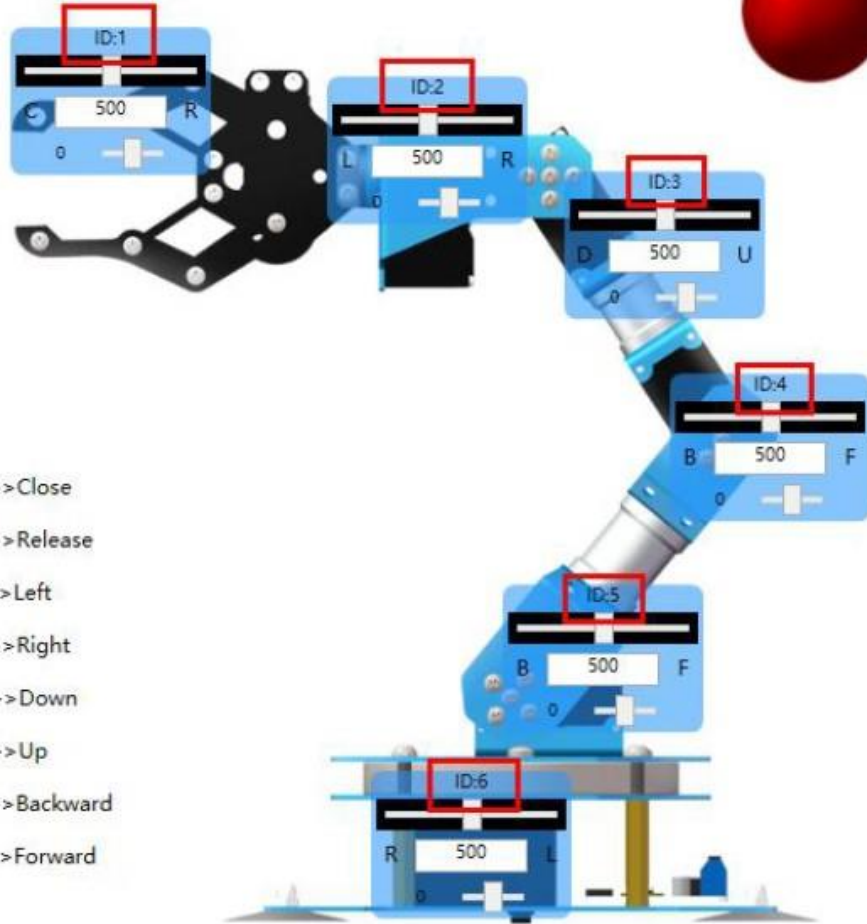
XARM Manipulation Modes

- PC Touch Screen/Mouse control
- Cell Phone App control
- Remote PS-2 Controller (alike, not the same)
- PC Program control (Action Groups)
- Arduino Program control

