Meal Delivery Robot User Manual

Version: 2.1.4 G

catalog

1. Product introduction

Use safety requirements

✧ Please use the robot within the temperature range of 5℃~40℃, and store the equipment and its accessories within the temperature range of 0℃~50℃.

✧ Do not use it immediately after a great temperature change (such as moving from a cold outdoor to a warm indoor).

✧ Do not use in dusty, damp, rainy, dirty, or close to magnetic fields.

✧ Do not use in an environment that is flammable, explosive, or close to a heat source.

✧ Do not place the robot in direct sunlight for a long time.

✧ The floor of the robot operating area should be solid, smooth, and level. It is not recommended to use it on carpets, soft and ditched ground, outdoors, etc. This will reduce the performance of the robot or cause the risk of the robot to fall.

(Because the robot can move autonomously and complete various actions, please pay special attention: Do not move on a sloped ground to prevent accidental dumping of the robot or uncontrolled operation of the robot, damage to the robot, and damage to equipment, facilities, and objects. Damaged, if you

move on a sloped road, you need someone to take care of it)

✧ Please note that there are steps or steps to prevent the robot from moving in this area to prevent falling or falling

✧ In the case of all-glass doors and all-glass walls, please pay attention to sticking safety identifiable signs between the glass and the ground 22cm-25cm. Personnel (especially children) should keep a safe distance from the robot (1 meter away from the robot). Prevent personnel injury or robot damage caused by the operation of the robot

✧ Do not fall, drop, squeeze, bend, puncture, cut, microwave, incinerate or paint the robot and its parts

✧ Please do not try to disassemble the robot and its accessories, the disassembly work can only be performed by authorized professionals

✧ Do not apply excessive pressure on the screen and device to avoid damage, only use your fingers to interact with the touch screen

✧ In order to ensure the reliability of this product and the safety of operation, please be sure to use the exclusive accessories of this robot

✧ Avoid obstacles with too low height (the height of the obstacle

shall not be lower than the installation position of the ultrasonic sensor and the laser sensor, and not lower than 25cm)

✧ Avoid escalators, stairs, steps and other environments where the drop is greater than 5cm

Charging precautions

● Please use the original AC power cord and charging pile configured with the robot to charge the robot

● Please use a power supply with proper grounding, complying with local laws and regulations and the requirements of this manual, otherwise it will cause electric shocks and damage to the robot

● Do not drop or hit the charging pile

● Do not touch the power cord with wet hands, or pull out the charging pile by pulling the power cord

● Prevent the charging pile from being drenched by rain, liquid, and damp

● If you do not use the robot for a long time, it is recommended that you charge it every 15 days or so to ensure that the battery is always in the best active state

- Do not use the battery in other equipment

- Do not try to touch the charging pile and the output end of the charging port of the robot, there may be certain risks

- The charging pile layout area needs to be against the wall, and it is open within a radius of 2 meters

⚠ Special attention: improper operation of the battery will cause accidents such as battery explosion, fire, leakage and corrosion

1.1 Overview of Robot Components

1. 7 inch display

2. Microphone

3. Microphone

4. Lidar

5. Depth Vision Camera

6. Infrared sensor

7. Automatic charging contact piece

8. Emergency stop switch

9. Vision camera

10. One key return

11. Switch

Specifications

Specification name	parameter
Operating System	Android5.1and above
Overall Size	Diameter: 500mm, height: 1300mm
Total Weight	48.5Kg
Pallet Size	320X400mm
Number of Pallets	3 pcs
Single Pallet Weight Limit	10Kg
Screen Size	7 inches, resolution 1024×600
Memory LPDDDR3	1G
Built-in NAND FLASH	8G
USB Debugging Port	Micro USB interface
Processor Type	RK3128
Navigation Method	Laser navigation + visual positioning +

	visual obstacle avoidance
Lidar	Laser wavelength 905 nm, working area 270°
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
Moving Speed	0.1~1m/s
Battery Capacity	24V 20AH
Battery Life	About 10 hours
Charging Time	4A (about 8 hours), 7A (about 5 hours)
Wireless Technology AP6255	Support dual frequency 2.4&5G WIFI 802.11b/g/n wireless LAN, 11ac 5.15GHz-5.825GHz
Environmental Requirements	Working temperature: 5℃~40℃ Ambient humidity: 5% ~ 85% Storage temperature: -10℃~50℃

2. Instructions for use

A. Get to know your robot

Power on: Press and hold the [Power on/off button] as shown in the figure, for about 1 to 2 seconds, the buzzer will make a short beep, the internal test light bar of the machine will light up, and wait for the

machine to turn on.

On / off button

Shutdown: Press and hold the [Power on/off button] for about 3 seconds, the beeping "di" screen will first shut down, and then the motor will be powered off.
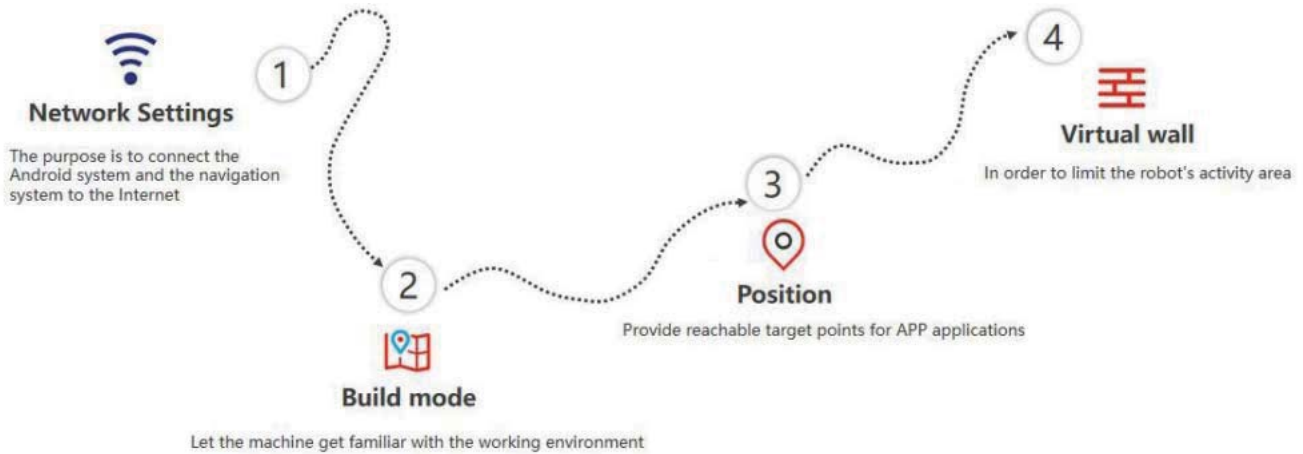
Charging: You need to insert the adapter plug into a voltage of 110-220V, and plug the DC plug into the automatic charging pile. At

this time, the green light of the charging pile will be on, indicating that it is ready for charging.

