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Yahboom ROS2 AI Robot Kit (ULT Ver Without Nano)

Yahboom ROS2 AI Robot Kit (ULT Ver Without Nano) Instruction Manual

Model: ROS2 AI Robot Kit (ULT Ver Without Nano)

1. INTRODUCTION

The Yahboom ROS2 AI Robot Kit is an advanced educational robot designed for mechanical engineers and AI enthusiasts. This Ultimate Version (without Nano) features an Ackerman steering structure, AI voice control, and capabilities for SLAM, AI vision, mapping, and navigation. It is built upon the Robot Operating System (ROS2) and supports various development boards, offering a comprehensive platform for learning and research in robotics and artificial intelligence.



Image: Complete Yahboom ROS2 AI Robot Kit components.

2. COMPONENTS OVERVIEW

The Yahboom ROS2 AI Robot Kit includes the following main components:

- Car body
- Wheels
- Depth camera
- Sensor Expansion board
- Lidar (Optional, depending on kit version)
- AI Voice Interaction Module (Optional, depending on kit version)
- 7-inch screen (Optional, depending on kit version)
- Various cables and mounting hardware

Product Structure



Image: Exploded view of the Yahboom ROS2 AI Robot Kit showing various components.

3. SETUP AND ASSEMBLY

Follow these steps to assemble your Yahboom ROS2 AI Robot Kit. Refer to the installation video for visual guidance.

3.1. Installation Video

Video: Detailed installation guide for the Rosmaster R2 robot kit.

3.2. Step-by-Step Assembly

- 1. Prepare the Chassis:** Begin by unboxing all components and identifying the main chassis plate.
- 2. Mount the Servo:** Attach the steering servo to the designated position on the chassis using the provided screws.
- 3. Install Motors and Wheels:** Secure the drive motors to the rear axle and attach the wheels. Ensure all connections are firm.
- 4. Attach Steering Mechanism:** Connect the steering linkages from the servo to the front wheels, ensuring smooth movement.

5. **Mount the Main Control Board:** Carefully place your chosen development board (e.g., Raspberry Pi, Jetson Nano) onto the chassis and secure it.
6. **Connect Power and Data Cables:** Route all necessary power and data cables between the main control board, motor driver board, and other peripherals.
7. **Install Lidar (if applicable):** Mount the lidar unit on the top plate and connect its power and data cables to the main control board.
8. **Attach Depth Camera:** Secure the depth camera to the front of the robot and connect it to the main control board.
9. **Integrate AI Voice Module (if applicable):** Install the voice interaction module and connect it.
10. **Mount Display Screen (if applicable):** Attach the 7-inch display screen to its bracket and connect it.
11. **Install Antennas:** Securely attach the Wi-Fi antennas to the main control board.
12. **Battery Installation:** Place the 6000mAh lithium battery pack in its compartment and connect it to the power distribution board.
13. **Final Checks:** Double-check all connections and ensure all components are securely fastened before powering on the robot.

4. OPERATING INSTRUCTIONS

The Rosmaster R2 offers a wide range of functionalities and control methods, leveraging the power of ROS2 and AI.

4.1. Key Functions and Capabilities

- **Robot Motion Control:** Precise control over the robot's movement, utilizing the Ackerman steering structure for optimal performance.
- **Remote Control Communication:** Control the robot via mobile phone APP, game handle, ROS system, or computer keyboard.
- **Mapping and Navigation (SLAM):** Utilize lidar and depth camera for simultaneous localization and mapping, enabling autonomous navigation in unknown environments.
- **Following and Obstacle Avoidance:** Advanced algorithms allow the robot to follow targets and intelligently avoid obstacles.
- **Autopilot:** Implement autonomous driving features based on AI vision and sensor data.
- **Human Body Feature Action Recognition:** Recognize human gestures and actions using AI vision.
- **Voice Interactive Control:** Command the robot using voice commands for various tasks.

ROS Main Features



Image: Overview of ROS Main Features including LiDAR mapping, deep learning autonomous driving, path planning, and object tracking.

4.2. Functionality Demonstration Video

Video: Demonstration of Rosmaster R2 functions including mapping, navigation, and object recognition.

4.3. Control Methods

The Rosmaster R2 supports multiple control interfaces:

- **Mobile Phone APP:** Use the dedicated mobile application (iOS/Android) for remote control and mapping navigation.
- **Game Handle:** Connect a PS2 handle for intuitive control.
- **ROS System:** Directly control and program the robot through the ROS environment on a computer.
- **Computer Keyboard:** Use a standard keyboard for basic robot movements.

②

YDLIDAR 4ROS lidar

It adopts TOF ranging method, can resist 70KLux~100KLux strong light irradiation, supports indoor and outdoor mapping and navigation, the measurement radius can reach 30m, the measurement blind area is only 5cm, the ranging error within 5 meters is only $\pm 6\text{cm}$, and the sampling frequency is 20000 times/s, scan frequency 5HZ~12HZ, support 512000bps communication rate.