xArm V2.4

Normal mode Servo Test

English ▾



PC Touch
Screen or
Mouse Control

X-Arm



My X-Arm

Easy to control X-Arm



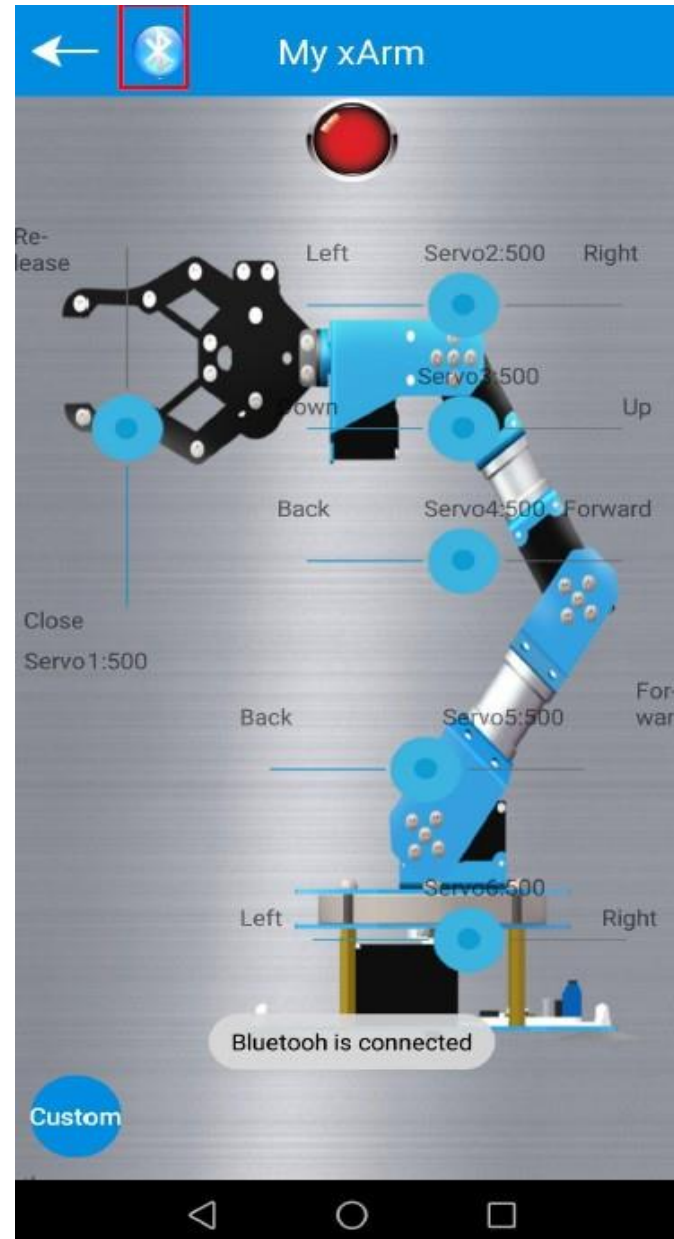
Create

Use your imagination to
achieve whimsy ideas

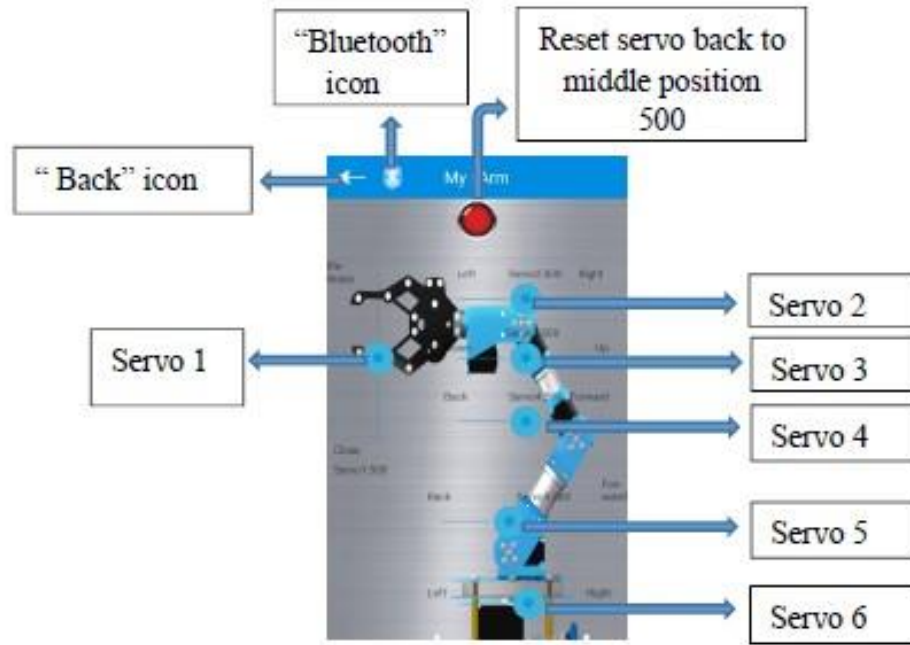


My action

View action items that
have been created

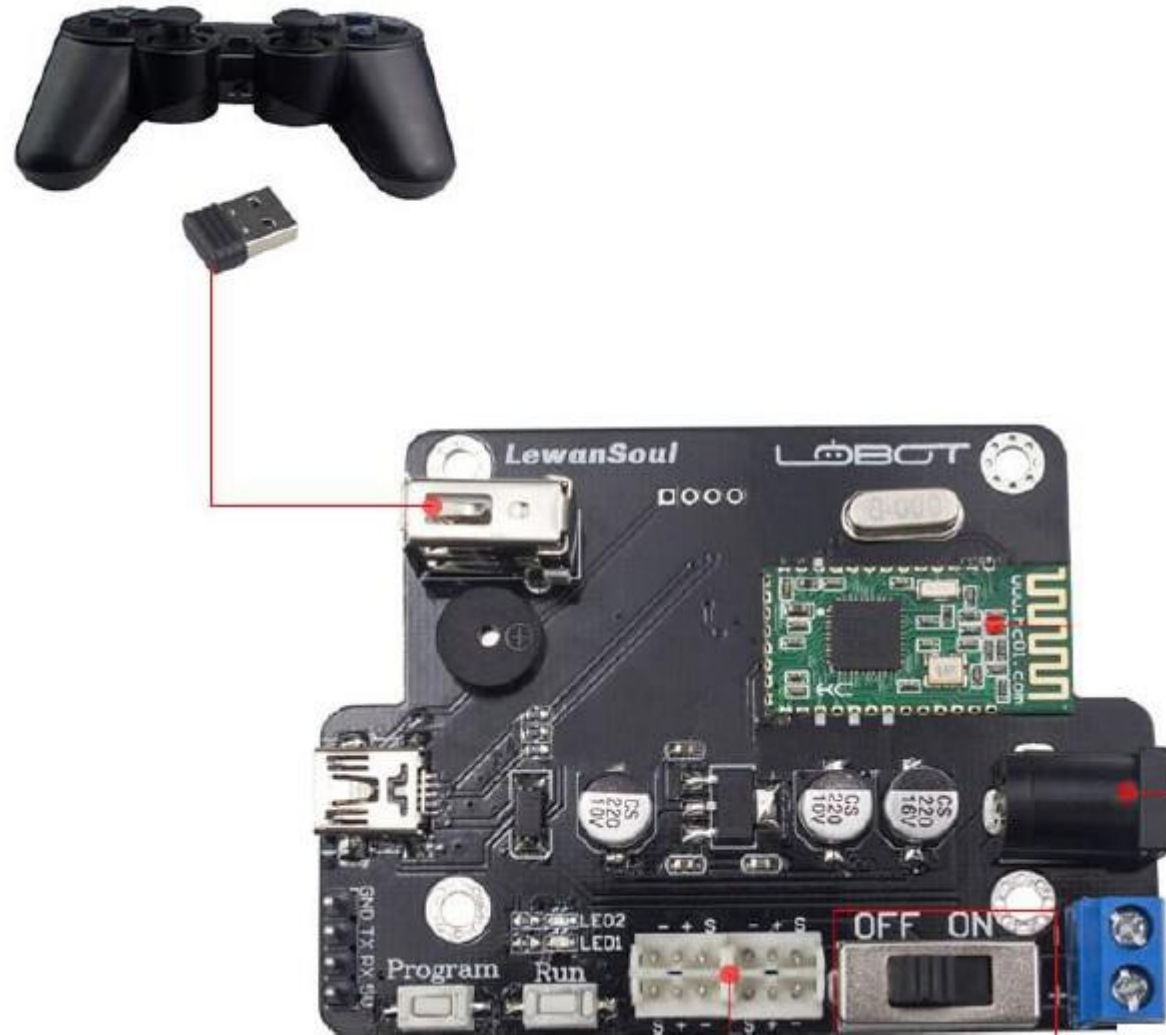


Cell Phone App Control



Cell Phone App Control

Servo	Instructions
Servo 1	Mechanical paw "Close" and "Release" (the range is 0-1000)
Servo2	xArm Left and Right rotation(the range is 0-1000)
Servo3	xArm Down and Up movement(the range is 0-1000)
Servo4	xArm Back and Forward movement(the range is 0-1000)
Servo5	xArm Back and Forward movement(the range is 0-1000)
Servo6	xArm Left and Right rotation(the range is 0-1000)



