

GS-Ecobot Scrubber

50

DEPLOYMENT GUIDE



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TABLE OF CONTENTS

| | |
|---|----|
| TABLE OF CONTENTS | 2 |
| INTRODUCTION | 5 |
| DISCLAIMER & RESPONSIBILITY | 5 |
| 1. DELIVERY & UNPACKING INSTRUCTIONS | 6 |
| 1.1. Preliminary Check | 8 |
| 1.2. Unpacking Inspection | 10 |
| 2. DEPLOYMENT INSTRUCTIONS | 12 |
| 2.1. Applicable Cleaning Area Investigation | 12 |
| 2.2. Communication with Customers | 12 |
| 2.3. Special Environment Treatment | 14 |
| 2.3.1. Laser Stickers | 14 |
| 2.3.2. Infrared Stickers | 14 |
| 2.3.3. Reflective stickers | 16 |
| 2.4. Robot Deployment | 19 |
| 2.4.1. Logging In | 19 |
| 2.4.2. Map scanning | 20 |
| 2.4.2.1 Physical locating | 20 |
| 2.4.2.2 Enter scanning interface | 21 |
| 2.4.2.3 Create a new map | 21 |
| 2.4.2.4 Create a new map - Route control | 22 |
| 2.4.2.5 Create a new map - Scanning Tips | 23 |
| 2.4.2.6 Forced closed-loop | 23 |
| 2.4.2.7 Map confirmation/saving | 24 |
| 2.4.2.8 Check map quality (important) | 25 |
| 2.4.2.9 Map extension | 26 |
| 2.4.3. Map editing | 27 |
| 2.4.3.1 Edit virtual wall | 30 |
| 2.4.3.2 Mark slopes | 32 |
| 2.4.3.3 Edit the original map | 33 |
| 2.4.3.4 Highlighted area | 34 |
| 2.4.3.5 Elevator area | 35 |
| 2.4.3.6 No-falling risk area | 36 |

| | | |
|----------|---|----|
| 2.4.3.7 | Temporary carpet area | 37 |
| 2.4.3.8 | Temporary display area | 37 |
| 2.4.3.9 | Glass wall | 38 |
| 2.4.3.10 | Recessed ground lamp area | 39 |
| 2.4.4. | Create cleaning path | 40 |
| 2.4.4.1 | Teaching mode | 41 |
| 2.4.4.2 | Auto-cover | 41 |
| 2.4.4.3 | Real-time auto-cover | 42 |
| 2.4.4.4 | Real-time auto-cover virtual wall tracking | 43 |
| 2.4.4.5 | Create new points | 45 |
| 2.4.5. | Create paths Combine new path | 47 |
| 2.4.6. | Create paths Combine new path – cleaning mode configuration | 48 |
| 2.5. | Precautions of deployment | 49 |
| 2.6. | Charging Pile Deployment | 50 |
| 2.6.1. | Deployment requirements | 51 |
| 2.6.2. | Set a charging point in-app | 52 |
| 2.6.3. | Deployment verification | 54 |
| 2.7. | Disinfection Package Deployment | 56 |
| 2.7.1. | Basic Introduction | 56 |
| 2.7.2. | Config settings | 57 |
| 2.7.3. | Cleaning procedure | 59 |
| 2.8. | Workstation Deployment | 60 |
| 2.8.1. | Basic structure and parameters | 60 |
| 2.8.2. | Installation requirements | 61 |
| 2.8.3. | Set a charging point in-app | 62 |
| 2.8.4. | Deployment verification | 64 |
| 2.9. | Debugging Preparation | 66 |
| 2.9.1. | Consumables | 66 |
| 2.9.2. | Cleaning mode | 67 |
| 2.9.3. | Consumables lifespan | 69 |
| 2.9.4. | Stop water distance | 70 |
| 2.9.5. | Keep suction on | 71 |
| 2.9.6. | Anti-falling function verification | 72 |

| | | |
|----------|--|-----|
| 2.9.7. | Cleaning effectiveness | 73 |
| 2.9.8. | Test run | 74 |
| 2.9.9. | Scheduled task | 75 |
| 2.10. | Application Deployment Scenarios | 77 |
| 2.10.1. | Office buildings Rules on path | 77 |
| 2.10.2. | Office buildings Solutions & precautions | 78 |
| 2.10.3. | Hotels Rules on path | 81 |
| 2.10.4. | Hotels Solutions & precautions | 81 |
| 2.10.5. | Schools Rules on path | 86 |
| 2.10.6. | Schools Solutions & precautions | 86 |
| 2.10.7. | Hospitals Rules on path | 89 |
| 2.10.8. | Hospitals Solutions & precautions | 90 |
| 2.10.9. | Commercial complexes Rules on path | 93 |
| 2.10.10. | Commercial complex Solutions & precautions | 94 |
| 3. | APPENDIX: TECHNICAL SPECIFICATION | 100 |

INTRODUCTION

The Cleaning Robot Scrubber 50 by Gausium (alias "Gaussian Robotics"), Singapore, is a fully autonomous cleaning robot that can automatically charge, dispense, and refill all by itself.

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1. DELIVERY & UNPACKING INSTRUCTIONS

Before the delivery acceptance, check the crate, and the robot's appearance, and confirm the robot functions well. If there is anything abnormal, please take photos and contact a product service representative.

1. Place the packing crate in an open area.
2. Remove the wooden board on the side of the box with a tail sign by removing all the screws, and then take the wooden board off.



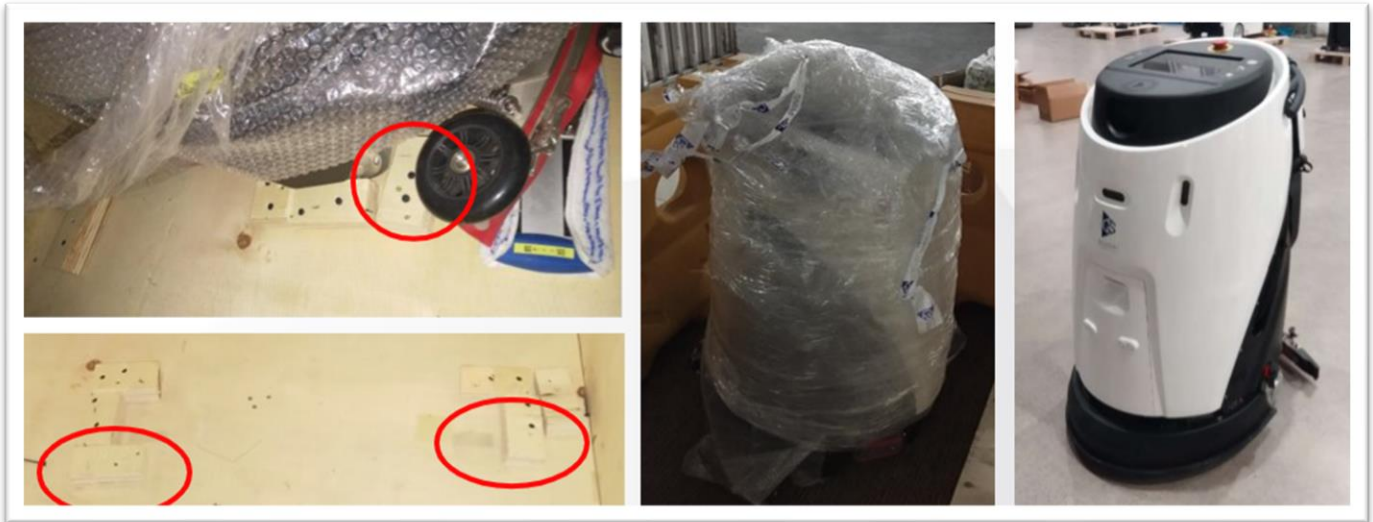
3. Use the electric screwdriver to remove the screws on one side of the crate, so that the wedge-shaped wooden ramp can be available.



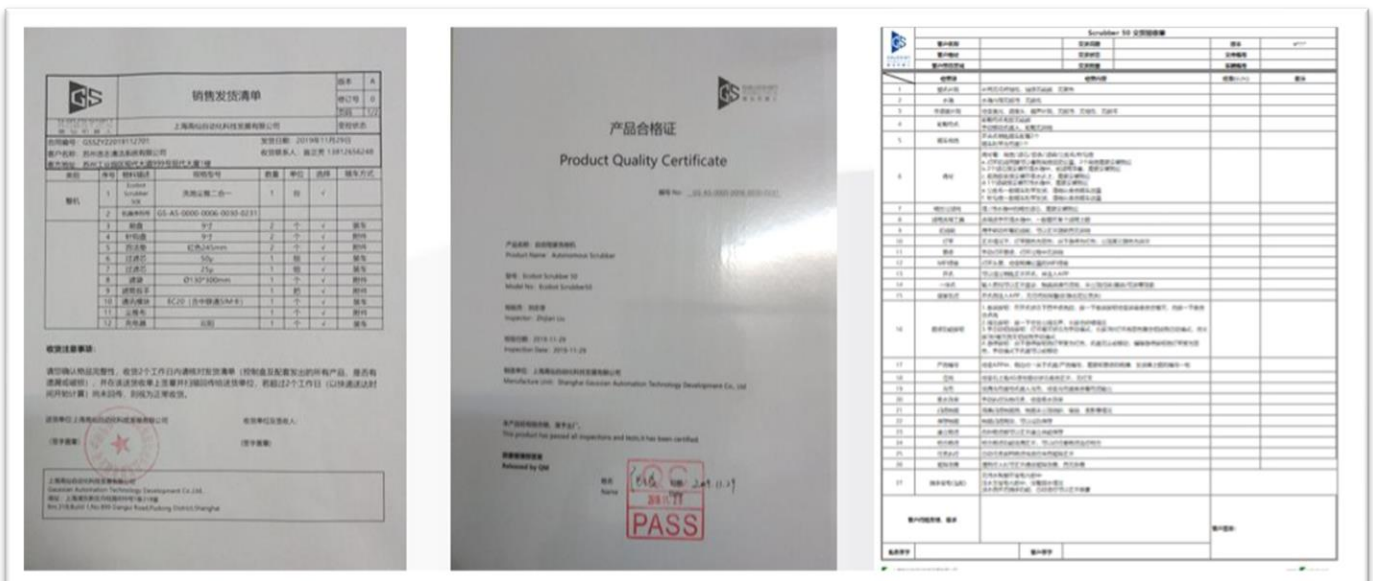
NOTE:

- An electric screwdriver with an M5 crosshead bit may be required.

4. Place it as close as possible to the pallet for pushing the robot to the ground.



5. Use the electric screwdriver to remove the wooden block fixed around the rear wheels and take out the accessories in the box shipped with the robot. Push the robot out through the ramp.
6. Remove the wrap and check the robot for any damage. If any scratches, dents, dirt, or other cosmetic issues are found, please notify the product service representative accordingly.



7. Check the "**Packing List**," and make sure there is no shortage of shipments for the listed stuff.
8. Ensure the "**Product Quality Certificate**" is provided along with the robot, and that all the information mentioned is accurate.

- Complete and forward to the after-sales department a copy of the signed "**Delivery Acceptance Form**" based on the actual findings.

1.1. Preliminary Check

Check accessories:

- Check if the material objects are consistent with the records on the invoice.

Robot appearance inspection:

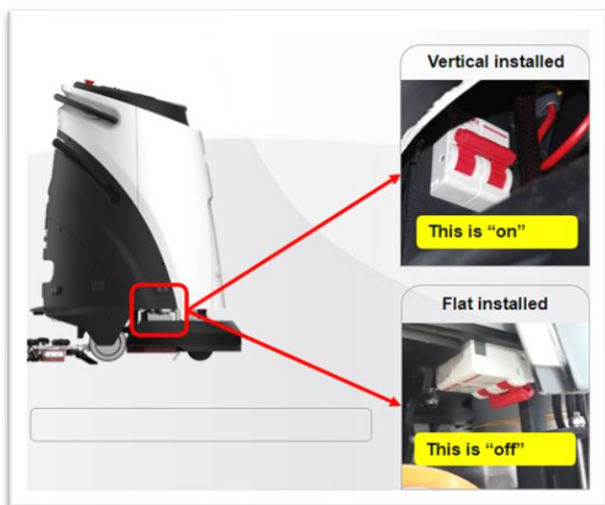
- Check if the robot's body is scratched.
- Check if there are any scratches on the surface of the sensors.

Device inspection:

- Check if the control panel can control all cleaning devices normally.

Steps to reproduce:

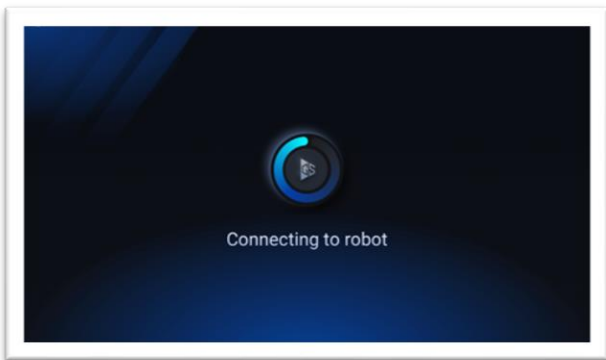
- Turn on the **air switch** positioned under the chassis on the right side of the robot. Check if it is switched on. (*Vertical installed*: toward up is "ON." *Flat installed*: toward the left is "ON").



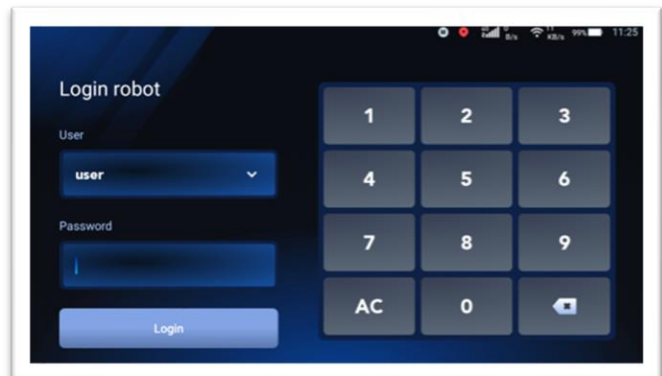
- Switch the circuit breaker on, boot the robot up by turning the key (next to the screen) clockwise, and check if the boot sequence is normal.



3. The **"Connecting Robot"** screen will appear, as shown in the figure below:



4. Please wait for the screen to reload.
5. Select the corresponding account and enter a password to log in for entering the APP.
6. Log in to the **"admin"** account with password **"314159"** (or Account: **"user"**/Password: **"123456"**) to enter the main interface of the APP.



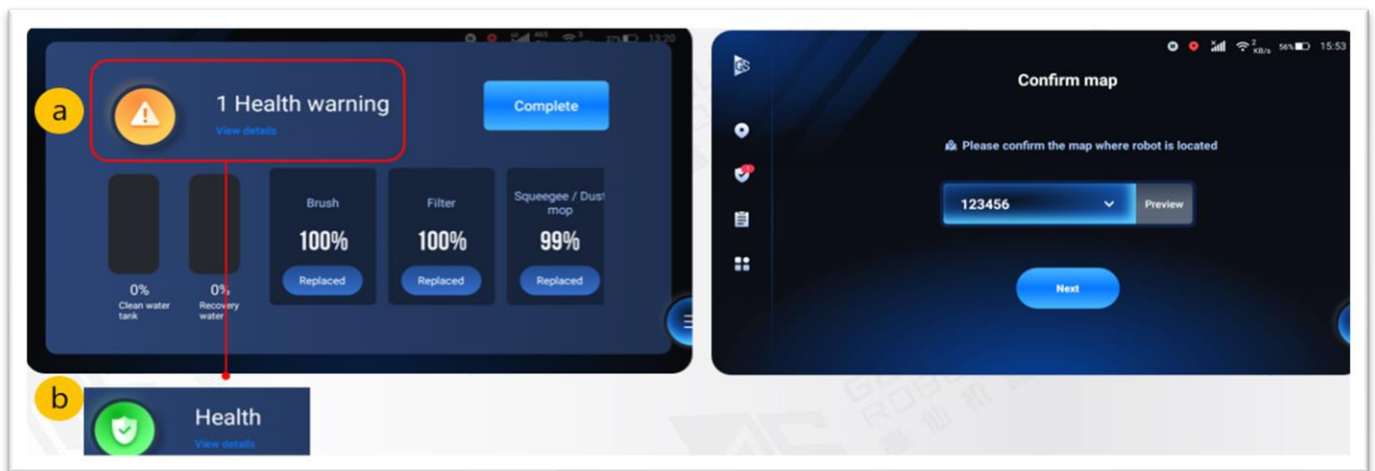
7. Check the robot's health status.



IMPORTANT:

- If the battery level is less than 50%, please charge it immediately to ensure that the machine can be used normally during deployment).

