

Product Overview

Thank you for choosing iTR E1 indoor intelligent mobile UV multi-point disinfection robot. We hope in the future, E1 can bring you and your company a cleaner, intelligent and convenient working environment.

This manual will help you better use our products and provide you with as comprehensive information as possible. We hope this manual can give you the best product experience when using our products.

If you have any questions in the process of using, please contact us at the first time, we will serve you wholeheartedly.

National after-sales service telephone number : +86-0571-87032179

Fax : +86-0571-87837189

Email : it@it-robo.com

Working hours: Mon ~ Fri , 9:00 ~ 18:00

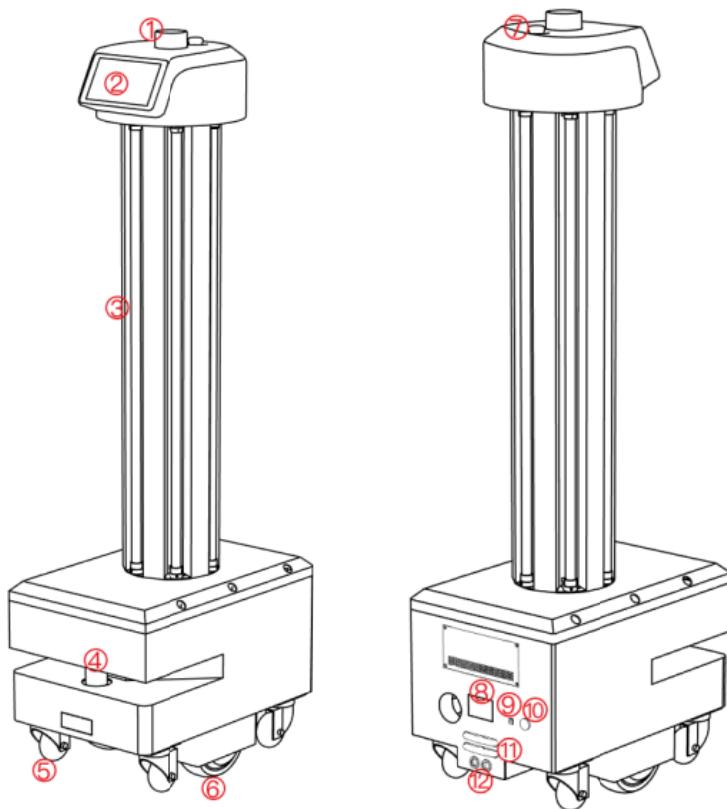
Product Introduction

E1 indoor intelligent mobile ultraviolet multi-point disinfection robot, based on the laser SLAM algorithm to complete the global environment map construction and positioning and navigation, high ultraviolet intensity, high projection rate, illumination power up to 180W, 360 angle all-round disinfection, full coverage and sterilization. E1 can carry out mobile regional automatic disinfection in crowded places, so as to auto working, thus reducing personnel contact, effectively reduce the risk of infection, can fully make up for the traditional fixed air disinfection machine、ultraviolet lamp、chemical fumigation method.

Packing list

The following is the body structure of iTR E1 UV robot:

- ① Camera
- ② Seven-inch display
- ③ UV light tube
- ④ laser radar
- ⑤ Vent Wheel
- ⑥ Active Wheel
- ⑦ urgent stop switch
- ⑧ infrared sensor
- ⑨ power plug
- ⑩ switch
- ⑪ charging contact
- ⑫ ultrasonic sensor

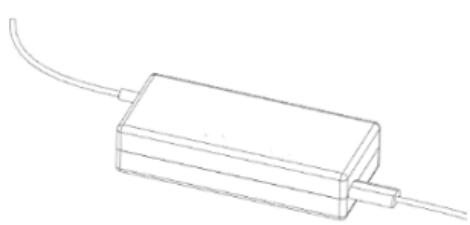


Cleaning precautions: ② display screen ④ laser radar, do not wipe the machine with a wet towel when cleaning, in case of water

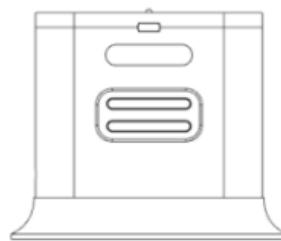
Use precautions: ④laser radar, do not block the laser with objects

⑦ Emergency stop switch: emergency stop switch can only rotate to the right, do not rotate left

Charger: The adapter plug needs to be inserted into the voltage of 110-240V, and the DC head is inserted into the automatic charging pile. At this time, the green light of the charging pile will be on, indicating that the charging state is ready.



Power Adapter



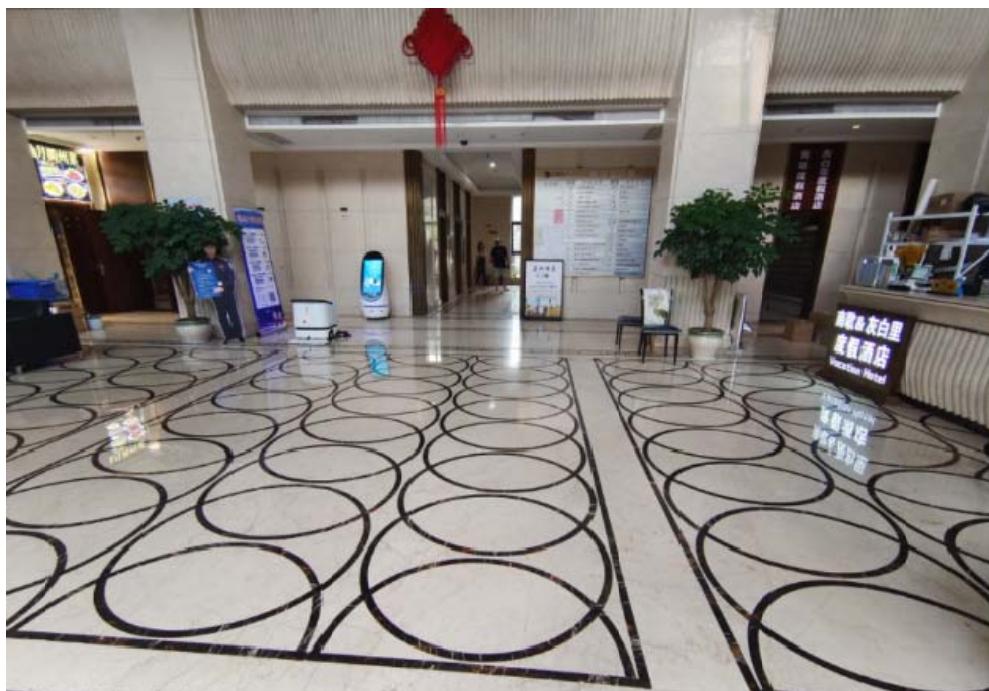
Automatic charging pile

Operating steps

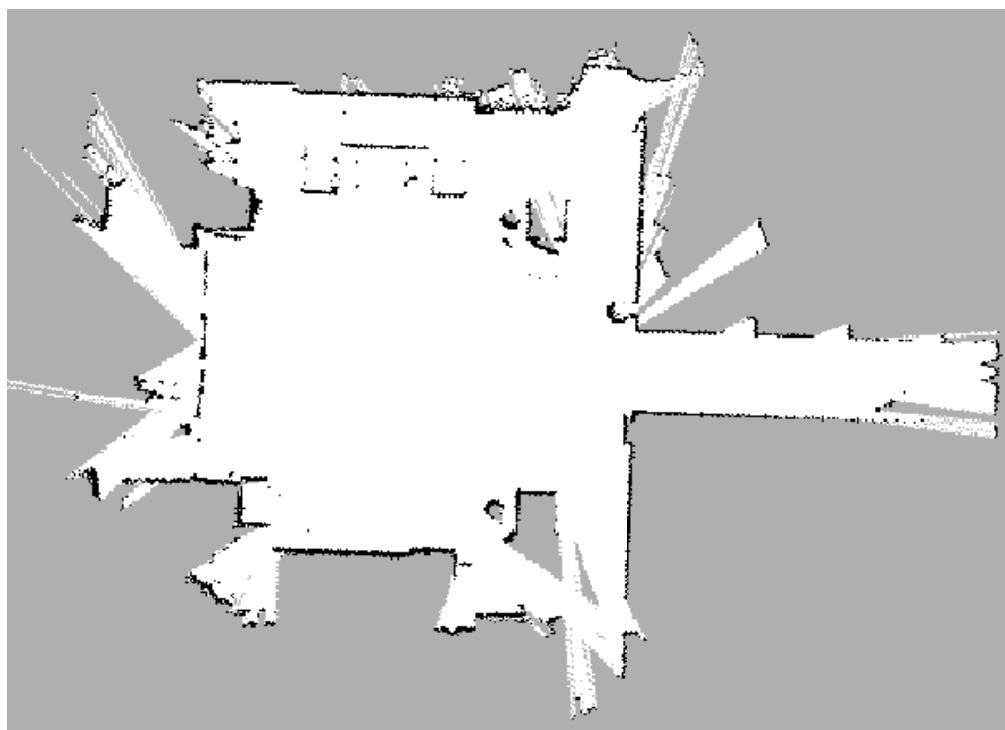
Preface

Why we should build a map ?