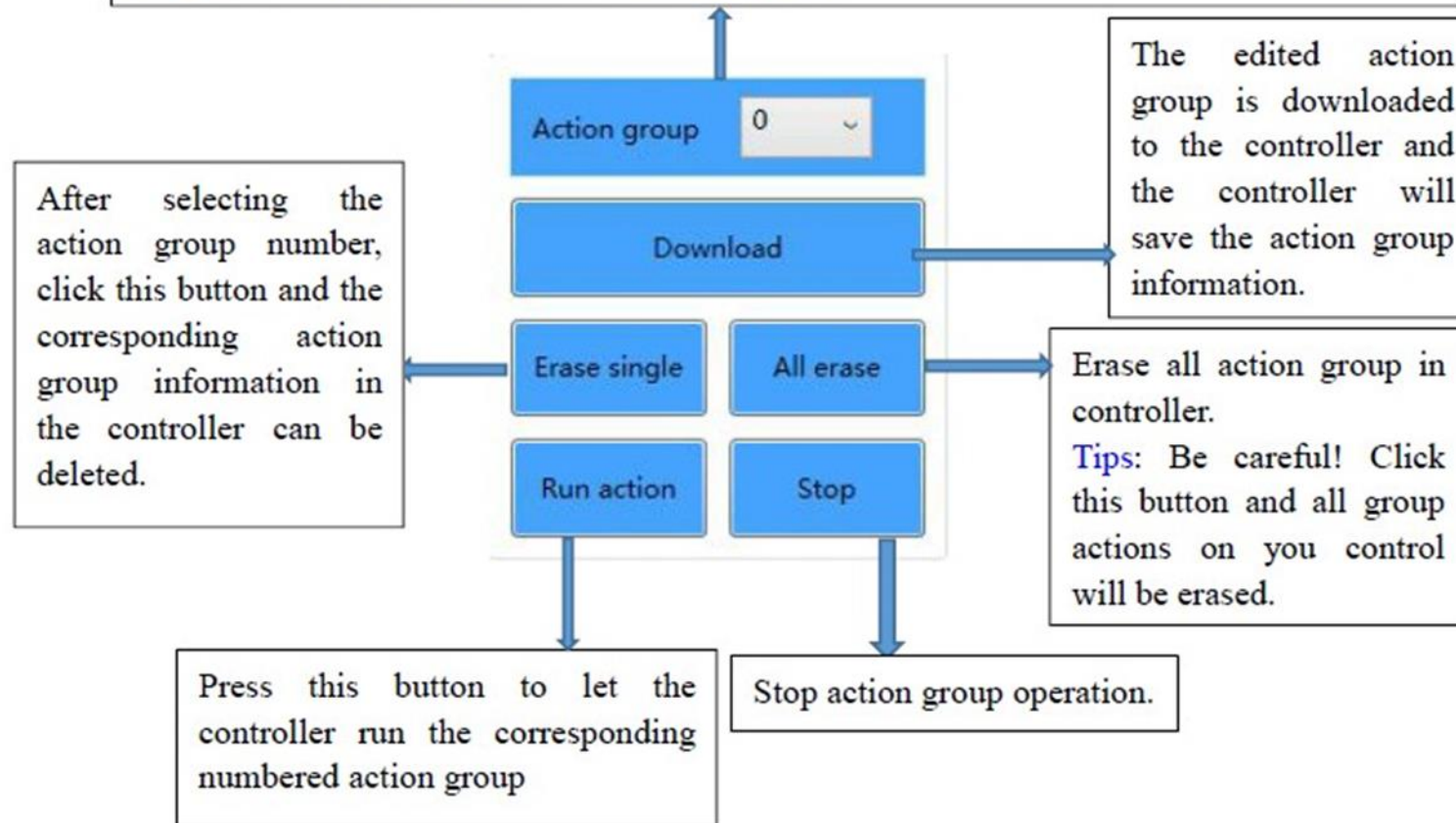
PS-2 Like Remote Control

PC Program Control

