Yahboom DOFBOT-RPI

Yahboom Robot Arm Kit 6DOF User Manual

Model: RPI-DOFBOT

1. Introduction and Overview

The Yahboom Robot Arm Kit 6DOF (Degrees of Freedom) is an advanced, programmable robotic arm designed for enthusiasts, students, and professionals interested in AI and robotics. This kit, model RPI-DOFBOT, integrates a camera for FPV (First Person View) video transmission and supports various AI bionic features such as color recognition, gesture recognition, face tracking, and object manipulation. It is compatible with Raspberry Pi boards and offers multiple control methods for a versatile learning and development experience.

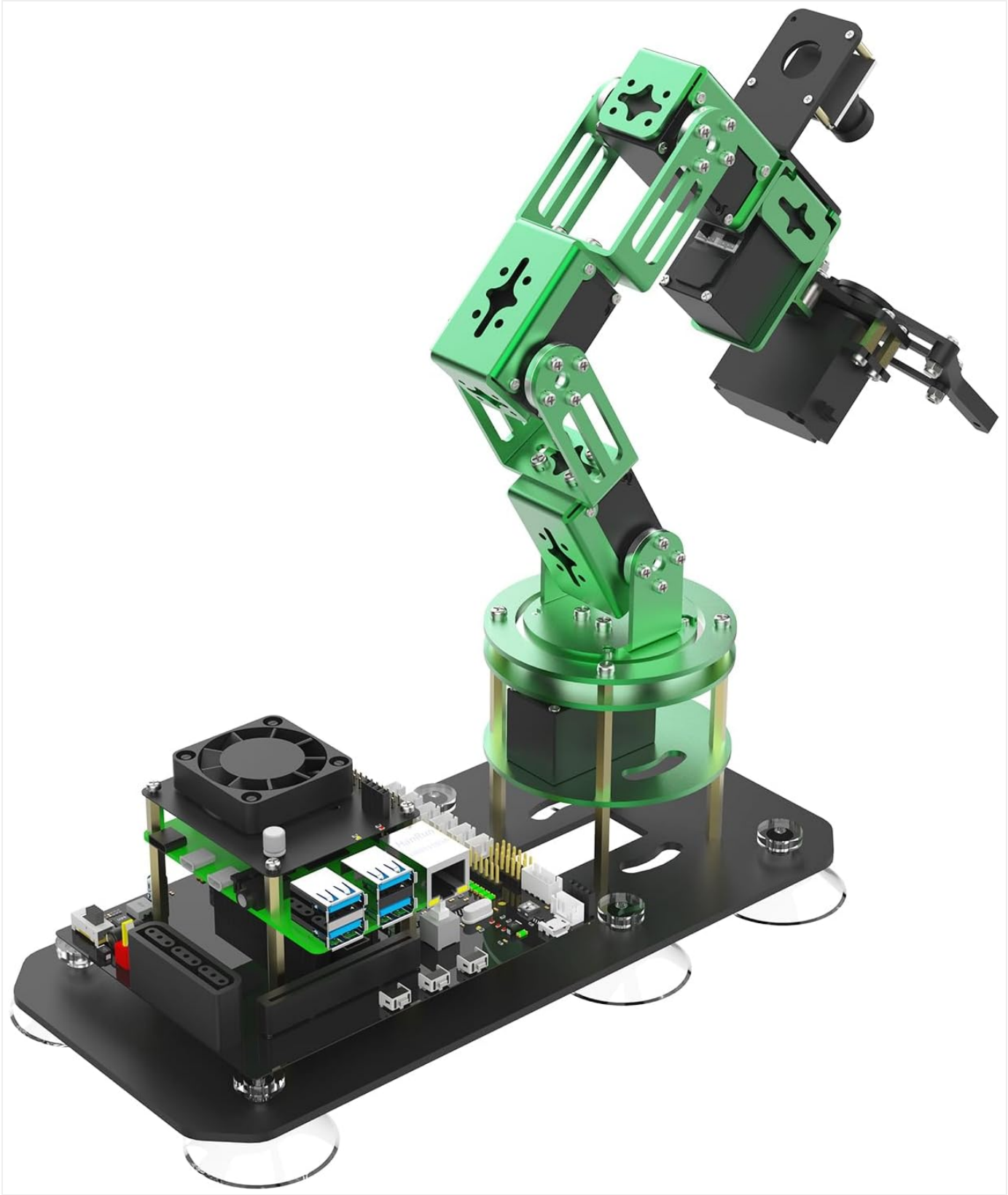


Figure 1: Overview of the Yahboom Robot Arm Kit 6DOF (RPI-DOFBOT).

2. Product Features

- **Artificial Intelligence Robotic Arm with Camera:** Equipped with a camera for FPV video transmission, enabling recognition of colors, specific gestures, and faces. The arm can respond to recognized gestures, track faces, track colors, and grab designated color objects, showcasing AI bionic characteristics.
- **DOFBOT Motion Control:** Features fixed action groups and allows for custom actions. Supports Master Machine to Slave Machine control for remote operation and real-time transmission of action gestures. The ROS system can be used to build obstacle models for avoidance.