① Manual charging: Push the robot onto the charging pile, so that the charging sheet on the back of the robot is in full contact with the charging sheet on the charging pile, and the charging pile indicator light is red to indicate that the machine is charging ② Automatic charging: refer to the navigation deployment below, deploy the charging pile points, and open the [Deligo] application on the Android screen to customize the power value that triggers automatic recharging

B. Navigation deployment

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 points 1, 2, 3, and 4 in the following figure. Other functions depend on the specific scenarios and usage conditions.

Network Settings
The purpose is to connect the Android system and the navigation system to the Internet

Build mode
Let the machine get familiar with the working environment

Position
Provide reachable target points for APP applications

Virtual wall
In order to limit the robot's activity area

The step 1 [Connect to the Internet]

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 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.

The step 2 [Build mode]

➢ **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.

Actual environment

The map scanned by the robot's laser

● The viewing angle of the Lidar is 270°, 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

A. Unlabeled map construction

It is recommended to use unlabeled map construction. If the robot loses positioning during use, please contact the technician in the group to investigate the specific reason.

1. Please follow the order of the figure below to enter the building page
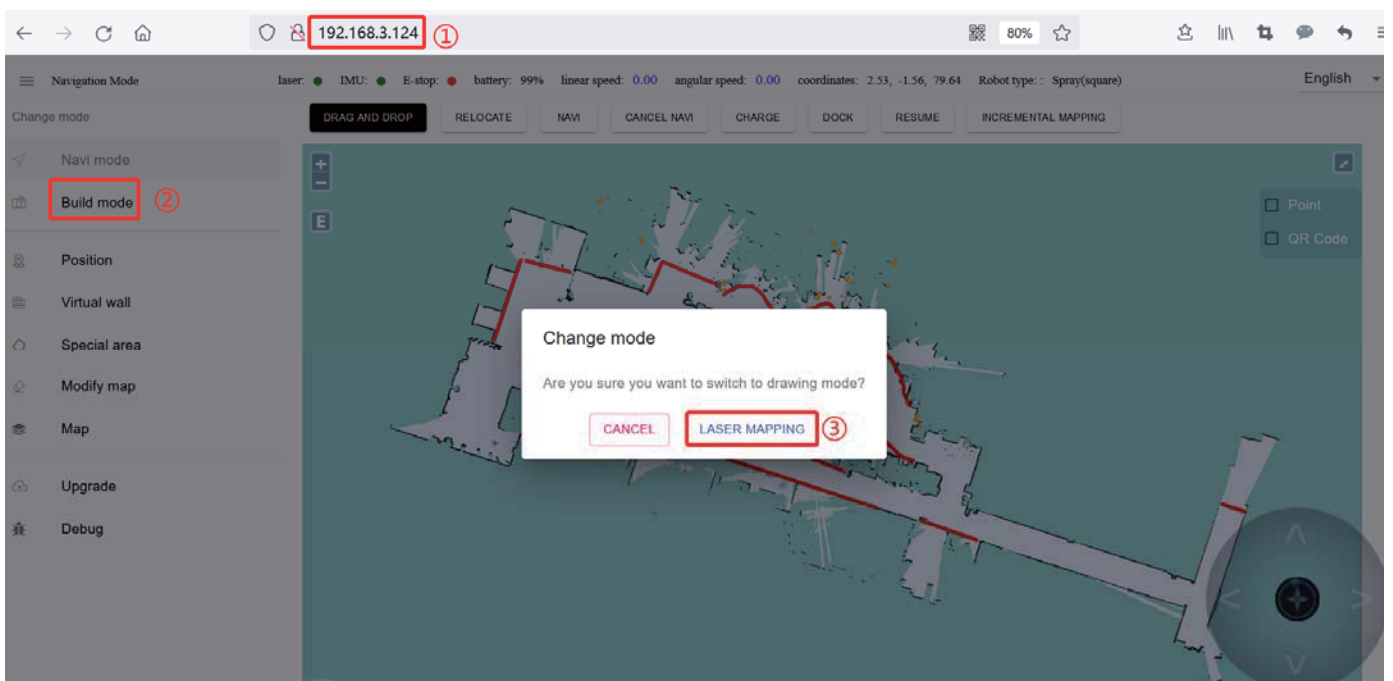
① get IP from FTP software

Mapping method : You 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:
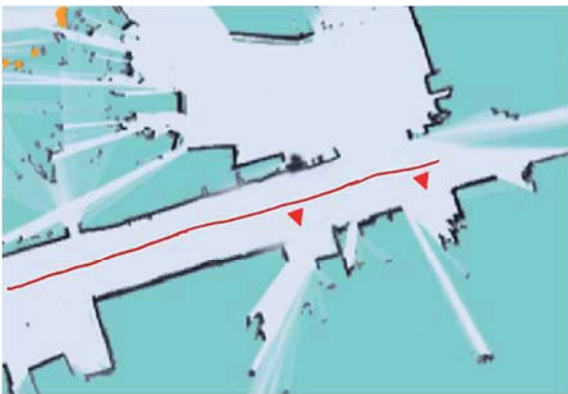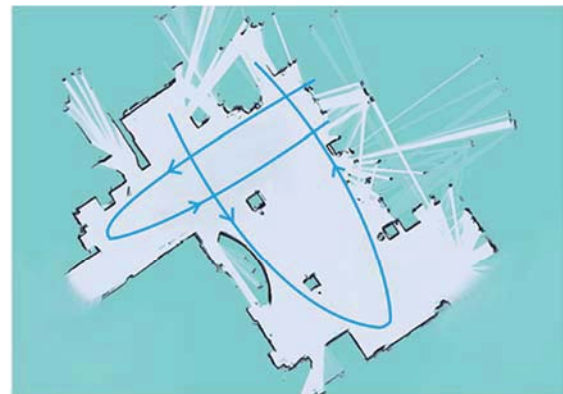
straight line   u-shaped route

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:
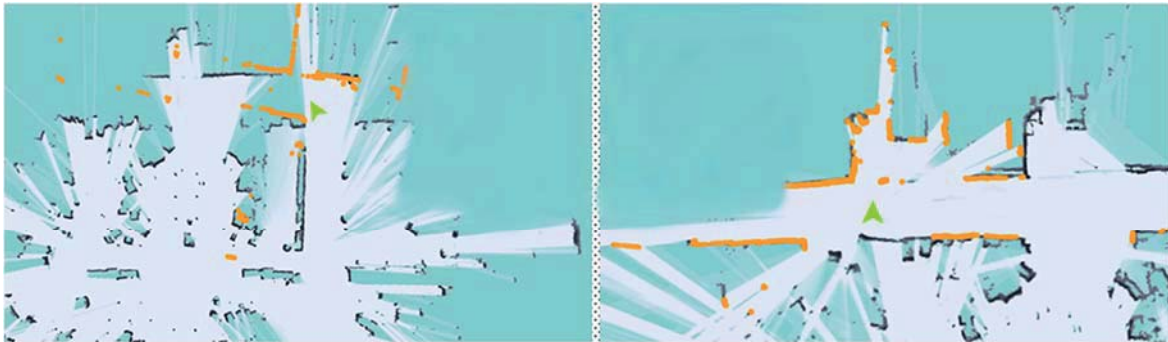

figure 1   figure 2

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. 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.