The robot needs to scan the actual environment and build a map that can be compared according to the real-time scanning situation, so as to find the correct position and improve the accuracy and efficiency of the operation.



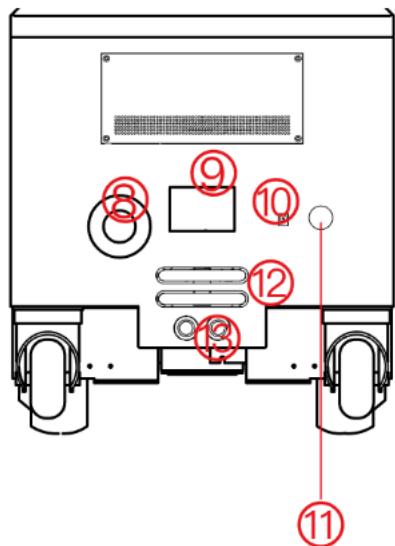
Actual environment (above)



Machine scan of the environment (above)

Power on

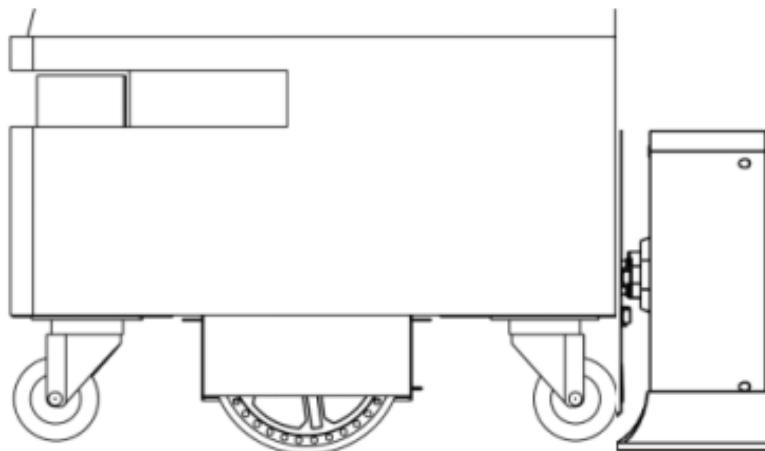
The power button is on the back of the robot^⑩ . It is a button switch. Press the power button once to turn on the robot, and long press the power button for 3 seconds to turn off the robot.



Shutdown precautions: Press and hold the power button for 3 seconds, the display screen will first turn off the screen and shut down, then the motor will power off, and finally the chassis light will go out.

Charging

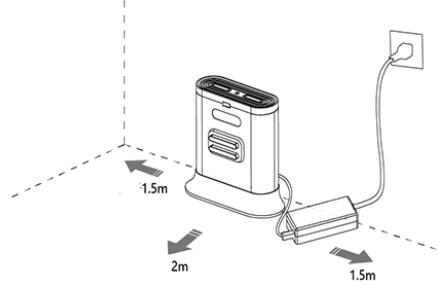
Automatic charging: When the electric quantity is lower than the set threshold value, the robot can automatically detect the electric quantity and charge automatically (prerequisite: the point of good charging pile should be well marked).



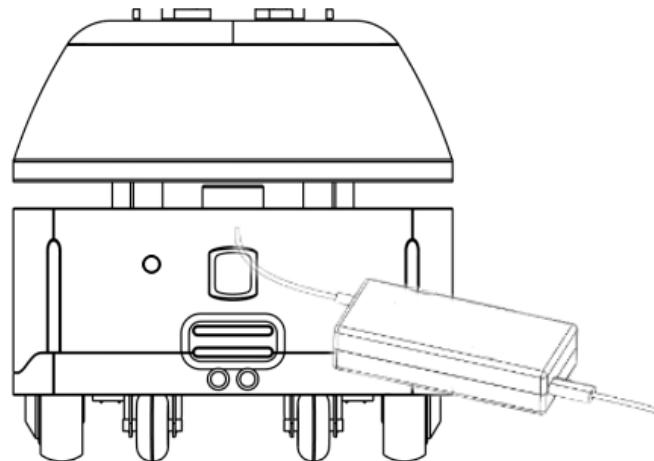
Selection of charging pile position and points for attention



- The location of the charging pile must be selected within the map and placed against the wall;
- Obstacles within 2 meters in front of the charging pile and within 1.5 meters on both sides;
- Place the charging pile to avoid moisture, dripping, high temperature environment;
- When multiple charging piles are placed, the charging pile spacing is not less than 1.5 meters;

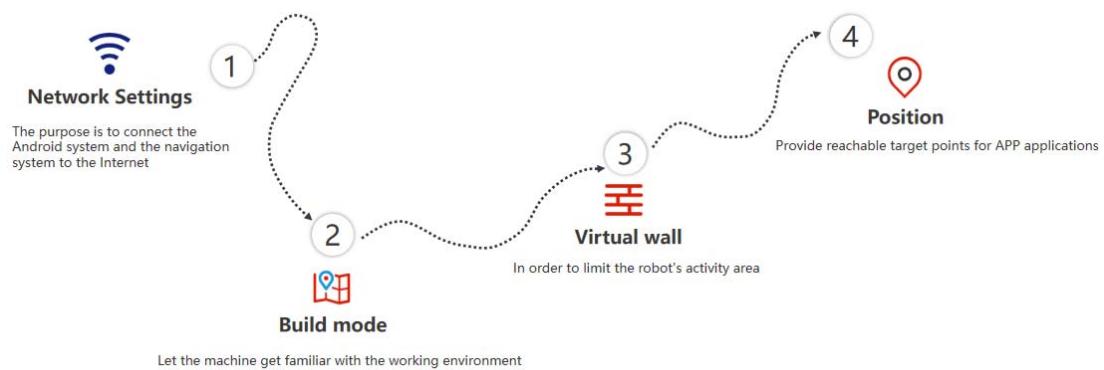


Direct charging: plug the power adapter cable into the power supply on the back of the robot.



Navigation

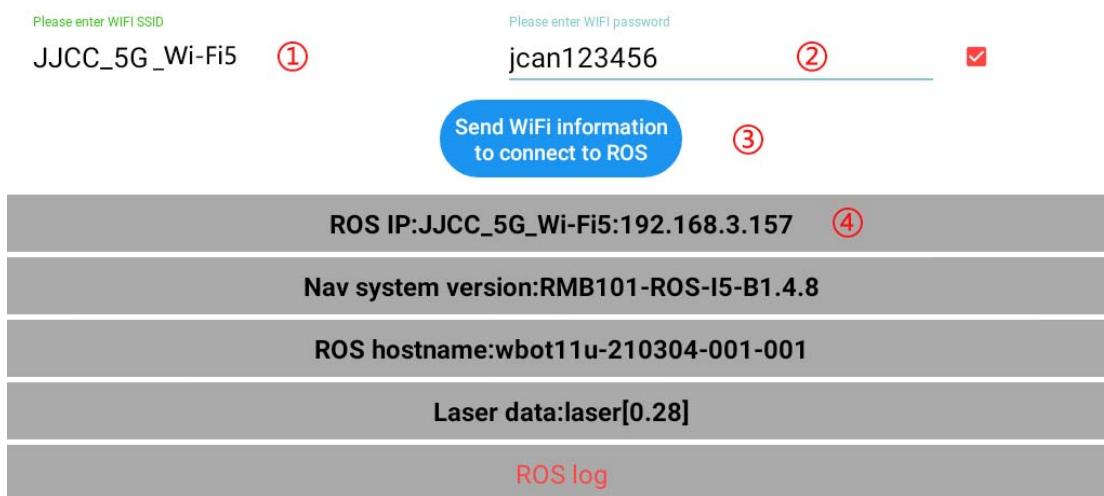
Note : The following content is an introduction to all the functions of the robot deployment background. The functions that must be operated are as shown in the points 1, 2, 3, and 4 in the following figure. Other functions depend on the specific scenarios and usage conditions.