- **Multiple Control Methods:** Offers five interconnected control methods including a multi-function APP (Android/iOS), USB gamepad remote control, PC upper computer view image transmission, 3D simulation model construction via ROS system, and Jupyter Lab webpage online programming.
- **Top Configuration:** Utilizes 15kg smart serial bus metal gear digital servos for precise control and angle reading. Includes a fully functional expansion board for future expansion and is constructed from fully anodized aluminum alloy for durability and aesthetics.
- **Easy to Get Started & Online Technical Support:** The assembled robotic arm can be controlled directly after simple installation and network connection (based on factory burned image). Basic Python programming knowledge is recommended. Yahboom provides extensive course materials and online technical support.

3. Components and What's in the Box

The Yahboom Robot Arm Kit 6DOF (RPI-DOFBOT) comes with the following main components:

- Robot arm (assembled)
- Raspberry Pi 5 (4GB/8GB/16GB Optional - *Note: This specific kit is "Without Pi"*)
- MAP (for color/object interaction)
- USB handle (gamepad)
- Adapter cable Power Adapter
- Robot arm expansion board
- I2C communication line
- Block*4 (colored blocks for exercises)
- Suction cup*6 (for stability)
- 32G TF card (pre-imaged)
- Card reader
- Screw nut copper pillar parts package*6
- Active radiator
- Manual
- Package box
- OLED display
- 30W USB camera
- Fixed bracket*2
- MICRO USB cable
- Power supply expansion board package
- Double-head Type-C board package
- Camera connection cable
- Screwdriver + Black tie*6