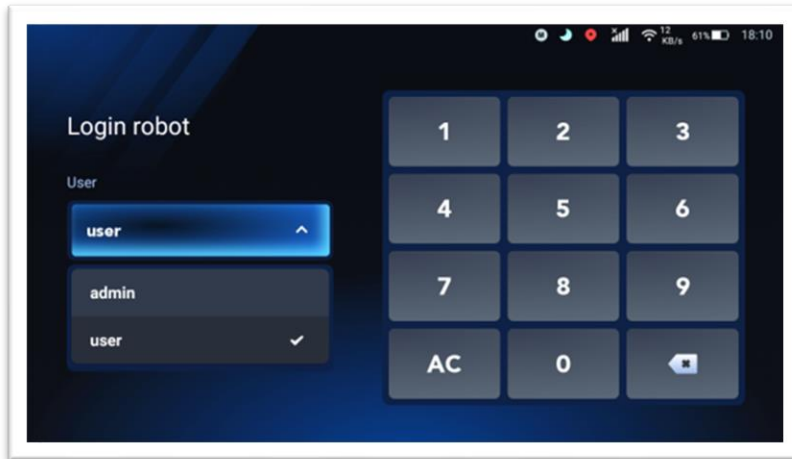
8. After entering the APP, the screen will show information such as health status, consumables usage, water level, etc.
 - a. If there is no fault, it will display the "healthy" status. Confirm the power of the machine by clicking on "Complete" to get into the UI.
 - b. If there is a fault, it will display the status of "health alarms."



9. If there are issues, they will be displayed on the screen. Click "**Preview**" and try to resolve the issue.
10. Click "**Back**" & "**Complete**" after issues have been successfully resolved.

1.2. Unpacking Inspection

1. Remove the outer packaging of the machine and check its appearance.
2. If the appearance is damaged or dirty, please contact the after-sales staff.
3. Turn on the air switch, use the key to turn on the machine, and check whether the machine can start normally.
4. Input account & password.



5. Log in to the "admin" account with password "314159" (or Account: user/Password: "123456") to enter the main interface of the application.



NOTE:

- Account: **admin** | Password: 314159
- Account: **user** | Password: 123456

6. A window pops up showing the water left in the water tank and the lifespan of consumables.
7. Check whether the screen and menu are normal and confirm the power of the machine (if the battery level is less than 50%, please charge it immediately to ensure that the machine can be used normally during deployment).
8. Confirm health status by clicking on "**Confirm**" to continue.
9. Check the whole vehicle after unpacking and fill in the "**Tracking Card**."
10. For abnormal record checks, check the machine history, whether there is an abnormal record.
11. Check the risk items and whether they have been solved.
12. Check the whole vehicle according to the inspection standard. If there is any abnormality, please record it in the Tracking Card.
13. Check the "**Packing List**," and make sure there is no shortage of shipments for the listed items.
14. Ensure the "**Product Quality Certificate**" is provided along with the robot, and that all the information mentioned therein is accurate.
15. Complete and forward us a copy of the signed "**Delivery Acceptance Form**" based on the actual findings.

2. DEPLOYMENT INSTRUCTIONS

2.1. Applicable Cleaning Area Investigation

Suitability:

Suitable scenario: Retail & shopping mall, Office building, Supermarket, Bank, Hotel, Hospital, Factory, and other small to medium-sized indoor areas with hard flat ground.

Unsuitable scenario: carpet area, underground parking lot, outdoor area, residential road, wooden floor, glass floor, other large indoor and outdoor scenes, special scenarios, etc.

The ground flatness:

$-1.5\text{cm} \leq \text{flatness} \leq 1.5\text{cm}$.

Minimal clearance:

The minimum width for GS-50 to run through is 95cm, while the minimum width for a U-turn is 130cm.

Slope:

It is not recommended to run through any slopes in auto mode, and no greater than 8° by manual push.

Laser detection:

Obstacles with black, highly reflective, transparent, and thin (2.5cm) surfaces are likely to cause light absorption or light drifting. Therefore, to have a better scanning result, laser stickers shall be applied.

Falling risk:

In areas with falling risk, such as stairs, up/down escalators, slopes, and holes in the ground, extra measures need to deploy infrared stickers.

2.2. Communication with Customers

Cleaning area:

Walk along with the customer to observe the entire cleaning area, while photos and notes may be taken for memo.

Find out the following:

- Reasonable route for mapping.

- Find a proper starting point for mapping.
- Determine whether a forced closed loop should be used depending on the complexity of the cleaning area.

Cleaning mode:

- scrubbing,
- dust mopping,
- scrubbing plus dust mopping,
- disinfection,
- disinfection plus dust mopping/scrubbing,
- roller brushing, etc.

Cleaning time:

- Create On and Off timeslots,
- set up do-not-disturb mode or scheduled task.

Landmarks:

- Where the robot shall be maintained and parked,
- charged,
- short-term and long-term stored.

Site environment:

Mark the environment with high change frequency and restricted area in advance. Bypass these places/obstacles when creating cleaning paths.

For example:

- Glass door opening and closing,
- booth relocation, shelf changes,
- stairs,
- escalators, etc.

Reflective and infrared stickers:

Communication with customers is required. Try to deploy stickers in all the places with potential hazards.

On-site assistance:

Request support from the customer. Check if temporary charging is needed, plan a field for testing, and even open the fire door for inspection, etc.

2.3. Special Environment Treatment

2.3.1. Laser Stickers

Deploy laser stickers as the solutions for the following environments:

Laser scanning at black/high-reflective/transparent/slim pole (2.5cm in diameter) obstacles is prone to omissions. Stickers must be attached 16-17cm high above the ground (both sides).

Traffic cones:

Generally used in a large area with risks → glass doors, temporary construction areas, stairs/escalators, etc.

Set-up method:

Place traffic cones around risky areas to prevent the robot from entering. (the distance between every two cones should not exceed 4m). Once the robot detects them, it will identify the area between the two cones as a “no entry” zone.



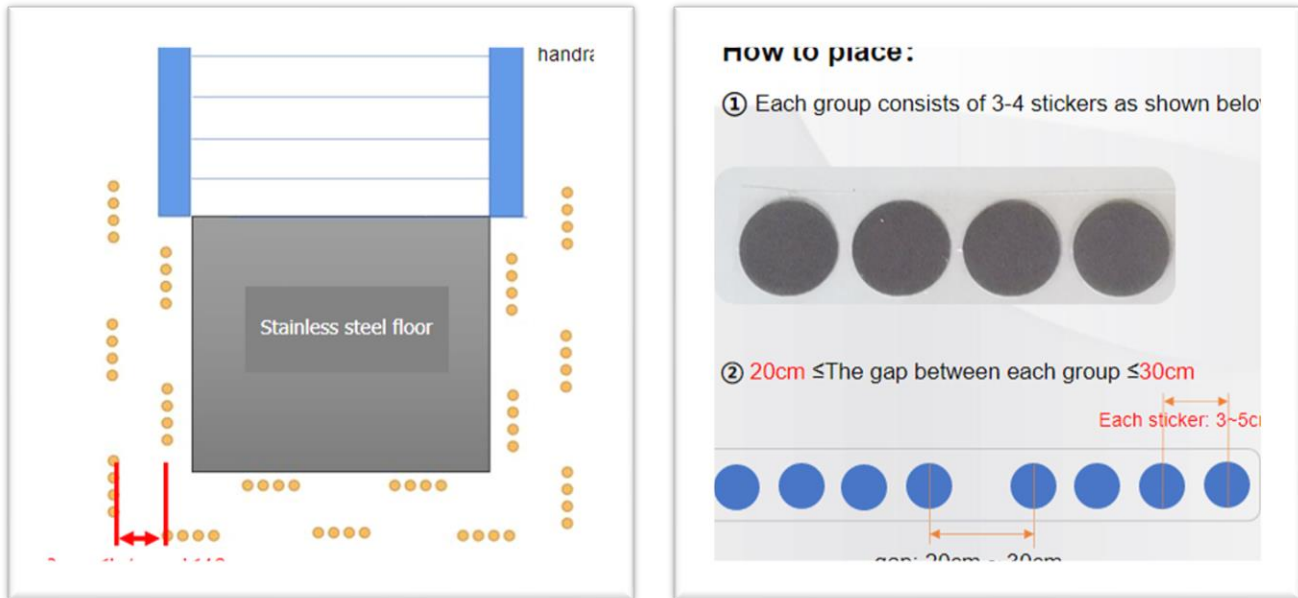
2.3.2. Infrared Stickers

Prevent falling:

Escalators (Going up or down), Stairs (Going down), and other potential areas with such risk.

The file path of infrared sticker settings:

/strategy/ir_sticker_enable



As the figure above shows, place an infrared sticker at least 50cm away from the risk area. Stickers in inner and outer rings should be interlaced. The distance between the inner and outer rings should be 30-40cm.



NOTE:

- The sticker must be well attached in a straight line.
- Please replace stickers if they are damaged or missing.
- Periodical check is mandatory.
- Place the stickers behind virtual walls as the last defense.
- Remember to tear off the plastic covers of the stickers.

2.3.3. Reflective stickers

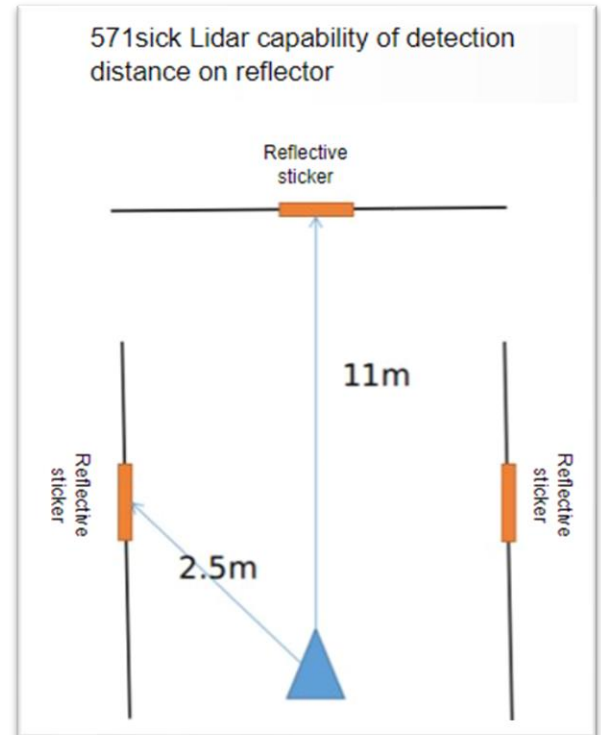
The capability of detection (distance)

The detectable range of laser on reflective stickers varies according to the viewing angle from which the laser reaches the reflector.

As shown in the right figure, the distance that the reflector can be effectively detected is 11m when the laser reaches the reflector vertically.

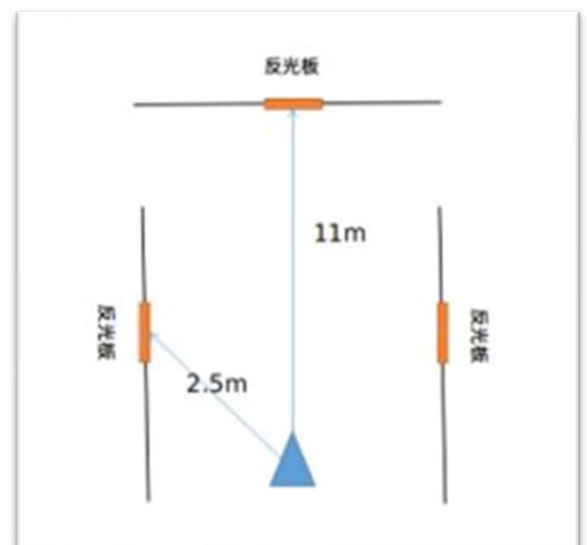
When the reflector is parallel to the laser, the effective detectable range is 2.5m.

Reflective board



Deployment guide

- ① Make 3 reflectors as visible in the view of the laser as possible, as shown in the figure.
- ② Avoid not deploying stickers to the areas with highly reflective objects (1.5m), such as glass and smooth metal objects as far as possible.
- ③ The distance between two reflectors should not be less than 1.5m, and the recommended distance is 3m.
- ④ The reflector must be attached to a permanently fixed object, and the length of the reflector should be 10-15cm.



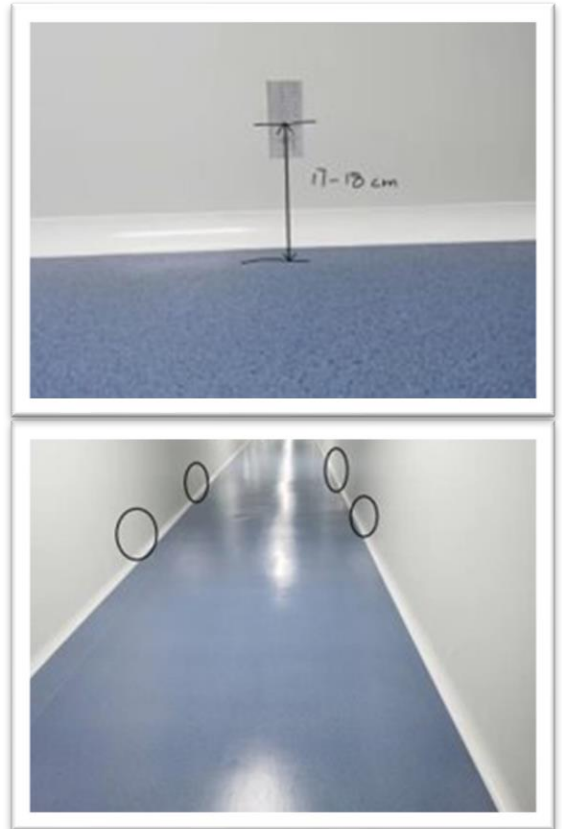
⑤ The reflector should be deployed as close as possible to the event point of the robot. Event points include turns, navigation points, and places where the robot can easily get lost.

⑥ In similar scenes, such as similar corridors, the position of stickers needs to be different to have the robot distinguish specific corridors.

⑦ To get a decent quality scan, ensure there is no ghost in the area near the reflector.

⑧ Deploy stickers alternately on both sides of the corridor. (For example: deploy stickers at an interval of 3 meters on the left side of the corridor, deploy the right ones between the 2 left ones.).

⑨ Scan the map with the reflective stickers deployed again. If the map was done before deploying the stickers, you need to expand the map to ensure that the reflective stickers are scanned by the laser.



Modify the parameter to enable the reflector function

Parameters related to reflector configuration are in gaussian_mapping_v5.yaml, the file's MAPPING and LOCALIZATION contain the following parameters.

Instruction for Parameters:

1. The distance between the two deployed reflectors must be greater than "outlier_reflector_dist."
2. Try to ensure that there are no other highly reflective objects within the outlier_reflector_dist distance, such as glass, highly reflective metals, transparent plastic films, etc.
3. The larger the "reflector_constraint_weight" is, the more trust the reflector owns, this increases the weight when the environment changes.
4. After turning "pub_visualize_message" on, observe "topic:/g_reflector_feature" in RViz, indicating that the optimized reflector is detected and added.
5. Configure the "laser_type" value as per the laser type.


```

1 reflector_options:
2   enable: false           #ture: enable reflector function, false: disable
3   merge_reflector_dist: 0.4      #unit: meter, the interval of merged reflector
4   outlier_reflector_dist: 0.8    #unit: meter, judge the interval outlier
5   loop_closure_dist: 5.0        #unit: meter, the searching scope of loop closure
6   loop_closure_merge_dist: 0.2  #unit: meter, the interval of merged reflector during loop closure
7   reflector_constraint_weight: 100 # the weight of reflector added into optimization
8   pub_visualize_message: true    #True: enable visualization, false: disable
9   min_obs_number: 5            #Determine the minimum times a reflector was detected
10  laser_type: "SICK_571"        #type of laser, else are WLR_76, SICK_571, SICK_681

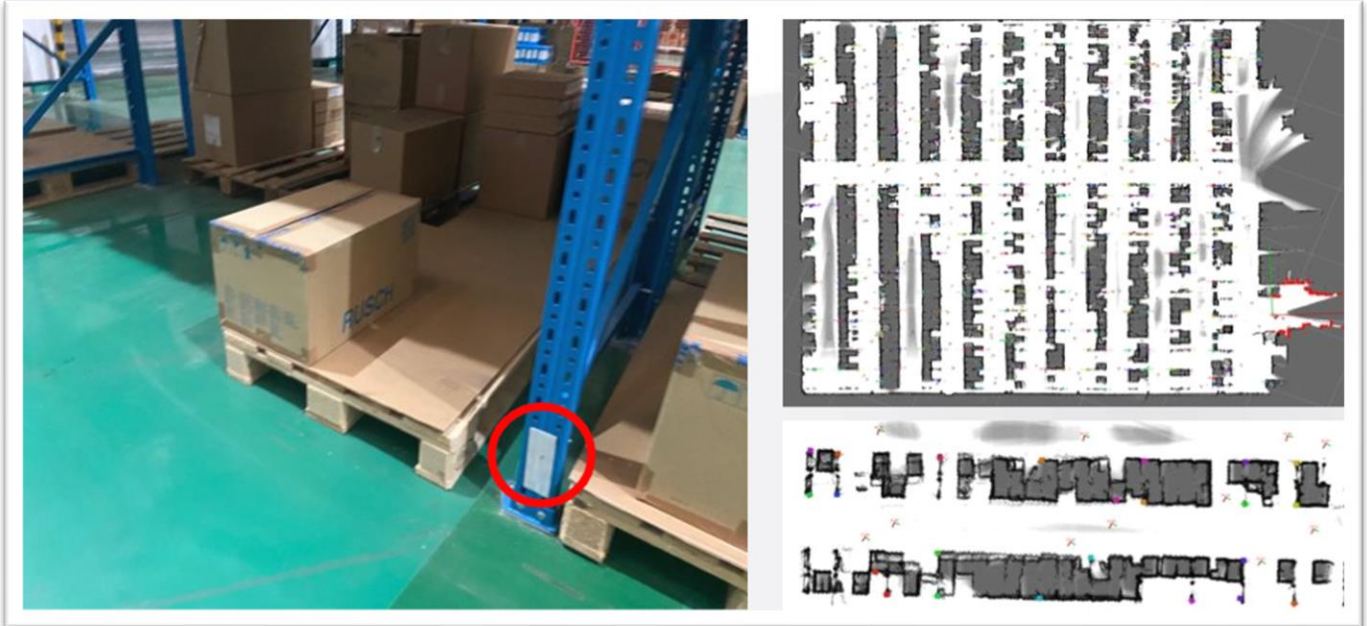
```

Add and Delete

1. An expanded map can add new reflectors, but it cannot delete the original reflectors and modify their positions.
2. At present, there is no editing interface for the reflector in the APP, and the reflector in the map cannot be deleted manually.
3. If the reflector that has been recorded on the map must be removed, and no other reflectors are added within 1.5m, it will not affect the positioning.

