XGO-mini2+

AI Education

luwu
dynamics

01.

Product Description

XGO–mini2+ Programmable Robot Dog

XGO–mini2+ is a desktop AI robot dog with 12 DOF and a gripper powered by Raspberry Pi CM4 for AI edge computing applications.With 4.5KG.CM serial bus servo,it supports omnidirectional movement, 6D posture control, posture stability, and multiple motion gaits, internally equipped with 6–axis IMU, joint position sensors and current sensors to feedback postures, joint rotation and torque readings for internal algorithms and secondary development. The robot dog allows for Blocky and Python programming via a custom APP or PC for developing AI applications.

Product Data

Model: XGO–mini2+

Dimensions: 270 * 150 * 180mm

Weight: 950g

Battery: 7.4V 3800mAh lithium battery

Material:Body–AviationAluminum & Legs–Silicone&ABS

Controller: Raspberry Pi CM4+ESP32

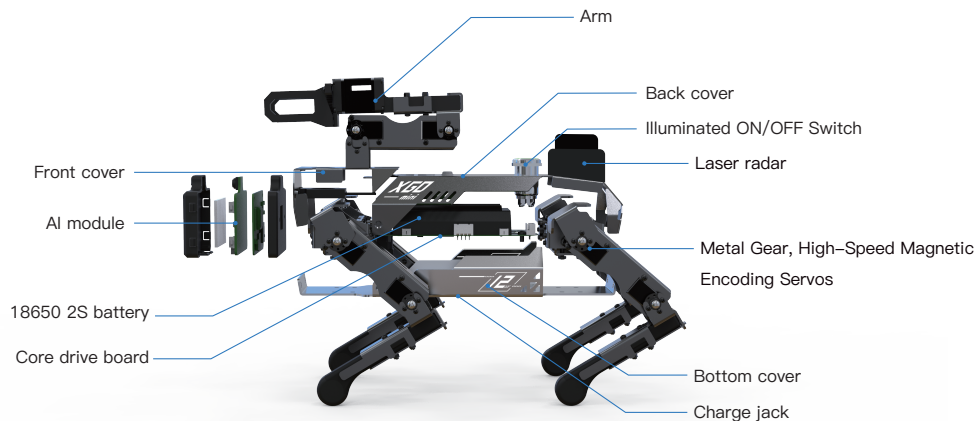Screen: 2.0 inch IPS 320*240

Camera: five–mega–pixel OV5647

Storage: 32G SD card

Charger : 8.4V 1A 100–240V AC 50/60Hz
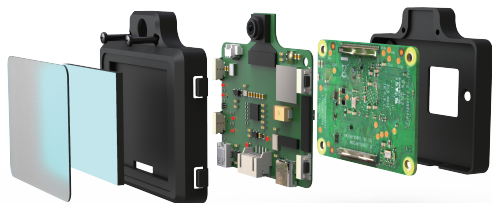
Laser radar：Range: 0.02–12m   Ranging frequency: ≥4500Hz

Scanning frequency: 5–13Hz   Scanning angle: ≥360°

Average ranging accuracy: ≤45mm

Arm

Back cover

Illuminated ON/OFF Switch

Laser radar

Front cover

AI module

Metal Gear, High–Speed Magnetic
Encoding Servos

18650 2S battery

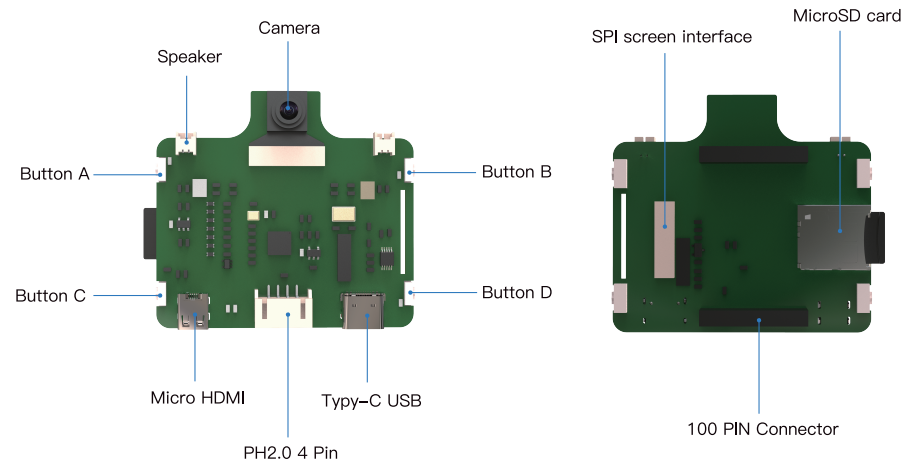Core drive board

Bottom cover

Charge jack

AI Module Features

The AI module is the master control for AI related applications and has basic computer vision recognition and machine learning model inference, which can facilitate both entry and advanced-level AI applications.