2. 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.

B. Map construction with tag code

To build a labeled map, you need to paste the label code in advance. If you need to use a labeled map, please contact the technician in the group to evaluate whether you need to use this method.

➢ **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 m and 5 m

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
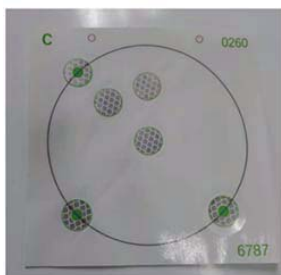
➢ **QR code paste method**
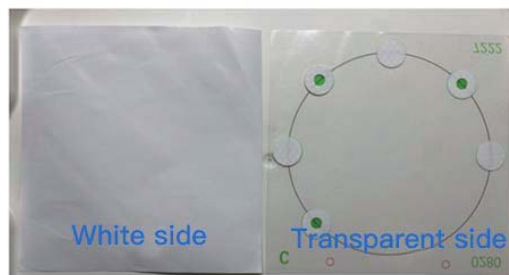

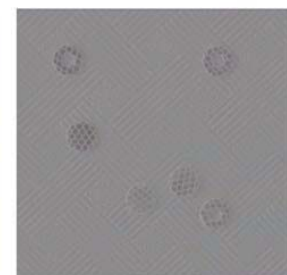Figure 1 Before tearing   Figure 2 After tearing   Figure 3 After pasting

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.

Note: Paste the QR code in the place designated by the technician. After the pasting is complete, create a map according to the method of "unlabeled code map construction". When the machine passes under the QR code, it will automatically record the QR code on the map.

The Step 3 [Position]

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

Note: The calibrated position must be at least 50 cm away from surrounding obstacles and virtual walls; the machine must be turned on within 2m of the charging pile for subsequent use.

Schematic diagram of charging pile calibration method:

First, move the machine so that the charging shrapnel of the machine is facing the charging shrapnel of the charging pile, and click the button "charging_pile" on the menu bar of the map.
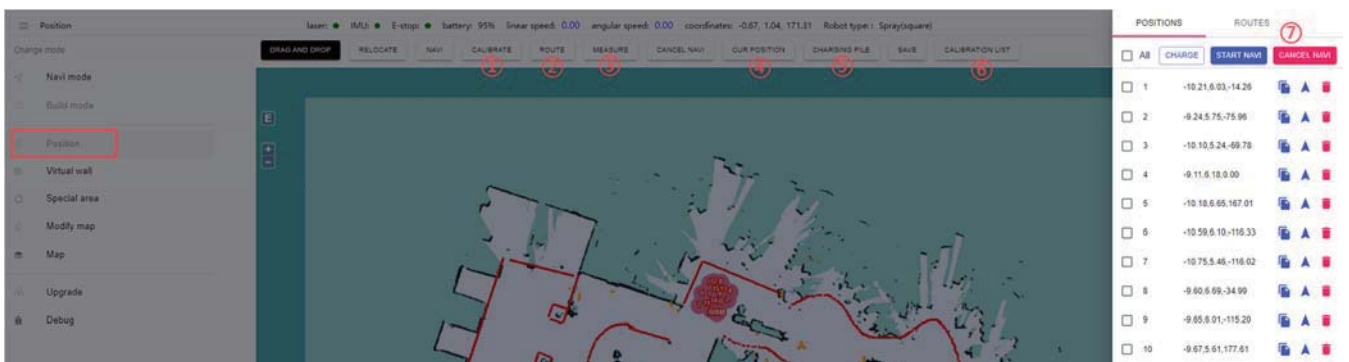

①**Calibrate:** you can drag on the map to get the coordinates of the specified location for calibration

②**Route:** click on the map to plan a fixed route to let the machine navigate

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

④**Cur position:** The current position of the robot can be obtained for location calibration

⑤**Charging_pile:** point the charging shrapnel of the robot directly to the shrapnel of the charging_pile, and then click "charging_pile" to calibrate, and

the icon will automatically move forward when the calibration occurs (note: only this point is the exception)

⑥**Calibration list:** Click on the right side of the screen to pop up ⑦this "location list" and "route list"

**The calibration example is as follows:**
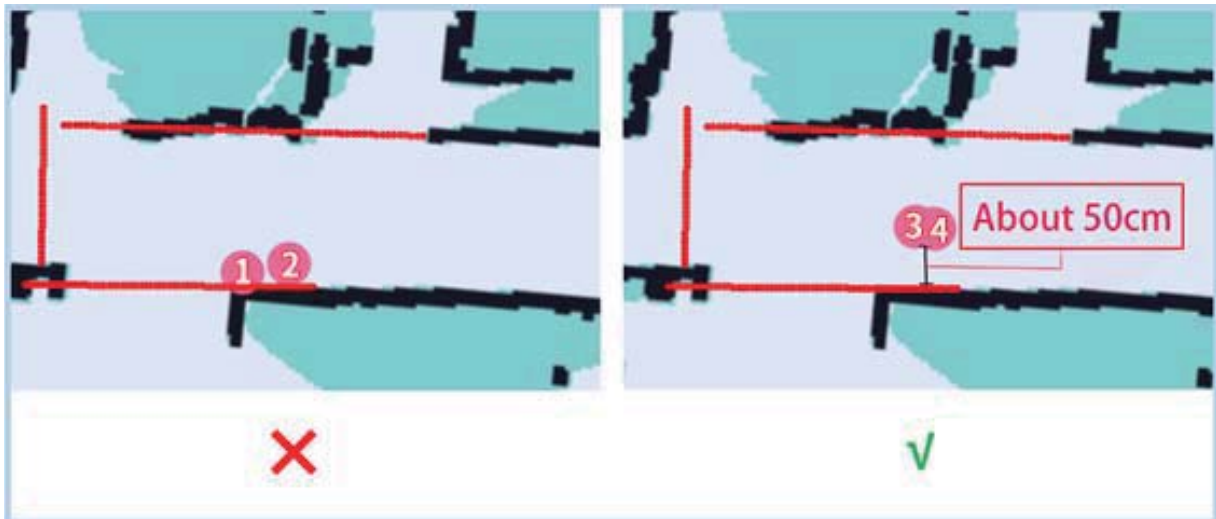
Precautions:

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 that there are no obstacles within 1.5 meters

on the left and right sides of the charging_pile

The step 4 [Virtual wall]