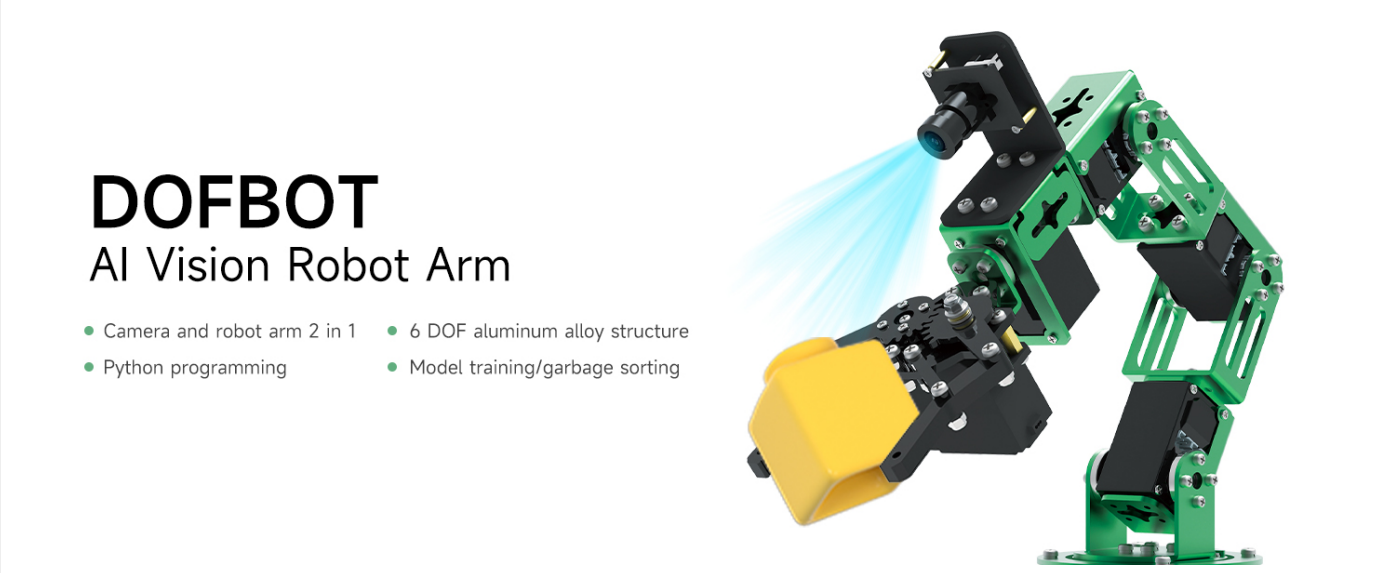


Figure 2: Detailed view of all components included in the RPI-DOFBOT kit.

4. Setup and Assembly

The DOFBOT robotic arm comes largely pre-assembled, simplifying the setup process. The primary assembly involves mounting the arm and the electronic boards to the base. Ensure all connections are secure before powering on the device.

4.1 Initial Setup Steps

1. **Unpack Components:** Carefully remove all items from the package and verify against the "What's in the Box" list.
2. **Mounting:** Attach the assembled robotic arm and the multi-function expansion board to the base using the provided screws and copper pillars. Refer to the detailed assembly instructions in the included manual or online tutorials for visual guidance.
3. **Connect Raspberry Pi (if applicable):** If your kit includes a Raspberry Pi, install it onto the expansion board as per the specific instructions. Ensure proper alignment and secure connection.
4. **Camera and Servo Connections:** Connect the camera and all servo cables to their respective ports on the expansion board. Double-check that all connections are firm.
5. **Power Connection:** Connect the power adapter to the robotic arm.
6. **Network Connection:** For initial setup and control, connect the DOFBOT to your network. The included SD card comes with a pre-burned image. You can use the mobile APP to connect by scanning a QR code or entering the IP address.



Figure 3: Exploded view showing the metal structure and key components for assembly. Note: Raspberry Pi is not included in this specific kit.