Deployment Effectiveness Verification

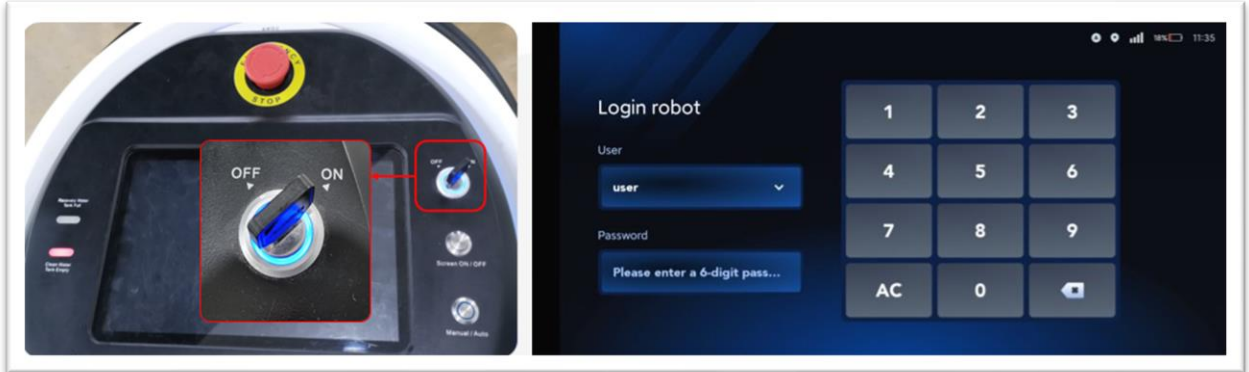
Observe reflectors in the map with RViz "topic:/landmark_poses_list," squares with assorted colors shown below. Lasers with an intensity greater than 220 will be detected as reflectors.



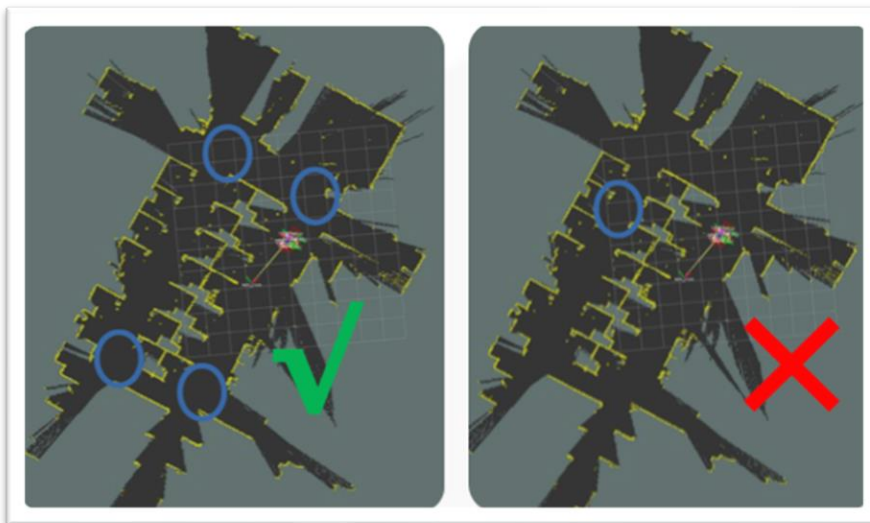
2.4. Robot Deployment

2.4.1. Logging In

- Insert the key and turn it to “on” to start up the robot.
- Select the “user” account, enter password “123456”, and log into UI.

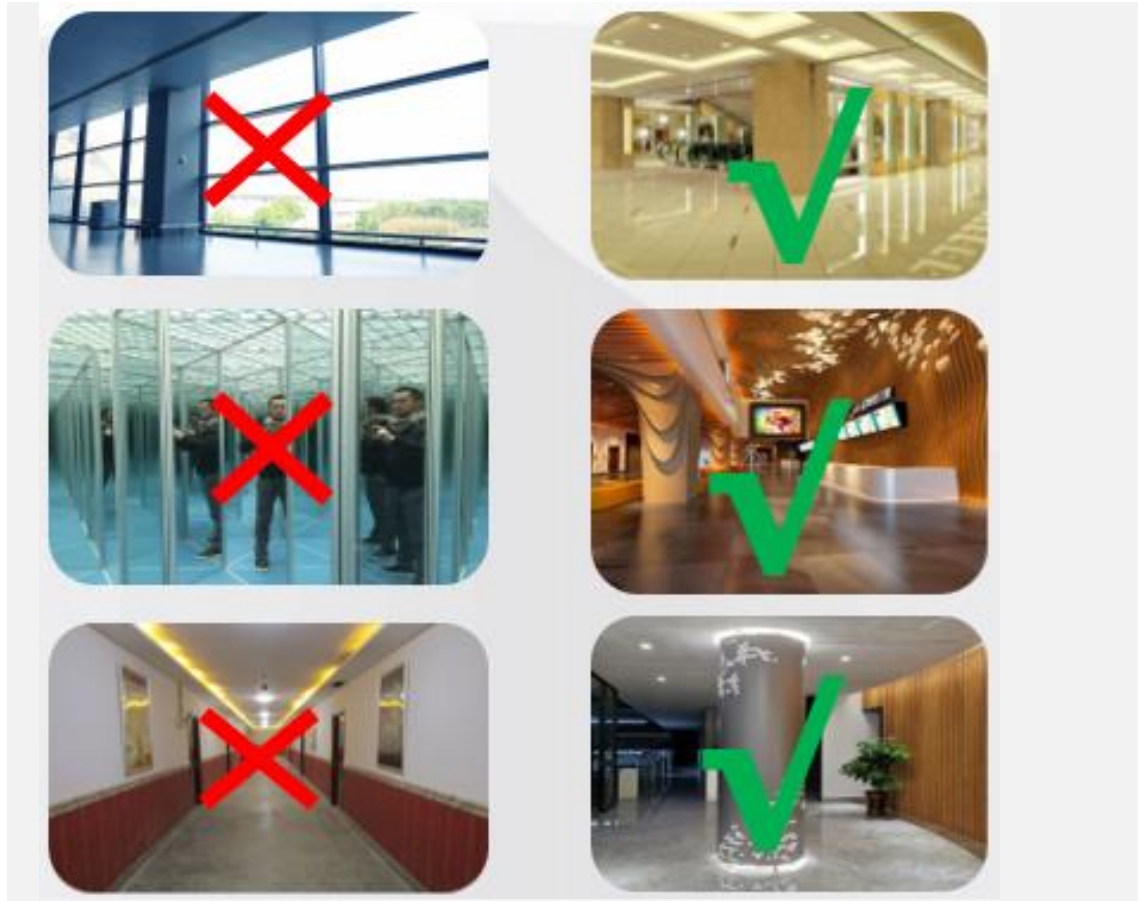


- Find a reasonable origin point before scanning.
- Before scanning, place the robot parallel or vertical to walls to reduce map jagging and improve narrow passability.
- As shown in the figure below, you should start scanning at the corner of the location contrasting with surrounding features.



NOTE:

- Glass walls and mirrors can easily cause interference with the laser and lead to poor scanning quality. There are not enough obvious features in the aisle, which make negative effects on locating.

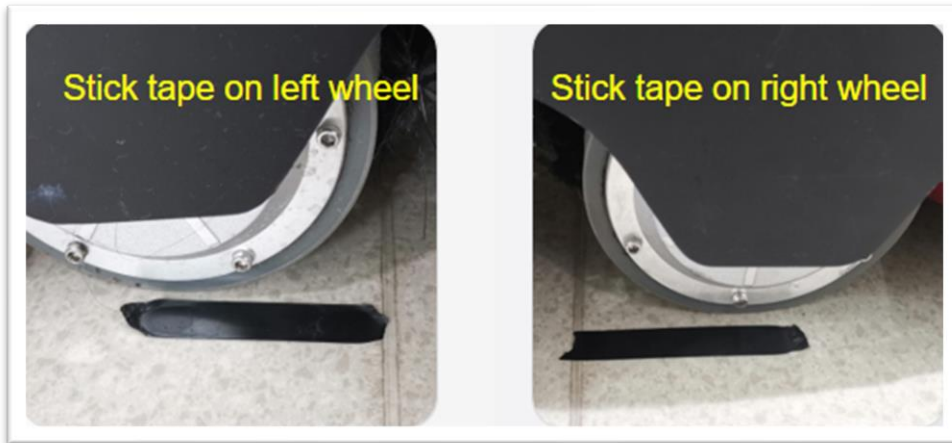


2.4.2. Map scanning

2.4.2.1 Physical locating

If there are the following scenarios, physically position the robot first before scanning.

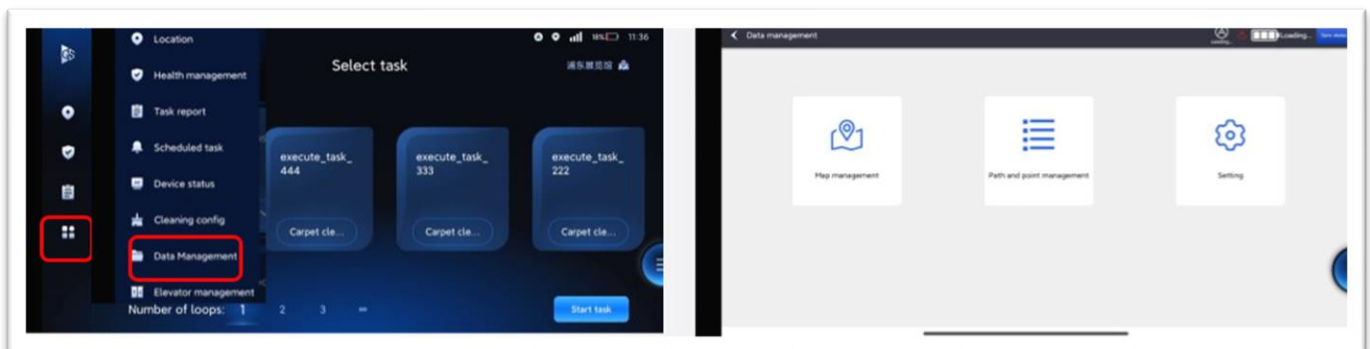
- A long corridor, symmetrical environment, environments with high similarity.
- Specific areas that the robot has to bypass with long paths.
- If the scene is relatively simple and there are many areas with obvious features, there is no need to force loop closure.



Before map scanning, find a floor tile gap (or custom position with a particular feature) within 1m of a reasonable origin point to make the left and right wheels align with the gap. In addition, stick the tape (or use a marker) to physically mark the position of the robot.

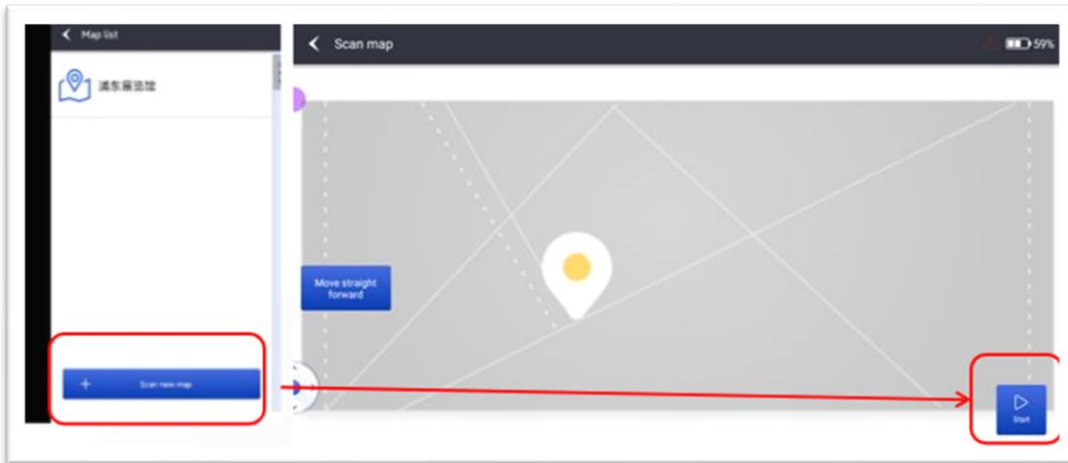
2.4.2.2 Enter scanning interface

1. Click the button on the left and select "**Data Management.**"
2. Click "**Map Management**" to enter the scanning interface.

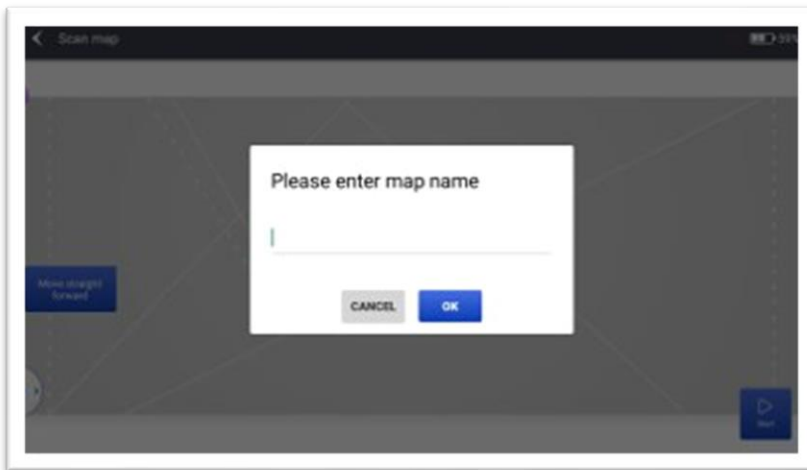


2.4.2.3 Create a new map

3. Click "**Scan New Map.**"
4. Click the "**Start**" button again.



5. Input the map name. (To facilitate customer identification, it needs to be named).



2.4.2.4 Create a new map - Route control

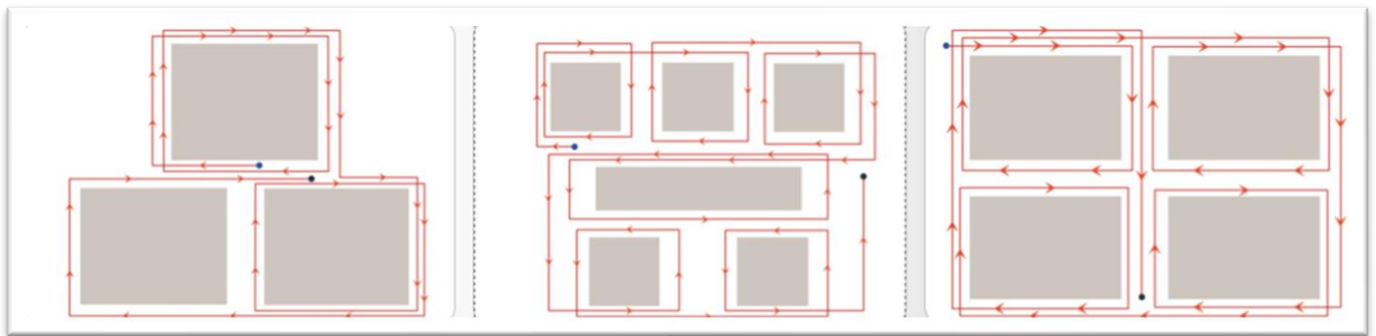
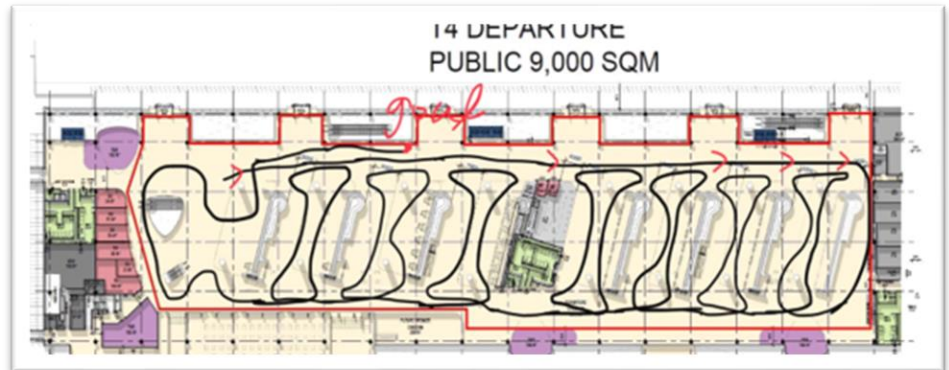
1. During the scanning, the status is visible on the LED screen. Push the robot forward steadily (smooth + straight line) and try to avoid a curved route.
2. When rotating or turning, it must be rotated slowly on the spot (less than 20°/sec at angular velocity), and then move straight forward again.
3. Forward velocity should be less than 1 m/s.



