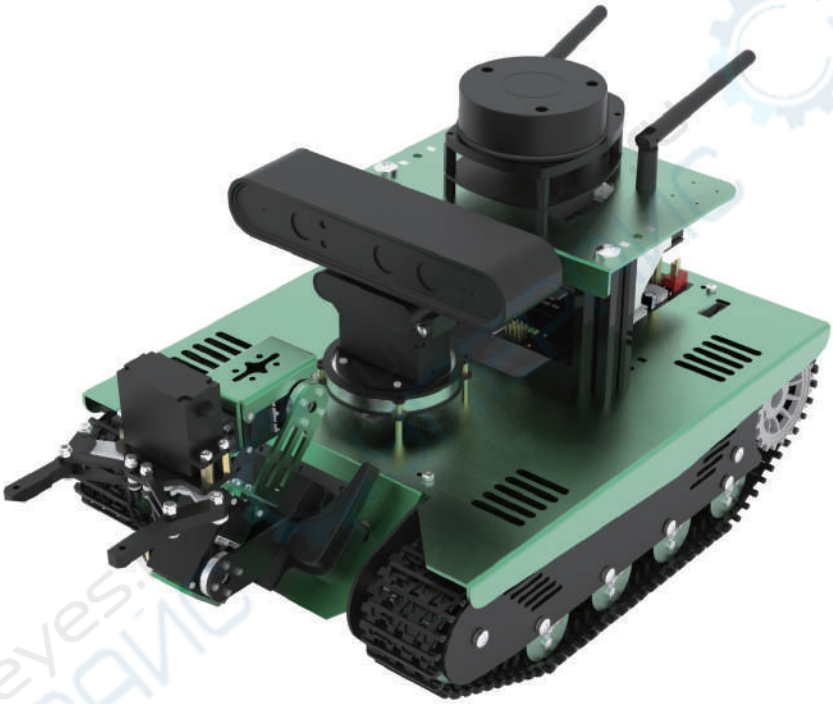
YAHBOOM

TRANSBOT

说明书/Manual



①使用前请仔细阅读本说明书
①Please read this manual carefully before use

②本公司保留说明书解释权
②Our company reserves the right of interpretation for this manual

③产品外观请以实物为准
③Product appearance, please prevail in kind

④阅后请妥善保留
④Please keep the manual properly after reading

官网在线学习：www.yahboom.com/study/Transbot
Raspberry Pi version: www.yahboom.net/study/Transbot-Pi
Jetson NANO version: www.yahboom.net/study/Transbot-Jetson_nano

Packing list (basic configuration)

	Frame		Expansion board
	Lidar fixed plate		Battery pack
	Battery case		OLED screen
	Charger		Packing box + anti-collision sponge
	USB wireless handle		Micro USB data cable
	Mechanical code & checkerboard paper		transbot manual
	Cable tie		Screwdriver
	Several cables		Parts kit
	Handle mobile phone holder		

SLAM A1 Lidar (Basic configuration)

	SLAM A1 Lidar		micro USB data cable
	No.6 package		

7-inch screen package (optional)

	7 inch screen		7 inch screen fixed bracket
	7 inch screen support		No.8 package

Astra Pro depth camera (optional)

	Astra Pro depth camera		Depth camera support (assembly)
	Depth camera fixed bracket		No.4 package

HD camera (optional)

	HD camera + searchlight (assembly)		HD camera bracket (assembly)
	Several cables		No.5 package

Jetson Nano Version (optional)

	Jetson nano 4GB SUB (optional)		(nano)U disk
	wifi bluetooth module + antenna		4010 cooling fan
	(nano) Parts package		

Raspberry Pi Version (optional)

	Raspberry Pi 4B (optional)		Card reader +(pi) TF card
	RGB cooling HAT		(pi)) Parts package

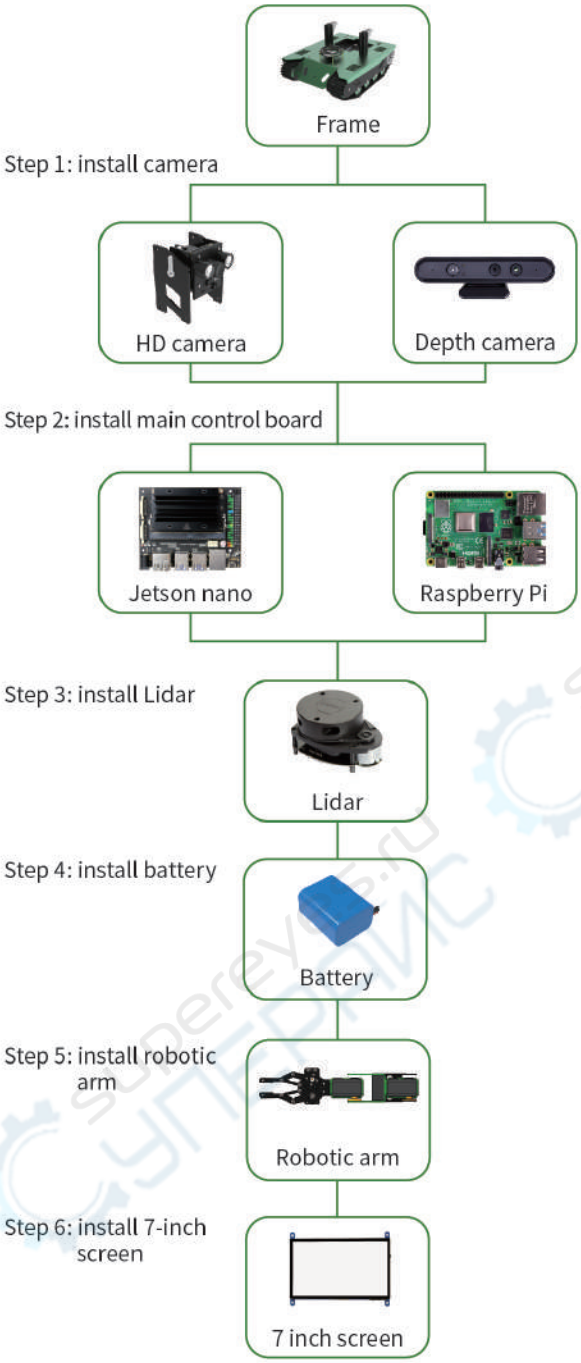
Robotic arm package (optional)

