Chengying Navigation Manual

Version 1.1.1

Date: September 8, 2020

Note: This document provides machine-related deployment procedures and precautions. Follow the instructions in the document to avoid abnormal situations when the machine is used later.

Contents

Robot use environment requirements

- The working environment cannot have a lot of transparent glass
- Cannot be used where there are stairs or where the drop is more than 2cm
- There should not be a lot of black marble and black reflective cabinets at the floor height of 50cm
- Can’ t travel on the ground with high friction. Example: thicker and softer carpet
- The slope cannot be greater than 15°, no steps
- Cannot be used in bathrooms and similar environments
- There should be no densely placed thin-legged chairs in the travel area

Specification

1. Display:7-inch IPS screen (1024*600)

2. Vision camera:HD 5 million pixels

3. Battery:18650 battery pack 37V 20800 mAh

4. Intel: I5 motherboard

5. Android motherboard:RK3128

6. WIFI:AP6255 dual frequency 2.4G+5G

7. 4G router optional

8. 4R3W speaker*1

9. UV lamp,UV output 11.2W UVC

10. Adapter 42V 3A

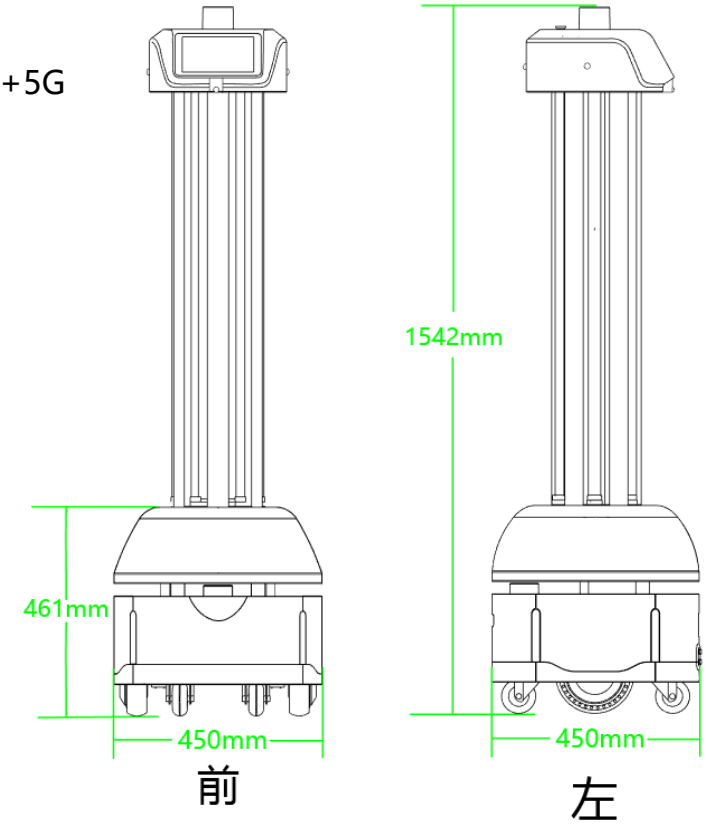
11. Life time 3H

12. Operating system Android5.1

13. Height 1542MM

14. Width 450MM

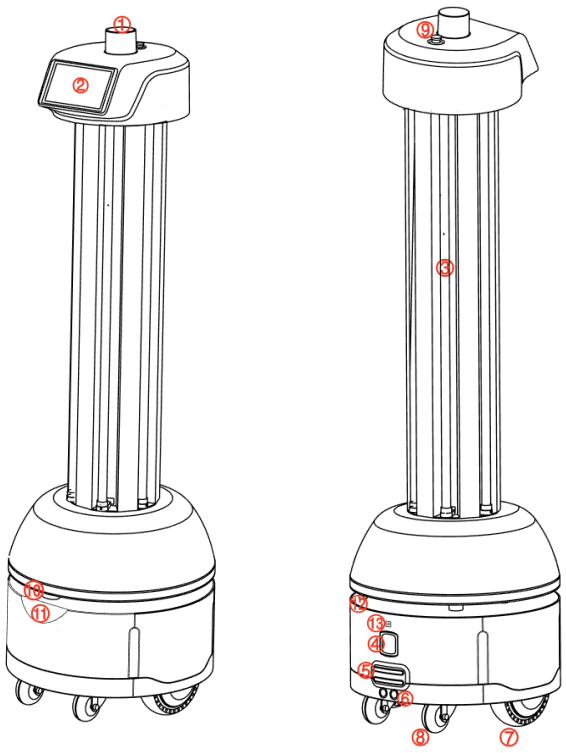
15. Weight 46KG



Meet your robot

Chengying UV disinfection robot has a beautiful beige appearance, centimeter-level precise navigation, world-leading remote deployment technology, multi-machine coordination ability, automatic obstacle avoidance and other functions. It can automatically navigate to a designated location indoors.

The following is the body structure of Chengying UV disinfection robot:



①Visual positioning camera

②Touch screen

③Ultraviolet disinfection lamp

④Infrared sensor

⑤Automatic charging shrapnel

⑥Ultrasound

⑦Drive wheel

⑧The Vientiane Wheel

⑨ Emergency stop switch

⑩Infrared human body sensor hole (reserved)

⑩Lidar

⑪3D camera (reserved)

⑫power button

⑬Power socket

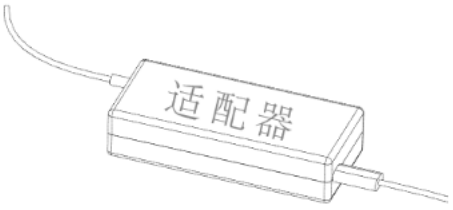
Cleaning precautions: ② Touch screen ⑩ Laser navigation, please do not wipe it with a wet towel to avoid water ingress!