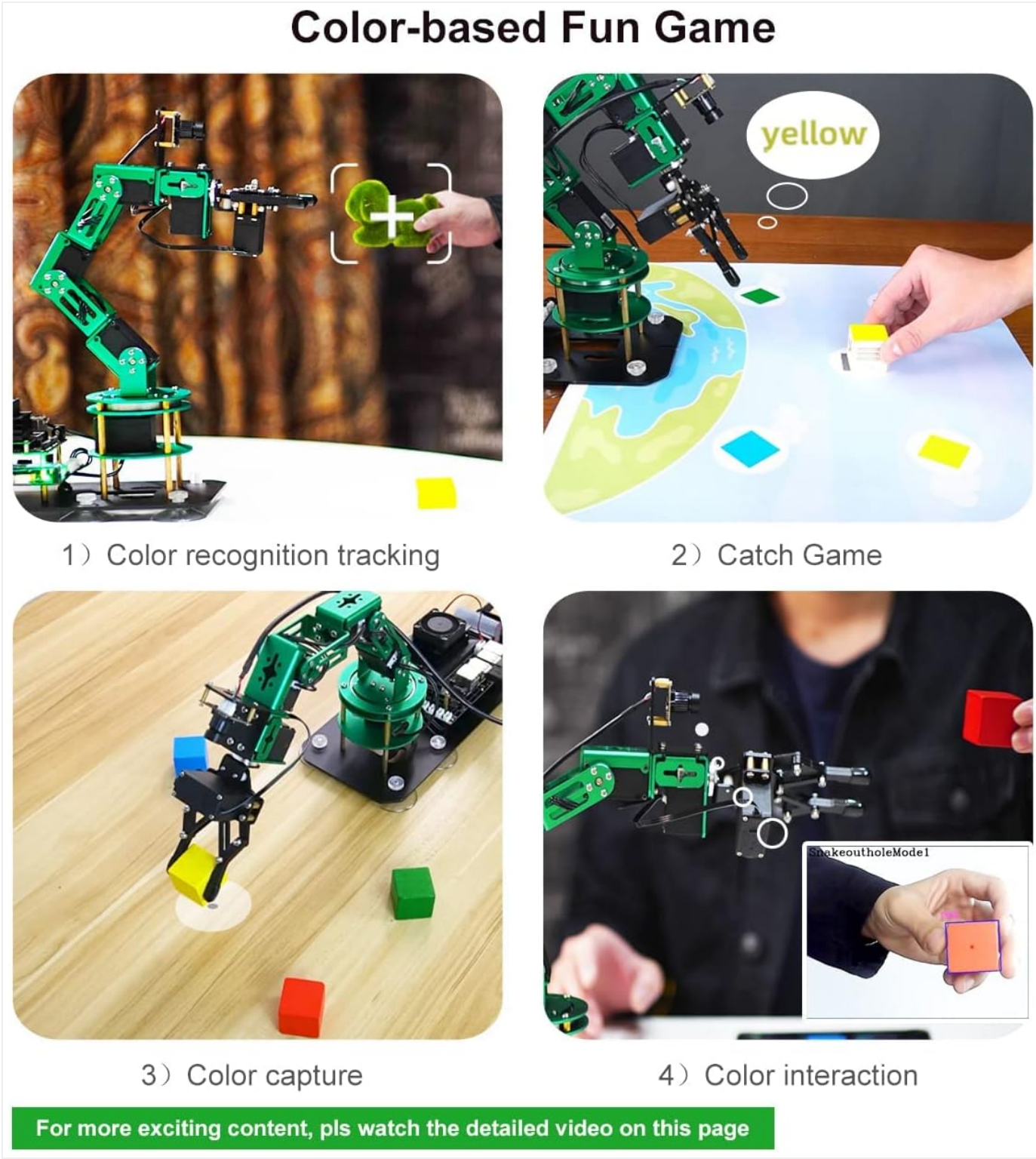


Figure 4: Steps for connecting devices and performing servo/color calibration via the mobile application.

5. Operating Instructions

The Yahboom DOFBOT offers a variety of control methods and intelligent functions. This section outlines how to operate the robotic arm and utilize its AI capabilities.

5.1 Control Methods

- **Mobile APP Control (Android/iOS):** The multi-function APP allows control over most features, including remote operation, action group execution, and AI functions.
- **USB Gamepad Remote Control:** Use the included USB gamepad for a tactile and responsive control experience.
- **PC Upper Computer Control:** View image transmission and control the arm from a PC interface.

- **ROS System Control:** Utilize the Robot Operating System (ROS) for advanced control, 3D simulation model construction, and obstacle avoidance.
- **Jupyter Lab Online Programming:** Program the robotic arm directly through a web-based interface for custom behaviors.