	Robotic arm		transbot buckle fixing plate
	transbot buckle		No.7 package

Installation flow chart

(Please complete the installation according to the purchased version. If your kit does not include the robotic arm and 7-inch screen, you can skip the corresponding installation steps)

(The red serial number that appears in the installation step correspond to screw pack number)

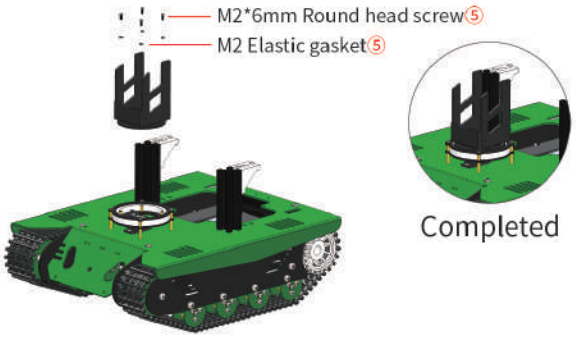


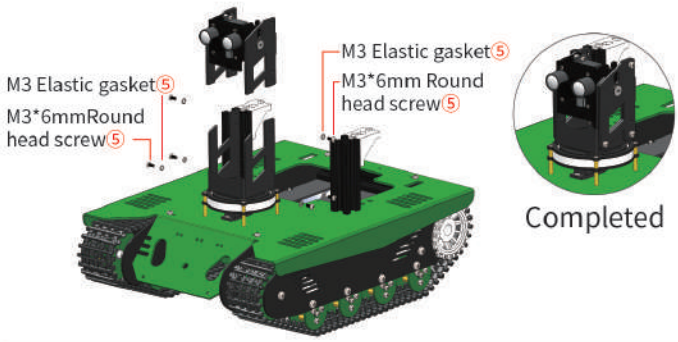
Depth camera installation steps

(If you didn' t purchase this accessory, please skip this installation step)

HD camera installation steps

(If you didn' t purchase this accessory, please skip this installation step)

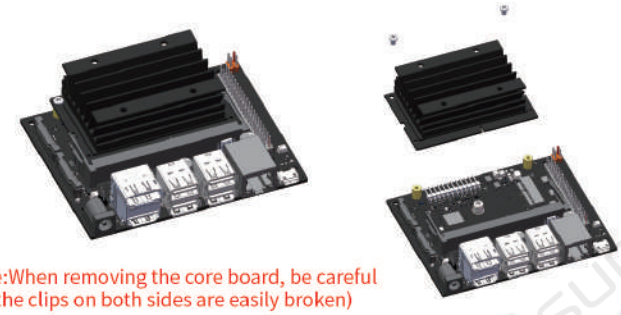




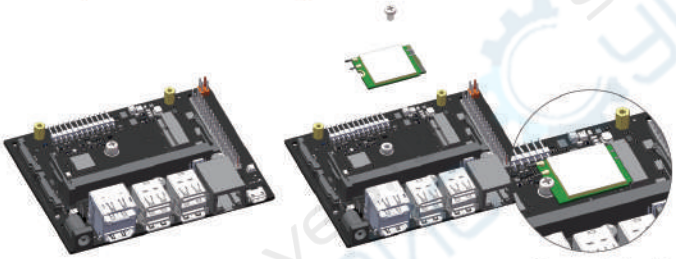
Jetson nano board installation steps

(If you didn' t purchase this accessory, please skip this installation step)

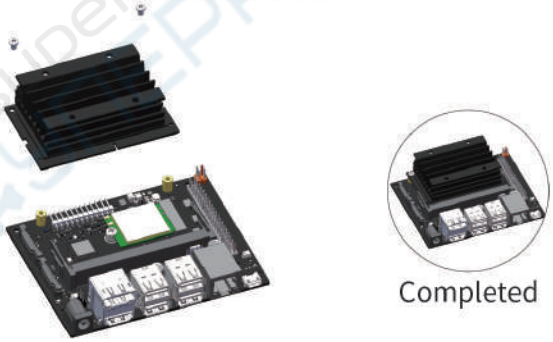
1 . Install network card (Note: Please keep the removed screws properly)



(Note:When removing the core board, be careful that the clips on both sides are easily broken)

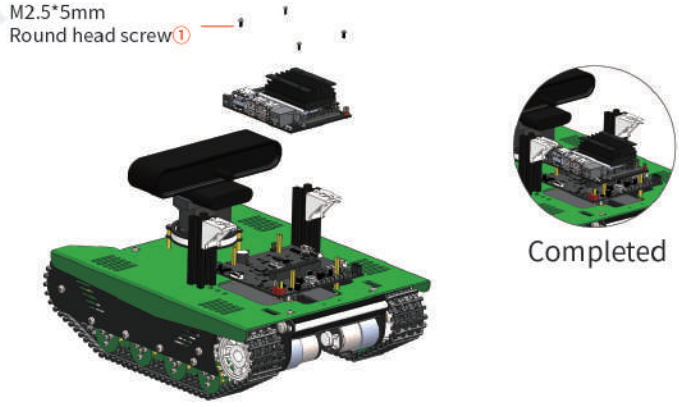


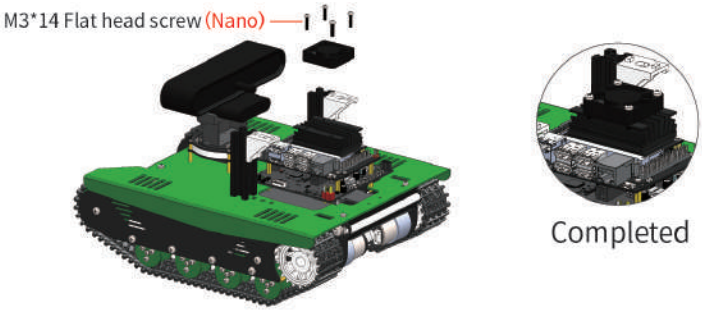
(Install network card)