Precautions for use: ⑩ Laser: Do not block the laser with objects

⑨ Emergency stop switch: the emergency stop switch can only be rotated to the right, do not rotate to the left

Get to know your charger

The adapter plug needs to be plugged into the 220V mains power supply, and the DC plug is plugged into the automatic charging pile. At this time, the green light of the charging pile will be on, indicating that it is ready for charging.



Power Adapter

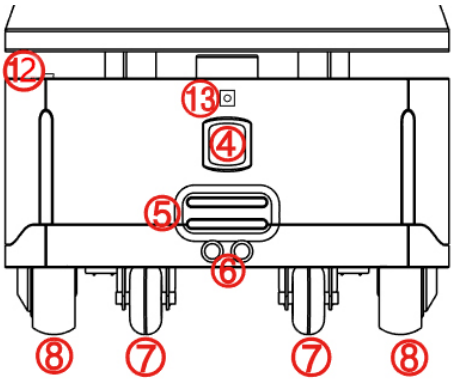
Automatic charging pile

Use your robot

1. Boot

The power button is located on the base ⑫ on the back of the robot. It

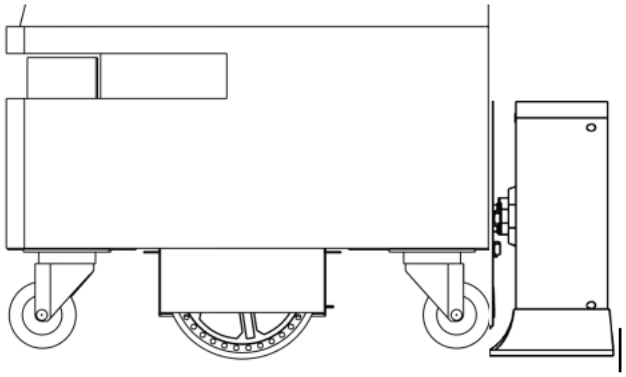
is a button switch. Press it once to turn it on, and press and hold the power button for 3 seconds to turn it off.



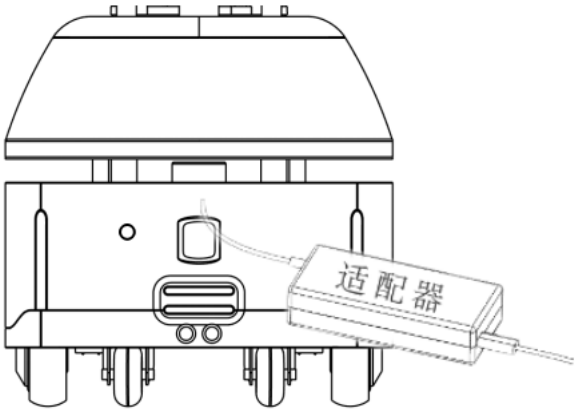
Note for shutdown: Press and hold the power button for 3 seconds, the display will first turn off the screen and shut down, then the motor will be powered off, and finally the chassis light will go out!

2. Charging

Automatic charging: the robot can automatically detect the power and charge automatically when the power is lower than the set threshold (Prerequisite: It is necessary to construct a good icon for the charging pile)



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



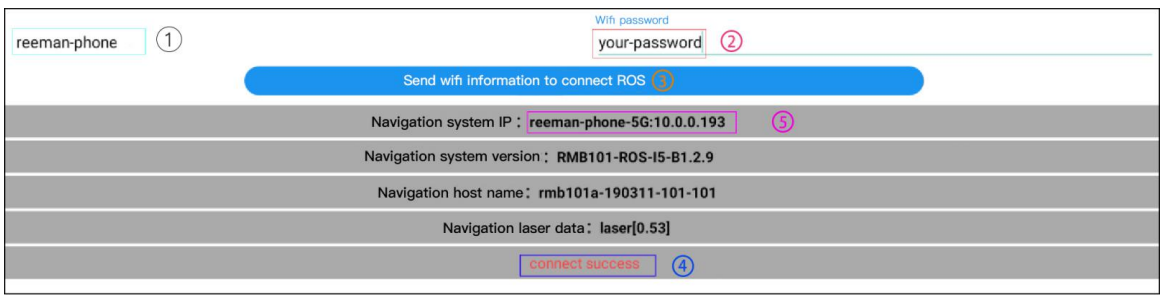
3. Navigation

The step 1 [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 connection status

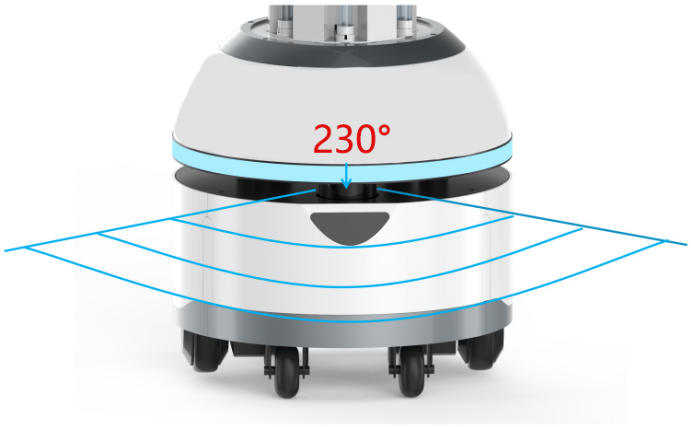
⑤ Show IP for connection success (show 127.0.0.1 for connection failure)

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)