Network Settings

Note: The router network segment cannot be the 192.168.10.x network segment

1. Open the [Settings]-[WLAN] on the Android screen of the robot to connect to Wi-Fi
2. Open the Ftp application and enter the following interface. Follow the steps shown in the figure. If the Wi-Fi password already exists, click "Send Wi-Fi Information to Connect to ROS".



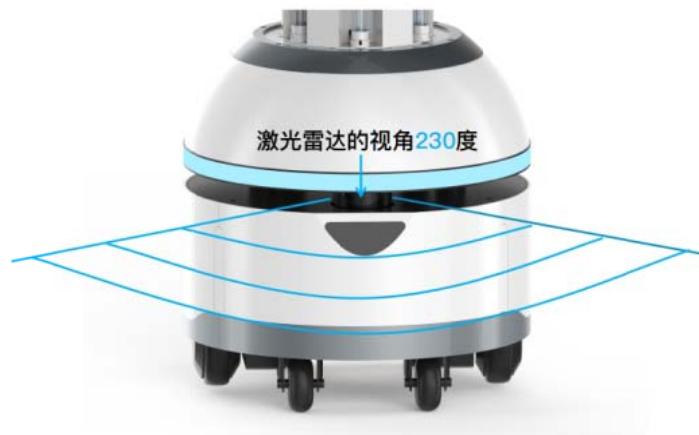
- ① Check the Wi-Fi name you want to connect to
- ② Enter Wi-Fi password
- ③ Send Wi-Fi information to the navigation system (just click once, don't click repeatedly)
- ④ Observe connect situation
- ⑤ Show IP for connection success (show 127.0.0.1 for connection failure)

3. The scanning device should be connected to the same LAN as the machine. Open the browser and input the IP address of the machine (Chrome browser is recommended)

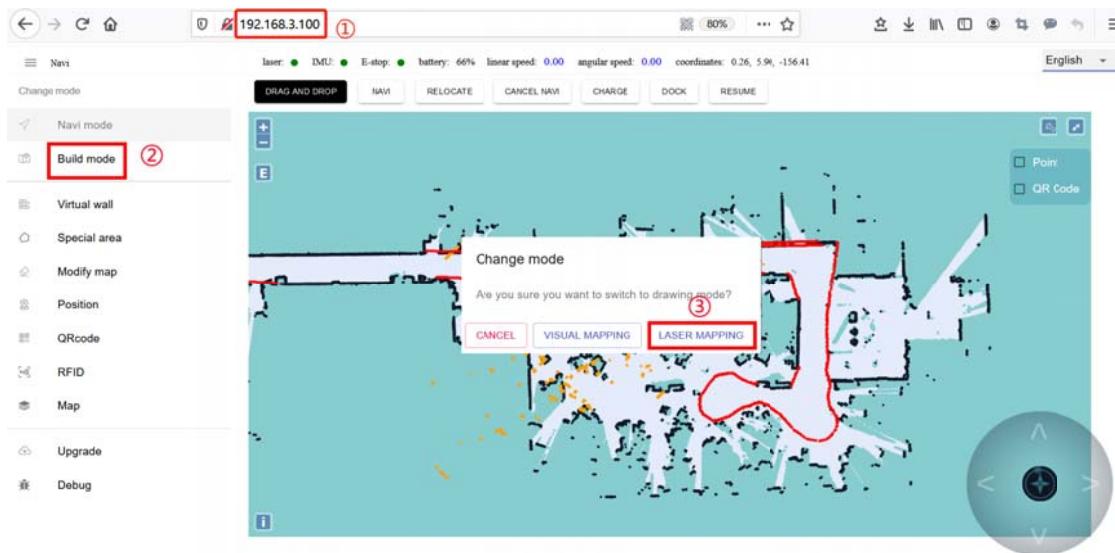
If the Wi-Fi connection fails, you can click ③ again to reconnect. If it still fails, you can connect to another network.

Mapping

- The purpose of building the map is to let the robot know the working environment
- The robot needs to scan the actual environment and construct an "original map". During the navigation process, the robot can compare with the original map based on the real-time scanning situation and find its own position.
- The viewing angle of the Lidar is 230°, and the scanning range is the horizontal plane of the radar height; the scanning distance is 25 meters
- Ask people to stand behind to push the robot, or use the keyboard arrow keys to control the mapping



1. Please follow the order of the figure below to enter the building page

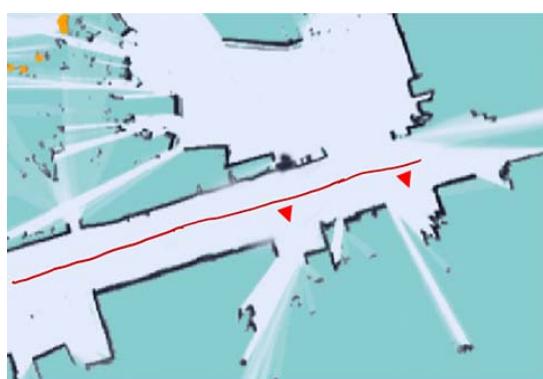


①Get IP from FTP software

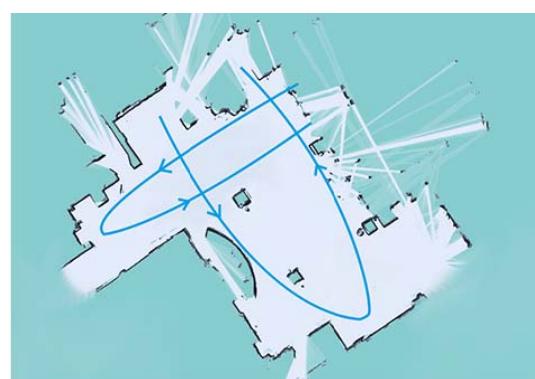
②Shift to Build mode, and choose Laser Mapping.

③You can turn on the emergency stop switch and click the button to control the robot, or use the keyboard arrow keys to control the robot to create a map; you can also press the emergency stop switch to push the machine to create a map

2. After entering "map mode", the machine first rotates in a circle to clean the surrounding feature points. When rotating, the speed should not be too fast. After one rotation, you can push (control) the machine. You can walk straight in narrow areas. Pay attention to the gaps during walking. Slowly rotate the machine 90° facing the gaps to clean the feature points, then slowly turn back to continue scanning; open areas can follow the U-shaped route, as follows:



straight line



u-shaped route

3. When pushing (controlling) the machine, pay attention to whether the laser matches the actual terrain. If it does not match, stop and wait for a while, wait for the laser to match the actual terrain, and then go. As shown below:



figure 1

figure 2

Figure 1: mismatch between laser and terrain (when the laser does not match the terrain, stop and wait for the laser to match the terrain before pushing the robot to build the map)

Figure 2: matching of laser and terrain (some areas need robot to turn to be able to scan clearly, such as wide terrain and room)

4. Do not move the machine after the machine reaches the end point. Just observe whether the map is clean, without ghosting and matches the actual terrain. If there is no obvious dislocation, click "composition completed". If there is any dislocation, please wait for a period of time, and the algorithm will correct it. If the correction is not successful in 10 minutes, consider rebuilding the map.