Edit the function of virtual wall: restrict the active area of robot
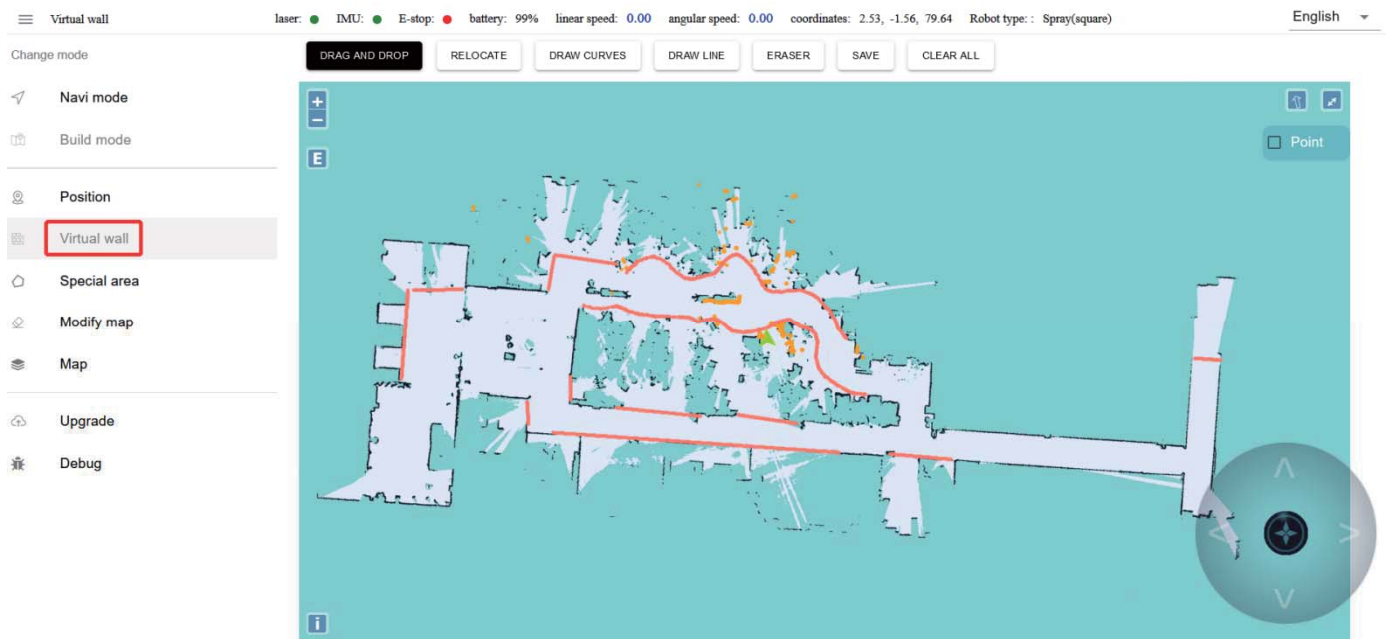
Drag: in this mode, you can zoom, pan and rotate the map. In this

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

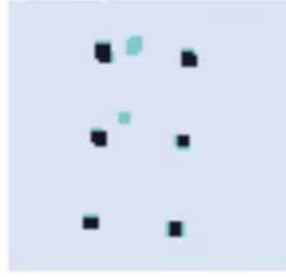figure 1   figure 2   figure 3   figure 4

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
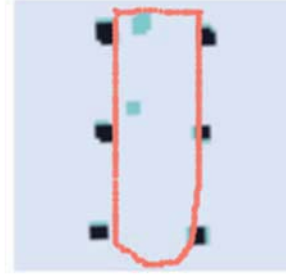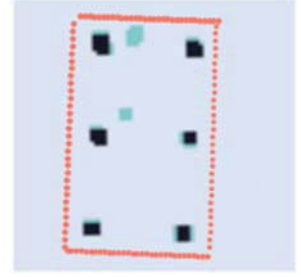
figure 1 Actual environment

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.

The Step 5 [Start delivery]

Find the application named [deligo] on the screen and open it, select the location to be delivered to start the delivery, the following is an explanation of the application function

a , Swipe to the left from the right side of the screen for more convenient operations, as shown in the interface below
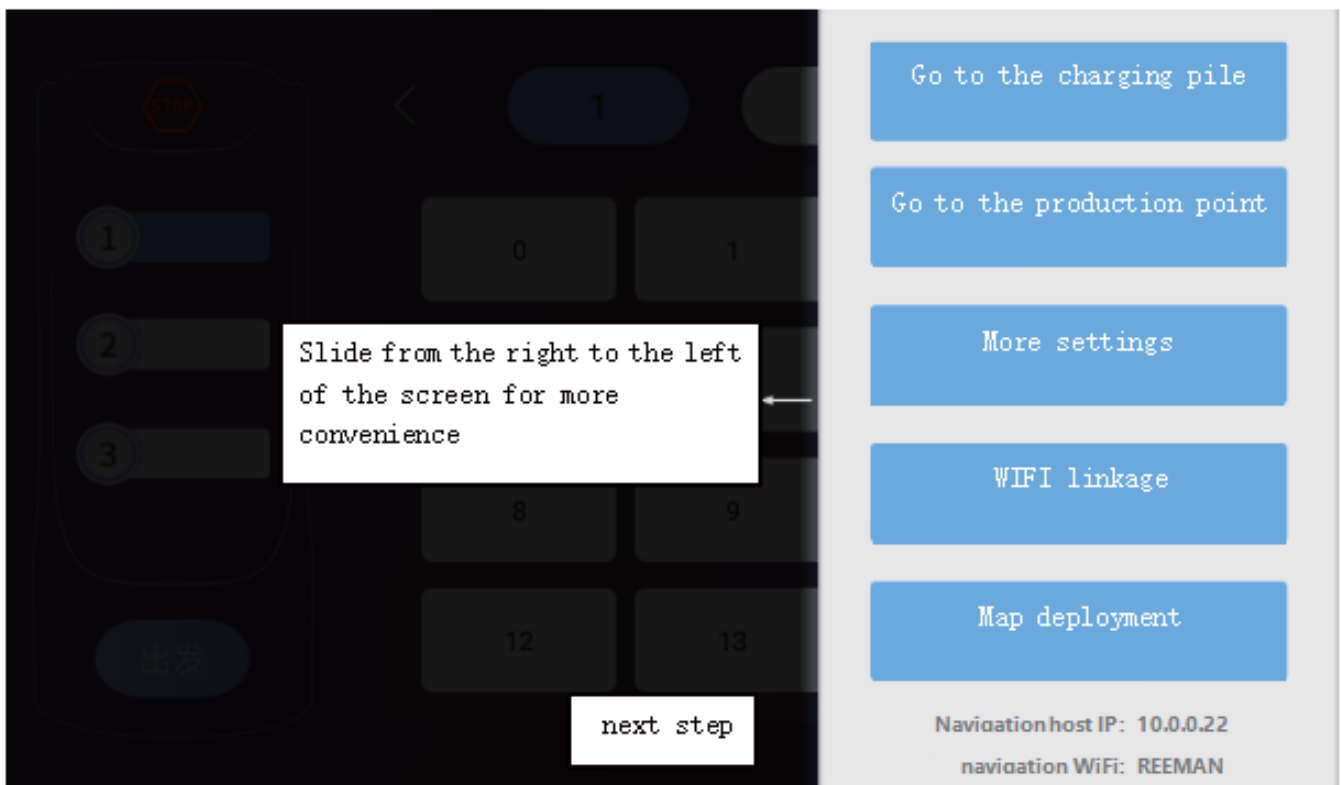
①GO to the charging pile：Click the machine to go to the charging station for charging