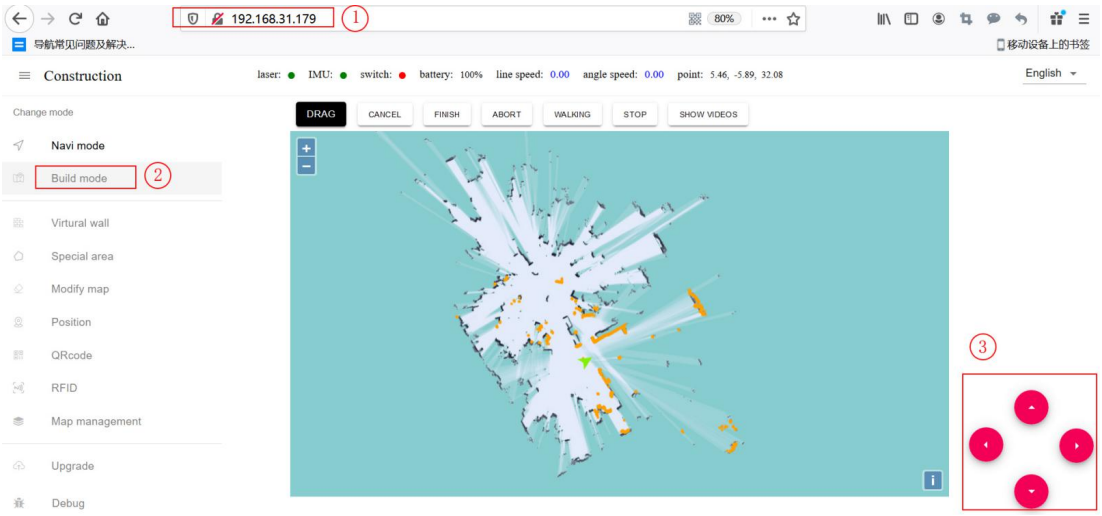
Note: if the connection to Wi-Fi fails, you can turn off the app and try again; if it still fails, you can power off the robot and restart it and try again

The step 2 [build a map]

- The viewing angle of the Lidar is 230°, and the scanning range is the horizontal plane of the radar height; the scanning distance is 20 meters
- Ask people to stand behind to push the robot, or use the keyboard arrow keys to control the mapping



1. After entering the webpage, the default state is "Navigation Mode". After pushing the machine to a spot with obvious feature points, click "Mapping Mode" and select "Laser Mapping" to enter the state as shown in the figure below to start generating the map. Let me teach you how to Generate a map.



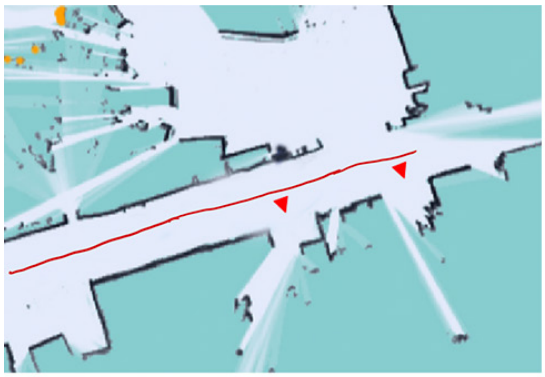
①Get IP from FTP software

②Switch to mapping mode and select "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:

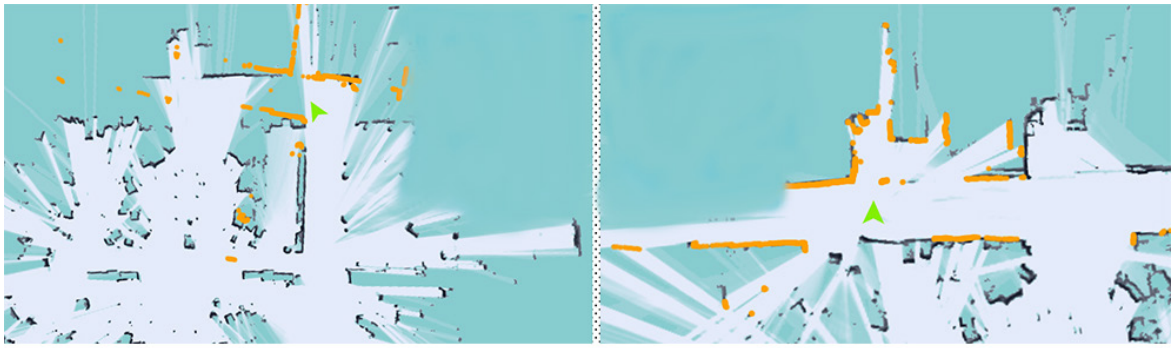


figure 1 figure 2

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.

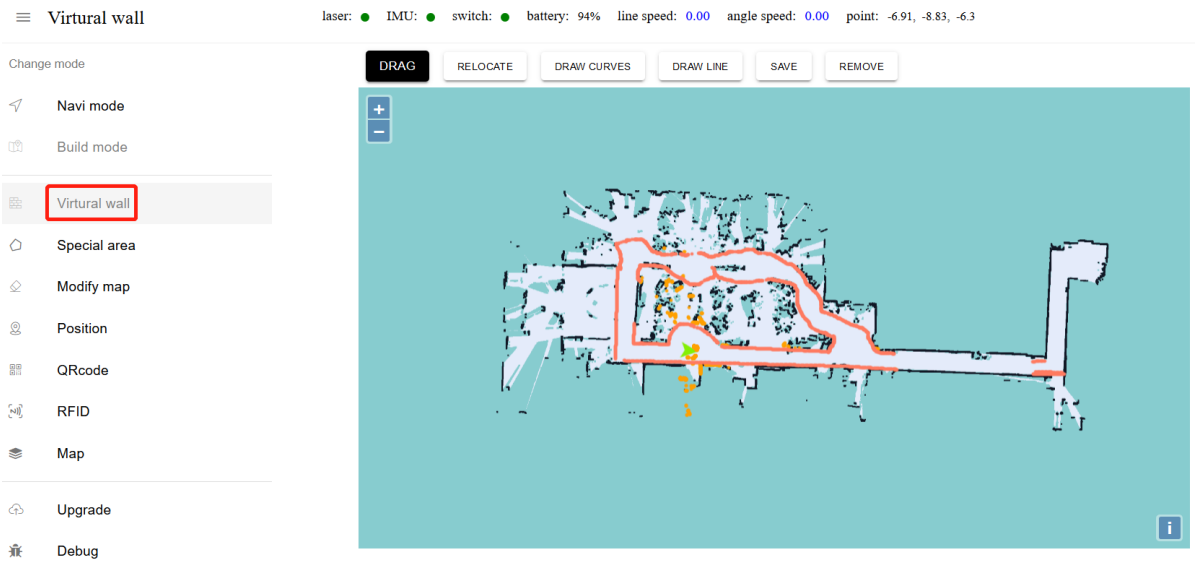
2. When pushing or controlling the robot, walk slowly and observe whether the laser matches the terrain. If there is a mismatch, stop and wait for the laser to match the current terrain.