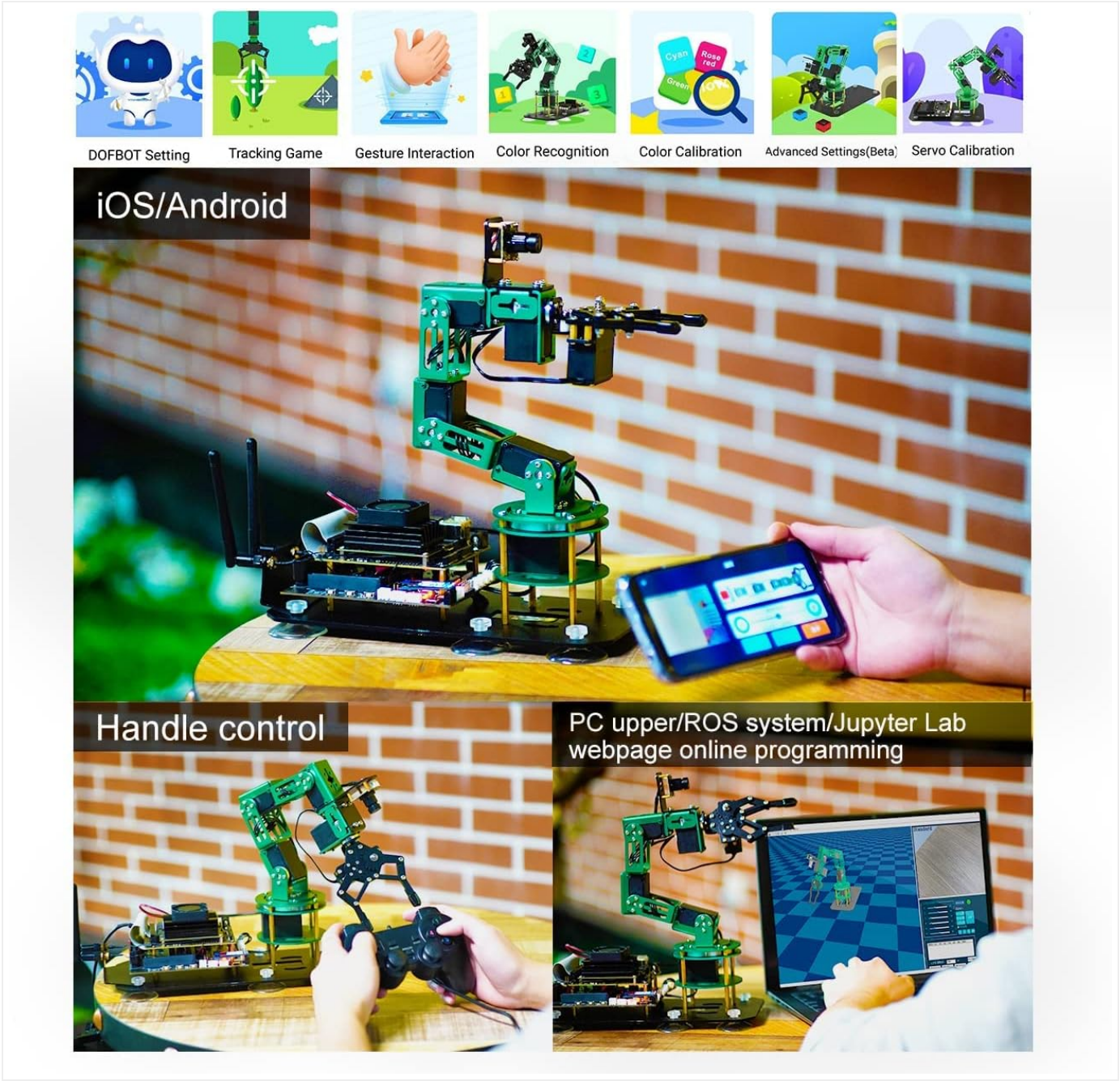


Figure 5: Different control interfaces including mobile app, gamepad, and PC-based programming environments.

5.2 AI and Intelligent Functions

- **Gesture Recognition:** The arm can recognize specific hand gestures and respond with programmed actions.
- **Face Recognition and Tracking:** The camera allows the arm to detect and track human faces, adjusting its position to follow movement.
- **Color Recognition and Tracking:** The arm can identify and track specific colors, enabling it to interact with colored objects.
- **Object Grabbing and Sorting:** Based on color or other recognized attributes, the arm can pick up and sort objects, such as in the garbage sorting program.
- **Motion Control and Custom Actions:** Beyond fixed movements, users can teach the arm custom sequences of actions.