Exploded view of AI module

Speaker

Camera

Button A

Button B

Button C

Button D

Micro HDMI

Typy-C USB

PH2.0 4 Pin

SPI screen interface

MicroSD card

100 PIN Connector

Key Technologies Employed

IMU posture self-stabilization

Based on the attitude data obtained from IMU and with closed loop control, the robot dog can remain stable regardless of surface movement.

6 DOFs posture control

With fixed foot tips, allows the entire body to remain under 6 DOF motion control.

Move, Record and Playback

You can even code by simply moving XGO's joints by hand while automatically recording the sequence for playback as a program.

User communication and secondary programming interface

The open-access underlying serial port protocol applies to secondary development and verification.

Motion gait planningMotion gait planning

The robot dog comes with Low, Medium and High height postures which is linked to three different speeds with appropriate gait strategies and rules are applied.

Kinematics and dynamics simulation interface

In a ROS scenario, kinematics and dynamics simulations are conducted on Rviz and gazebo platforms.

Omnidirectional motion

With 12 active joints and through kinematics decoupling, the robot dog can perform omnidirectional motion combining Forward/Reverse, Right/Left with Rotational input for a smooth gait in any direction.

Artificial Intelligence

Machine vision, face recognition, speech recognition, model training and other AI functions.

Technical Robotic Content

Mechanics

Motor and drive
12 micro-sized servos provide 6 DOF single-leg 3 DOF motion analysis

Sensing

Gyroscope + Accelerometer + Magnetometer

Provides joint position, speed of the robot dog, torque (via current) and other motion data.

Simulation

Simulation practice
Kinematics and dynamics simulation

Motion

Motion and drive
Derived forward and inverse kinematics, complete Cartesian space control and joint space control

Control

Control theory and control planning
PID control, trajectory planning control, space posture stability control.

## Intelligence

Robot dog intelligence
Machine vision, speech recognition, face recognition, Face detection and color recognition and other AI functions

02.

Operation Instructions

Start

Important: Please charge the XGO before using it the first time to increase battery life and DO NOT allow the Battery Charge level to fall below 20% to avoid Battery Degradation over time.
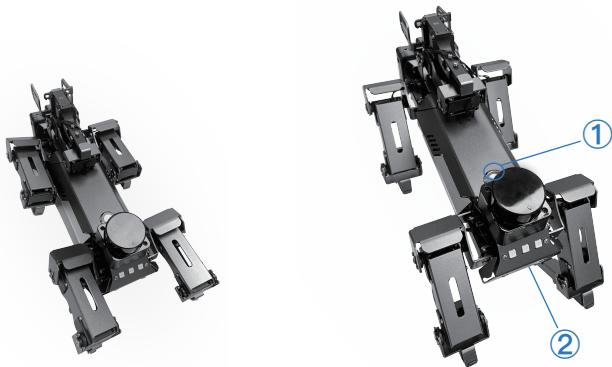
① How to Power Robot ON and OFF

Powering ON: First, place the robot dog in a prone position laying down to avoid joints from jamming during initial boot up. Then press the ON/OFF Switch once (the Power Indicator will flash and then illuminate, indicating that the Robot is now Powered ON.

Powering OFF: Press the ON/OFF Switch once, the Power Indicator will start flashing and the dog will slowly lie down in the prone position. When the Robot is fully at rest the Power Indicator will no longer be illuminated, indicating that the Robot has fully Powered OFF.

② **Charging the Robot:** The Robot's Charging Port is located under the Robot. Insert the Charger Plug into the Charging Port. The Charger's LED will glow Red while charging and turn Green when the batteries are fully charged.

Display Screen

After the Robot is Powered ON, press "A" or "B" to reach the Application Menu "Try Demos", then use "A" and "B" separately to scroll up and down to select the desired AI Application, then press "D" to confirm and execute the action selected,press "C" to return to previous menu.
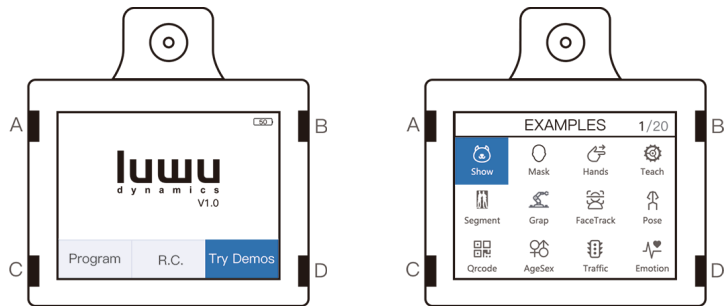