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.

The step 3 [virtual wall]

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

After composition, it will automatically switch to "navigation mode", click "Edit virtual wall" on the left menu bar



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

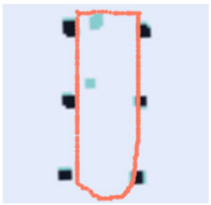


figure 3

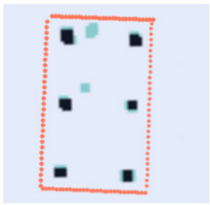


figure 4

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,

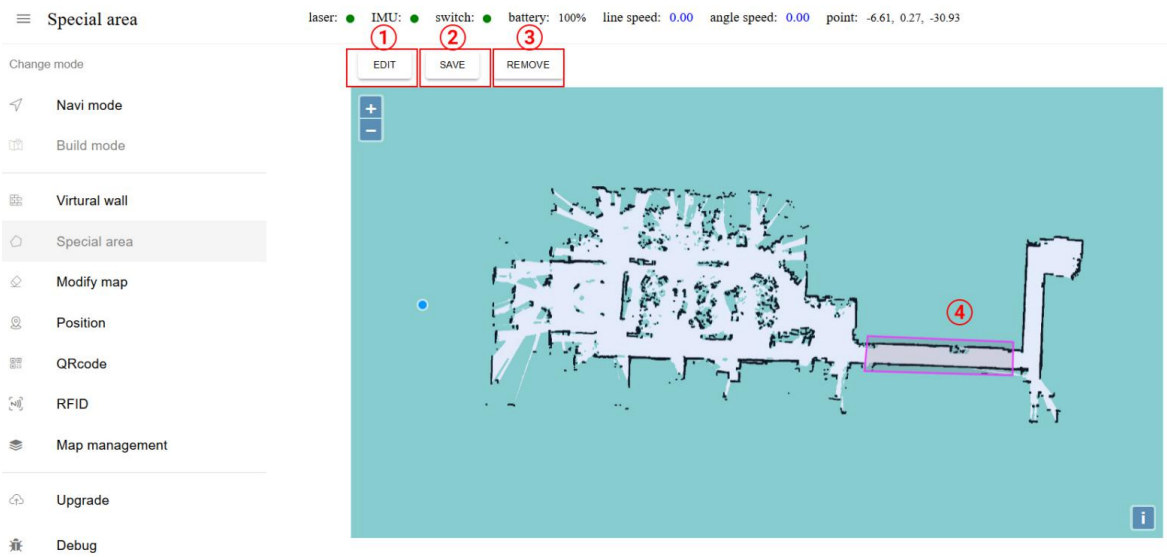
etc.) please make sure to build virtual walls.

4、Click "navigation mode" after saving to return to navigation mode.

The Step 4 [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.

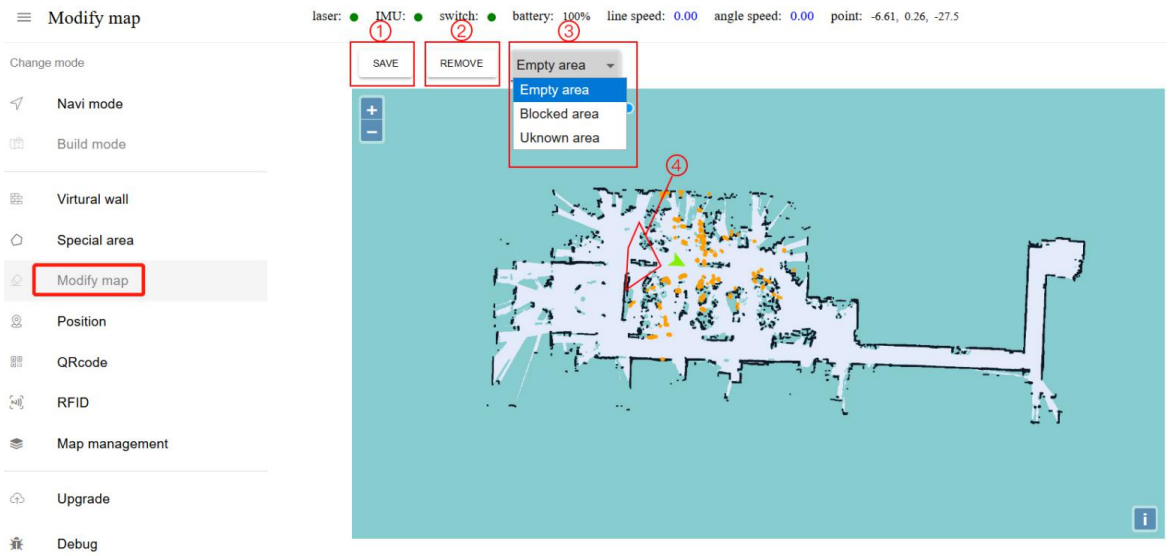
3、Click "navigation mode" after drawing and saving to return to navigation mode.