2.4.2.5 Create a new map - Scanning Tips

During the scanning process, loop closure is applied. Proceed as follows:

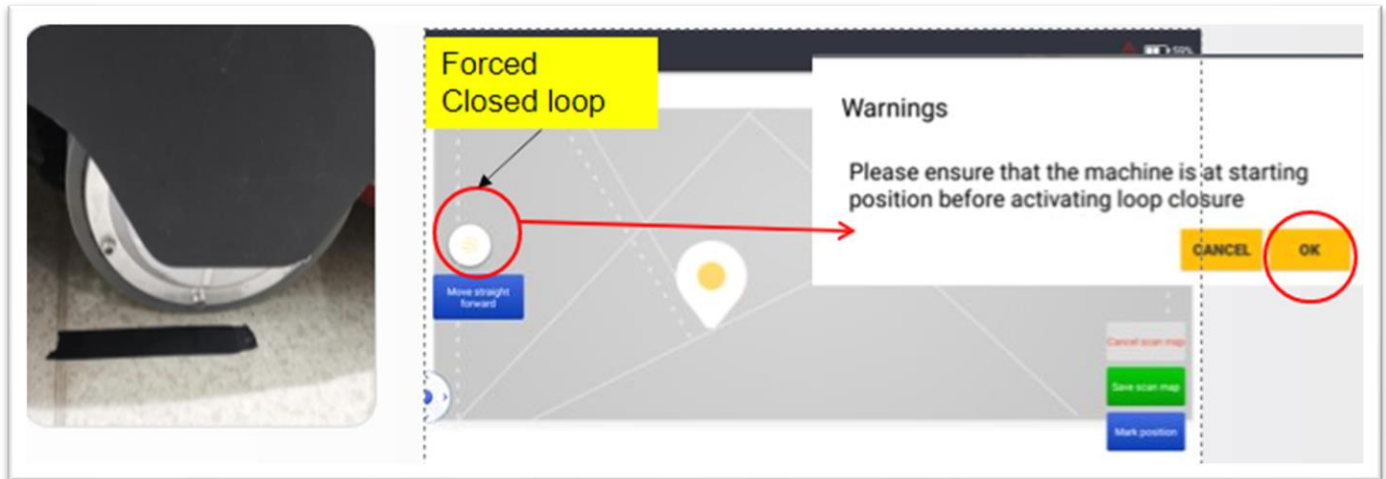
1. Select a reasonable route for the map scanning (1st - small closed-loop, 2nd- followed by large closed-loop).
2. All the cleaning areas must be scanned.
3. Avoid scanning the same area repeatedly.



2.4.2.6 Forced closed-loop

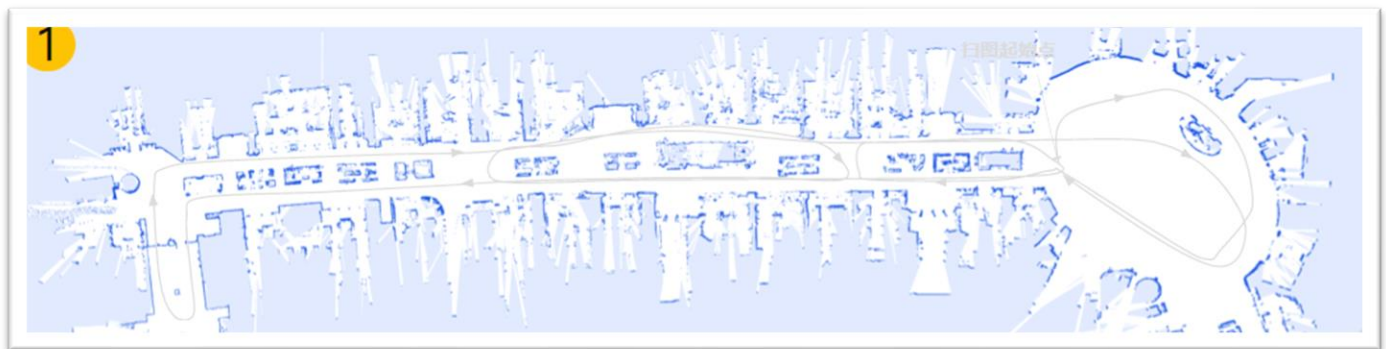
1. After scanning the map according to the closed-loop rules, move the robot to this position.
 - If the map status is normal, there is no need to use the forced closed-loop and go to the next page directly.
 - If there are still ghosting, distortion, etc. after waiting for 5 minutes, please perform the following operations:
2. Click the **"Forced Closed-loop"** button on the APP.
3. Steps to reproduce:
 - Click the **"Forced Closed-loop"** button → Click **"OK"** → Prompt that the closed-loop is successful.



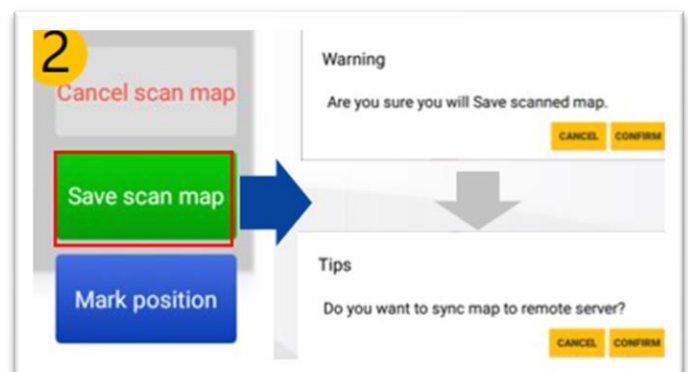


2.4.2.7 Map confirmation/saving

After the map has been scanned (after the forced closed loop), you need to check the following points before clicking **"Save"**:



1. If there is an obvious distortion or ghosting in the start/end point, please try forced closed-loop.
2. If there are places that missed scanning, please do supplementary scanning.
3. If the scanned map has distortion and ghosting due to the wrong closed loop, which cannot be revised, please scan the map again.





NOTE:

- The final map you saved could be different from the preview during scanning. It is recommended to save the map and then check the quality.

2.4.2.8 Check map quality (important)

Carefully check the quality of maps

If there are issues in the locality, delete the locality with “map editing” and do a map extension. If the map frame was distorted, please scan the map again.



NOTE:

- The poor map quality would lead to random operation risks. There might be no issues in a test run, but there might be locating lost or jams in daily operation.

Key attention:

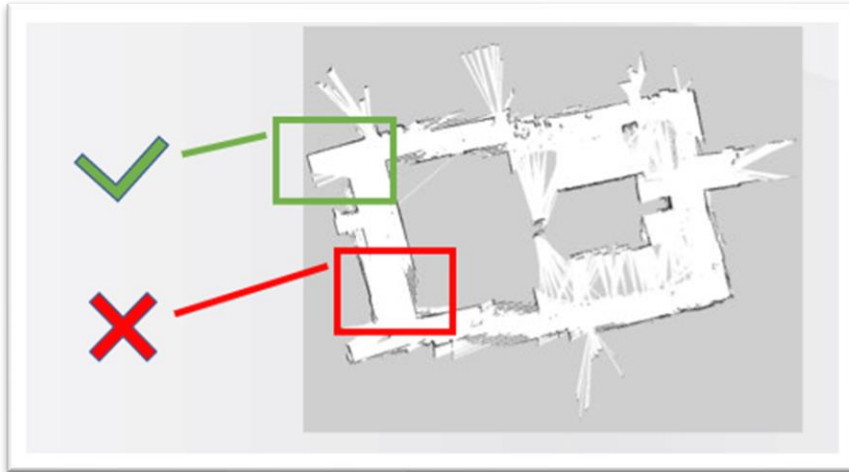
Closed-loop

The closed-loop means that the same area scanned by the machine at various times can be overlapped. False or missing closed-loop will lead to incorrect information on a map, which results in great locating offset or deviation, in the end, the robot loses locating or gets jammed.



Distortion

Distortion or ghosting is not acceptable. A common example is when one wall becomes 2 or more parallel walls. Distortion or ghosting will cause a great interference to navigation, such as locating jumping, lost, or jamming.



2.4.2.9 Map extension

Map extension is needed for one of the situations below:

1. There is a new area that needs to be cleaned that was not covered by the original map scanning. (Even if obstacles were scanned, the confirmation that obstacles are completed is necessary).
2. The environment has obvious changes, like decoration, displacement of furniture, etc. For this kind of situation, use "map editing" to delete these areas on the map and do map extension.)
3. The area is too big to scan only once. Use map extension to increase the success rate of map scanning.



NOTE:

- The map is to be less than 20,000 square meters, otherwise, robot operation would be not stable.
- If the area is over 20,000 square meters, separate it into several maps.
 - If all regions are connected, it is recommended to scan the major frame first, and then extend the map on the details in regions.
 - If all regions are connected only in one place, extend the map in turn.

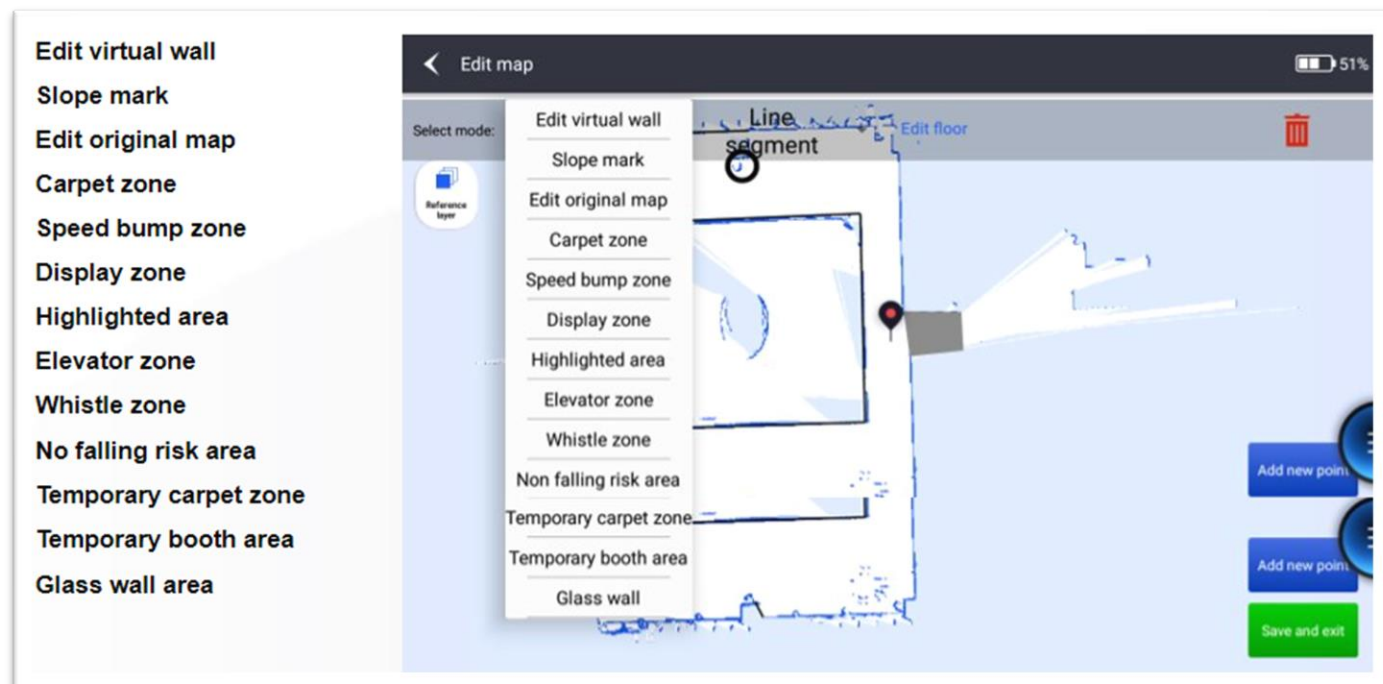


How to:

1. Select the map that needs to be extended in the map list, and click "**Map extension**"
2. Choose the appropriate start point for map extension, which is similar to map scanning
3. Small closed-loop first, then big closed-loop. Confirm there are no ghosting and distortion before saving.
4. Locating the robot in the original map first, manually move a robot to the major route, then click map extension in APP.
5. Push the robot for more than 10 meters in the original map before entering the area to be extended. Map extension needs to follow the closed-loop rule as well.
 - a. Scan the major frame and the aisles for connections first, like in the figure above. Then do a map extension for the red highlighted areas.
 - b. Scan the areas from right to left and ensure their decent quality each time. If the quality of the map extension is not good, use "map store" to return to the previous status.

2.4.3. Map editing

The Map Editor has a total of 13 edit function buttons, as shown in the following figure:



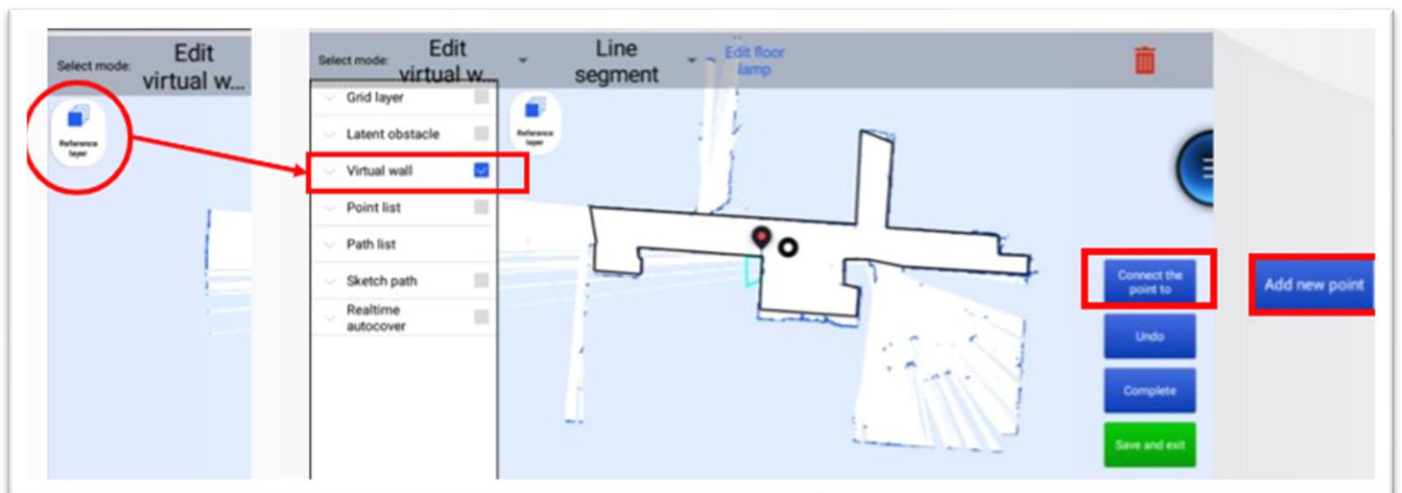
| Edit Mode | Description | Available shapes | Remarks |
|-----------------------------|--|---------------------|------------------------------------|
| Original map editing | Clear area: modify the noise and obstacles on the original map and clear them by box selection (frame selection). Restore unknown areas: navigation and tasks are prohibited (in progress). | Polygon | The area surrounded by black lines |
| Virtual Wall Edit | It is used to mark the area that cannot be scanned by a laser, to prevent the robot from colliding in the above area and causing danger. For example, shops, fragile goods, etc. | Line/Polygon/Circle | black |
| Glass Wall | It is necessary to draw in the area with a glass wall. The sensor will filter the noise refracted by the glass to reduce the running jam of the robot caused by noise. | Polygon/Circle | Light blue |
| Highlighted area | The highlighted area is the key reference area for the robot to realize independent locating. It is necessary to select the fixed physical features in the map, such as walls, partitions, columns, pillars, etc. Try to make the highlight area range cover the fixed physical features, and do not exceed too much to prevent the introduction of non-fixed physical features. The robot will give more recognition weights to the physical features in the highlighted area. reduce the interference of the | Polygon/Circle | Cyan |

| | | | |
|------------------------------|--|----------------|-------------|
| | frequently moving non-fixed physical features to the machine's independent locating. | | |
| Temporary booth area | When the robot moves to the temporary booth area, the robot will detect the interior of the area. If there is a temporary booth in the detection area, it will automatically avoid it; If there is no temporary booth in the detection area, the robot will perform the cleaning task normally. | Polygon/Circle | Grey |
| Carpet area | Give priority to avoiding this area. If there is no way to go, turn off / lift the cleaning equipment to pass through this area. After passing, the robot will turn on the cleaning equipment again. | Polygon/Circle | Green |
| Temporary carpet zone | In this area, only robots equipped with carpet ultrasonic detection sensors will work. When the robot moves to the temporary carpet area, it will detect the interior of the area, After the carpet ultrasonic detection sensor detects that there is carpet in this area, it will mark this area as a carpet area and trigger the idler running mechanism, that is, lift/off the cleaning equipment to cross the carpet area. If the carpet ultrasonic detection sensor does not detect a carpet in this area, it will normally perform tasks in this area. | Polygon/Circle | Green |
| Speed bump area | Turn lift/off the cleaning equipment to go through this area, and then turn on/put down the cleaning equipment again. | | |
| Slope zone | Amplify/enlarge the recognition threshold of the sensor system for the height of obstacles and broaden the threshold triggered by anti-falling. When passing through this area, the machine will slow down for cleaning, that is, the cleaning equipment is still working. | Polygon | Dark blue |
| Whistle zone | Not supported now | Polygon | Light brown |
| Non-falling risk area | Estimate and define that there is no falling risk in this area and the anti-falling function is not triggered (common environment: Glass Kanban, glass floor, etc.) | Polygon | Grey Green |
| Elevator area | This functional area can only be used on the site where the elevator integration system is installed, which is the elevator car area. | | |
| Recessed Floor lamp | Detour | | |