Tip: If you already have SLAM A1 or YDLIDAR 4ROS lidar, you can contact us to subtract this configuration.



YDLIDAR 4ROS Lidar				
Model	YDLIDAR 4ROS	Angular resolution	0.09°@5Hz/0.13°@7Hz/0.22°@12Hz	
Supply voltage	5V	Supply current	840mA	
Recommended scene	Suitable for indoor and outdoor environments, better anti-glare ability	Communication Interface	TTL UART serial port	
Scan range	360°	Operating temperature	0°C~50°C	
Measurement method	TOF ranging	Storage temperature	-10°C~60°C	
Measuring radius	0.05m~30m	Measurement accuracy	0.05m-5m error $\leq \pm 6\text{cm}$ 5m-20m error $\leq \pm 4\text{cm}$ 20m-30m error $\leq \pm 10\text{cm}$	
Baud rate	512000bps	Laser safety level	IEC-60825 Class 1	
Sampling frequency	20000 times/s	Scanning frequency	5~12Hz	
Waterproof and dustproof	IP65	Size	75.8mm*70.3mm*34.7mm	

Image: Various control methods including mobile APP, FPV handle, keyboard, and ROS system control.

4.4. Advanced Features

- Ackerman Steering Structure:** Mimics modern car steering, optimizing turning radius and performance.
- AI Visual Recognition:** Includes MediaPipe development, KCF target tracking, color identification, autopilot, AR tag recognition, and AI deep learning frameworks.
- Lidar Functions:** Supports voice control multi-point navigation, lidar mapping, lidar obstacle avoidance, and RRT exploration for map building.
- Depth Camera Functions:** Enables RTAB-Map 3D visual mapping and navigation, ORBSLAM2+Octomap mapping, and depth image data point cloud imaging.
- Multi-machine Formation Control:** Allows for multi-robot navigation, synchronous remote control, and queue performance.
- AI Voice Interaction:** Voice control for movement, color recognition, and lighting effects.

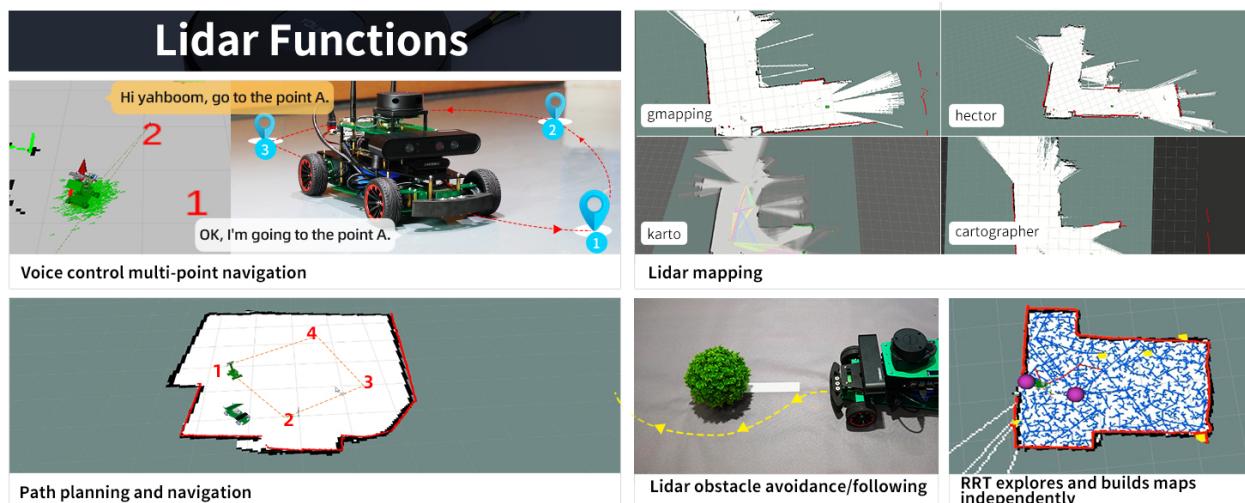


Image: Detailed diagram illustrating the Ackerman chassis patented steering structure.

5. MAINTENANCE

To ensure the longevity and optimal performance of your Yahboom ROS2 AI Robot Kit, regular maintenance is recommended:

- Cleaning:** Periodically clean the robot's chassis, wheels, and sensors to remove dust and debris. Use a soft, dry cloth. Avoid using liquid cleaners directly on electronic components.
- Battery Care:** Ensure the battery is charged using the provided charger. Do not overcharge or

completely drain the battery. Store the robot with a partially charged battery if not in use for extended periods.

- **Software Updates:** Regularly check for and install software and firmware updates provided by Yahboom to ensure access to the latest features and bug fixes.
- **Component Inspection:** Periodically inspect all cables, connectors, and mechanical parts for any signs of wear, damage, or loose connections. Tighten screws as needed.
- **Storage:** Store the robot in a cool, dry place away from direct sunlight and extreme temperatures.