The step 5 [Modify map]

Tip: Please operate carefully in this step. Generally, we use the "blank area" (i.e.the obstacles placed temporarily or by people are swept onto the map during the process of scanning). At this time, we need to use the "blank area" to remove the obstacles.Skip without this step.

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

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).

④ In the same way as a special area, the interior of the drawn polygon is a modified area

The step 6 [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 1.5m and 2.3m

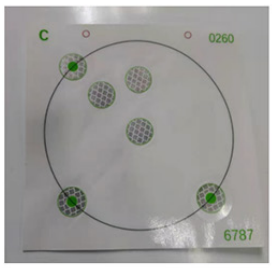
5. The QR code should be pasted in the middle of the road as much as possible, not close to the obstacles

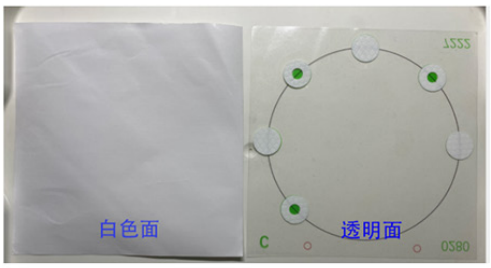
6.The two-dimensional code shall be pasted smoothly, and the circular spot position of the two-dimensional code label shall not be inconsistent

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





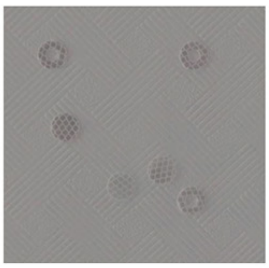


figure 1 figure 2 figure 3

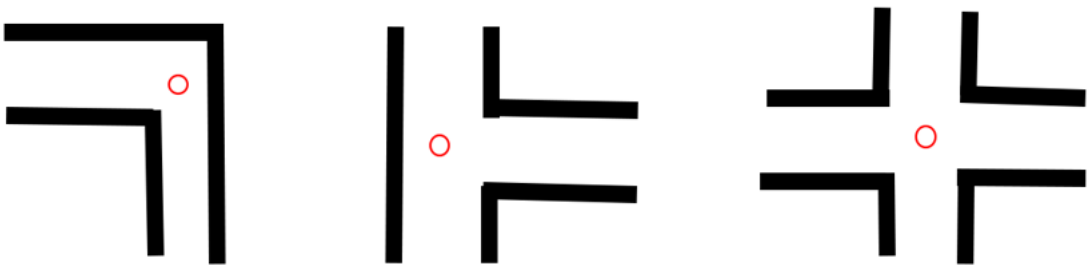
figure 1 Before pasting

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.

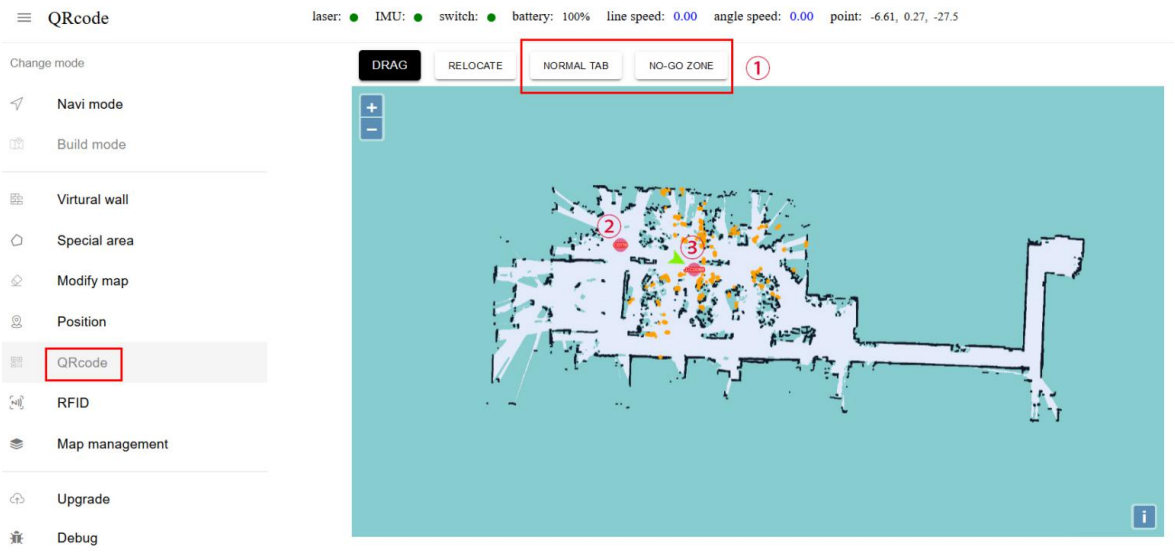
- **Where to place the QR code label**



As shown in the figure: in "□" Place QR code at the corner and

intersection

Click the left menu bar to switch to QR code mode



①When pushing the robot past the QR code label, these two label options will pop up, you can choose the type of label you want to set

②c starts with Ordinary label: When an ordinary label is detected, the robot will relocate near the location, generally used when the machine is easy to lose positioning

③ At the beginning of j- is the forbidden zone label: when the forbidden zone label is detected,the machine will immediately stop navigation, reducing the risk of danger.

➢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.