2 . Install Jetson nano board

(Please install the 40Pin cable before installing Jetson NANO)
(Please install Jetson NANO board correctly according to the diagram on the right)

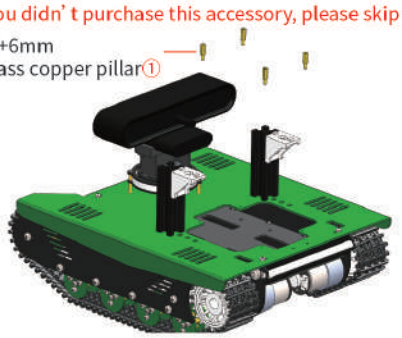


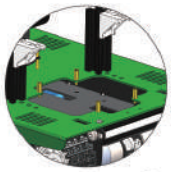


Raspberry Pi board installation steps

(If you didn't purchase this accessory, please skip this installation step)

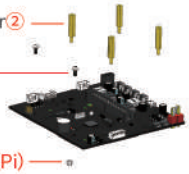
M2.5*11+6mm
Single pass copper pillar①



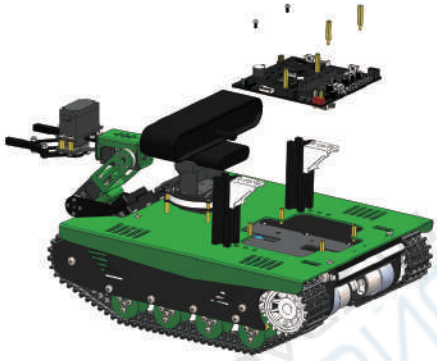


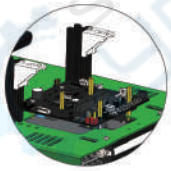
Completed

M2.5*19+6mm
Single pass copper pillar②
M2.5*5mm
Round head screw①



M2.5 Lock nut (Pi)

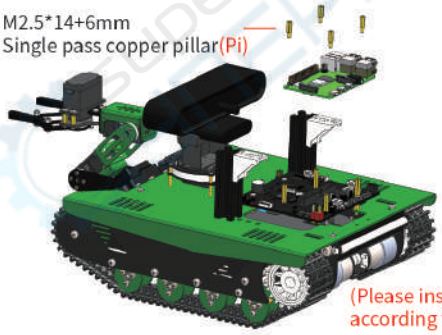




Completed

(Please install the 40Pin cable before installing Raspberry Pi)

M2.5*14+6mm
Single pass copper pillar(Pi)

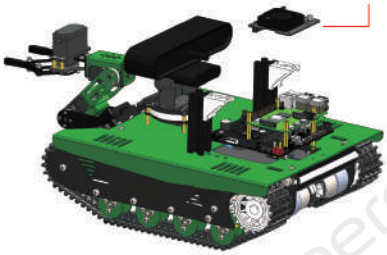


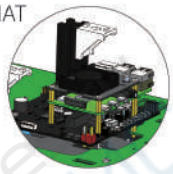
Completed

(Please install Raspberry Pi board correctly according to the diagram on the right)

M2.5*5mm Round head screw①

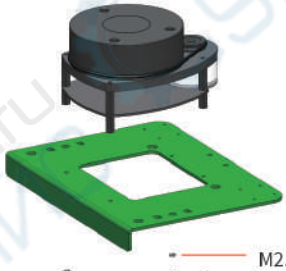
RGB cooling HAT

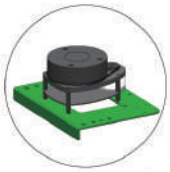




Completed

Lidar installation steps

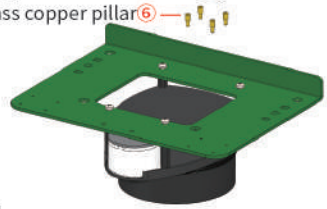


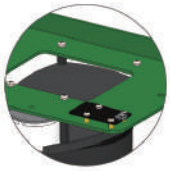


Completed

M2.5 Elastic gasket⑥
M2.5*5mm Round head screw⑥

M2*4mm
Round head screw⑥
M2*4+4mm
Single pass copper pillar⑥

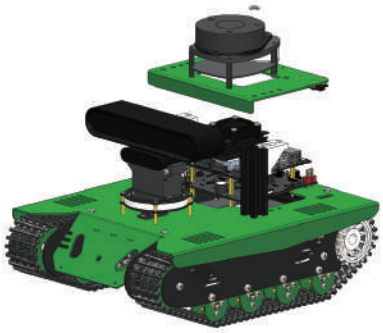




Completed

M6*10mm Hexagon
socket head screw②

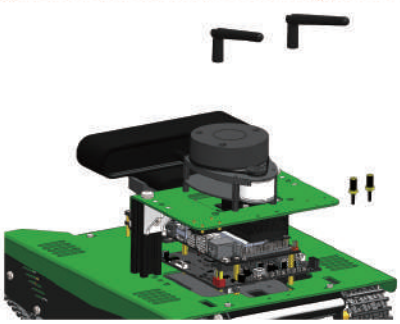
M6 Elastic gasket②



Completed

Jetson antenna installation steps

(If you didn' t purchase this accessory, please skip this installation step)