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Video 1: Demonstration of AI robot arm capabilities, including gesture recognition, face tracking, color interaction, and motion control.

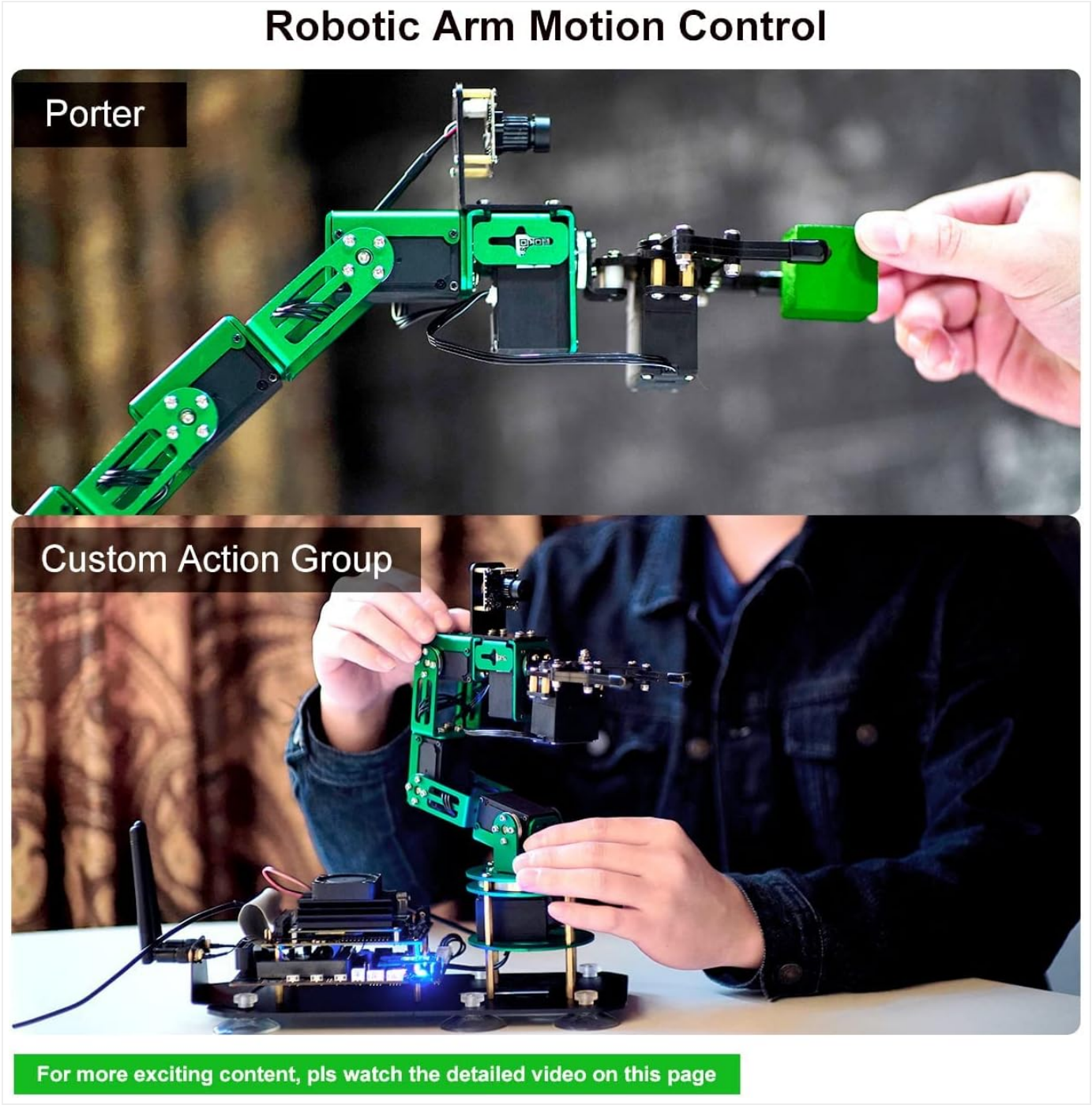


Figure 6: The robotic arm demonstrating both 'Porter' (fixed) and 'Custom Action Group' movements.