②GO to the production point：Click on the machine to go to the meal picking window

③More settinge

- **Current language：**Can switch language

- **Residence time：**You can adjust the stay time of the point

- **Reloccate：**Move the machine to the relocation location and turn on the emergency stop switch of the machine to the right, then click the relocation button and the machine will relocate the current position

- **Working hours：**After activation, the machine will automatically go to the production point to wait for duty according to the set working hours, and will automatically return to the charging station to charge when the off-duty time is up.

- **Low charge：**Threshold for triggering automatic recharging of the machine at low power

- **Current version：**The version number of the app

④**WiFi connection：**Can switch other network connections

⑤**Map deployment：**You can re-enter the map to add points or rebuild the map and other operations

b，Choose table

As shown below: 1, 2, and 3 displayed on the table selection interface correspond to the plate grid on the food delivery robot, and only one food delivery spot can be selected for a plate grid.

c , Meal delivery

① The machine will deliver the food in sequence according to the table selection in the dinner plate grid. After the machine reaches the target point, it will start a countdown. After the countdown is over, it will go to the next delivery point or use the shortcut key (the shortcut key is located on the top of the machine, place your hand on the touch sensor After the regional machine senses it, the countdown will end in advance)

② After the machine arrives at the designated delivery point, the tray grid for picking up the meal will light up, and the lights on the rest of the tray grid will go out
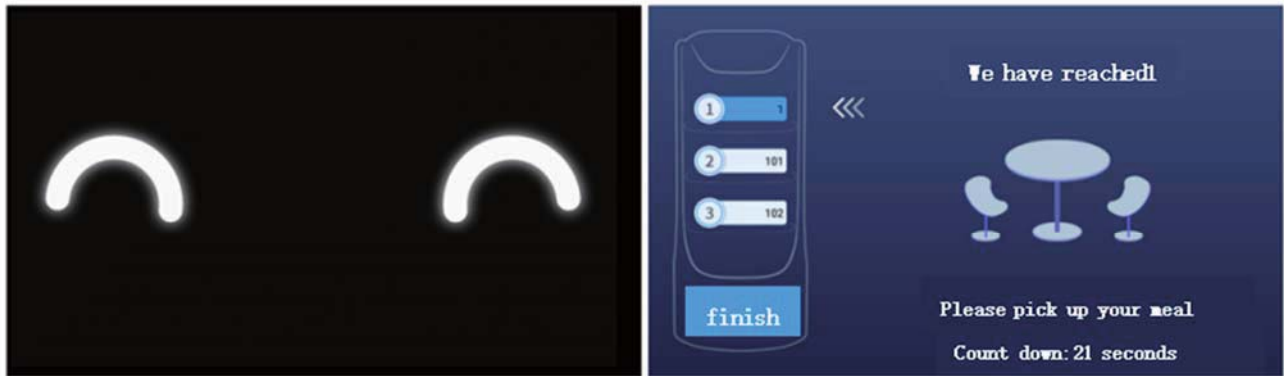
Interface status at delivery

Interface state after reaching the target point.

d，Charge

① After being turned on, the machine will return to the charging pile for charging when it is lower than the set value during working hours. The low battery value plus 20% is equal to the value of the machine continuing to perform tasks.

② When the machine starts charging, the interface status is shown in the figure below. If you put your hand on the touch sensing area on the top of the machine, the machine will move 20cm forward and leave the charging pile to exit charging.
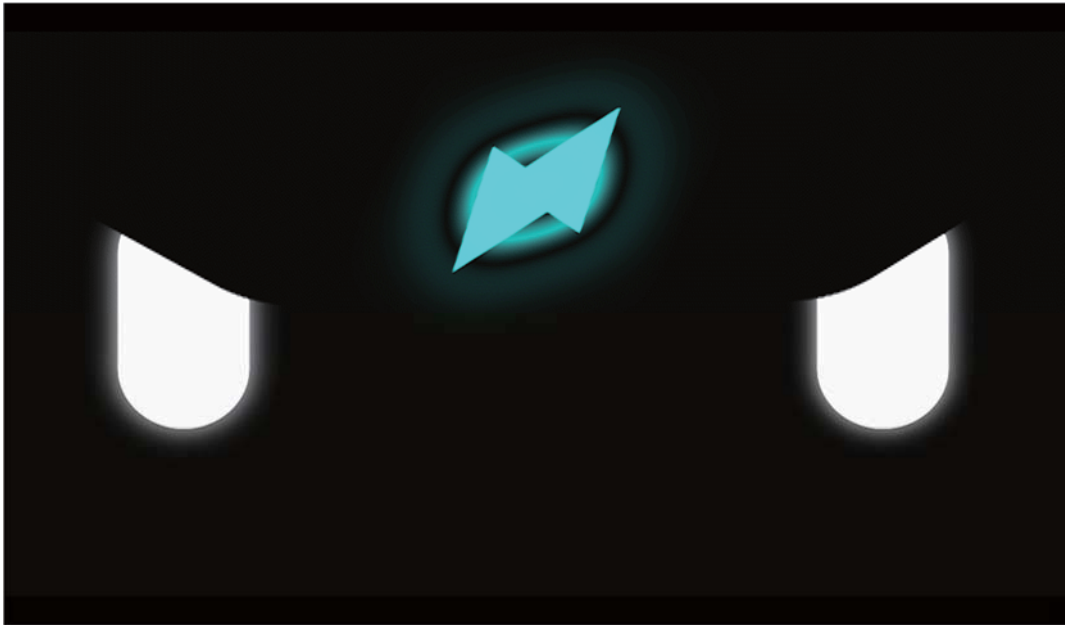
3. Explanation of other functions

a [Special Area]