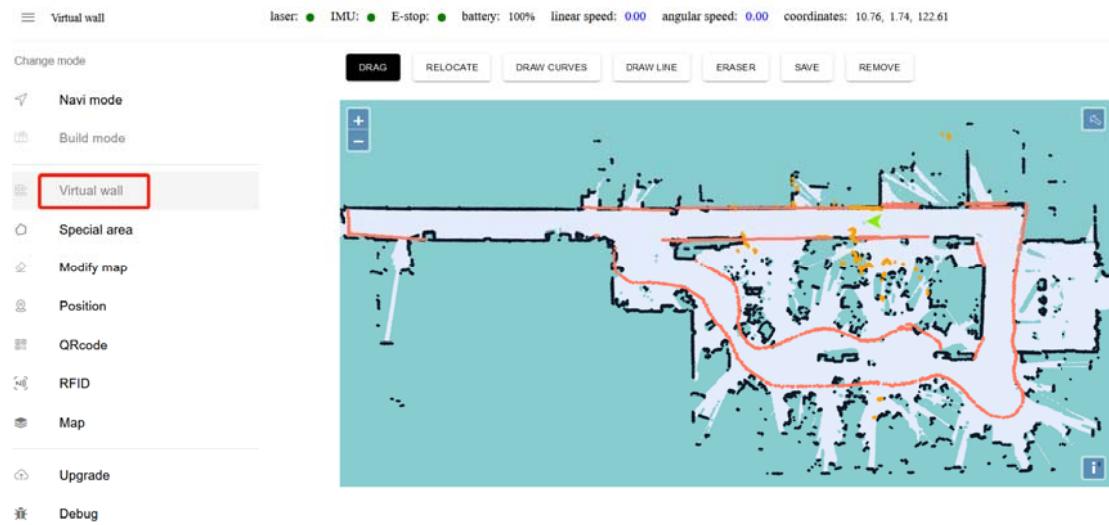
matters needing attention:

1. Select the place with obvious feature points and clean terrain as the starting point and end point, and scan the surrounding environment in a slow circle at the beginning.
2. When pushing or controlling the robot, walk slowly and observe whether the laser matches the terrain. If there is a mismatch, stop and wait for the laser to match the current terrain.

3. After the robot reaches the destination, observe whether the map is clean without ghosting and matches the actual terrain. If there is no obvious dislocation, click "composition complete". If there is any dislocation, please wait for a period of time, and the algorithm will correct it. If the correction is not successful in 10 minutes, consider rebuilding the map.

Virtual wall

Edit the function of virtual wall: restrict the active area of robot



Drag: in this mode, you can zoom, pan and rotate the map. In this mode, you can select a rectangular area according to "Ctrl + left mouse button", and the virtual wall in this area will be cleared

Draw curve: you can draw a curve, which is often used to draw irregular terrain

Draw a straight line: click two positions to draw a straight line between the positions you click. It is often used in regular terrain or rough area drawing

Eraser : Circle the virtual wall that needs to be cleared

Save: only click Save to save the drawn virtual wall

Clear: if you are not satisfied with the current virtual wall, click the clear button to clear all the virtual walls (you need to click Save to take effect)

Example: glass wall

Note: the laser can penetrate the glass, so when drawing the virtual wall, pay attention to the virtual wall outside the glass



figure 1



figure 2



figure 3

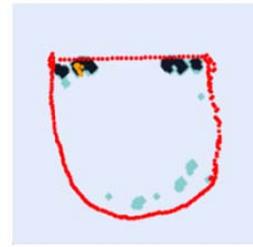


figure 4

figure 1 Actual environment figure 2 Map scanned by laser

figure 3 error figure 4 correct

Example: table

Note: the laser can only scan one horizontal plane, so when drawing the virtual wall, consider the desktop projection



figure 1

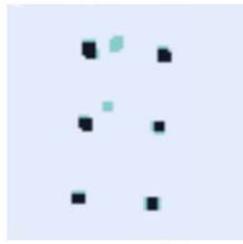


figure 2

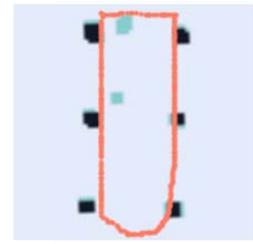


figure 3

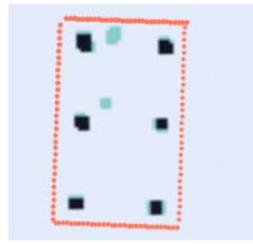


figure 4

figure 1 Actual environment figure 2 Map scanned by laser

figure 3 error figure 4 correct

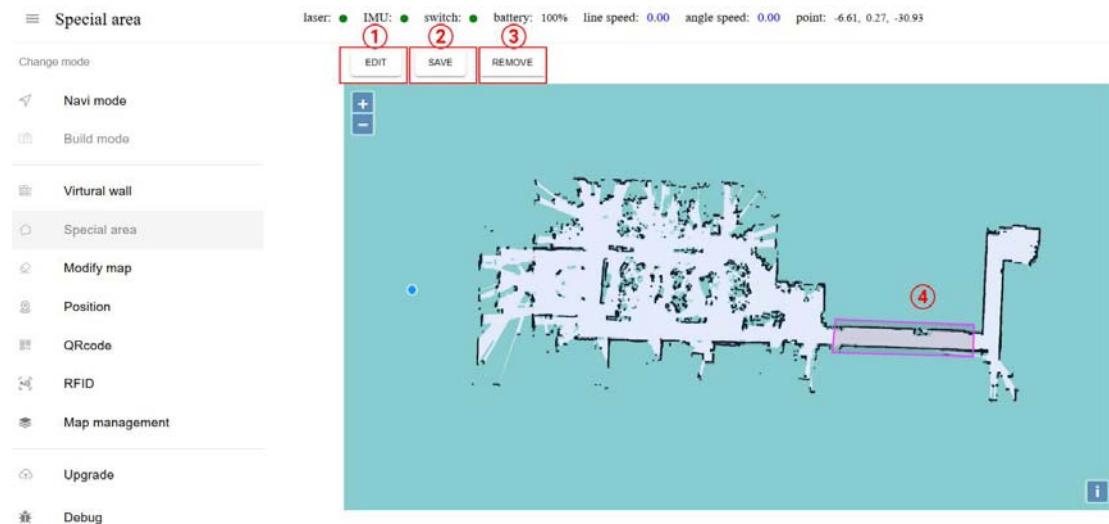
matters needing attention:

- 1.The minimum passing distance of the machine is 80cm, so attention should be paid when drawing the virtual wall
- 2.The main function of the virtual wall is to draw the robot's moving space and separate the areas where the robot does not want to travel with the virtual wall.
- 3.Some areas that do not need to be driven or cannot be scanned by laser (glass walls, tables and chairs, steps, transparent and fragile objects, etc.) please make sure to build virtual walls.
- 4.After save,click[navi mode],will back to navigation mode.