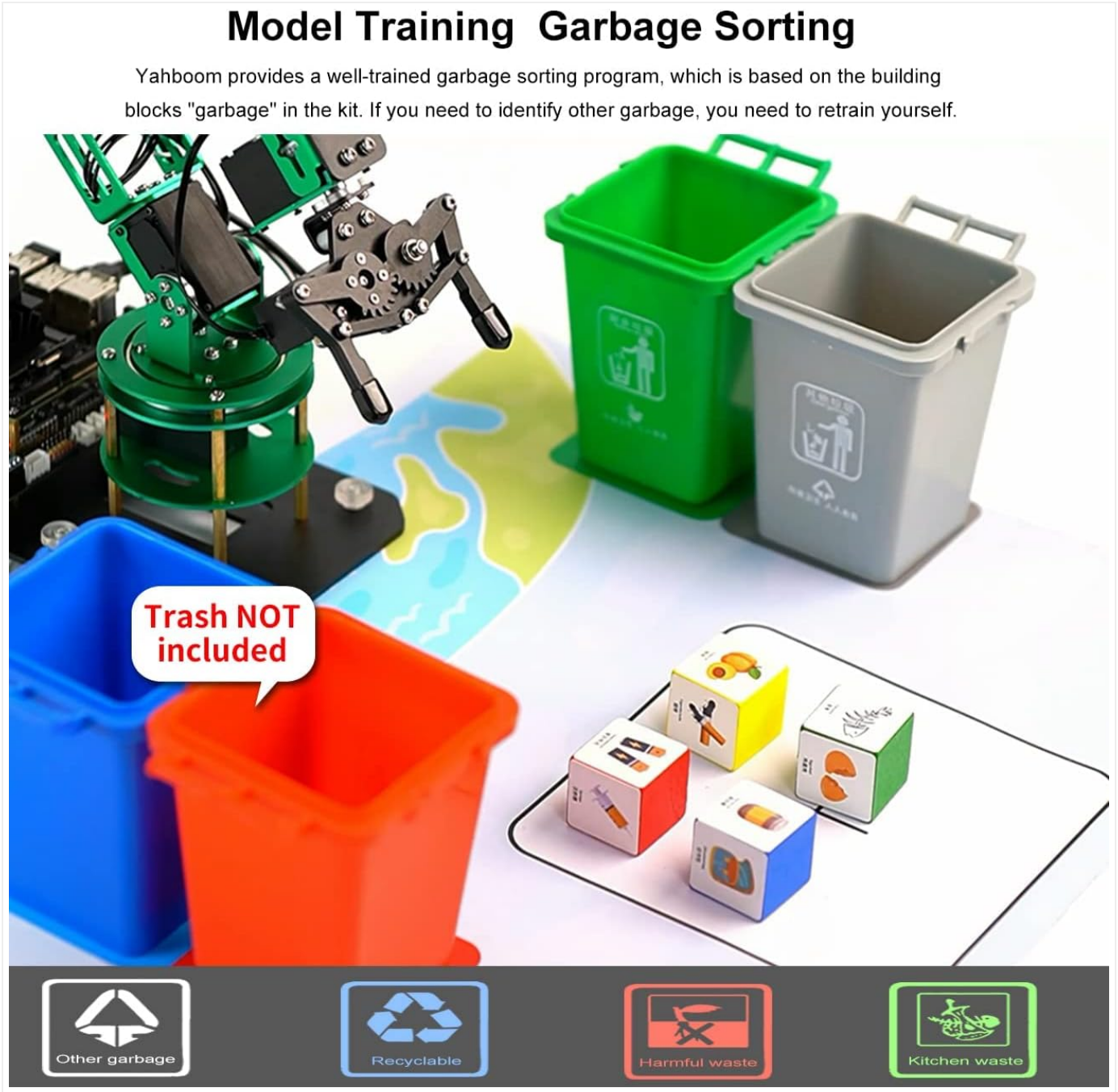


Figure 7: The DOFBOT performing model training for garbage sorting, identifying and moving different waste types.