Function: The drawable area limits the speed of the robot in a certain area
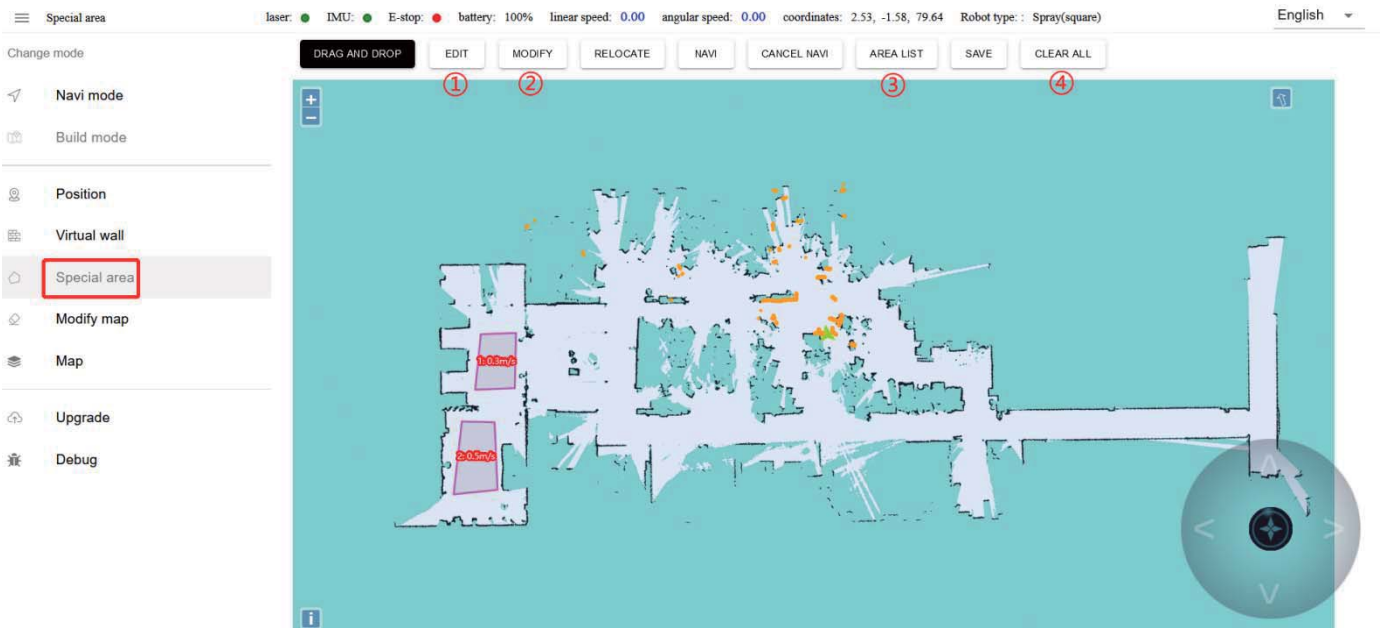
①**Edit:** In the map, click with the left mouse button to draw a polygon at will, and a naming box for the area will pop up after completion to define the area and speed

②**Modify:** adjust the edited speed area, click on the speed area that needs to be edited, the color of the area will change (the line around the selected area will become thicker and become red), then pull the line to proceed Area size adjustment

③**Area list:** After clicking, the edited area list will pop up on the right side of the page. You can redefine the speed and name of the area in the area list and delete the area.

④**Clear all:** Refers to one key to clear all edited special areas

Note: After editing is completed, click Save to take effect

b [Modify map]

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

Editing premise: The map has changed after the scan is completed, and the map editing function can be used to edit the map appropriately if the change is not significant. If the map is too different from the actual environment, it is recommended to scan the map again.
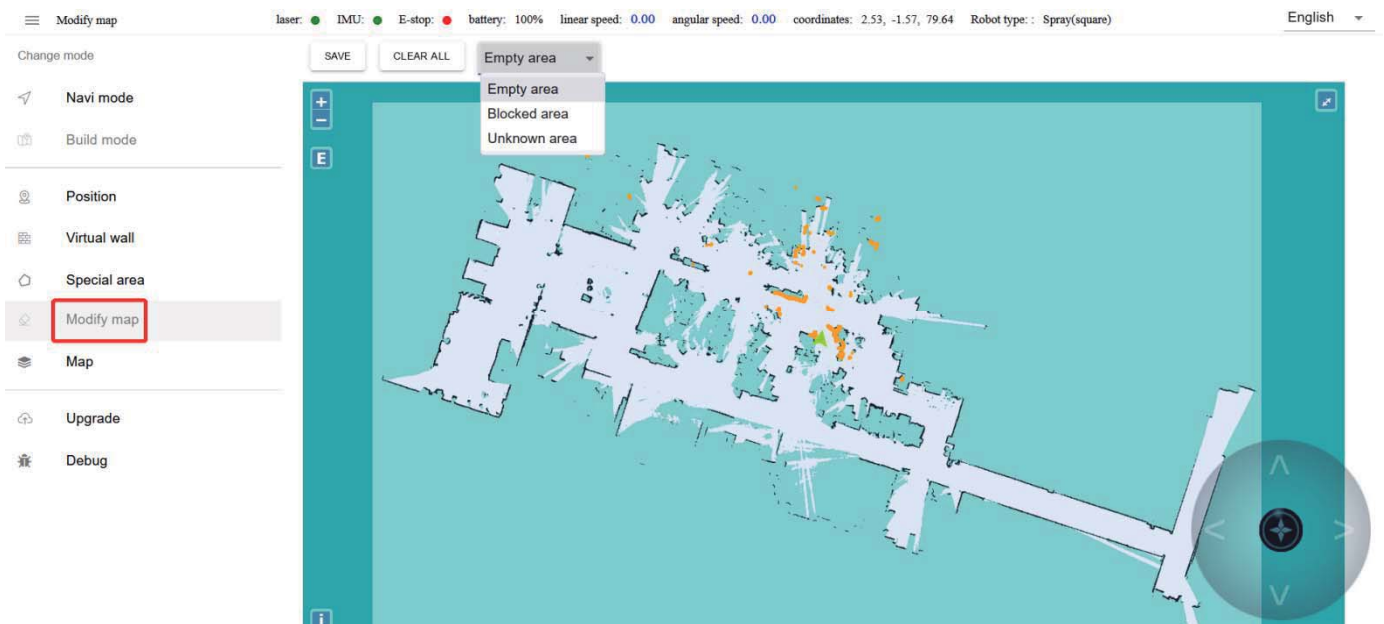