6. TROUBLESHOOTING

If you encounter issues with your Yahboom ROS2 AI Robot Kit, refer to the following common troubleshooting tips:

- **Robot Not Powering On:** Check the battery connection and ensure the battery is sufficiently charged. Verify that the power switch is in the ON position.
- **No Response to Controls:** Ensure the remote control device (APP, handle, keyboard) is properly connected and paired with the robot. Check Wi-Fi connectivity.
- **Navigation Errors:** Verify that the lidar and depth camera are clean and unobstructed. Ensure the mapping environment is suitable and re-map if necessary. Check for any software errors in the ROS system.
- **Motor Malfunction:** Inspect motor connections and ensure they are secure. Check for any physical obstructions preventing wheel movement.
- **Voice Control Issues:** Ensure the AI voice interaction module is correctly installed and configured. Check microphone input and environmental noise levels.
- **Software/System Errors:** Consult the comprehensive course content and tutorials provided by Yahboom for specific ROS1/ROS2 system troubleshooting.

For persistent issues, refer to the detailed online documentation or contact Yahboom customer support.

7. SPECIFICATIONS

Feature	Detail
Product Dimensions	50 x 30 x 23 inches
Item Weight	5 pounds
Manufacturer Recommended Age	20 years and up
Batteries	1 9V batteries required (included)
Manufacturer	Yahboom

③

Astra Pro Depth Camera

It can not only realize all AI visual functions of HD cameras, but also realize advanced functions such as depth image data processing and 3D navigation and mapping. With the high-angle bracket, it can be adjusted manually.

Tip: If you already have Astra Pro depth camera, you can contact us to subtract this configuration.



Can be adjusted manually

Astra Pro depth camera product parameters			
3D technology	ORBECR monocular structured light	Range	0.6-8m
Precision	1m: ±3mm	Field of View (FOV)	H 58.4 × V 45.7
Resolution@ Frame rate (depth)	1280×1024@7fps 640 × 480@30fps 320×240@30fps 160×120@30fps	Resolution@ Frame rate (RGB)	1280×720@7fps 640×480@30fps 320×240@30fps
Advanced processing chip	MX400	Close protection	Support
RGB Field of View	H66.10° × V 40.2°	UVC(RGB)	Support
Support operating system	Android / Linux / Windows	Data transmission interface	USB2.0
Size (mm)	164.85×48.25×40	microphone	Two-channel stereo
Power consumption	<2.5W	Safety	Class1 laser
Operating temperature	10°C-40°C		

Image: Detailed product dimensions and technical parameters for the Rosmaster R2.

8. WARRANTY AND SUPPORT

The Yahboom ROS2 AI Robot Kit is covered by the manufacturer's standard warranty. For specific warranty details, technical support, or any inquiries, please refer to the official Yahboom website or contact their customer service directly. Keep your purchase receipt as proof of purchase for warranty claims.

Related Documents - ROS2 AI Robot Kit (ULT Ver Without Nano)

	<p>Yahboom Transbot Robot User Manual and Installation Guide</p> <p>Comprehensive guide to assembling, installing, and operating the Yahboom Transbot robot. Includes packing lists, step-by-step instructions, wiring diagrams, software setup, and detailed explanations of app control features.</p>
	<p>Yahboom Pico Robot Car: Features, Functions, and Programming Guide</p> <p>Explore the Yahboom Pico Robot Car, powered by Raspberry Pi Pico and MicroPython. Discover its extensive features including APP control, various sensors for line tracking, obstacle avoidance, voice control, and more. This guide details its hardware, software, and course content.</p>
	<p>Yahboom Arduino Batmobile: Graphical Programming Tutorials</p> <p>Learn to program the Yahboom Arduino Batmobile robot car with graphical tutorials. This guide covers LED control, buzzer sounds, sensors, motor control, line following, obstacle avoidance, and more.</p>

	<p>Yahboom WOM Sensor Kit for BBC micro:bit - User Manual and Building Models</p> <p>Comprehensive guide to the Yahboom WOM Sensor Kit for BBC micro:bit, covering packing list, module introductions, building models, tutorials, and safety instructions. Learn how to use various sensors and build different models.</p>
	<p>Yahboom Raspblock AI Smart Robot Car for Raspberry Pi 4B Omnidirectional AI Platform</p> <p>Explore the Yahboom Raspblock, an AI omnidirectional mobile smart car based on the Raspberry Pi 4B. Features include advanced AI functions, 360° Mecanum wheel movement, FPV capabilities, and Python programming via Jupyter Lab.</p>
	<p>The Robot Operating System (ROS1&2): Programming Paradigms and Deployment</p> <p>A comprehensive chapter detailing the Robot Operating System (ROS), covering its history, core concepts, differences between ROS1 and ROS2, communication protocols, launch files, ROS bags, transforms, visualization, perception, navigation, and simulation tools like Gazebo. It includes an industry perspective and Linux essentials for robotics development.</p>