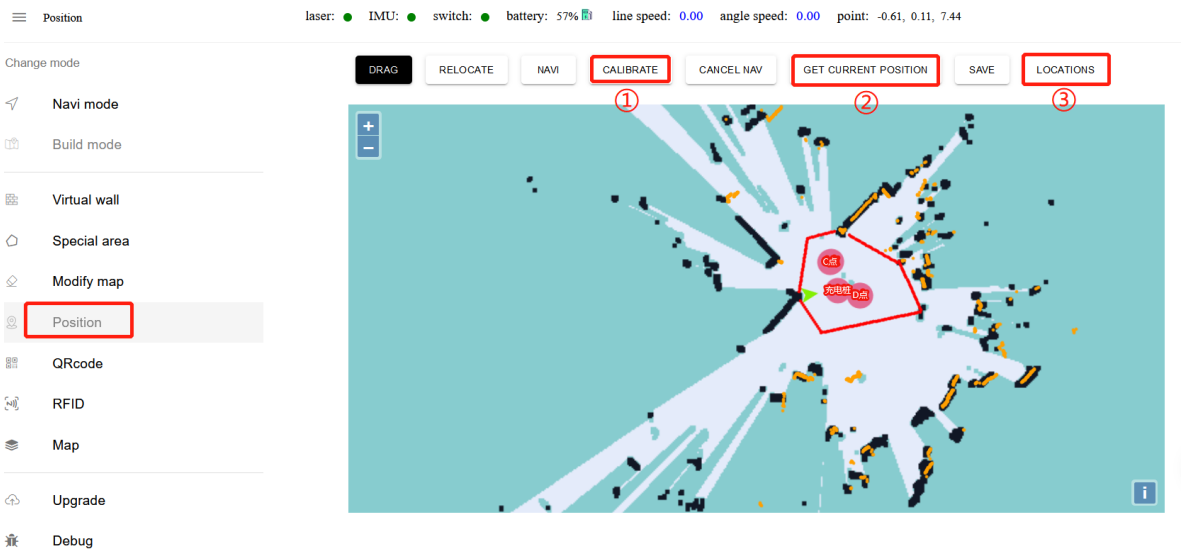
2. Deleting the label is similar to the previous one. In the "drag" or "calibration" state, hold down "Ctrl + left mouse button" to drag and drop, a rectangular frame will appear, and the label inside the rectangular frame will be deleted.

The Step 7 [Position]

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.

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

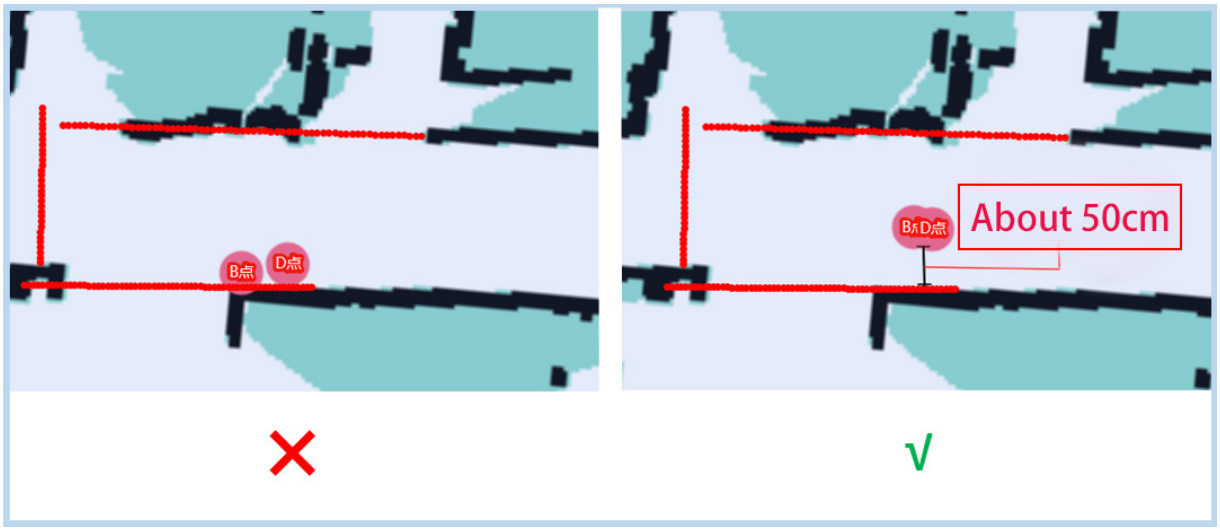


① In the calibration position mode, you can drag and drop on the map to get the coordinates of the specified location for calibration

② You can also get the current position of the robot for calibration

③ Can display relevant information of all points

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

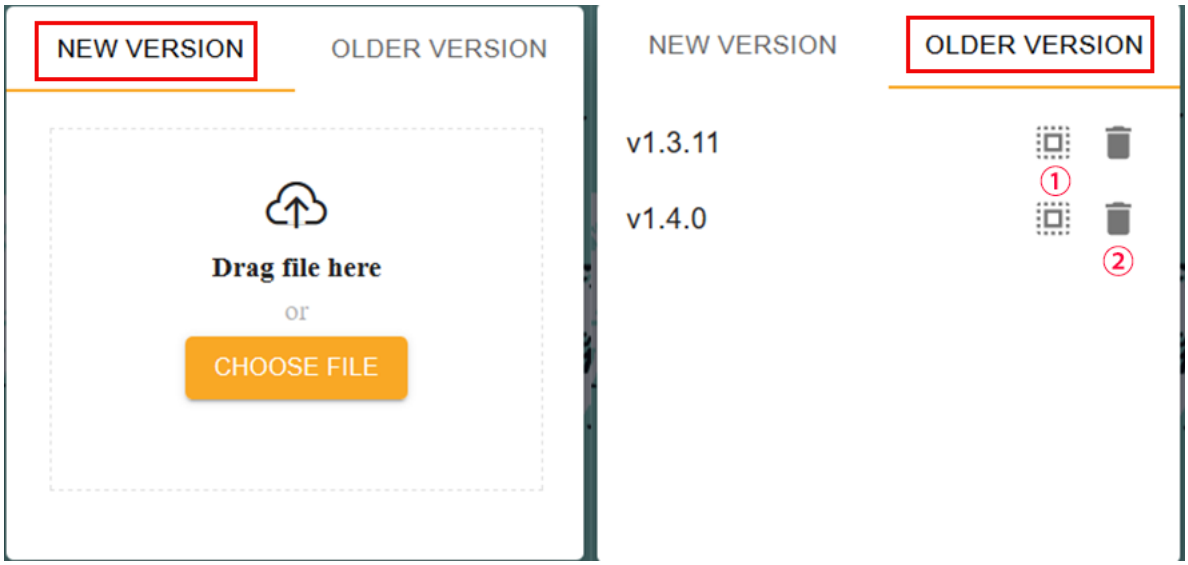
The Step 8 [map]