① Click Save to apply the map modification

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
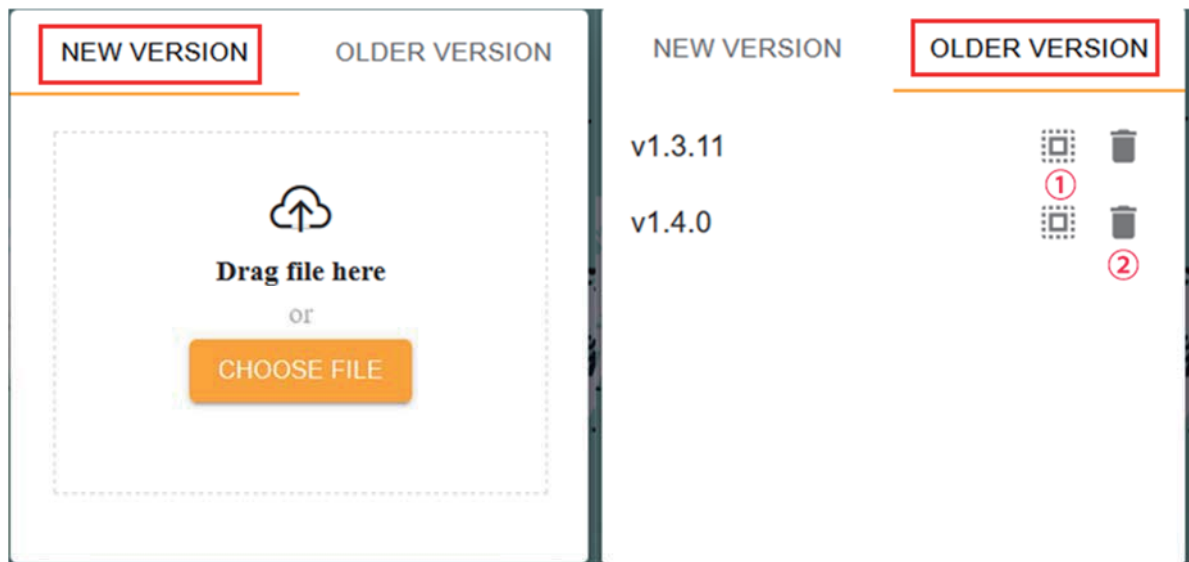
c [Map]
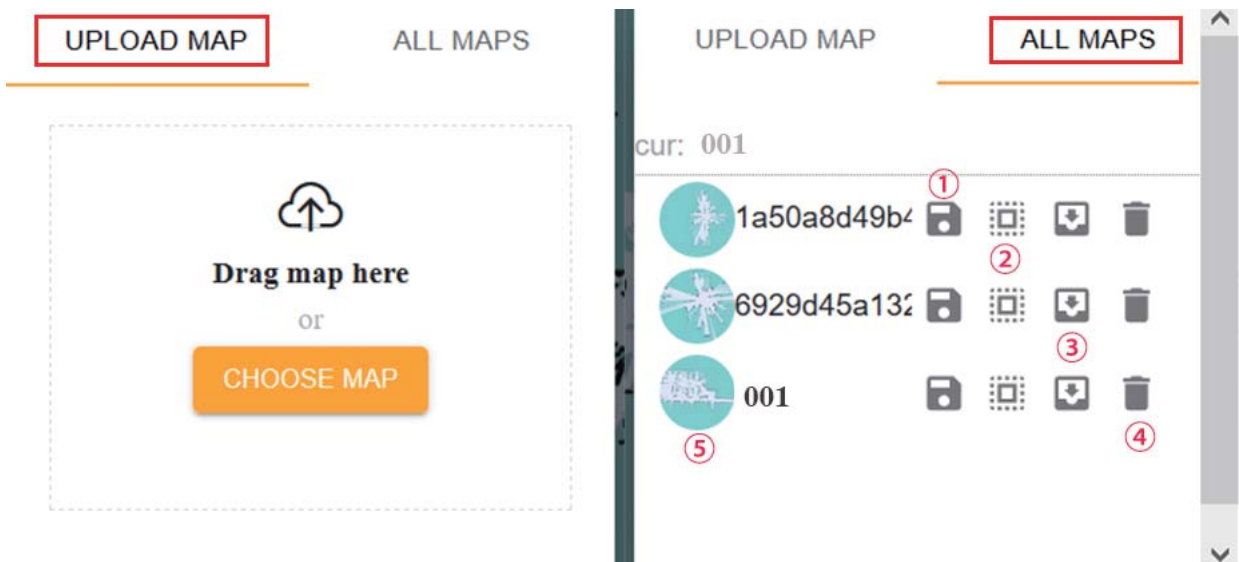
① Edit map name　　② Apply this map　　③ Export the map to the computer

④Delete this map ⑤ Mouse over to show preview map, click to show original image
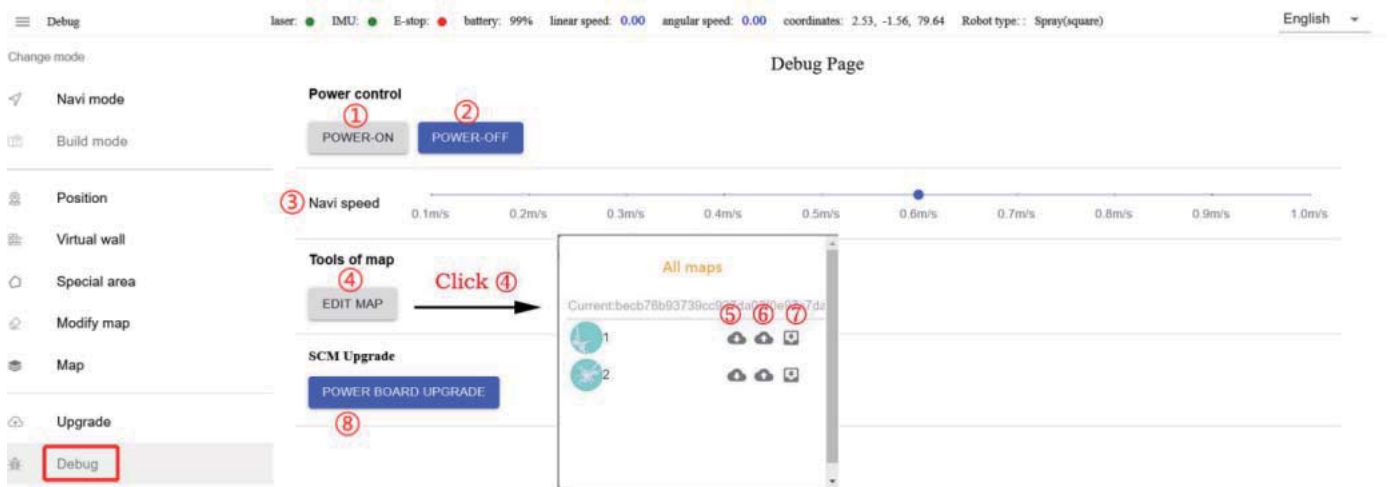
Note: The map will not be applied immediately after uploading, you need to find the row of the map in "All Maps" and click the "Apply" icon

d [Upgrade]