Special Area

Tip: skip this step if there is no long corridor

The function of special area: optimize the corridor area



- ① Click this button to switch to "drag" mode
- ② Special areas drawn will not take effect until they are saved
- ③ Click this button to clear all special areas in the Council (also click Save to take effect)
- ④ Special areas drawn

- In the corridor, where the feature points are relatively single (only two lines), special areas can be drawn
- Edit mode click the left mouse button on the map in order to form a polygon
- It is recommended to mark the long corridor with no obvious characteristic points more than 10 meters with special area
- When drawing special areas, pay attention not to cover the end of the corridor, and reserve a distance of at least 2 meters

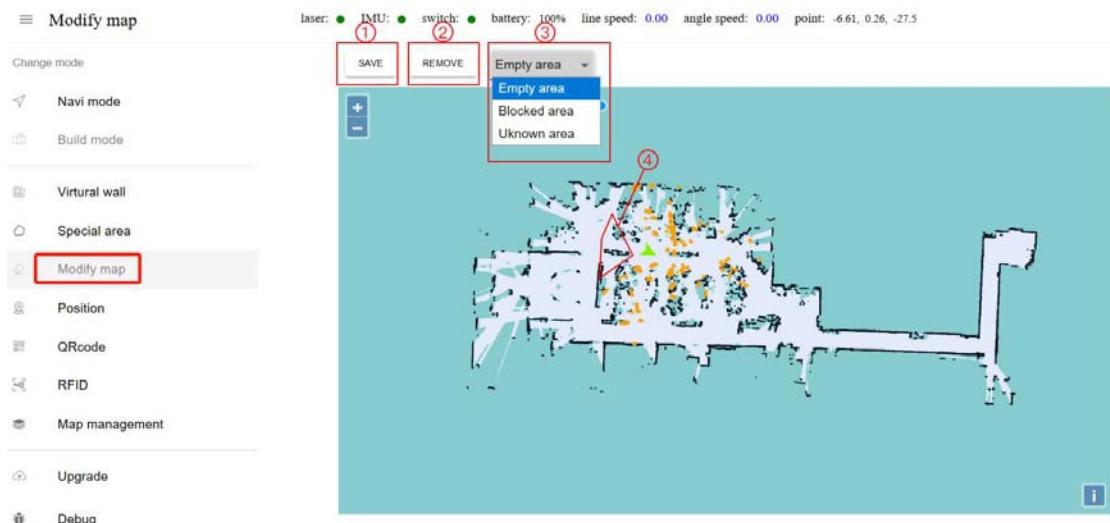
matters needing attention:

- 1.The main function of special area is to deal with some areas with single feature points (such as long corridor) or few feature points (such as open hall).
- 2.Before drawing special areas, it is recommended to navigate to the vicinity of each area to see if there is any missing location, and draw special areas as required.

Modify map

The function of editing map: correcting the errors in scanning map

Tip: Premise of map editing: if an obstacle is missed in the process of scanning, or the map changes after scanning, and the change is not big, you can use the map editing function to edit the map properly. If the map is too different from the actual environment, it is recommended to scan again.



① Click Save to apply the map modification

② Clear drawn polygons

③ Here is the drop-down menu. You can select different amount map area types

- **Blank area:** remove the noise (such as the noise left by pedestrians walking on the map and temporary obstacles, etc.) during the process of scanning the map. Do not remove the real obstacles as noise.
- **Obstacle area:** some real fixed obstacles may not be scanned very clearly when building the map, so it is necessary to draw obstacles artificially on the map (note that the obstacles drawn must match the obstacles that can be swept by the real laser).

- **Unknown area:** some frequently changing feature points need to be drawn into unknown areas (for example, the area where robots will not walk outside the glass wall).
④In the same way as a special area, the interior of the drawn polygon is a modified area

QR code

- **Positioning QR code deployment requirements**

- 1.The ceiling is parallel to the ground and does not reflect light
- 2.The ceiling shall be flat, and it is better to apply paint or emulsion paint, or have flat metal surface, and do not support materials with insufficient viscosity
- 3.There should be no big obstructions above the robot's road, so that the machine can't see the QR code on the road
- 4.Ceiling to camera height between 1m and 5m
- 5.The QR code should be pasted in the middle of the road as much as possible, not close to the obstacles
- 6.The two-dimensional code shall be pasted smoothly, and the circular spot position of the two-dimensional code label shall not be inconsistent with the original position due to too many wrinkles
- 7.The pasting distance of the QR code is 5-10 meters, and the corner and intersection should be pasted

QR code paste

method

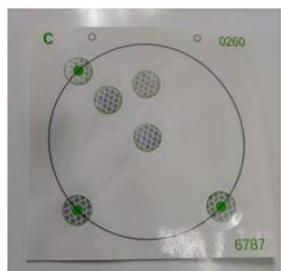


Figure 1 Before tearing

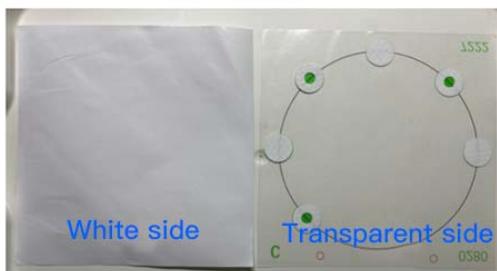


Figure 2 After tearing

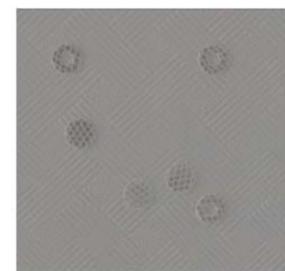
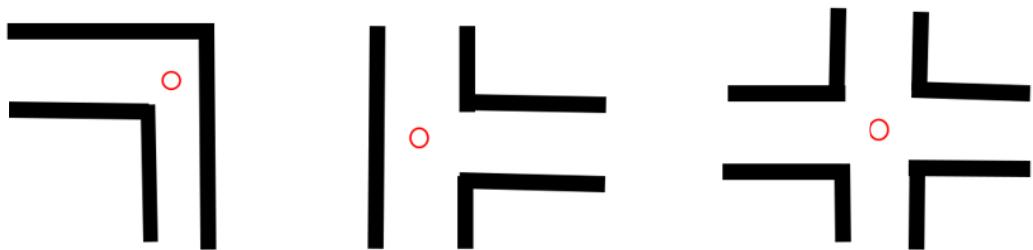


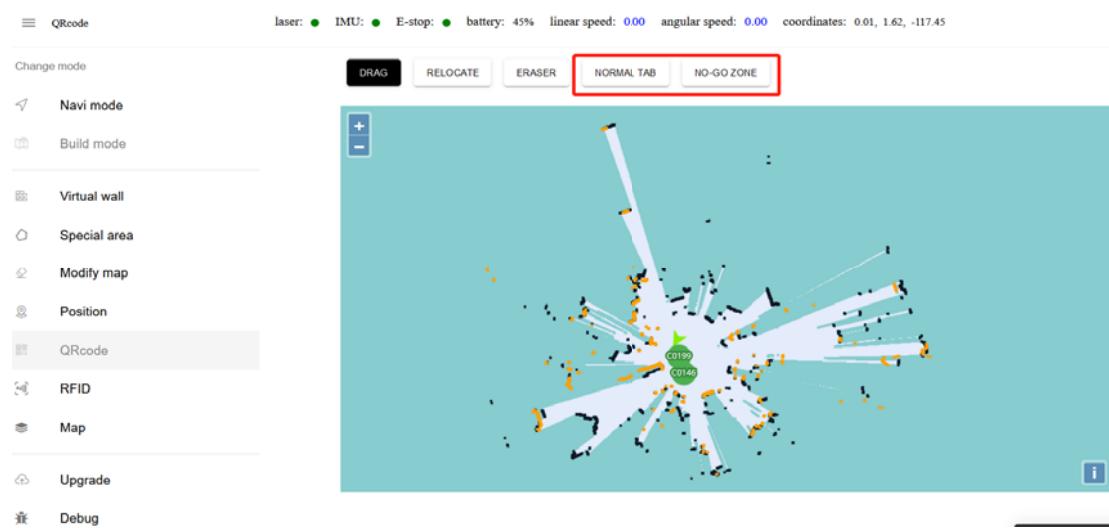
Figure 3 After pasting

Pasting method: as shown in Figure 2, first tear off the white paper of the QR code label, paste the transparent surface onto the ceiling, and then tear the transparent surface, taking care not to drop the round or ring spots during the tearing process, after completion As shown in Figure 3.

Where to place the QR code label



As shown in the figure: in “□” Place QR code at the corner and intersection



Eraser: Hold down the left button of the mouse and drag it, a rectangular box will appear, select the label to be deleted

Ordinary label: When an ordinary label is detected, the robot will relocate near the location, generally used near the machine where it is easy to lose its location **Forbidden zone label:** The machine will immediately stop navigation when detecting the forbidden zone label, reducing the chance of danger. The restricted area label is marked with "J-".

Calibration QR code process

1. After switching to the "QR code" interface, make sure that the robot positioning is correct, and control the robot to walk in the area where the QR code label is located.