Figure 8: The robotic arm engaging in a color-based game, demonstrating color recognition, object catching, and interaction.

5.3 ROS System Integration

The DOFBOT is designed with ROS (Robot Operating System) compatibility, allowing for advanced robotic applications. This includes using MoveIt! for motion planning and obstacle avoidance, as well as other ROS tools for complex tasks.

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Video 2: Yahboom ROS Robot Transbot video, showcasing ROS capabilities and advanced control.

6. Maintenance

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

- **Cleaning:** Keep the robotic arm and its components clean and free from dust and debris. Use a soft, dry cloth for cleaning. Avoid using liquid cleaners directly on electronic parts.
- **Connection Check:** Periodically inspect all cable connections (servo, camera, power) to ensure they are secure and not damaged. Loose connections can lead to erratic behavior or component failure.

- **Servo Inspection:** Check the movement of each servo for any stiffness or unusual noises. If a servo is not moving smoothly, it may require recalibration or inspection.
- **Software Updates:** Regularly check the Yahboom official website for software and firmware updates. Keeping your system updated ensures access to the latest features and bug fixes.
- **Storage:** When not in use for extended periods, store the robotic arm in a dry, dust-free environment, ideally in its original packaging or a protective case.

7. Troubleshooting

This section provides solutions to common issues you might encounter with your Yahboom Robot Arm Kit. For more detailed troubleshooting or complex problems, please refer to the online documentation or contact Yahboom technical support.

Problem	Possible Cause	Solution
Robotic arm not responding.	Loose power connection, software not running, network issue.	Check power cable and adapter. Ensure the main program is running on the Raspberry Pi. Verify network connection and IP address in the APP.
Servos are not moving smoothly or are jittery.	Incorrect servo calibration, power supply issues, physical obstruction.	Perform servo calibration using the mobile APP. Ensure the power supply is stable and sufficient. Check for any physical obstructions preventing smooth movement.
AI features (e.g., color/face recognition) are not working.	Camera not connected, incorrect lighting, software configuration.	Verify camera connection. Ensure adequate and consistent lighting in the operating area. Check software settings for AI functions and recalibrate if necessary.
Cannot connect to the robotic arm via APP/PC.	Incorrect IP address, firewall blocking, Wi-Fi issues.	Confirm the correct IP address of the DOFBOT. Temporarily disable firewalls on your PC/router. Ensure both the DOFBOT and your control device are on the same Wi-Fi network.
General software errors or unexpected behavior.	Outdated software, corrupted image, programming errors.	Ensure all software is up to date. If issues persist, consider re-flashing the SD card with the factory image. Review your custom Python code for errors.

For further assistance, please contact Yahboom technical support. Basic Python programming knowledge is beneficial for advanced customization and troubleshooting.

8. Specifications

Feature	Detail
Product Dimensions	10.7 x 5.3 x 18.6 inches
Item Weight	4.4 pounds
Country of Origin	China
ASIN	B08T8XG2J6
Item Model Number	DOFBOT-RPI
Manufacturer Recommended Age	16 years and up
Manufacturer	Yahboom

9. Warranty and Support

Yahboom is committed to providing high-quality products and excellent customer support. While specific warranty details may vary, general technical support is available for the Yahboom Robot Arm Kit 6DOF (RPI-DOFBOT).

- **Online Technical Support:** Yahboom provides online technical support to assist with any difficulties you may encounter during setup, operation, or programming.
- **Course Materials:** A large amount of course materials are available to help users learn and master the robotic arm's capabilities.
- **Contact Information:** For support inquiries, please refer to the contact details provided on the official Yahboom website or through your purchase platform.

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Ask about setup, troubleshooting, compatibility, parts, safety, or missing instructions. Manuals+ will review the question and use this page's manual context to help answer it.

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Question

Example: How do I reset this device or fix this error?

Details

Model number, symptoms, what you tried, or the section of the manual you are using.

Submit question