Operating by Phone App

Visit www.xgorobot.com and follow the Quick start,download 'XGOBOT'app and install.Set a WIFI SSID:XGO2 PWD:LuwuDynamics,turn on the robot and enter R.C. Mode , there will be a IP address at the bottom of the screen, connet the mobilephone to the same WIFI.
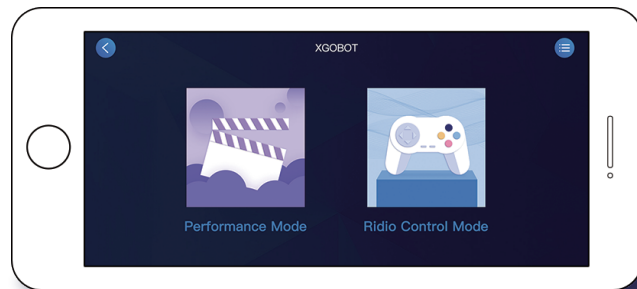
PC Operation

Visit www.xgorobot.com and follow the Quick start,enter XGO—Blockly cloud platform which was second develope from EduBlocks,input the IP address of your XGO, user can simply create programs by just selecting and dragging existing programming blocks.
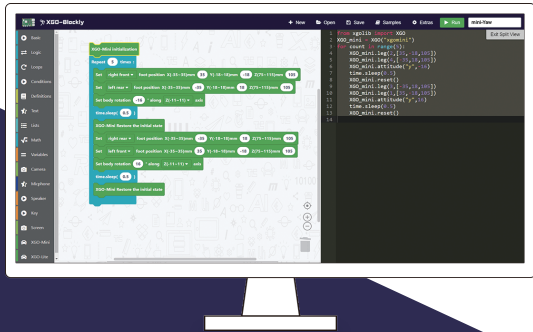
Special Operation Notes

Caution: This operation is irreversible and the factory settings will be overwritten. Read this manual thoroughly and carefully before you attempt calibration.

When the posture of the Robot dog no longer returns to the proper starting position (per pictures), e.g.: in the standing positon, one or more legs cannot touch the floor due to a servo joint being seriously offset, it is likely that the initial position of one or more servos is mechanically offset from the predefined program value. This may be simply due to a loosened screw or a slipped servo gear. If all of the screws are tight, you may need to recalibrate the Robot to establish the mechanical offsets to the original predefined values. To correct this situation, open the XGOBOT APP, connect to the Robot via Wifi, click the option   to run as developer and then return to the home screen. Click   and go to the calibration screen, click " Calibrate ". At this point, the servo joints of the robot will not output torque, you can rotate all joints freely.

Place the robot dog in the posture as shown above, make sure the shoulder part of every leg is perpendicular to the body, with upper legs perpendicular to the table surface and lower legs perpendicular to the upper legs, open the claw the maximum. This positioning directly affects the working posture of the robot.After the robot is placed in original good starting position, click " Calibrated " on the calibration screen, after10s the robot will return to the standing posture. If the standing posture is still seriously offset, DO NOT USE the ROBOT, otherwise the robot may malfunction or become damaged. Please contact our after-sales support if you cannot calibrate the Robot to the original good starting position.

Appendix

Precautions:

1. Unplug the unit if left unused. When charging, only use the specific charger that came with the Robot.
2. The Robot's skeleton and frame are made of metal, use caution when handling to avoid injury to hands and fingers.
3. DO NOT expose the Robot to water, moisture, humid conditions or long periods of direct sunlight. To prevent serious damage, avoid dropping the Robot from any height.
4. CAUTION: After prolonged periods of use, the Servos (in the leg joints and hips) may become warm. This is normal, but higher than normal operating temperatures through continuous and prolonged use may cause permanent harm to the Servos. It is strongly advised not to use the Robot for extended periods of time.

Maintenance and Storage:

Caution: ALWAYS Power the Robot OFF before attempting ANY maintenance procedure.

1. Clean the exposed surfaces of the Robot while not exposing the control board to any moisture.
2. Check for loose screws and tighten any you may find.
3. When storing or transporting your Robot, use the special packaging box that your XGO came in, to avoid accidental damage. The Robot's four legs should be securely retained in the foam cutouts to avoid excessive movement during transport.

Troubleshooting:

Problem	Possible Cause	Solution
The ON/OFF Indicator does not light after the unit is Powered ON	Battery has little or no charge remaining (check the battery charge indicator in the App to verify)	Charge the battery with the supplied power adapter
The ON/OFF Indicator is lit but no actions are executed after the unit is Powered ON	There is a problem with the control system Robot is still in calibration mode	Contact our after-sales support for advice or repair service
The standing posture is seriously offset compared to the Robot's reference picture	The initial position is offset from the predefined values	Recalibrate the Servo Joints according to Special Operation Notes
One joint has no torque output (no movement is observed at this joint)	The Servo of the join is damaged	Contact our after-sales support for repair service