2. If you encounter a mismatch between the laser and the map of the robot (the positioning is wrong), you need to perform a relocation operation first to reposition the robot accurately.
3. After controlling the robot directly under the QR code label, the button "Common Label" and "Forbidden Area Label" will appear in the button bar at the top of the map. If the QR code label is only used for positioning purposes, click "General Label" Click OK; if this area is more dangerous (for example, there are steps), you can select "Forbidden Area Label".

Additional notes:

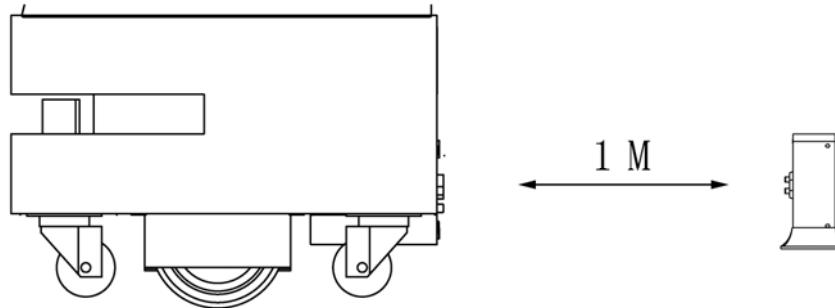
1. There is no need to save the calibration of the QR code label, it will be automatically saved after the calibration and deletion.
2. Deleting the label is similar to the previous one. In the "drag" or "calibration" state, hold down "Ctrl + left mouse button" to drag and drop, a rectangular frame will appear, and the label inside the rectangular frame will be deleted.

Position

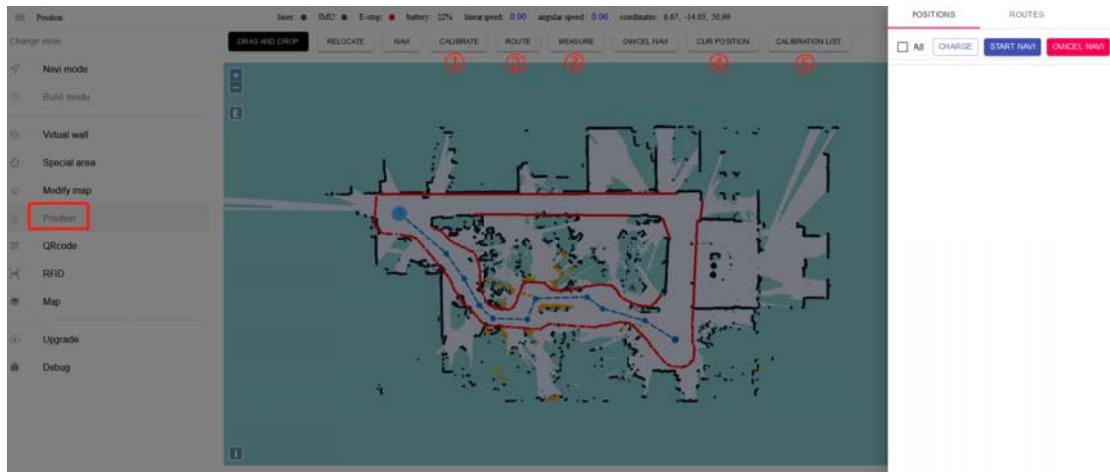
The function of calibration location: provide reachable target points for business layer applications

Note: The calibrated location must be at least 50 cm away from surrounding obstacles and virtual walls; the point "charging_pile" must be marked on the map and the device must be powered on near this location.

Schematic diagram of charging pile calibration method:



First move the machine so that the charging shrapnel of the machine is facing the position about 1m directly in front of the charging shrapnel of the charging pile, and then observe whether the current positioning of the machine on the map is correct (the orange laser and the black obstacle are completely overlapped, that is, the positioning is correct), and finally Use the [Current Position] button to name the point "charging_pile"



① You can drag on the map to get the coordinates of the specified location for calibration

(Note: If you need to use the "Disinfection Robot" application on the machine, please use the [Calibration] button to punctuate the map with Arabic numerals starting from 1 in order.)

Calibration method: The white area on the map indicates that you can walk. Click a point in the walkable area and then press the left mouse button to drag and release the meeting. A naming box will pop up, and then you can name the point)

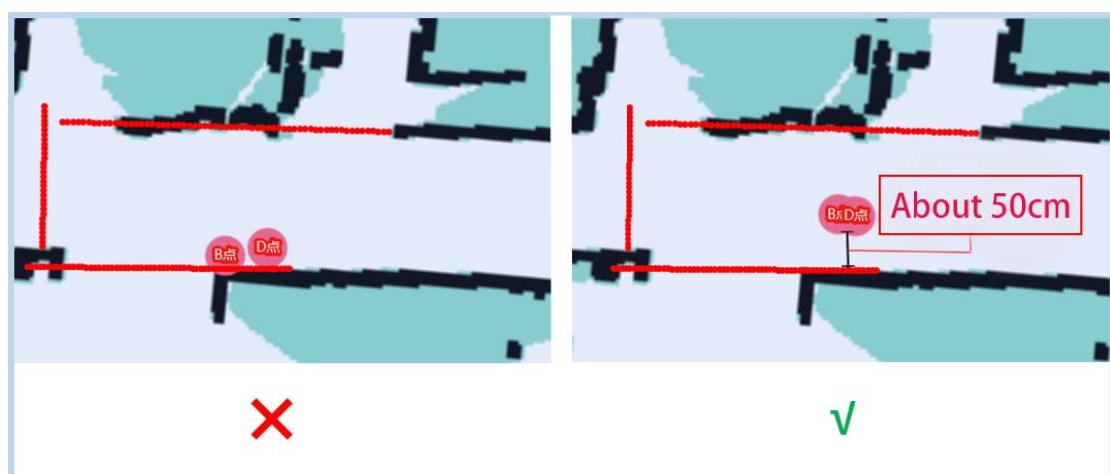
② You can click on the map to plan a fixed route and let the machine navigate to walk (as shown by the blue line in the above figure)

③ Click any two points on the map to get the length of the driving route

④ You can also get the current position of the robot for calibration

⑤ Click on the right side to pop up the toolbar

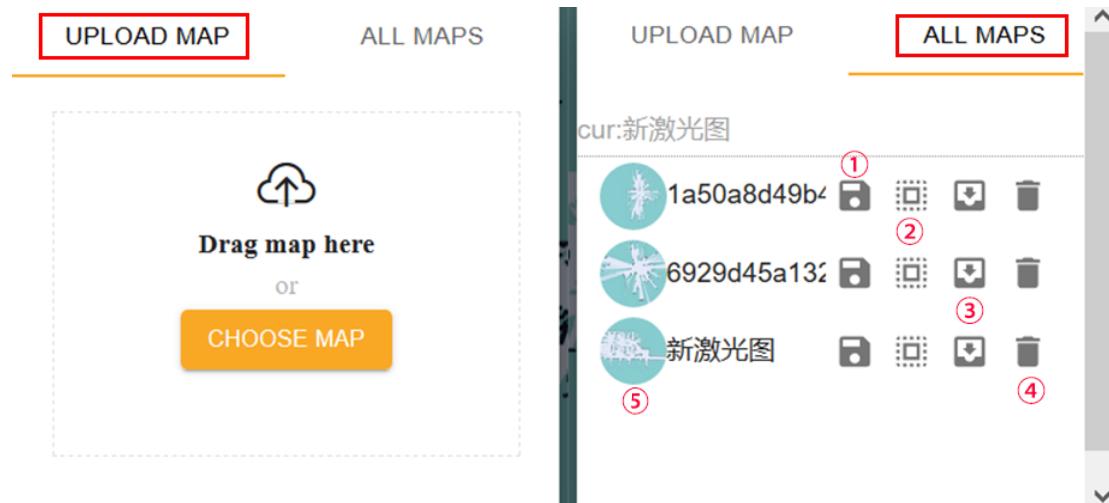
The calibration example is as follows:



Precautions:

1. When calibrating the position, make sure that the current positioning of the machine is correct.
2. The calibrated position must be at least 50 cm away from surrounding obstacles and virtual walls.
3. It is recommended to control the robot to 1 meter directly in front of the charging pile. Use "Get Current Position" to set it. Make sure that the setting position is accurate.
4. It is recommended that there are no obstacles within 1.5 meters on the left and right sides of the charging pile