①Edit 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

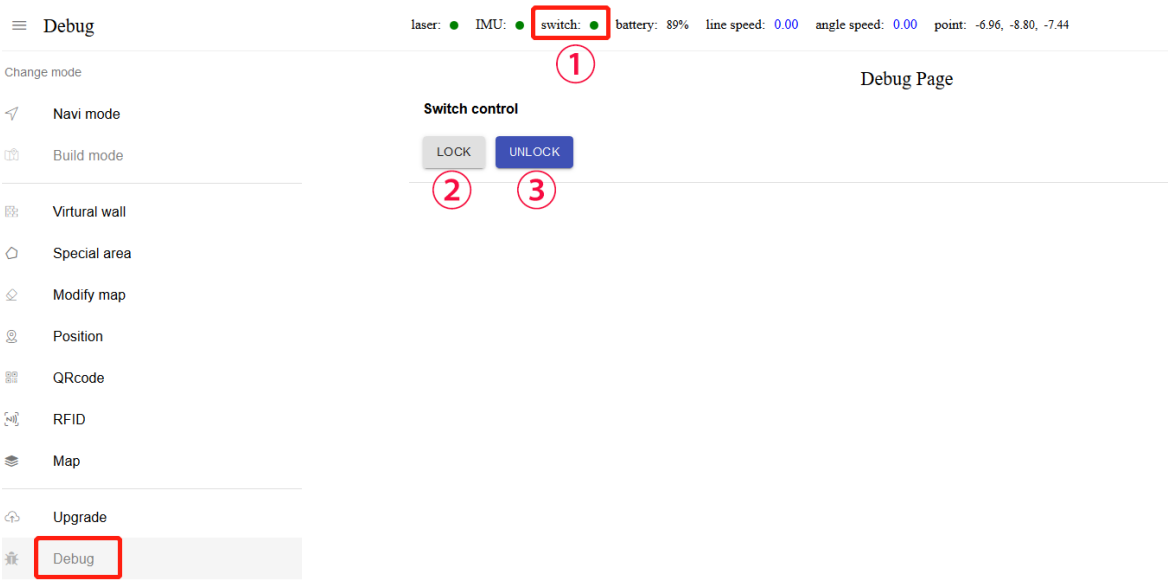
Note: The map will not be applied immediately after uploading, you need to find the row of the map in "All Maps" and click the "Apply" icon

The Step 9 [upgrade]



① Apply this version ② Delete this version

The Step 10 [Debug]