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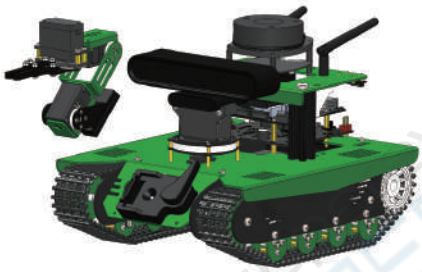
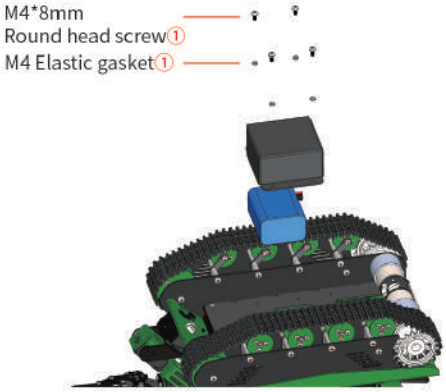


Completed

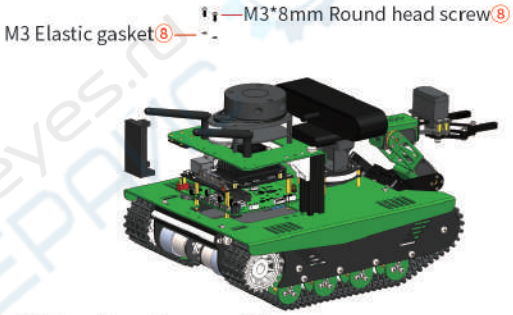
Battery installation steps



Completed

7-inch screen installation steps

(If you didn' t purchase this accessory, please skip this installation step)



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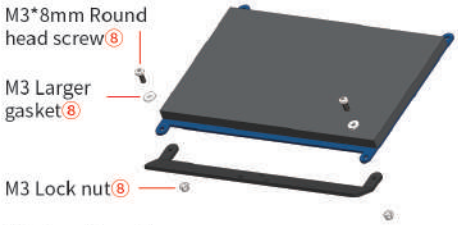

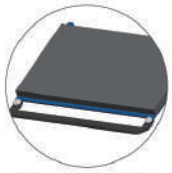

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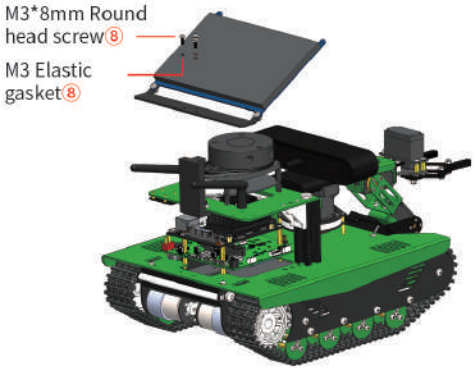
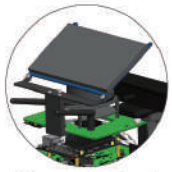
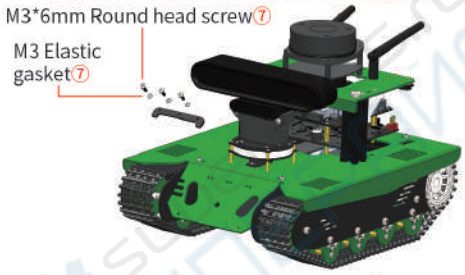




Completed

Robotic arm installation steps

(If you didn' t purchase this accessory, please skip this installation step)



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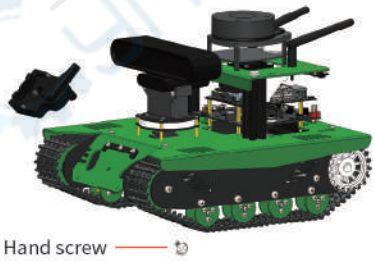
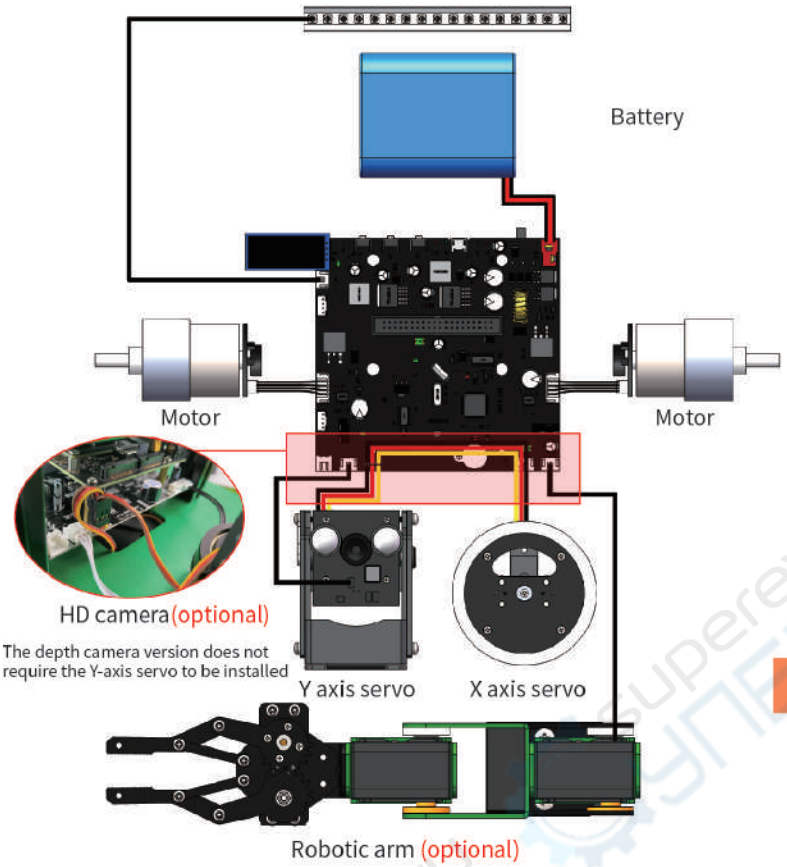


Completed

Wiring diagram on expansion board



Note:

1.Please install the 40Pin cable before installing main control board.