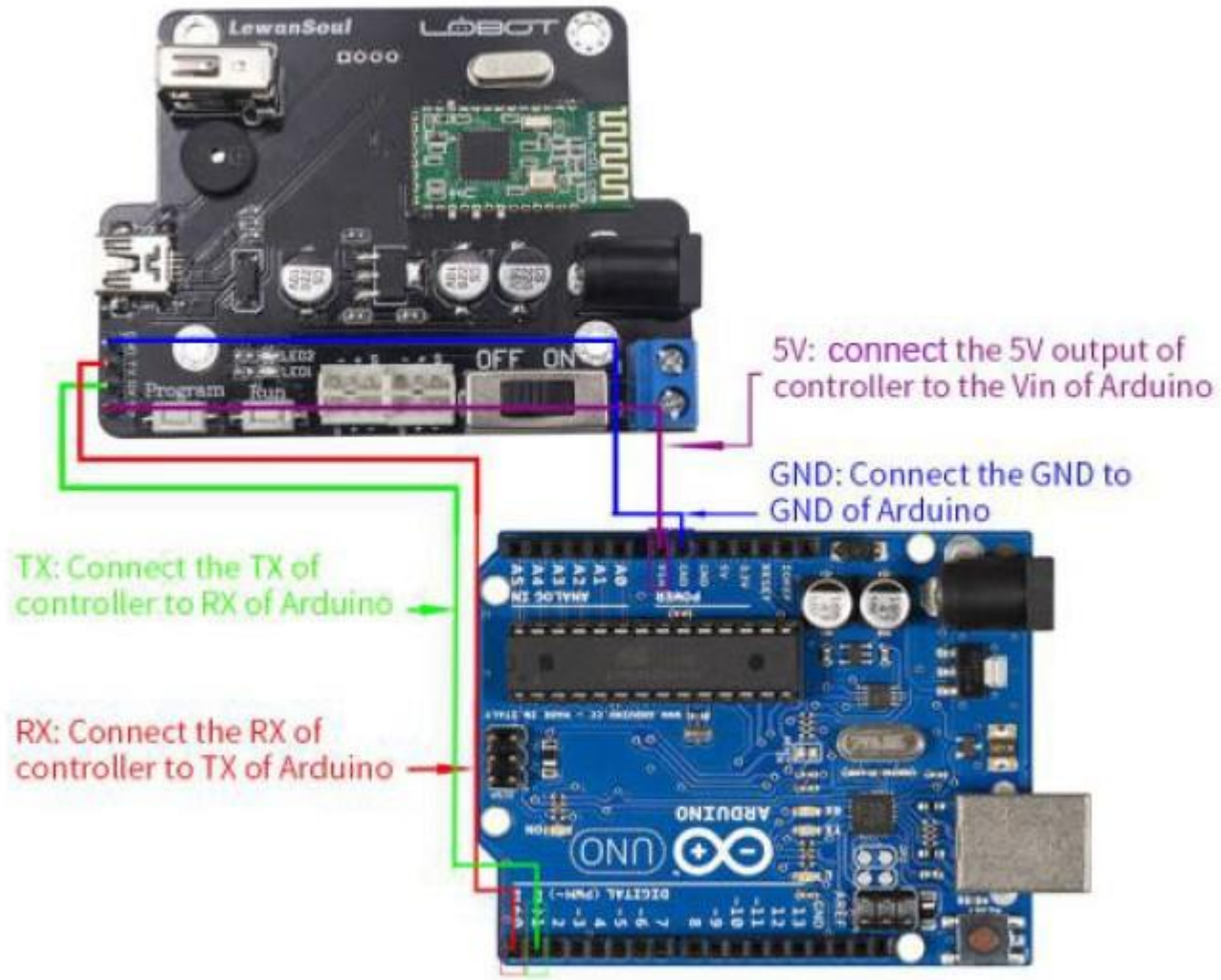
Action group

Select the action group number, range 0~230.