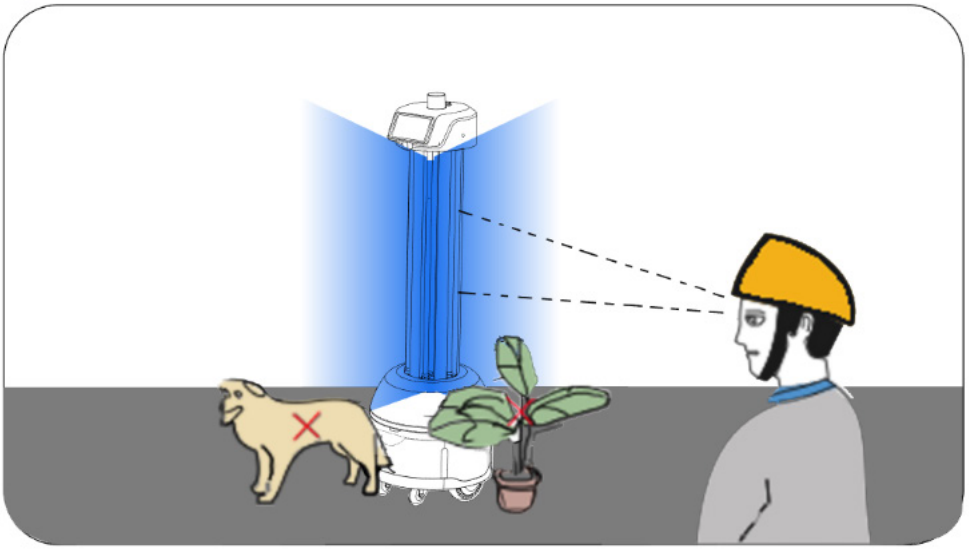


① Turn on the emergency stop switch of the machine manually

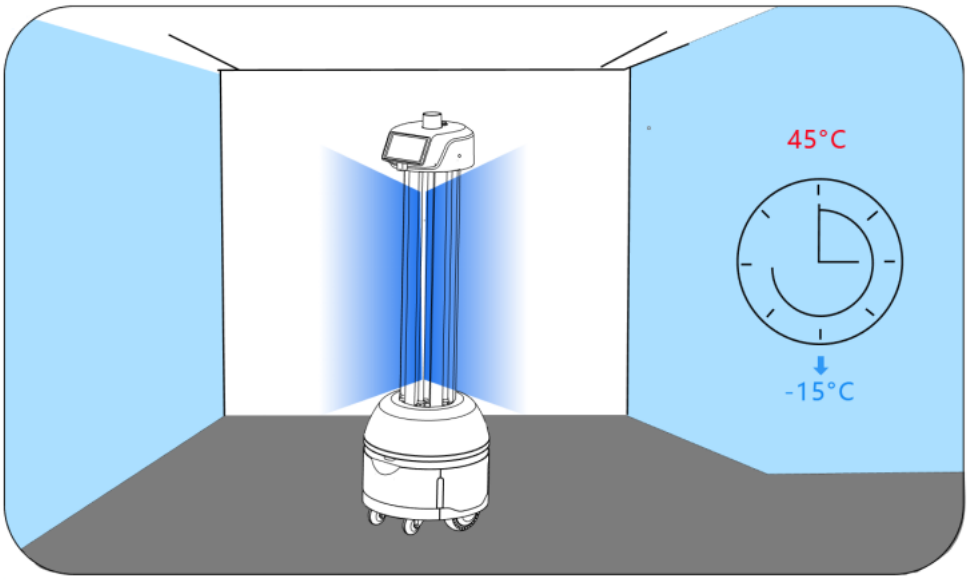
② Close lock: open 36V external power supply

③ Unlocking: turn off 36V external power supply

Precautions for the use of UV lamps

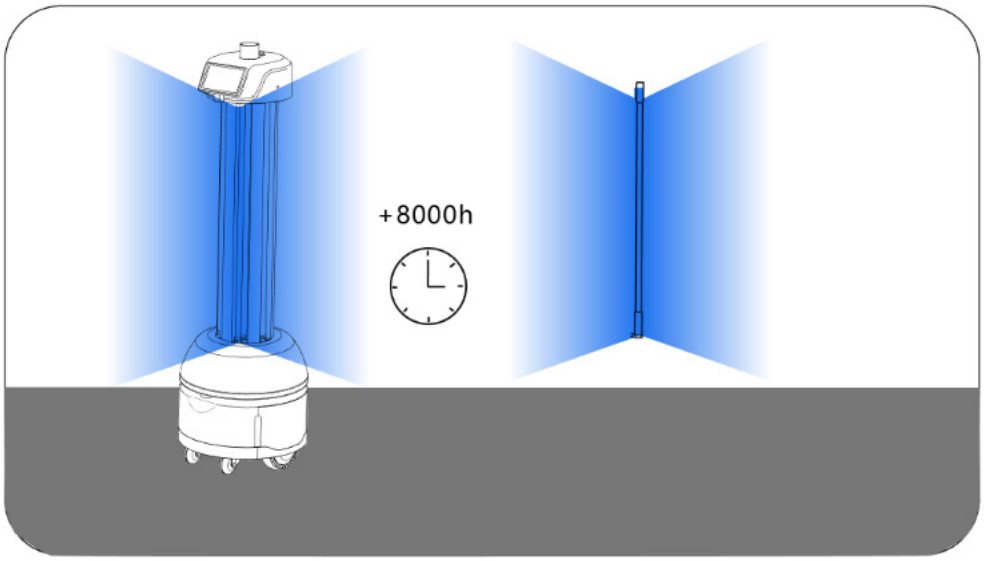


When using the UV disinfection robot, people and animals should stay away from the UV irradiation area and do not look directly at the UV light source.

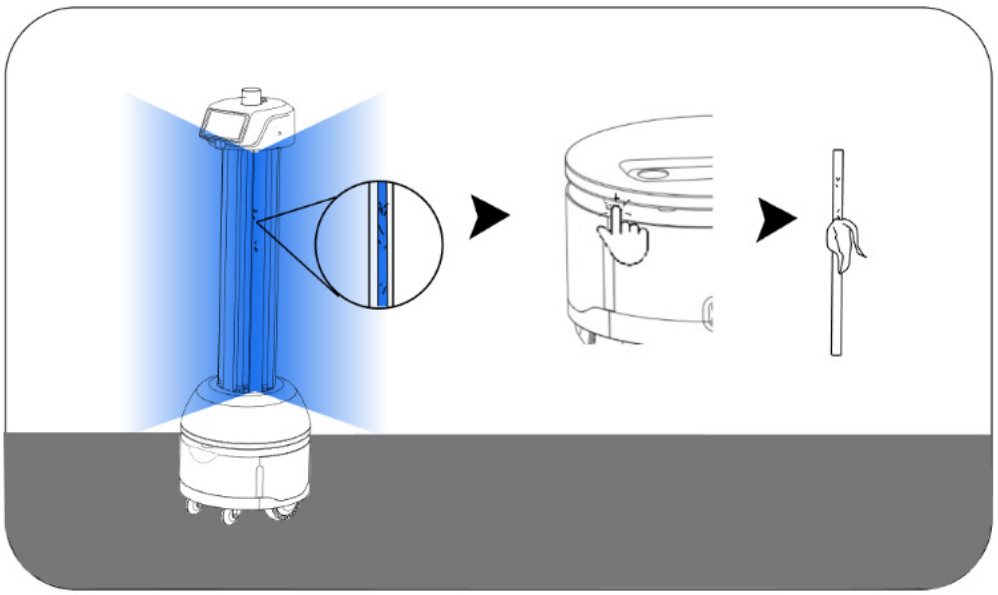


The best temperature for ultraviolet disinfection and sterilization is 15-45°, and the relative humidity is less than 80%. Too high or too low temperature will affect the sterilization effect, and the light time can be

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.

FCC Caution：

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.

Radiation Exposure Statement

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with minimum distance 20cm between the radiator and your body.

This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.