2. Insert the OLED screen correctly according to the schematic diagram.

3. Left and right motor cables need to be inserted into the left and right motor interfaces on the expansion board.

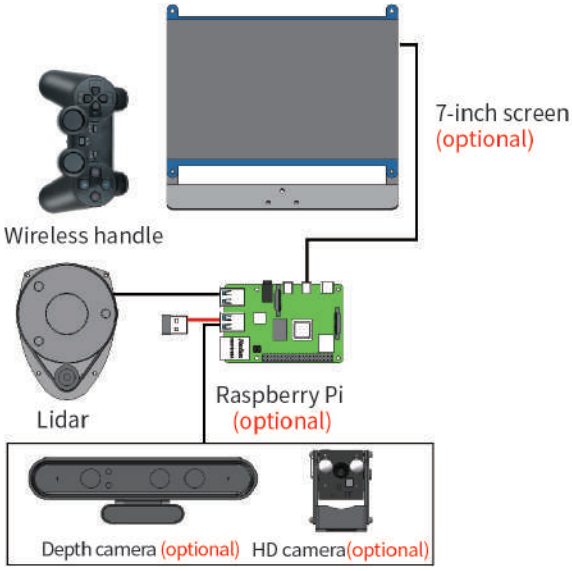
4. After the red and black wires of the battery are inserted into the T-shaped sockets on the expansion board, please fix the charging wire of the battery on the top of the frame to prevent it from falling to the ground and damaging the charging wire.

5. There is an X-axis servo at the bottom of the pan/tilt, and a Y-axis servo is installed on the high frame rate camera assembly. Please insert the servo cable into the corresponding pin according to the optional accessories.

6. The bus servo cable at the end of the robotic arm can be inserted into any of the Servo1/Servo2 ports on the expansion board.

Jetson Nano wiring diagram

Raspberry Pi wiring diagram



Note:
1. Please remove the network card antenna before removing the lidar fixing plate to prevent damage to the antenna.
2. The USB interface on the main control board has a limited location, and all devices need to be inserted in order.

First Trial

1. Download and install APP

Android users search"YahboomRobot" in Play Store or enter tutorial link on the homepage to download APP.
iOS users search"YahboomRobot" in App Store to download APP.

2. Preparation

The TF card and U disk we provided has been written into the system image file and you can use it directly.

For Jetson NANO version:
This step includes three cases, please check the corresponding operation according to your actual situation.

A: You possess the Transbot with Jetson NANO 4GB (SUB).
Please insert the USB flash disk provided by us into the USB port of the Jetson NANO 4GB board.

B: You possess the Transbot without Jetson NANO 4GB (SUB) and you have the NVIDIA Jetson NANO 4GB developer kit.
Please remove the TF card in the card slot, and insert the USB flash disk provided by us into the USB interface of the Jetson NANO 4GB board.

C: You possess the Transbot without the Jetson NANO 4GB (SUB), and you purchased Jetson NANO 4GB (SUB) board separately.
Please enter our tutorial link to view the tutorial [First Trial]--[First TrialV2.0].

For Raspberry Pi version:
Insert the TF card we provided directly into the card slot on the back of the Raspberry Pi board.

Note:
Yahboom Jetson NANO image, user name: **jetson** password: **yahboom**
Yahboom Raspberry Pi image , user name: **pi** password: **yahboom**

3. Start the TRANSBOT

3.1 Please check the corresponding wiring of the exapansion board and ensure the battery is correctly inserted into the expansion board.
3.2 Open the power switch and wait patiently. When the buzzer whistle three times, which indicates that the Transbot has been successfully started.

Tip: Yahboom Transbot image system comes with WiFi (Name: Transbot, password: 12345678), users can connect their phone to Transbot WiFi to form a local area network to realize APP remote control of the robot car.

Note: This Transbot WiFi is only used for communication between the car and phone, and cannot surf the Internet.

If you want to connect the robot car to your home, office or school WiFi, please read the following steps carefully.

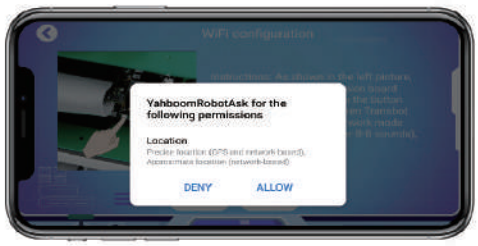
4. Connect network

4.1 Ensure your phone already connected WiFi.Open YahboomRobot APP, choose [ROS Robot]--[TRANSBOT].

Note: If you have already connected to Transbot WiFi, or have already connected to your homw WiFi signal, click **[Skip]** this step.
This step is only prompted once when the APP is run for the first time, and it will be automatically hidden after one operation. Next time, if you need to use the camera WiFi network configuration method, please click the **[Network Configuration]** in the upper right corner.

4.2 After turning on the power of Transbot, wait for the system startup to complete (the buzzer beeps three times in succession), press and hold the K1 button on the expansion board for about 2 seconds to enter the WiFi network configuration mode. At this time, the WiFi indicator flashes and the buzzer keep beeps , Click **[Next]**

4.3 If the phone need to obtain any permission, please click "ALLOW".



4.4 If the current WiFi name is not displayed or displayed incorrectly, please click **[Refresh]**. If the WiFi is not currently connected, please click the **[WiFi]** button to enter WiFi connection interface on your phone.Then, back to APP and input password of the WiFi connected to the mobile phone, click the **[Connect]** button to enter the next step.

4.5 As shown below. Scan the QR code on the APP with the camera of Transbot. When buzzer whistle 3 times and the blue WiFi indicator light on expansion board keep on, we can click [OK]. Then you can IP address on OLED, which means Transbot has connected to WiFi successfully.

4.6 The phone will automatically search for the device, and a prompt info will appear after a few seconds, click **[Connect]**. If the device is not found for a long time, please click **[Search for device]** to search again.

4.7 If the device is not searched for a long time. We can also click the **[IP Connect]** to connect to the network manually. As shown below, input Transbot IP address on APP, "Port":6000 , "video": 6500.