For example, selected action group number is 10 , click download button , then the No.10 action group will be download to controller. When you add action group number is 10 on you phone APP, it will run the No.10 action group



Arduino Processor Board Control





Software: WeMake

File Edit Connect **Boards** Language Study

Scripts

Motion

Looks

Sound

Pen

Data&Blocks

CarBoard ▼

WeMake Program

---Serial---

set serial port

Arduino

Arduino Uno

Arduino Leonardo

Arduino Nano (mega328)

Arduino Mega 1280

Arduino Mega 2560

WeMake

✓ CarBoard

TestBoard

Qbot

SensorBoard

Others

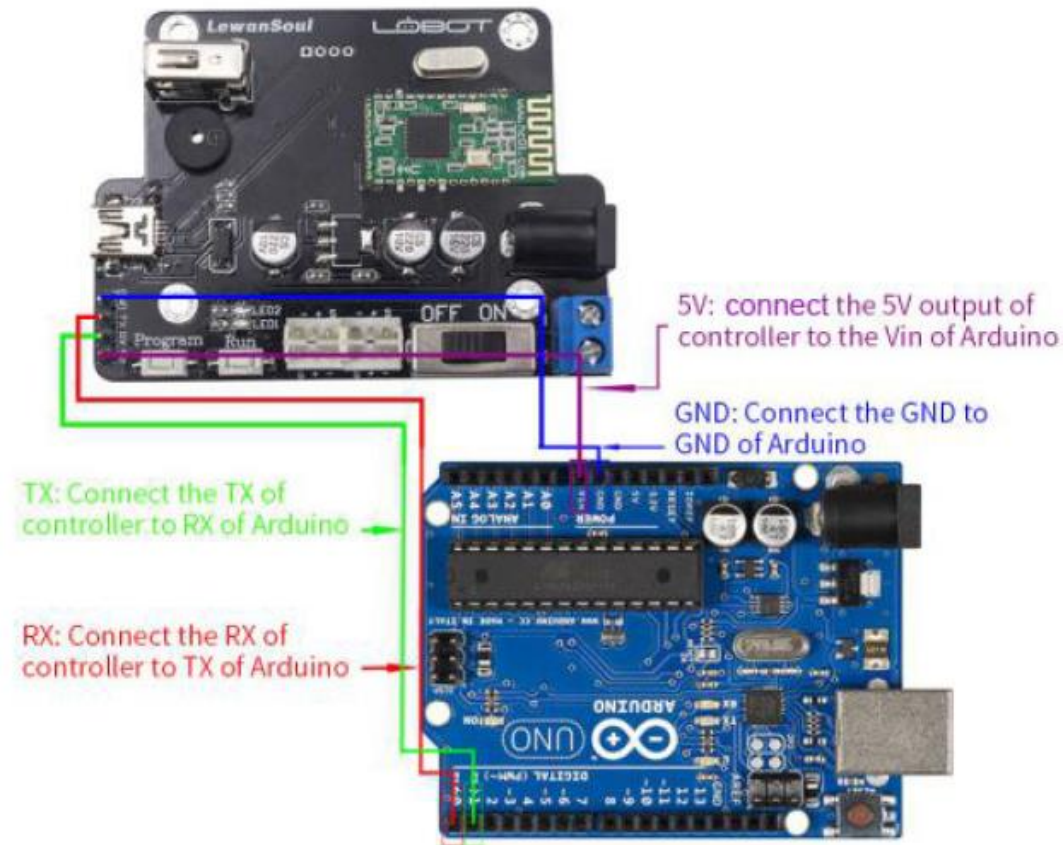
PicoBoard

Secondary Board (Sensors and Display)

SECTION 6



Extension Secondary Development Kit





Extension Secondary Development Kit



- This sensor and module kit is only for xArm robotic arm, It can't be used alone, you need to use it with xArm robotic arm.
- To make xArm more functional and creative, we have prepared a secondary development package for everyone. With more than a dozen electronic modules and structural components, we can use Scratch or Arduino programming to implement
- various ideas and gameplay. We provide you with ten secondary development games for xArm, each with detailed program documentation and video tutorials. Help everyone to learn it!