Map



UPLOAD MAP

ALL MAPS

Drag map here
or

CHOOSE MAP

UPLOAD MAP

ALL MAPS

cur:新激光图

Map ID	Map Name	Actions
1a50a8d49b4	1a50a8d49b4	① Edit, ② Apply, ③ Export, ④ Delete
6929d45a132	6929d45a132	② Apply, ③ Export, ④ Delete
新激光图	新激光图	④ Delete

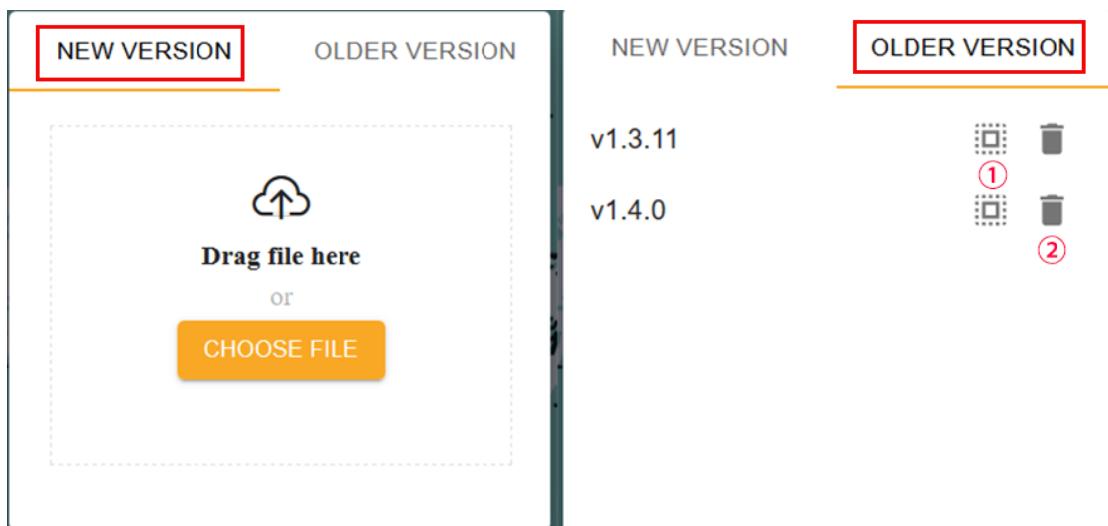
① Edit map name ② Apply this map ③ Export this map
④ Delete this map ⑤ Mouse over to show preview map, click to show original image

Note: The map will not be applied immediately after uploading, you need to find the row of the map in "All Maps" and click the "Apply" icon

① Edit map name ② Apply this map ③ Export this map
④ Delete this map ⑤ Mouse over to show preview map, click to show original image

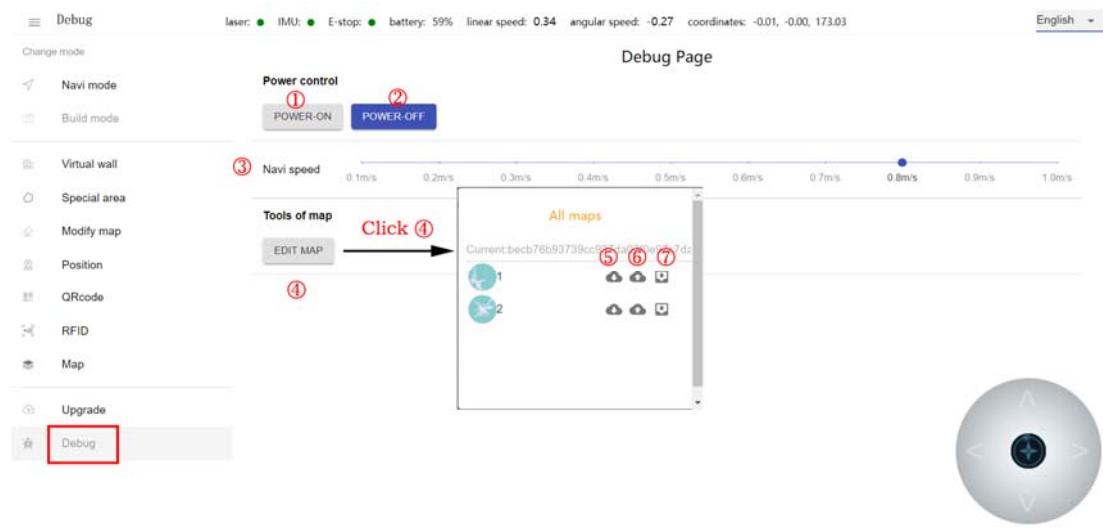
Note: The map will not be applied immediately after uploading, you need to find the row of the map in "All Maps" and click the "Apply" icon

Upgrade



1.Apply this version 2.Delete this version

Debug



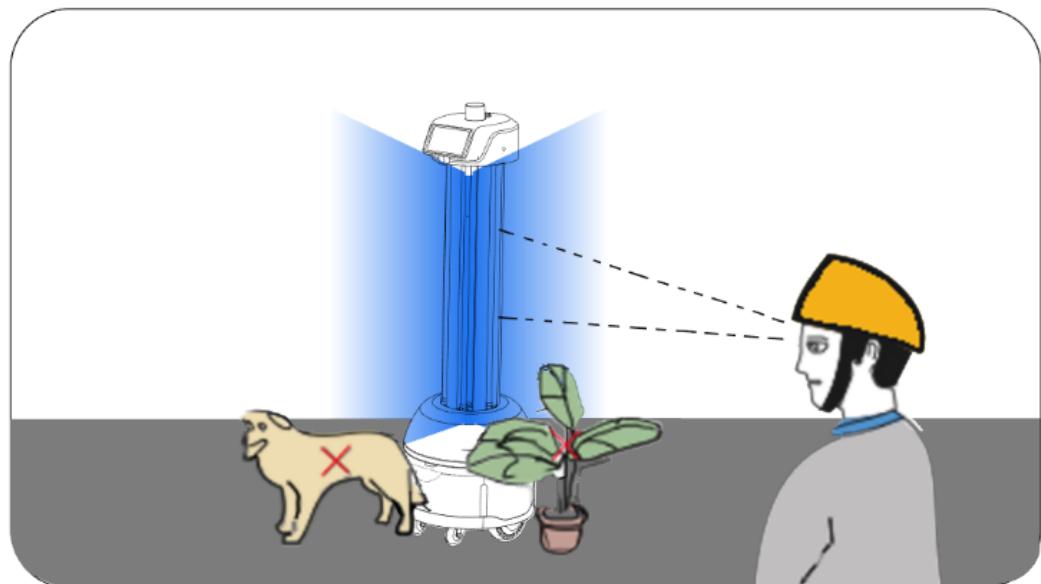
- ① Power on: turn on 36V external power supply (turn on the atomizer)
- ② Power off: turn off 36V external power supply (turn off the atomizer)
- ③ Navigation speed: adjust the driving speed of the machine (unit: m/s)
- ④ Make a map: click on make a map and a map file box will pop up
- ⑤ Export: export the pgm file to be combined
- ⑥ Import: Import the assembled pgm file
- ⑦ Generate a new map: click to generate a new map