5. APP control

5.1 CONTROL

Click the **[CONTROL]** icon, the following interface will appear on APP.

The remote control interface is divided into four parts.

Part 1. Left area. There are three ways to control Transbot: gravity, button, joystick, which can control robot car forward, backward, turn left and right, rotate left and right. The buttons at the bottom can also adjust the speed of the robot car.

Part 2. Middle area. View video captured by the camera, and the images support zooming in and out. The upper left corner of the screen shows the frame rate, and the suffix -X represents the function number currently running.

Part 3. Right area. Control the camera servo platform, buzzer and

searchlight. When the servo platform button is pressed, the servo will automatically rotate in one direction, when we release the button, it will stop. Press the middle button once to restore the servo platform to the middle position. When the buzzer button is pressed, the buzzer will sound, when we release this button, the buzzer will turn off. The searchlight button is a switch, click once to turn on the light, click again to turn off the light.

Part 4. The [Arm control] button in the upper right corner.
After clicking, we will enter the interface for controlling the robotic arm. We can view the current video screen in full screen. The joystick on the left of the video screen can control the car, and the button on the right can control the robotic arm. There is a full-screen display switch in the upper right corner.

5.2 COLORFUL LIGHT

Click the **[COLORFUL LIGHT]** icon, the following interface will appear on APP.

The Colorful light interface is divided into four parts.
Part 1. The upper left area. By dragging the drag bar of [R] [G] [B], we can modify the RGB color of the light bar in real time.

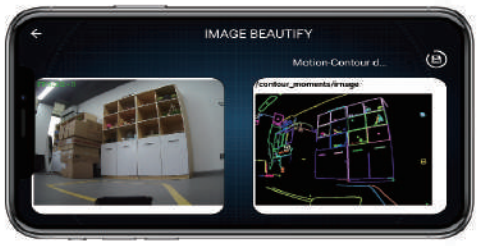
Part 2. The lower left area. We can control the RGB light bar to display red, green, blue, yellow, purple, cyan, white, and off. At the same time, we can also adjust the color of the breathing light.

Part 3. Right area. Click the button to make the light bar realize the corresponding special effect, and click the button again to exit the special effect. The drag bar at the bottom can change the speed of light effects, the default is 5, the fastest is 1, the slowest is 10.

5.3 IMAGE BEAUTIFY

Click the **[IMAGE BEAUTIFY]** icon, the following interface will appear on APP.

We can choose two special effects [Sketch-Edge Detection] and [Motion-Contour Detection]. The following figure shows the effect of the two special effects.



Click the picture save button in the upper right corner to save the current beautified picture to the phone album, the album name is [YahboomAlbum]. (This function requires the APP to open the storage data permission.)

5.4 LASER RADAR

Click the **[LASER RADAR]** icon, the following interface will appear on

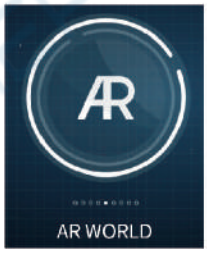
There are three functions: [Radar avoid], [Radar track]] and [Radar guard]. Click the corresponding button to open the function, and click again to close the function.
The lower slide bar can adjust the parameters before starting the function, including lidar detection distance, lidar scanning angle and car speed, among which [[car speed] is only effective in the function of [lidar avoid].[detection distance] and [scan angle] need be used in three functions.

[Radar avoid]: Automatically avoid obstacles in front within the detection range set by lidar.

[Radar track]: Automatically track the nearest object within the detection range set by the lidar.

[Radar guard]: Within the detection range set by the lidar, the front of the car will automatically turn to the nearest object.

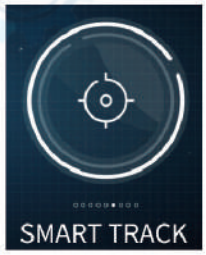
5.5 AR WORLD



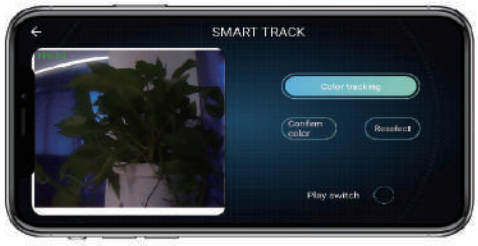
Click the **[AR WORLD]** icon, the following interface will appear on APP.

The AR game requires checkerboard paper. Click the button on the right, select one of the shapes to be displayed, and put the checkerboard paper in front of the camera. For example, as shown above, the small windmill graphic is selected. Click the button again to close this function.

5.6 SMART TRACK



Click the **[SMART TRACK]** icon, the following interface will appear on APP.



Principle of smart track: First identify the HSV value of a color, and then process it with an algorithm to detect whether there is an object similar to the color in the screen. If there is, mark the object with a circle, and the camera tracks the object.

Before starting this function, we click the [Color Tracking] button. If it is the first time to use, a small box will automatically appear on the video interface. We need to fill the entire small box with the color to be recognized, and then press [Confirm color] button.

After confirming the color, the system will save it to the Transbot/transbot/TransbotTrackerHSV.text file in the system user directory. Next

time you turn on the [Color Tracking] function, you do not need to recognize it again, and will automatically read the value of the file.

If you need identify the color, click [Re-select] button a small box will displayed. After filling in the color to be identified, click [Confirm Color].

[Play switch] Turn on the smart track function.

5.7 SMART PATROL

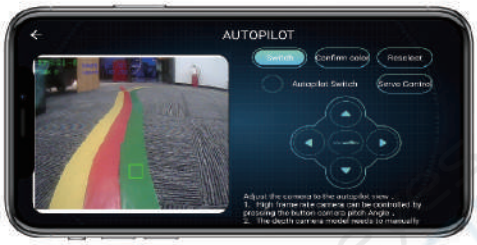
Click the **[SMART PATROL]** icon, the following interface will appear on APP.

There are four paths for the patrol function. Click the button, the car will automatically move a similar path according to the graphic on the button, click again to close the function.