① Apply this version ② Delete this version

e [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 **Navi speed:** adjust the driving speed of the machine (unit: m/s)

④ **Edit 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

⑧ **Power board upgrade:** the factory is the latest version, no need to update

Tools of map

Function: The effect of maps constructed for larger scenes or similar feature points is not good. You can use this function when there is ghosting or deformation. You can scan the map partitions and combine the 2 maps into one map.

Example of merged map:
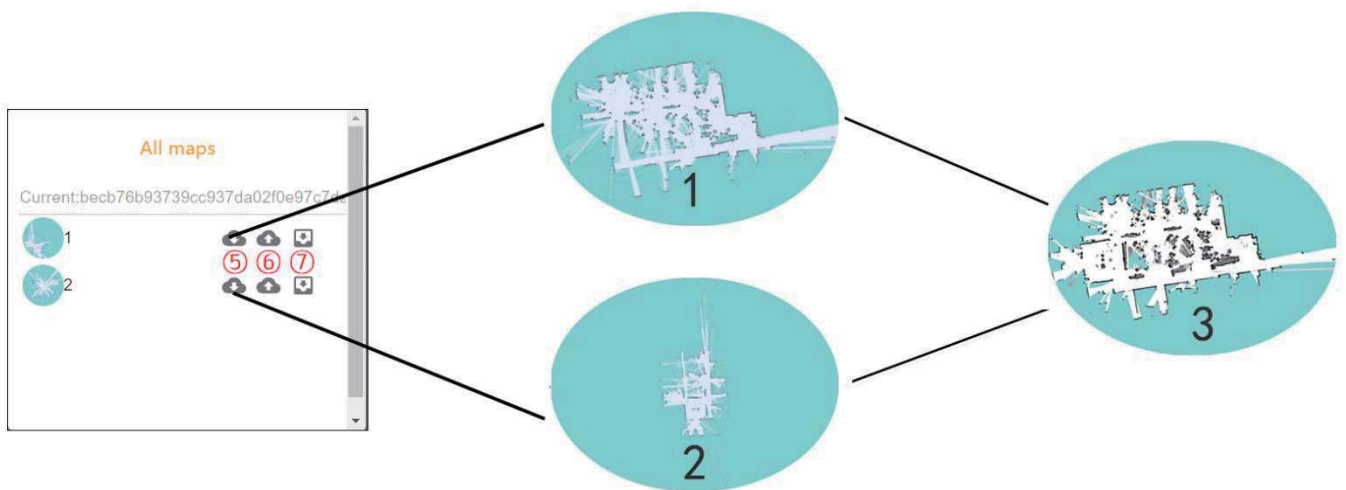
As shown in the picture above, first export pictures 1 and 2 to the computer, and then freely choose picture 1 or picture 2 as the original base map of ps. Open the ps software on the computer, assuming that map 1 is the original base map of ps, splicing map 2 to map 1 to get map 3, import map 3 (pgm format) into map 1, and then click "in Figure 1" Generate a new map" (the generated new

map will be automatically downloaded to the computer), and finally go to the "Map Management" to upload the generated map, and then go to the "All Maps" to find the Map 1 application.

4. Precautions for use

①Loss of machine positioning

Overview: Loss of positioning means that the location of the robot's location map does not match the actual environment location.

Cause of :

- Loss of positioning caused by manually pressing the emergency stop switch to move the machine
- The robot will match the current map according to the actual laser data during the movement. If the current environment and the map are too different, the robot will fail to match the map, resulting in loss of positioning, and loss of positioning will cause the robot to lose path planning ability and cannot move
- If someone surrounds the machine in front, the location will be lost. If there are too many people around the machine, the laser will be blocked, and the match between the laser and the terrain

will become very low, which will cause the location to be lost.

Solution:

- Press the emergency stop switch of the robot, push the robot below the QR code label nearby, and then open the FTP application on the screen to observe the information in the last column. If the machine recognizes the QR code, the last column will display visual_mark[name: C0189] means that the label has been recognized and the machine has completed relocation. At this time, turn on the emergency stop switch and continue to let the machine perform the task. (Note: The label number of C0189 is not fixed, and the number of each label is different)

- Open the FTP application on the screen, enter the ip address displayed in the IP column of the navigation system in the browser to enter the background of the machine to manually relocate the machine

- Move the machine to the location of the charging pile and restart the machine within 2m of the charging pile (note: the target point of the charging pile should be marked on the map)

②The machine does not navigate

Overview: The machine does not navigate refers to let the machine navigate to a certain point and the machine does not move

Cause of :

- Check whether the emergency stop switch of the machine is turned on, and the machine can be autonomously navigated only when the machine is turned on (Turn the emergency stop switch to the right to indicate on, and press to indicate off)
- Check whether the machine has lost its location (the orange laser and black obstacles on the map do not completely overlap, which means it has lost its location)
- Check whether the machine is close to obstacles or virtual walls (the machine will be unable to navigate if the machine is close to obstacles or virtual walls)
- Check whether the target point is close to obstacles or virtual walls

Solution:

- Loss of positioning: Reposition the machine according to ①The solution of machine positioning is lost
- The machine is close to an obstacle or a virtual wall, move the

machine out a bit, and then start navigating

● The target point is close to the obstacle or the virtual wall. Reset the target point. When setting it, it should be about 50cm away from the obstacle or the virtual wall.

③The machine navigation charging does not respond

Overview: Send navigation charging instructions to the machine, the machine does not start navigation

Cause of :

● Check whether the charging pile point is calibrated by using the charging pile button after the machine is connected to the charging pile

● Check whether the charging pile target is close to obstacles or virtual walls

Solution:

● Please refer to the calibration method of the charging pile in step 7 [Calibration position]

● There should be no obstacles within 1.5m on the left and right sides of the charging pile

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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 20cm distance between the radiator and your body: Use only the supplied antenna.