2.4.3.1 Edit virtual wall

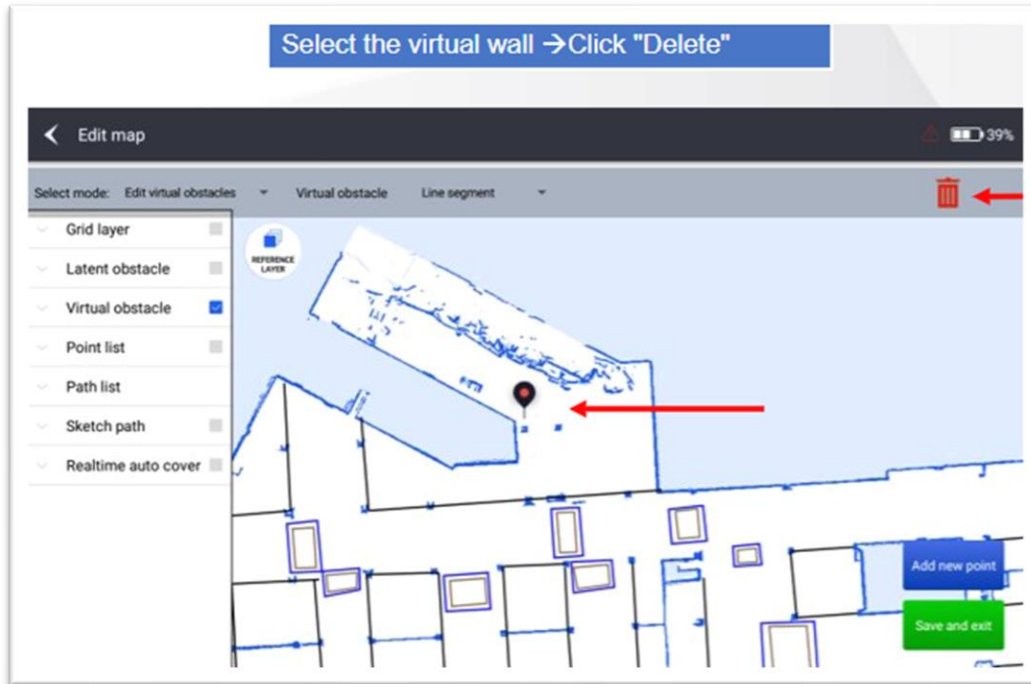
Add virtual walls for irregular/transparent/fragile items like glass walls, chairs, etc. to isolation, as well as stairs.

1. After entering "**Map Editing**," click "**Reference Layer**" in the upper right corner, tick all the paths, and draw a virtual wall according to the periphery of the path.
2. Drag the buoy to a suitable position on the touch screen, click "**Add New Point**" and then move the buoy to the next target position, and continue to click "**Connect to.**" At this time, a line will be generated. This line is the virtual wall. It can be ended at any time and is not limited by quantity or length. You can stop drawing at any time, not limited by quantity or length.
3. Try to use polyline to draw it so that you can delete and redraw it at any time in case of the wrong drawing.
4. After creating the virtual wall, select "**Save All and Exit**" in the lower right corner → Click "**OK**".



Delete virtual wall

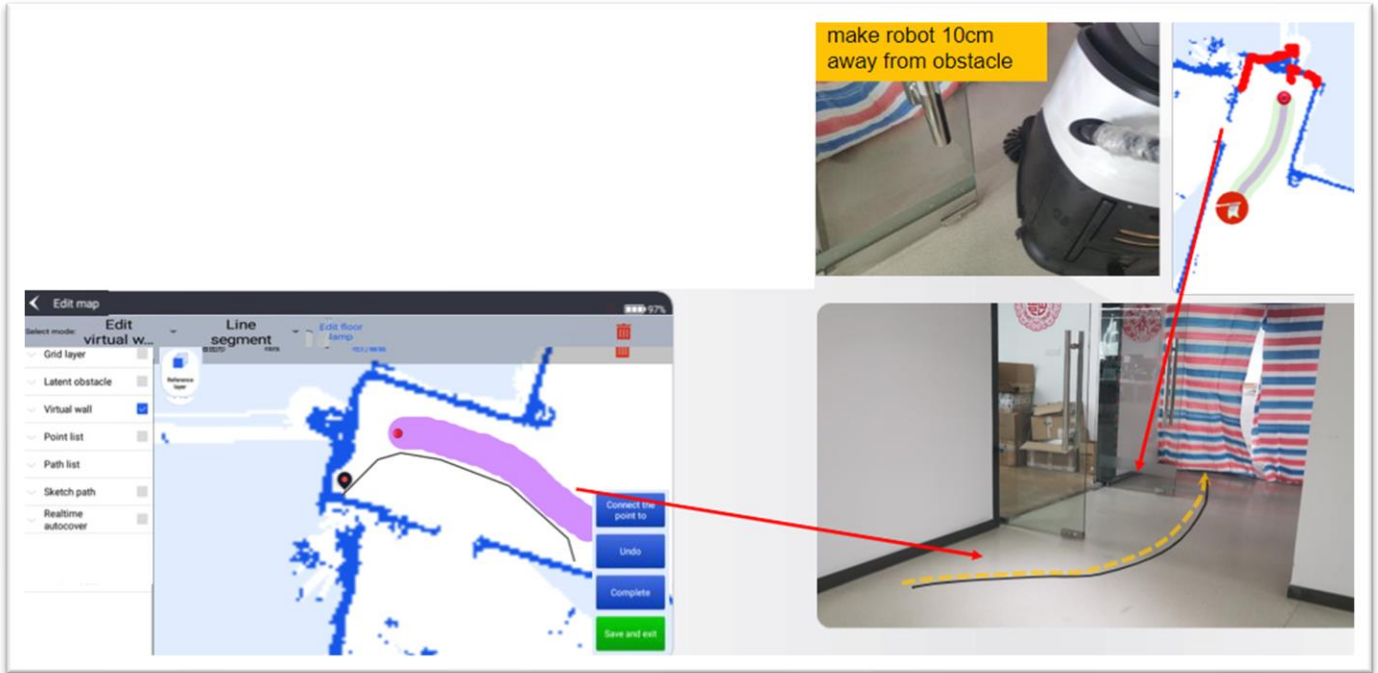
1. Click the virtual wall that needs to be deleted.
2. The virtual wall changes from **black** to **red**.
3. Click the red deletion symbol in the upper right corner to pop up the dialog box "**Confirm to Delete?**"
4. Click "**Save All and Exit**" in the lower right corner → Click "**OK**".



How to draw a virtual wall in specific areas:

When encountering scenes where the outline cannot be scanned normally, such as glass doors and we cannot draw the virtual wall accurately, we need to use other methods to achieve it.

1. After scanning the map, move the robot past the obstacle in the teaching mode and draw a path out.
2. Then return to the map editing interface, open the reference layer, and check the teaching path.
3. Draw a virtual wall according to the expansion area of the path, and then save.
4. Finally, delete this teaching path.



2.4.3.2 Mark slopes

The robot can intelligently identify slopes when going up or down. Users themselves design their robot response logic, such as deceleration, according to robot application requirements.

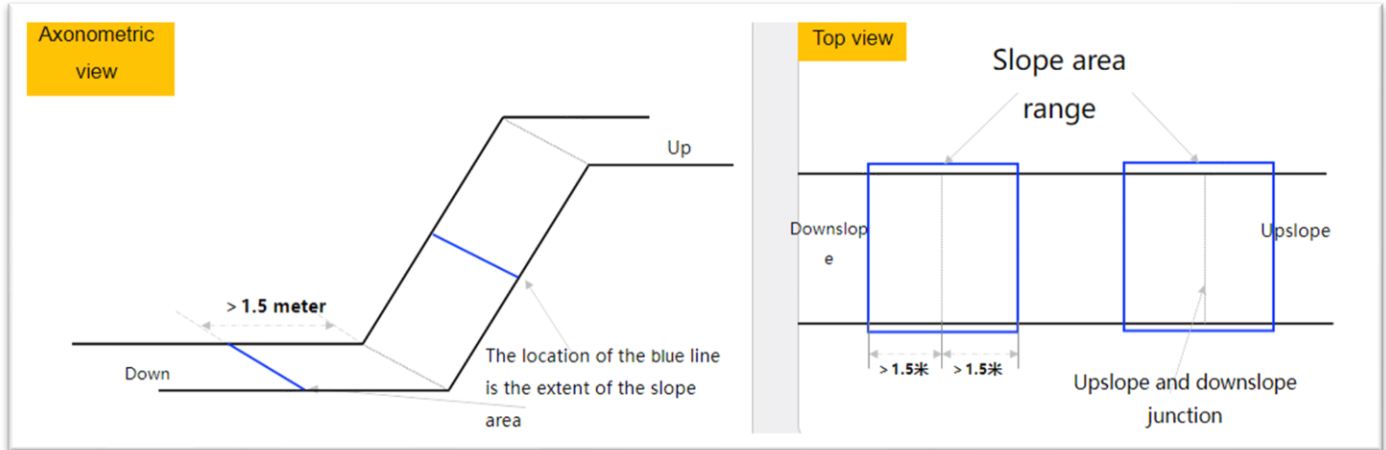
The area is only marked at the junction of uphill or downhill. Do not mark the entire slope.



NOTE:

- If the slope is less than 4 meters, it can be marked complete.

If the slope area is used to define the passable area, it is recommended to encircle the obstacles into the slope area, which does not need to activate obstacle avoidance.



2.4.3.3 Edit the original map

1. Modify the noise and obstacles on the original map and empty them as needed.
2. **Only the "Empty Area" function is currently recommended.**
3. The **"Fill Area"** feature is not recommended and can be replaced with a virtual wall.



NOTE:

- Do not remove the real wall, only the extraneous noise.

Drawing method:

Select mode → Edit original map → Find the noisy area → Choose a noisy area with the **"Connect to Point"** button → Click **"Complete"** → Select an Empty Area → Then **"Save and Exit."**



2.4.3.4 Highlighted area

Position:

Draw it on a fixed object, e.g., a pillar, wall, corner, etc.



NOTE:

- Do not introduce other movable obstacles when drawing the highlighted area.
- One highlighted area is drawn every 15~20 m.
- For commercial complexes and metro stations, all corners and pillars in the hall are required to be drawn as highlight areas. Refer to the link below:
<https://gaussian.yuque.com/docs/share/4cedb1db-e419-4373-ac22-8293b0500061?#>
- Do not draw symmetric highlighted areas on the map.



How to draw highlighted area:

“Add New Points” → “Connect Points to,” until the target is surrounded. The cyan box is generated at this time, i.e., the highlighted area. Finally, click “Save all and exit.”

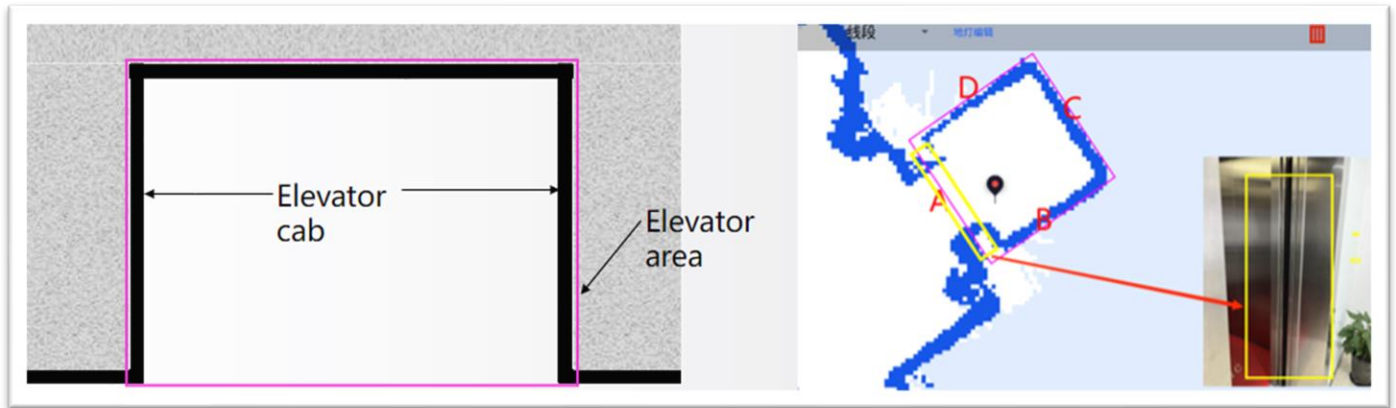


2.4.3.5 Elevator area

Use map editing to remove the noise inside the elevator or its door.

The elevator area should wrap the entire elevator, ABCD 4 sides. Draw the elevator area along the external outline of the elevator.

Side A is the door of the elevator, there must be no noise here, remove them after map scanning. Side A must be drawn in the middle of the elevator door (as follows) to facilitate the auto-generation of elevator points. Elevator points generated in the middle of the elevator door is also an important basis for the location generation of elevator point. There might be position deviation on the map, but the actual generation is based on the elevator door.



Position:

Scan the boundaries of the elevator according to the map to mark the elevator area, just to include the entire elevator in the elevator area.



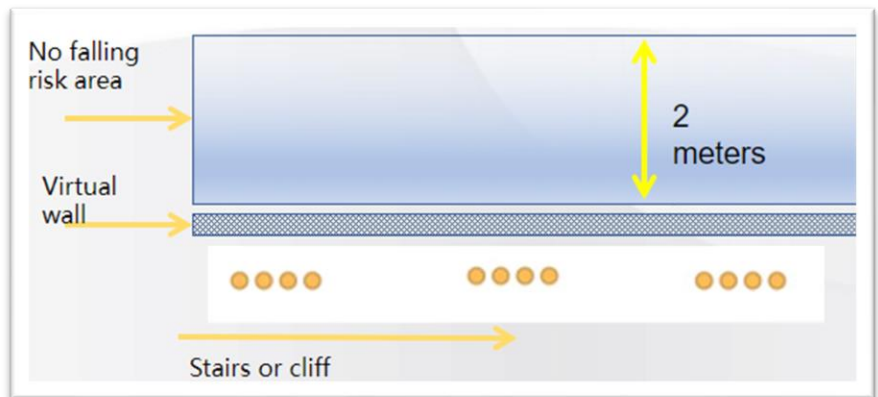
NOTE:

- The C side of the elevator area of each map should be consistent with the outline of the elevator. Do not draw lines near and far.

2.4.3.6 No-falling risk area

The rules for the area with falling risks are as follows:

1. The task area and area with falling risks should be isolated by virtual walls.
2. Virtual walls should be away from areas with falling risks as far as possible.
3. The distance is recommended to be more than 0.5 meters.



Purpose of no-falling risk area:

- The robot will neglect the falling risk recognized in this area. Avoid activating the anti-falling feature when passing through this area.

Applications:

- The inside of glass doors or fire doors, etc.



NOTE:

- Make sure the “no-falling risk area” has been separated from the areas with falling risks with virtual walls.
- Regard the area within 2m inside the glass wall as a no-falling risk area, like in the right figure.

2.4.3.7 Temporary carpet area

When the robot moves to the temporary carpet area, it will make judgments based on the inside area.

- If a carpet was detected in this area, the feature will be triggered to lift the corresponding equipment to go over the carpet.
- If no carpet was detected in this area, the robot will perform the cleaning task normally.



NOTE:

- Only the robot that equips carpet – ultrasonic has this feature. Use virtual walls to avoid this area.