Daily maintenance

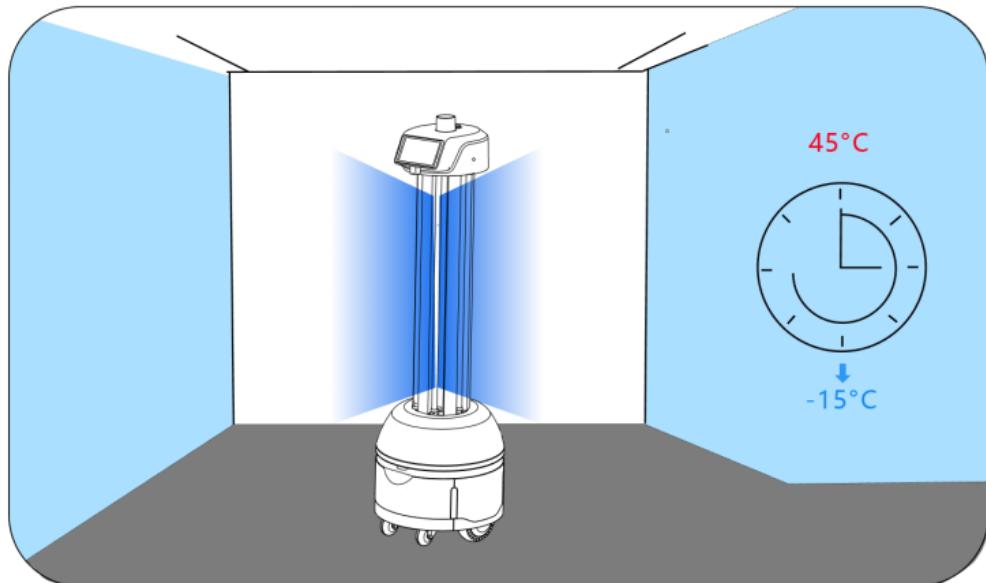
Use environmental requirements

- 1.Do not use them where there are stairs or drops of more than 2cm
- 2.There cannot be many black marble and black reflective cabinets at 30 cm
- 3.Do not travel on high friction: thicker, soft carpet
- 4.Do not use it with slopes greater than 5
- 5.shall not be used in the bathroom and similar environments
- 6.There cannot be dense thin leg chairs in the travel area
- 7.Do not use it in an environment where the temperature is higher than 50°C or lower than 0°C
- 8.Do not use it on uneven road surface
- 9.There are a lot of transparent glass and thin legs tables and chairs, depending on the drawing and test conditions can be used

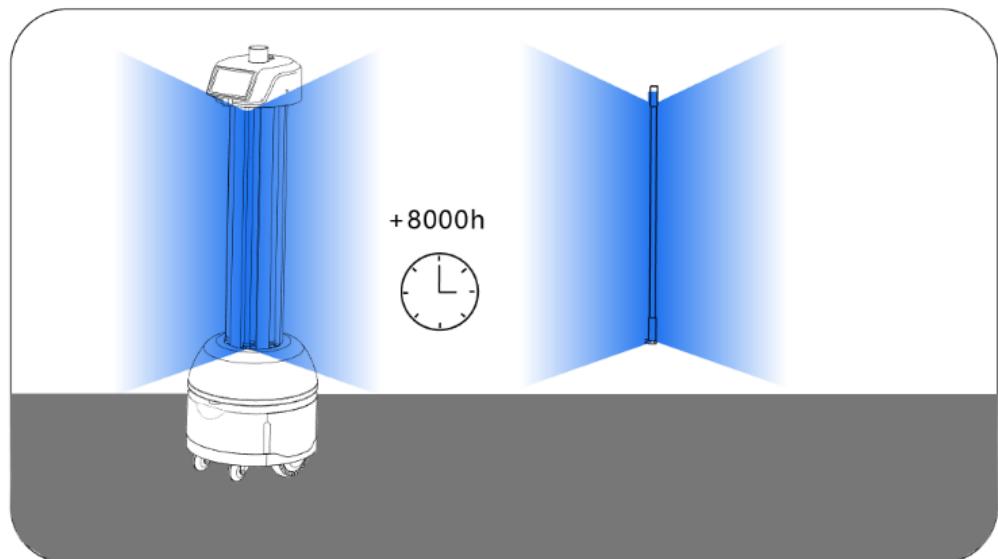
Precautions for the use of UV lamps



When using the UV disinfection robot, people and animals should stay away from the UV irradiation area and do not look directly at the UV light source.

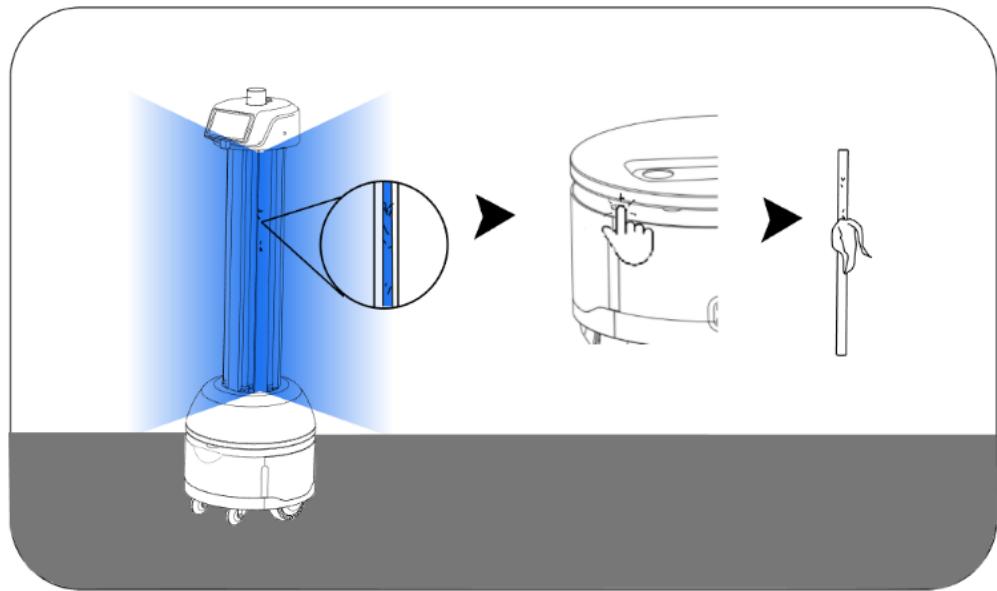


The best temperature for ultraviolet disinfection and sterilization is 15-45°, and the relative humidity is less than 80%. Too high or too low temperature will affect the sterilization effect, and the light time can be appropriately extended.



The radiation intensity of the ultraviolet disinfection robot is gradually reduced during use, and the ultraviolet radiation flux should be

measured regularly. The lamp is recommended to be replaced after 8000h.



In daily use of UV disinfection robot, the lamp should be kept clean, and the surface of the lamp should be cleaned in time when the power is off.

Hardware parameters

E1	
Product Size	Length 540mm * Width 360mm * Height 1506mm
Product Weight	46kg
Product color	white
product material	Cold rolled steel sheet
Environmental requirements	Storage temperature: -15°C~55°C; Working temperature: -10°C ~ +50°C Humidity (RH): 10%~90%
QR code camera	Two-dimensional code positioning (the height of the two-dimensional code from the camera is 1-3m or 1-5m); 5 million pixels
UV lamp	Philips TUV T8, UV output: 12W UVC, lamp power 30W
operating system	Android 5.1
language support	Chinese-English
Processor type	RK3128
Memory LPDDR3	1G
Built-in NAND FLASH	8GB
USB Debug port	Micro USB interface
Display screen	7 inch, IPS screen (16:9) resolution 1024X600
External I/O port	1 USB 2.0 (MICROUSB), RJ45 network port
speaker	4Ω/3W mono speaker

Wireless technology AP6255	Support dual frequency 2.4 WIFI 802.11b/g/n Wireless local area network,
LASER SENSOR	Laser wavelength 905 nm working area 270°
Single axis gyroscope sensor	Yaw angle measurement
hard disk	32G high-speed solid state drive
motor driven	5.5 inch hub motor
Infrared sensor	Communicate with charging piles within 1 meter
Moving speed	The smallest 0.1 m/s , maximum 1 m/s
Navigation board	Intel Core I5 motherboard
charging method	Automatic recharge, DC direct charge
adapter	Input: 220V Output: 42V--3A (5A optional)
Robot input power	42V--3A (5A Optional)
battery	37 V/20 AH lithium battery
Charging pile parameters	Overcurrent protection, intelligent power off, output rated voltage: 42VDC, output rated current: 3A (5A optional)

FCC WARNING

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

Any changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

NOTE: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications.

However, there is no guarantee that interference will not occur in a particular installation.

If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

To maintain compliance with FCC's RF Exposure guidelines, This equipment should be installed and operated with minimum distance between 20cm the radiator your body: Use only the supplied antenna.