The [Linear Speed Scaling Ratio] and [Angular Speed Scaling Ratio] below can adjust the movement of the trolley more accurately according to different venues.

5.8 AUTOPILOT

Click the **[AUTOPILOT]** icon, the following interface will appear on APP.



The Autopilot function interface is divided into two parts, the left side displays the camera screen, and the right side is responsible for the control functions.

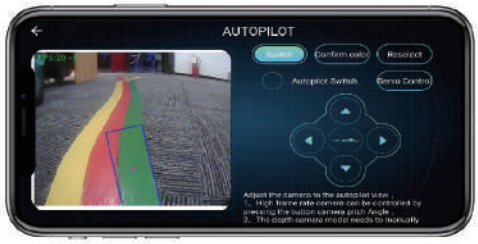
[Display Switch]: Switch the original image and the binary image screen, the binary image screen will display the recognized color as white, and display other colors as black.

[Confirm color]: Save the HSV value of the color to be recognized in the small box to the Transbot/transbot/TransbotFollowHSV.text file in the system user directory. Next time you enter [Autopilot], you do not need to recognize it again, and it will automatically read the value on file.

[Re-select]: Re-identify the color and display a small box. After filling in the color to be identified, click [Confirm Color].

[Autopilot switch]: Transbot will process the algorithm according to the color recognized by the camera screen to realize the Autopilot function.

[Servo /car ontrol]: Click button to adjust servo pan/tilt or the motor movement.



When the [Autopilot switch] is turned on, the arrow keys that control the car will be replaced with the PID parameter adjuster. You can only adjust one parameter at the same time. Touch the circle on the left of the corresponding PID text to select the modified parameter. For example, if P is selected, it will display the current P value, then click the [+] to increase the value, and click the [-] to decrease the value. If the debugged PID parameters are not effective, you can click the [Reset] button on the right to restore PID parameters to default values.

5.9 USER GUIDE

Click the **[USER GUIDE]** icon on the main interface, and the following interface will appear. Please read the color calibration instructions carefully and click **[Next]**.

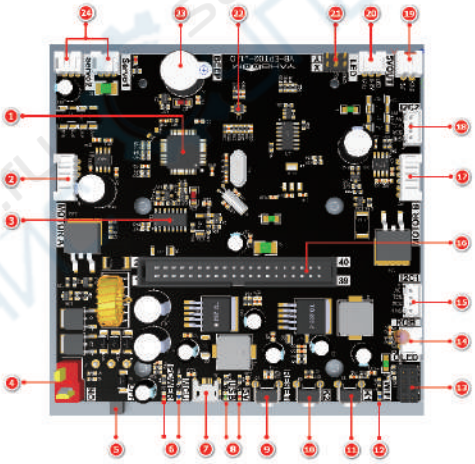
In this interface, we can adjust the HSV value of the color recognition of the automatic driving and smart tracking functions. On the upper right side, you can choose [Autopilot color calibration] or [Smart track color calibration], and only one of the two functions can be selected at the same time.

[Display switch]: Switch the original image and the binary image screen, the binary image screen will display the recognized color as white, and display other colors as black.

[Color Calibration]: Save the color calibration data to the TransbotFollowHSV.text or TransbotTrackerHSV.text file for the [Autopilot] or [Smart track] function.

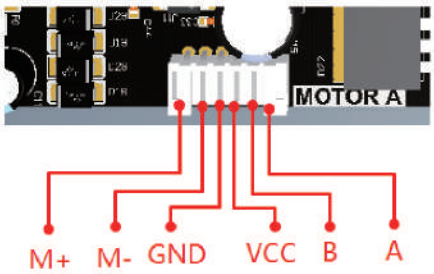
Color calibration instructions: Please select Autopilot color calibration or smart track color calibration, and then point the Transbot camera at the color to be recognized, and then click the [Display Switch] switch to fine-tune through the HSV slider. The effect is that the recognized color area is white. Others are black, indicating successful debugging, click [Color Calibration] to save the data, and finally click [Return].

Introduction of expansion board



① On-board single-chip microcomputer: In order to simplify the development steps, the Transbot expansion board integrates a which mainly manages the component drivers on the expansion board. The driving content includes: robotic arm, active buzzer, six-axis attitude sensor, PWM servo pan/tilt , LED searchlight, motor, RGB colorful light bar, button K2. The single-chip microcomputer and Jetson Nano board communicate through the serial port. When the single-chip microcomputer will respond to the serial port information. The specific communication protocol can be viewed in [Transbot communication protocol].

② Motor interface A: Connect to the Transbot motor of left wheel. The interface line sequence is shown below.



③ Serial communication chip: onboard CH340C serial chip.

④ DC 12V power supply T-type interface: be used to connect battery pack.

⑤Power switch: ON/OFF.

⑥Indicator light: MCU indicator light indicates whether the MCU on the expansion board is working normally. Normally working status: fast flashing twice every 3 seconds, abnormally working status: always on or off. Power indicator indicates whether the expansion board is normally powered.

⑦Micro USB interface: connect to the computer USB port, it cab be used update the firmware of the expansion board.

⑧Indicator light: When the 5V indicator light is on, it means that the 5V voltage supply of the board is normal. If the USB indicator flashes, it means there is data coming in from the Micro USB port.

⑨RESET button:It can restart the MCU on the expansion board.

⑩K2 key: The buzzer will sound once every time the K2 key is pressed, and the special effect of the RGB colorful light bar will be switched. K2 key is only connected to the MCU in the expansion board. The function of this button has been fixed and cannot be customized by yourself.

⑪K1 key: By default, after the Transbot system and APP control process is started, long press the button K1 to enter the network distribution mode, and the robot car can connect to the network by scanning the QR code.When the APP control process is closed, the function of this button can be customized by yourself. K1 is connected to the physical pin 11 of Jetson NANO(BCM number is 17).