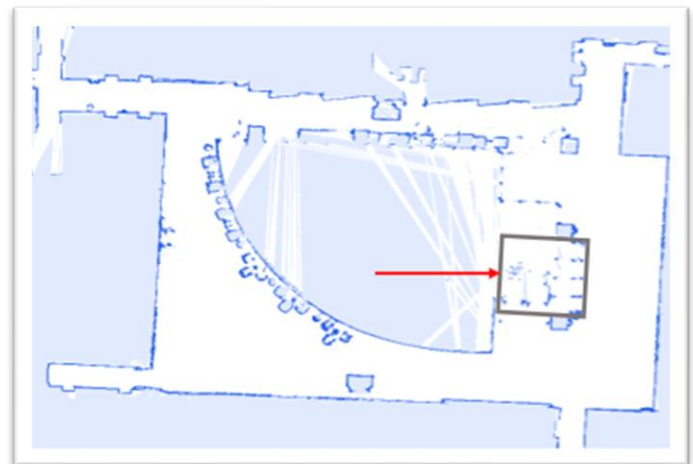
2.4.3.8 Temporary display area

Temporary display area:

Temporary placement of stands and activity areas need to draw temporary stand area.

Explanation:

The robot detects a large number of obstacles in this area, and this area will become a restricted area; if there are fewer obstacles, the robot can judge intelligently and continue the cleaning task.



Judgment criteria:

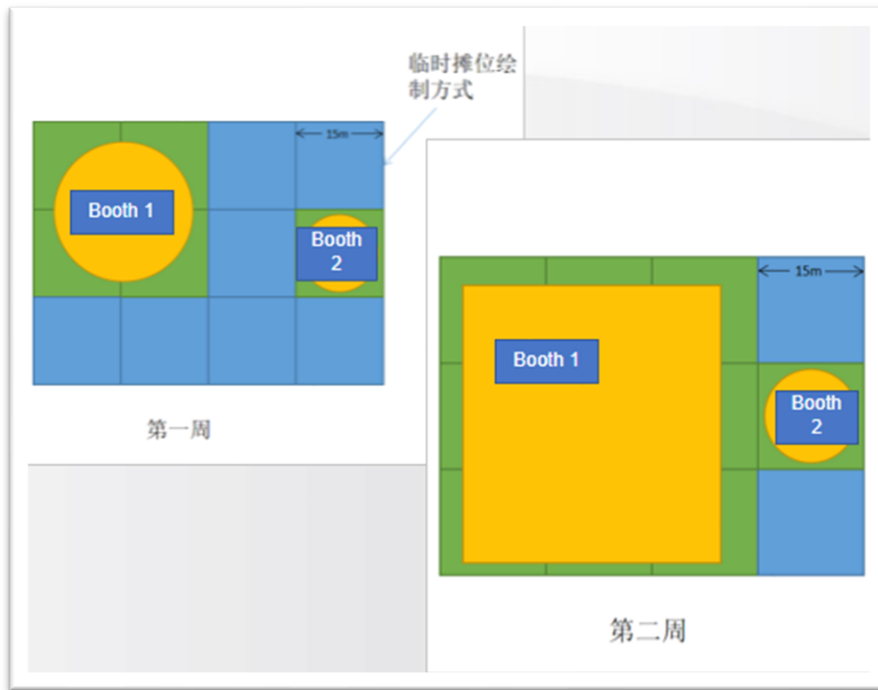
Less than 40% of the area is covered by obstacles.

Reference:

<https://gaussian.yuque.com/rh21ns/gxv6wx/behtye>

For large areas (event booths > 15m in length on equal sides), please follow the drawing method below.

Multiple temporary stand area splicing



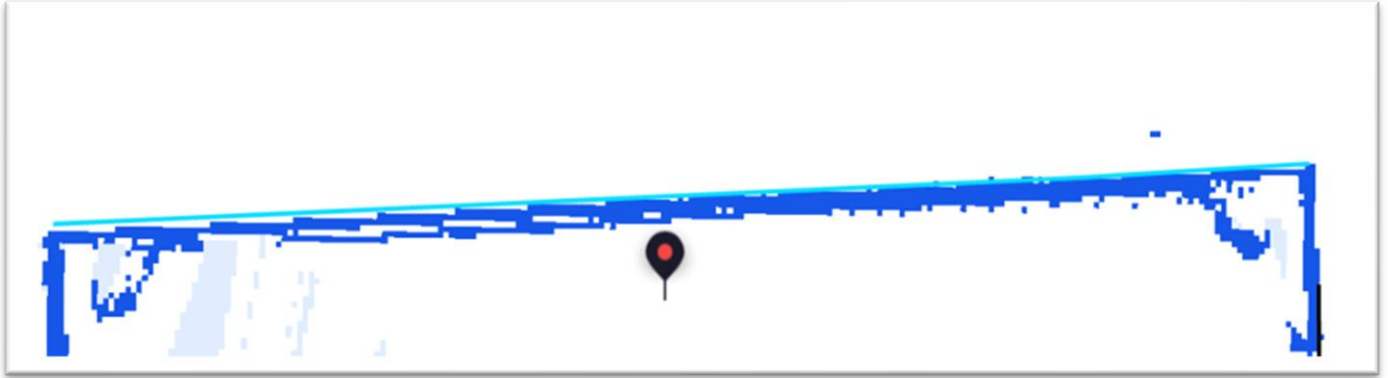
2.4.3.9 Glass wall

When the robot runs against the glass, it may generate noise and trigger obstacle avoidance. If a glass wall is painted, the robot can intelligently filter irrelevant noise.



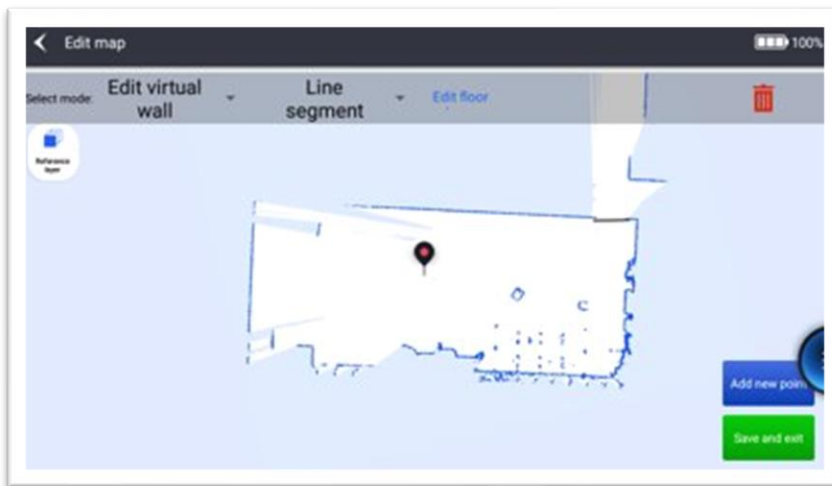
NOTE:

- Draw glass walls and virtual walls at the same time in the place where there are actual glass walls (within 10cm).



2.4.3.10 Recessed ground lamp area

The area with a recessed ground lamp or pop-up floor plug needs to be marked to avoid damage to these devices.



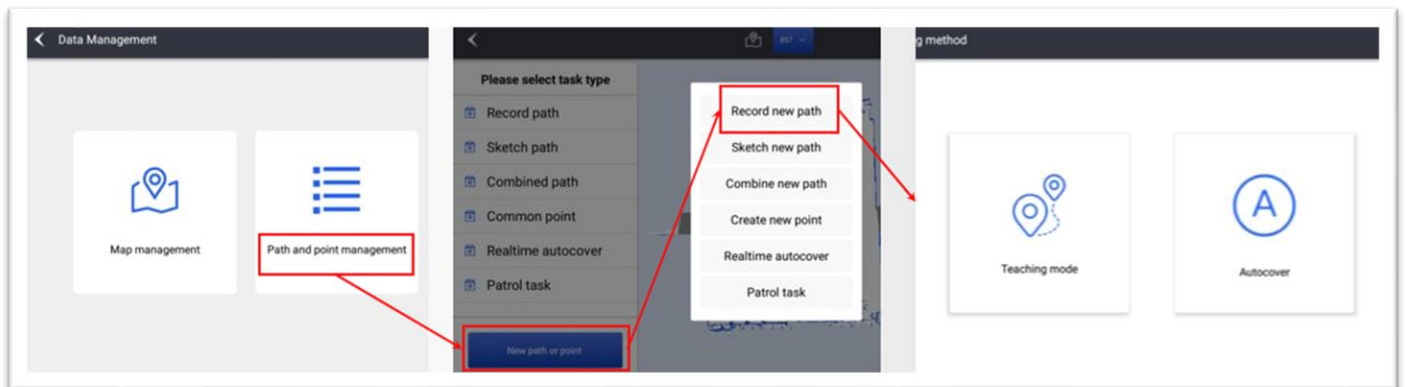
1. Select "**Edit floor**," then confirm locating status, if the locating is normal, select "match", and re-locating robot if it's abnormal.



2. Make the robot face the ground lamp for the bumper to touch the center of the ground lamp. Then, click **"Start to mark"** and save.

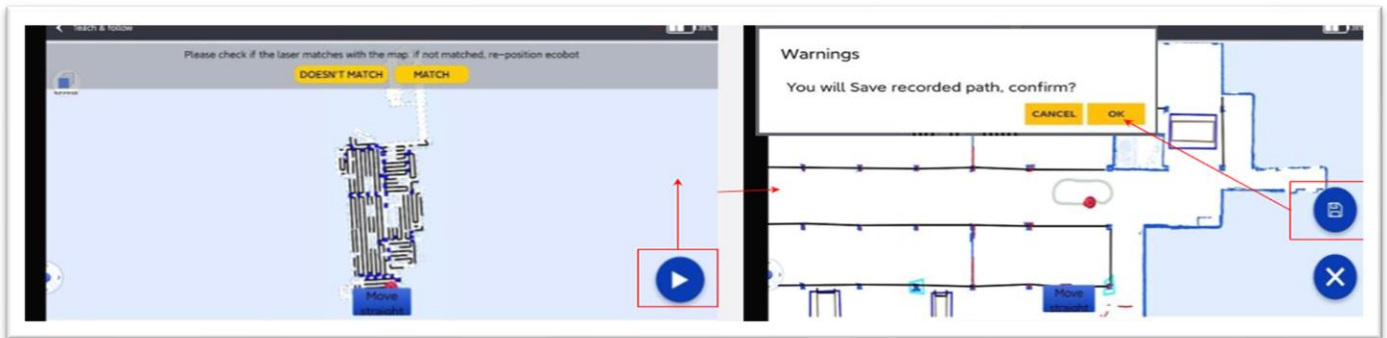
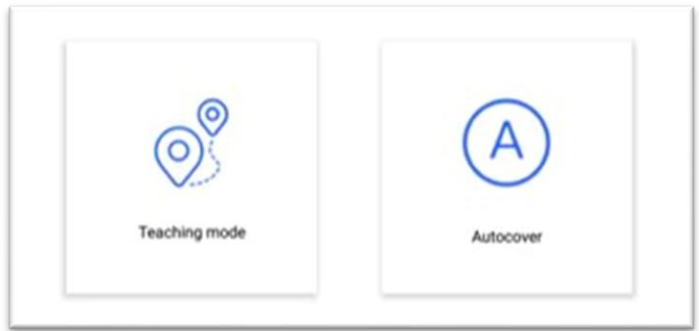
2.4.4. Create cleaning path

- After editing the map, you will see the following screen when you do the path planning: **"Path and Point Management."**
- Click the **"New Path or Point"** button at the bottom left.
- When the window pops up, please click **"Record New Path."**
- Then you will enter another selection screen: **"Teaching Mode"** & **"Autocover."**



2.4.4.1 Teaching mode

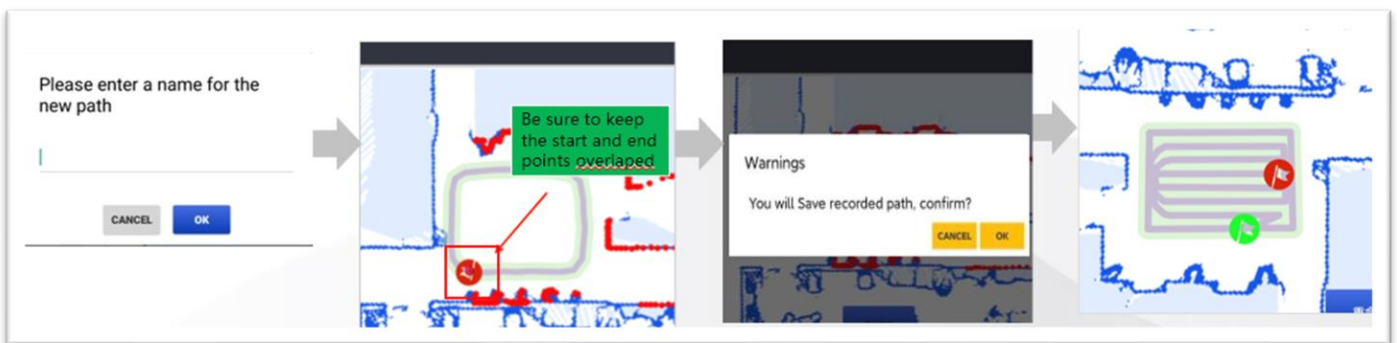
- Click "Record new path" to bring up the page on the right and select "**Teaching mode.**"
- Push the robot through the area to be cleaned. The auto mode will only follow this route.
- The route must be straight + arc. Do not bend and do not leave white.



Teaching mode → Enter path name → Manually move the robot through the areas that need cleaning → Then save it.

2.4.4.2 Auto-cover

Autocover → Enter a path name → Drive the robot manually to record a closed-loop path → Then save it.

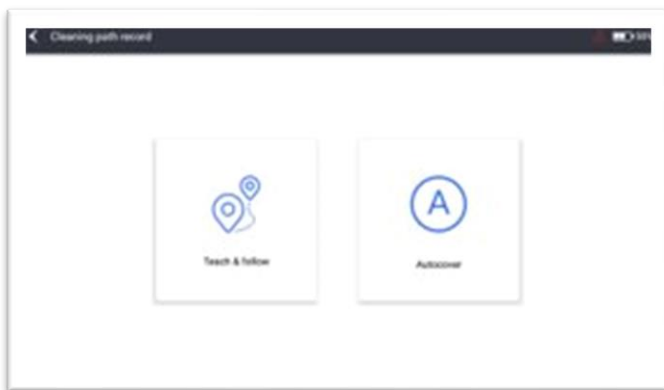


The following two examples are not feasible, so please avoid them:

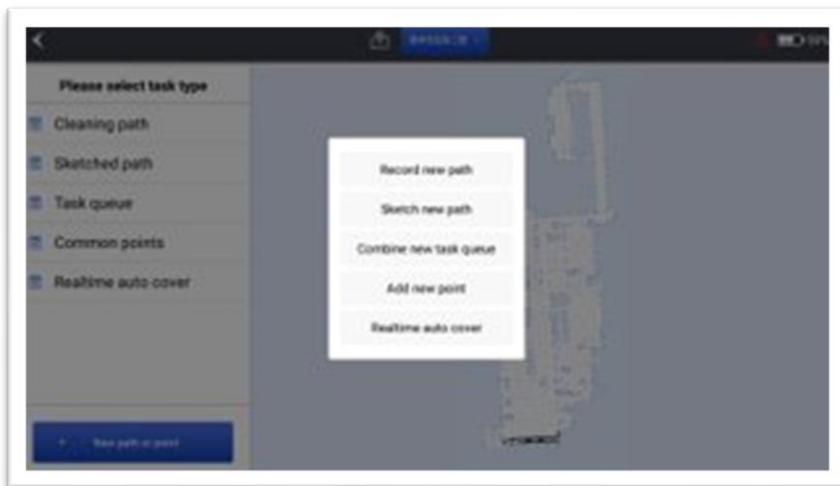


2.4.4.3 Real-time auto-cover

- Enter data management and click **"Path and Point Management."**



- Click **"Real-Time auto-cover."**



- Through pinch-to-zooming/rotating and dragging on each side, make the red square cover the area to be cleaned (allowing to exceed walls and obstacles, no effects on path generation).

- You can click the **"Preview"** button in the lower right corner and click **"Cancel Preview"** after confirming that the path is correct.
- Go back and click **"Save All"** in the upper right corner, and finally, enter the new path name.



2.4.4.4 Real-time auto-cover | virtual wall tracking

Support version:

M line optimized version, the version later than 3-22-0.

- Draw virtual walls less than 10 centimeters away along obstacles, like green lines in the figure below:

Artificial wall:

A new language that makes a robot clean the area close to obstacles along the virtual wall.



How to activate:

- It is ON if the default scenario is a hotel.
- If it is not employed in a hotel, activate it via the APP Data Management → Setting → Advanced → robot config → check parameter → strategy → realtime_auto_cover, turn on **"use_virtual_wall_tracking"** and reboot the robot.



NOTE:

- Make the artificial wall line overlap the real wall as far as possible.
- A virtual wall should be placed outside the door at a safe distance to avoid scratch risk.
- The value of "safe_distance" in the advanced parameter setting should be higher than 0.04. Otherwise, the robot is too close to a wall, and crashing might happen.

Support version:

M line optimized version, the version later than 3-22-0.

Set the distance against the virtual wall:

APP Data Management → Setting → Advanced → robot config → check parameter → strategy → realtime_auto_cover → safe_distance (this value is the distance between the robot shell and obstacle, unit: meter. Revise this value to adjust the distance against the wall. Restart the robot after revising it.



NOTE:

- These 2 parameters will be saved in public/user_config.yaml after revision. The software upgrade will not restore them to default.
- The "safe distance" parameter works not only on the virtual wall but on the artificial wall as well.

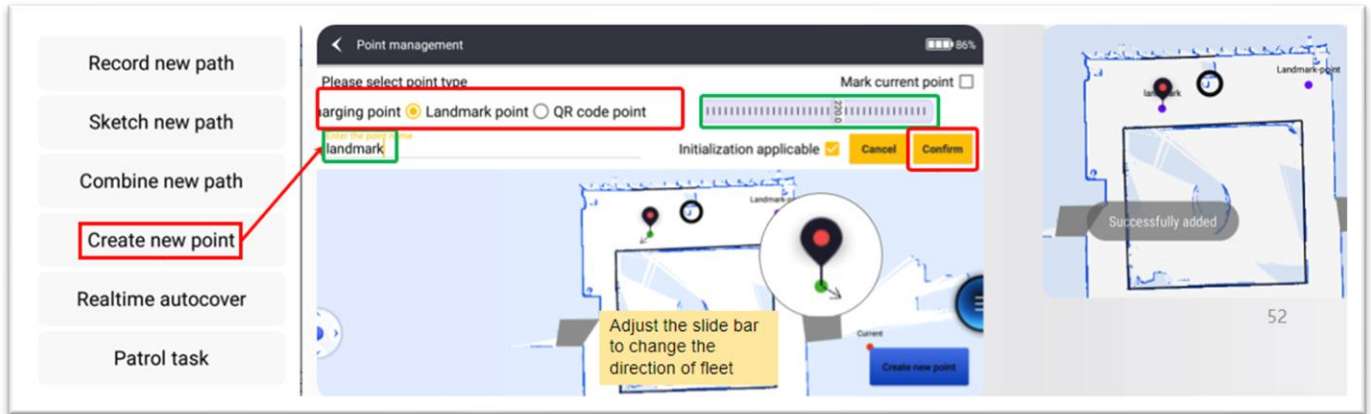
- Revising "safe distance" would lead to crashing or jam issues. Assess it several times if it needs to be revised. The value should not be less than 0.04.
- Turning "virtual wall tracking" on/off will not affect "wall tracking." These 2 features can be used simultaneously. Turn "wall tracking" on/off in APP as needed.
- To perform the first "wall tracking" task, confirm to select the right cleaning device. Refer to this file to choose the right cleaning device:
 - <https://gaussian.yuque.com/docs/share/6a06d2bf-9d9c-4760-9c1e-036f11d3afb6?#>
- Walls cannot be recognized in real-time auto-cover due to the gap in front of a door in a hotel. So, it is necessary to draw walls manually (artificial walls).
- In the corner of the actual wall, do not draw virtual walls to avoid activating the wall tracking feature, which would lead to a crash with actual walls.

2.4.4.5 Create new points

| Point Name | Definition | Creation Method | Remarks |
|--------------------------|---|--|--|
| Landmark Point | Points for robot positioning. | Mark directly on the map, paying attention to the direction of the arrow, i.e., the front of the robot. | It must be created. Be sure to communicate with the client about the location to be created (Make sure the location is stable and reliable, will not change, and is easy to find). |
| Charging Point | Points are to be created for automatic charging. | Manually dock the robot and directly mark the current point as the charging point. | It must be created and equipped with a charging station. There should be only one charging point. |
| Workstation | Automatic charging, water filling, and draining point. | Manually dock the robot to the workstation and directly mark the current point as the workstation. | It must be created if you have a workstation. |
| Maintenance Point | Triggering back to this point when the low battery, the clear water tank is empty, sewage tank is full. | Mark directly on the map, paying attention to the direction of the arrow, i.e., the front of the robot. The robot goes to this point and waits for maintenance from an operator. | It's not a charging point, and no workstation must be created. |

| | | | |
|-------------------------|---|--|---------------------------------------|
| Navigation Point | The robot automatically navigates to the point of the target location. | Mark directly on the map, paying attention to the direction of the arrow, i.e., the front of the robot. | Not required to create. |
| QR Code Point | Scan the QR code to automatically locate and select tasks. | Need to print the completed QR code and fixed on the wall (and the front flat camera height), the front flat camera is facing the QR code according to the prompt to create the point. | Not required to create. |
| Entry Point | No need to establish manually at present, the elevator control area will be generated automatically after drawing; the waiting point for entering the elevator cabin. | | Ladder control sites must be created. |
| Initial Point | Not currently in use. | | Not required to create. |

- Each point type has a different color.
- The workstation point and charging point cannot be used simultaneously.
- When "initialization applicable" is selected, this point should be set up in a place that has specific features.
- For the elevator feature, a landmark should be set up in front of the elevator for each floor.



- ① Click "**Create new point.**"
- ② Click the type of point you need, then enter the point name at the bottom, pass the slider to adjust the angle, and click **OK**. The point is created.
- ③ It will prompt "**Added successfully.**"

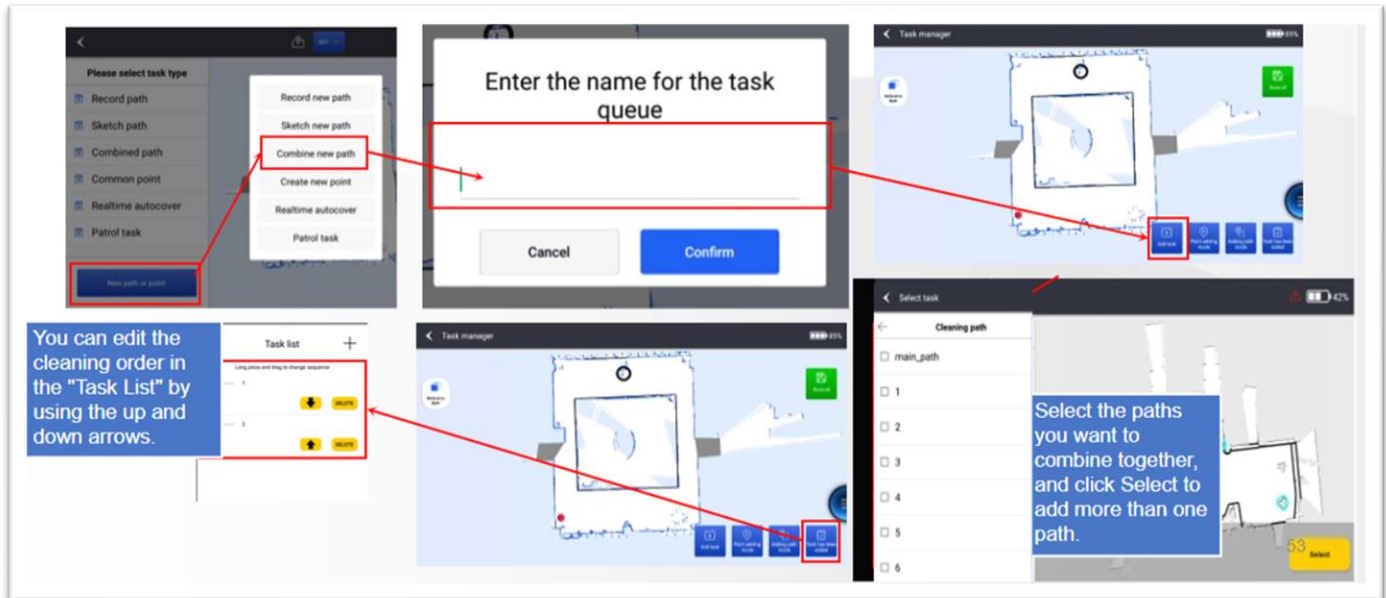
2.4.5. Create paths | Combine new path

- Click the "**Combine new path**" button → enter the name of the combined path → add the path to be cleaned → edit the order → save.



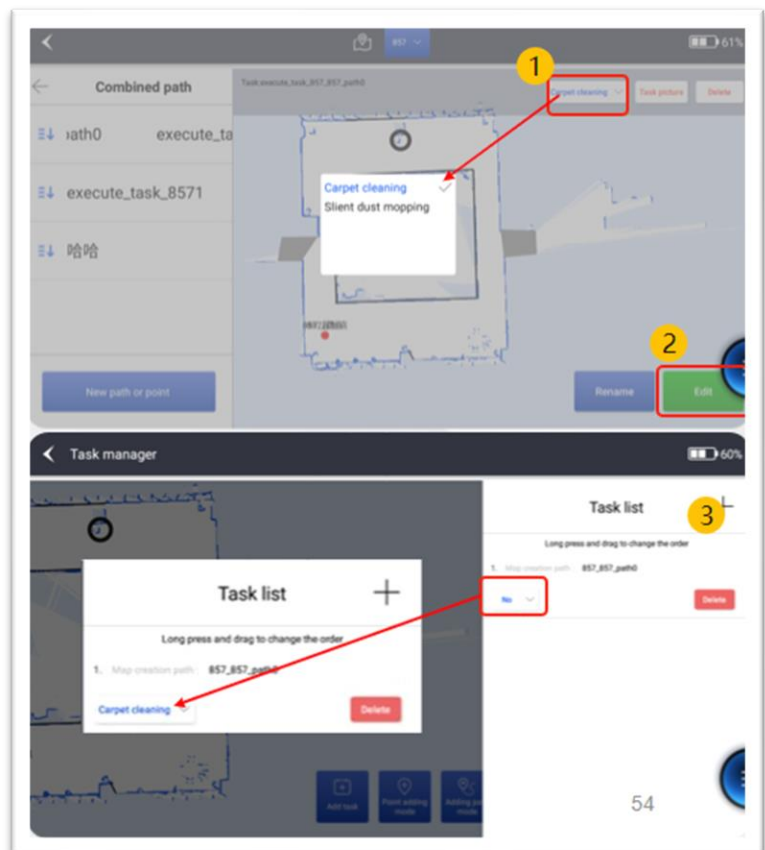
NOTE:

- There should be a "go home" task after each combined path. If "go home" is unavailable due to cross-floor, add "back to maintenance point" to combine the path.



2.4.6. Create paths | Combine new path – cleaning mode configuration

- First, in the "cleaning configuration," complete 2 cleaning mode configurations under "cleaning mode".
- Enter the combination path interface. First, select the combination path that needs to be adjusted, and select cleaning mode in the upper right corner.
- Then, click "Edit" in the bottom right corner to enter the task scheduling interface.
- If there are single or multiple sub-paths, the cleaning mode needs to be configured separately and can be adjusted manually.
- Save and Exit.



Logical explanation :

- If single or multiple sub-paths are configured with cleaning mode, these sub-paths will not be affected by the cleaning mode of "combined paths" and will take effect separately when performing automatic tasks.
- The cleaning mode of the sub-path has the highest priority, and the cleaning mode of the combined task has the second highest priority.

2.5. Precautions of deployment

Map scanning

- The turning speed of the scanning map should be slow (not higher than **20°/s**), to avoid ghosting/deformation.
- For map scanning, we must take a small closed-loop first and then a large closed-loop (simple scenes only need a large closed-loop); the extended map must also be a closed loop.
- If the quality of the map is poor, please re-scan it; because it will directly affect the robot's locating, please be careful.
- For the places with glass, tables, and chairs, it is recommended to put laser stickers first to improve the quality of scanning and stabilize the auto-locating of the robot.

Path

- For on-site path deployment, the "**Real Time auto-cover**" path is recommended; for narrow passages (≤ 1.5 m), the "**Teaching Mode**" is recommended.
- Avoid obvious grooves/bumps in the path, otherwise, the auto-generated path will be messy and there may be blank space.
- If it is a recorded cover path, the origin point and the endpoint should be as close as possible, and the two points should not be more than **2 m** apart.
- If the cleaning area is large ($> 1,000$ m²) or irregular, it is recommended to divide it into several regular auto-cover paths.

Map editing

- For any on-site deployment, please be sure to draw the virtual wall and highlighted area.
 - The virtual wall should completely encircle the cleanable area.
 - One highlighted area is drawn every about 15 to 20m, with no need to draw too many.
- When editing the original map, the real wall must not be deleted, but just the irrelevant image noise is deleted.
- In areas where there is a risk of falling, a virtual wall must be drawn slightly away from the risk area.

- It is recommended to draw the virtual wall after the path is deployed so that it is not easy for the path to interfere with the virtual wall.
- All functions are edited in the same way.
- All functional areas that have been edited are deleted in the same way.
- Each functional area is displayed in a distinct color.
- The highlighted area and the display zone have opposite literal meanings, but their purpose is the same, and they are both used for locating assistance.
- The display zone can be drawn at the temporary active area.

Deployment of charging pile

1. Issues about laser reflective stickers

Solution:

B5010142111 Deploy laser stickers for workstation & charging pile
<https://gaussian.yuque.com/rh21ns/cig8as/gg8aco>

2. Issues with the configuration

Solution:

SOP for issues relating to auto-docking
<https://gaussian.yuque.com/docs/share/904ba703-87ef-4215-901b-e4d95e9eff5e?#>

3. Issues with QR code

Solution:

Z5009262111 QR code replacement for charging pile & workstation
<https://gaussian.yuque.com/rh21ns/cig8as/tig3fs>

2.6. Charging Pile Deployment

1. Auto-charging triggering.

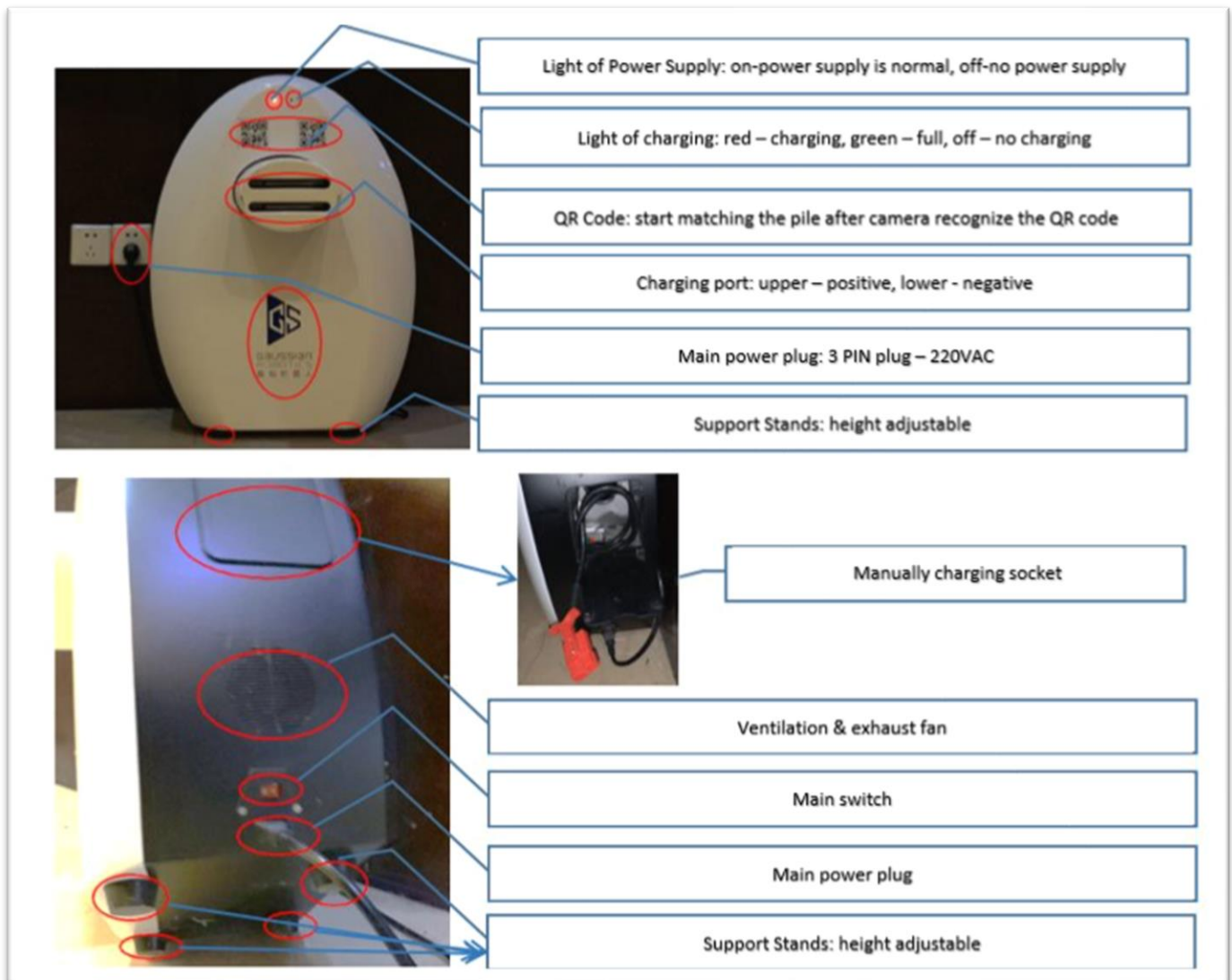
- a. When the power of the robot drops to 20%, the robot will go to the charging pile and do auto-docking for charging.
- b. A charging point is added to the combined task, and the robot will go to the pile and dock itself for charging.