⑫WiFi indicator: By default, after the Transbot system and APP control process is started, when robot car connect WiFi, this light will keep on. When the APP control process is closed, the function of this light can be customized by yourself. It is connected to the physical pin 12 of Jetson NANO(BCM number is 18).

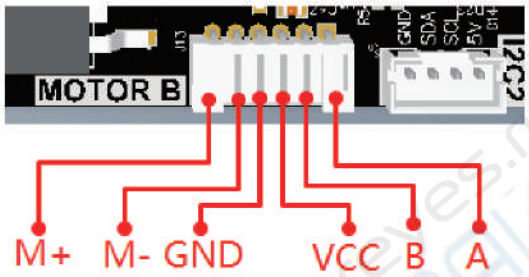
⑬OLED interface: IIC communication, I2C interface 1 and interface 2 are connected in parallel. It is connected to the physical pin 3, 5 of Jetson NANO.

⑭Colorful light bar interface: Connect to the RGB colorful light bar.

⑮IIC interface1: It is connected to the physical pin 3, 5 of Jetson NANO.

⑯Flat cable socket: The expansion board is connected with the main control board through the flat cable, communicates with the main control board and supplies power to it.

⑰Motor interface B: Connect to the Transbot motor of right wheel. The interface line sequence is shown below.



⑱IIC interface1: It is connected to the physical pin 3, 5 of Jetson NANO.

⑲DC 5V power output: 5V DC voltage can be output, rated current: 0.5 A.

⑳OLED searchlight interface: connect to the LED searchlight, support adjusting the brightness of the searchlight.

㉑PWM servo interface: Two PWM servos can be connected, the yellow is the signal line, the red is 5V, and the black line is GND.

㉒Six-axis attitude sensor: Provides the current pose information of Transbot to Jetson NANO.

㉓Active buzzer: When receiving a high-level signal, the whistle will sound.

㉔Robotic arm interface: Servo1 and Servo2 are connected in parallel, robotic arm can be connected to any one of them, rated current: 2.6 A.

FAQ

1: How does main control board communicate with the expansion board?
A: Main control board sends data through the serial port, and then transmits the data to the MCU on the expansion board through the 40 Pin cable. The MCU automatically receives and parses the serial data.

2: When using the Transbot, does the main control board need additional power supply?
A: Transbot kit include a battery pack insert the battery pack into the DC 12V power T-type interface of the expansion board. Open the power switch, the expansion board integrates a voltage conversion chip will provides DC 5V power, and transmits it to main control board through a 40 Pin cable. So main control board does not need an additional separate power supply.

3: Which functions on the Transbot are managed by the MCU on expansion board? Which functions are directly managed by main control board?

A: The parts managed by main control board: K1, WiFi indicator, I2C interface, OLED interface.
The part managed by MCU on the expansion board: robotic arm, active buzzer, six-axis attitude sensor, PWM servo, LED searchlight, motor, colorful light bar, K2, RESET button, etc.

4: Why does the buzzer whistle once every second when Transbot hits the wall and causes the motor to stall?
A: The above situation means that the motor still outputs torque when the speed is 0 rpm.
At this time, a large current will be generated on the expansion board. If there is no protection circuit, it may cause the motor to burn out. Therefore, we have designed a motor protection circuit on the Transbot expansion board. When the motor stall current is too large, the protection circuit will sound a whistle and automatically disconnect the power supply of the motor. When the power supply is restored after 1 second, the system will again determine whether the current motor

Lithium-ion battery safety specification

1.It is strictly forbidden to connect to equipment that exceeds the load used by the product.

2.Please use the official battery, power adapter and battery box provided by Yahboom.

3.When charging the battery, please turn off the power switch on the expansion board. Do not use the battery while charging to prevent the charger or the battery from exploding.

4.When the battery is charging, the charger indicator light is red, and when it is full, indicator light will become green. After charging, the charger should be unplugged in time to avoid overcharging and damaging the battery. Someone needs to be present when charging.

5.When the battery voltage is less than 9.6V, the expansion board buzzer will emit a "di di di di" alarm sound and the MCU indicator will flash quickly. At this time, you need to turn off the power and then charge the battery.

6.After using, turn off the power switch on the expansion board. When not in use for a long time, please keep the voltage of the lithium battery pack 11.1V~11.7V, use a screwdriver to remove the battery box, take out the lithium battery pack and put it in the battery safe area. Do not mix with metal objects, and the insulating film wrapped on the outside cannot be torn off.

7.Keep away from heat, fire, any liquid. Don't use it in wet or rain. Humid environment may cause the battery to ignite or even explode.

8.When the lithium battery pack or battery charger catches fire or smoke, please use sand or dry powder fire extinguisher to extinguish the fire, and then quickly evacuate to a safe area.

9.Don't use the battery when it is leaking, damaged, heated, deformed, discolored, smelly or any other abnormal phenomenon, and contact Yahboom or other agents in time.

10.Please use the battery at 0° C~35°C environment.The battery will be damaged or the discharge performance will be extremely reduced at other temperatures.

11.Intentional puncture, short circuit, reverse connection, unauthorized welding, impact, crushing, and throwing of batteries are strictly prohibited.

12.Do not use the battery in a strong static and magnetic field environment, otherwise the battery may leak fluid, catch fire or even explode.

13.It is strictly forbidden to modify the hardware circuit board without permission.

14.Do not allow children to replace batteries without adult supervision. Keep batteries out of the reach of children.

15.If the charger or battery pack smokes or hot (the outer packaging will crack in severe cases) or the battery leaks, please disconnect the power strip or the main gate, then quickly pull out the charger, remove the battery and put it in an open area.

Solemnly declare: Users must read this manual carefully, especially the parameter indicators, precautions, etc., understand the use method and application range of the product.Any economic loss and safety accident caused by failure to comply with the above-mentioned lithium ion battery use specifications or operating errors shall be borne by the user.

Tutorial link

Jetson NANO version: www.yahboom.net/study/Transbot-Jetson_nano
Raspberry Pi version: www.yahboom.net/study/Transbot-Pi

Technical Support

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