2. The robot recognizes the charging pile.

- a. When the charging task is triggered, the robot autonomously navigates to the front of the charging pile and uses the laser to identify the shape (length and width) of the charging pile.
- b. If the charging pile position recognized by the robot deviates, the robot will adjust the position left and right.

3. The robot moves backward to identify the QR code for docking.

- a. After the robot recognizes the charging pile, it turns around 180 degrees, retreats about 40cm away from the charging pile, and will use the rear camera of the robot to identify the position of the QR code and prepare to locate the position of the charging pile. After the precise position of the QR code is accurately recognized, the robot adjusts the angle and continues to retreat to dock itself.



2.6.1. Deployment requirements

1. The charging pile must be placed against a wall and be perpendicular to the ground. If a laser sticker is deployed, there is no requirement on a wall.
2. There should be no obstacles within 0.7 m on the left and right of the charging pile.
3. There should be no reflective material object within 0.6m around the charging pile.
4. If it is necessary to be moved, the movement distance should be less than 10cm.
5. Start from the fusion of the M line: 1.6 meters from the walls is fine for the length of the reserved place.

6. Ensure there are no obstacles in the way of “go home” mode, and the task was combined with paths.
7. The appointment feature can be turned off for all charging piles. Docking does not need an appointment. Close the appointment feature following the path in the APP: **/strategy/gs_work_station/need_order**.



2.6.2. Set a charging point in-app

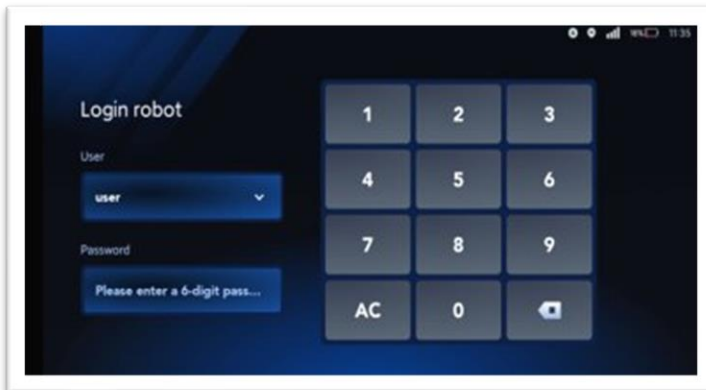
1. Manually dock the robot to the charging pile:

- a. Ensure that the robot is located precisely and make the back of the robot face the charging pile (as shown in the figure below).
- b. Make their charging ports fully contacted.
- c. Then create a charging point by marking the current point.



2. Set the charging point:

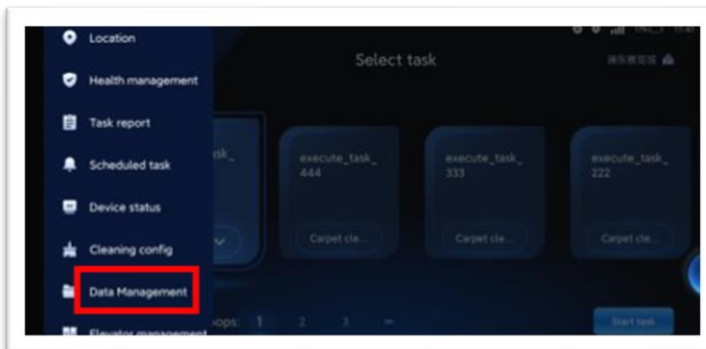
- a. Enter the following parameters:
 - i. User: admin
 - ii. Password: 314159.



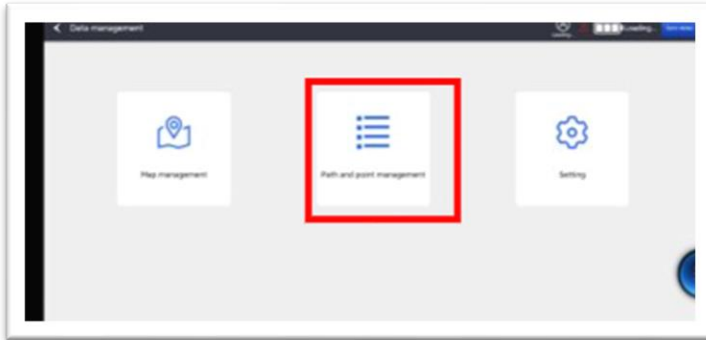
- b. Click the Menu on the left.



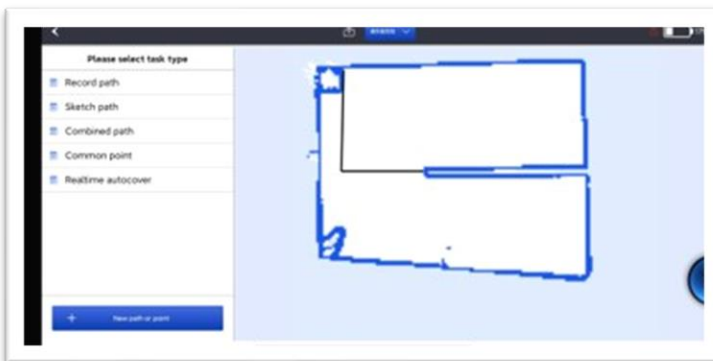
- c. Click "**Data Management.**"



- d. Click "**Path and Point Management.**"



e. Select **"New Path and Point."**



f. Complete the creation of the point according to the serial number above.



NOTE:

- After setting the charging point, when the power of the robot is down to **20%**, it will automatically go to the charging pile and dock itself for charging.

2.6.3. Deployment verification

1. Set up a combined task (only add the charging point to the combined task):

After completing the following operations, you will be able to execute the newly created charging task and test the function of auto-docking and charging.



- ① Select **"New Paths or Points"** → **"Combine New Task Queue."**
- ② Add tasks.
- ③ Select the charging point.

2. Make sure the charging is working:



- ① The charging indicator light of the charging pile turns **red**.
- ② The APP pop-up window shows "charging."
- ③ The lightning icon is displayed on the power screen.



NOTE:

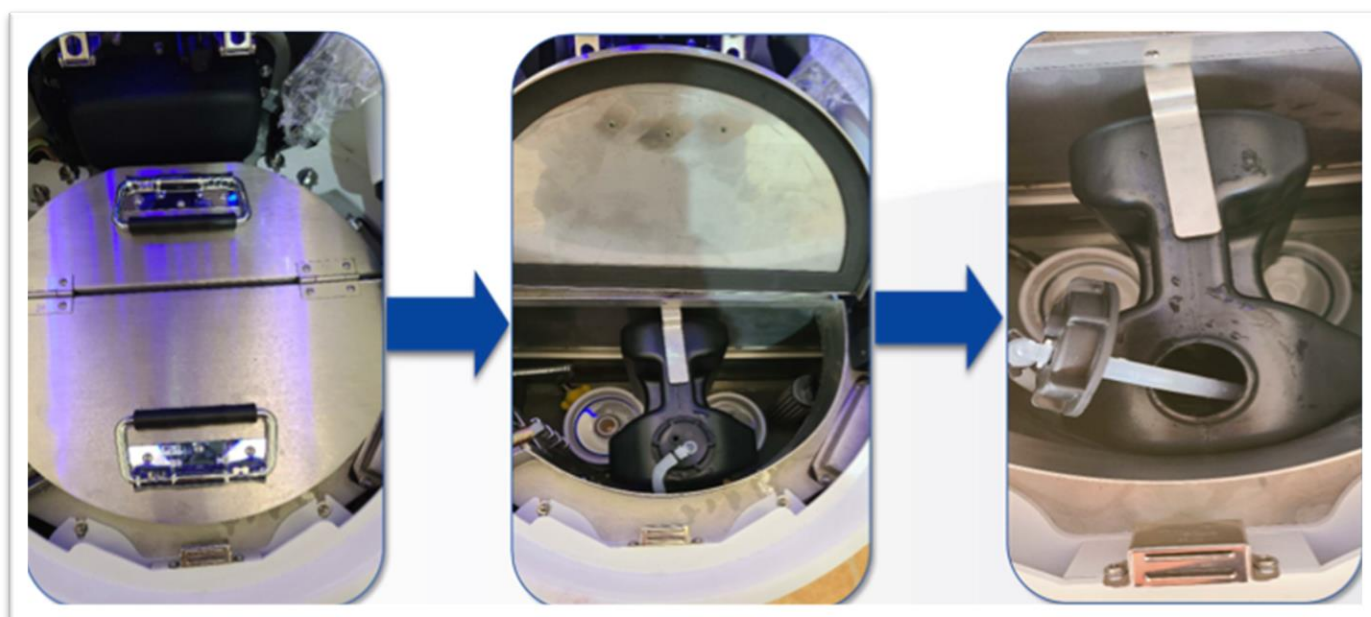
- Manual charging and auto charging cannot be used at the same time.
- Do not turn off the robot during charging.
- The QR code shall not be damaged or soiled.
- Do not put debris on both sides of the charging pile.
- Only one charging point can be set in the APP.
- The charging point can be added to the task queue and placed at the end of the task queue.
- The power supply of the robot cannot be switched off.

2.7. Disinfection Package Deployment

2.7.1. Basic Introduction

Get access to the disinfectant box:

- ① Open the top lid.
- ② Open the cleaning water tank.
- ③ Open the disinfectant tank.



NOTE:

- Toggle the buckle left or right, then take the disinfectant tank out.



Disinfectant: hypochloric acid (recommended)

Liquide level display:

- Load in the disinfectant tank: maximum - 5 liters
 - Load in the water tank: maximum - 20 liters
1. Smoothly add disinfectant to avoid overflow.
 2. Observe the liquid level while filling the disinfectant. Pay attention to the liquid level when filling the disinfectant without a measuring cup.
 3. Stop filling when it is close to full.



2.7.2. Config settings

You need to complete the following steps during deployment:

1. In "Advance Settings," enable mist spray to turn on the feature.
2. Restart the robot to activate this feature after turning it on.



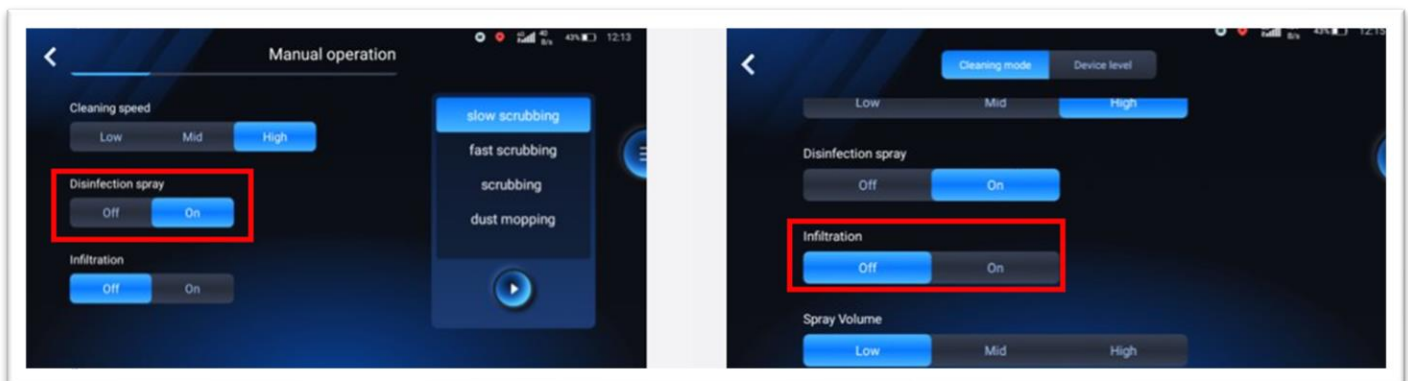
For operator:

3. After enabling the disinfection feature, turn "**Disinfection Spray**" **ON** in the cleaning mode interface. It is available in both auto and manual modes.
4. "Disinfection Spray" is set to open by default.



NOTE:

- If the "Disinfection Spray" option is not displayed, "scrubber/enable_mist_spray" may not be enabled.
- Enable it first.



- Set the "spray" feature enabled to have it work together with the cleaning task. If it is set to "disabled," it will not work together with the cleaning task.
- The spray will be paused when the robot moves backward. The spray is not restricted by turning and speed with a regular value of 0.8L/H.
- The "**Spray**" feature has two statuses: "**ON/OFF**." The speed and level are adjustable.

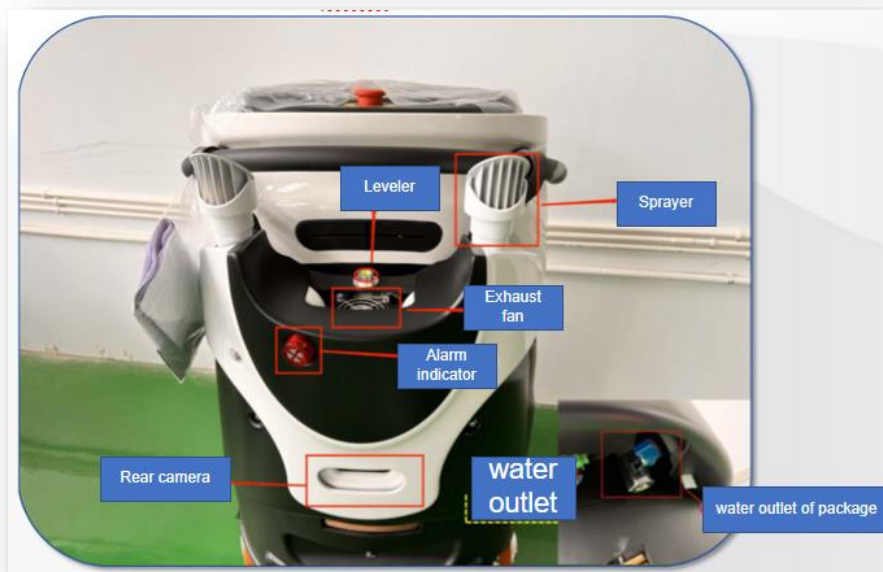


- When the spray feature is turned on, and if there is no disinfectant, there will be an alarm message pops up in UI.
- If a low liquid level of disinfectant was detected during operation with the spray ON, the spray will be stopped; and an alarm message will pop up – “20043 ran out of disinfection”. Pause the operation and add disinfection on time.
- If the spray was turned OFF, the liquid level will not be monitored, and the alarm will not pop up during cleaning tasks.
- The liquid level sensor will not be affected by water waves. It monitors consistent levels.



2.7.3. Cleaning procedure

1. Drain disinfectant from the outlet first.
2. Fill the tank with clean water.
3. Drain the clean water.
4. Keep the outlet open and fill the tank with clean water for about 1 minute.



2.8. Workstation Deployment

2.8.1. Basic structure and parameters

For the workstation, it is necessary to carry out a small-scale transformation in the field. Power supply, water supply, drainage, and other interfaces need to be provided in the field. The product information is as follows:

| Item | Specification |
|---------------------------|---------------|
| Length | 450mm |
| Width | 480mm |
| Height | 1400mm |
| Weight | 30 kg |
| Drain Tank Capacity | 18 L |
| Rated Voltage | 24VDC |
| Rated Power of Water Pump | 28.8W |
| Working Temperature Range | -10℃ - +45 ℃ |
| Working Humidity Range | 20% - 75% RH |
| Temperature for Storage | -40℃ - +45 ℃ |
| Humidity for Storage | 20% - 93% RG |



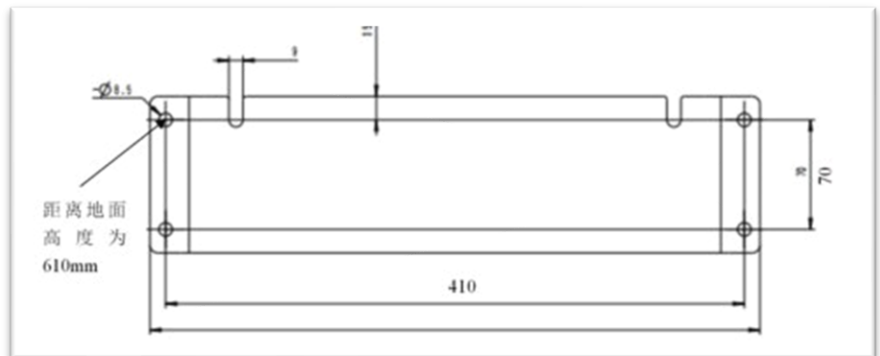
2.8.2. Installation requirements

Power supply:

- The voltage is 220VAC, 10A with a three-pin plug.

Pipe:

- The joint of the inlet pipe/drainpipe is the GB DN15 (1/2 inches), 1 for each. The height of the joint of the inlet pipe/drainpipe is 294mm from the ground.



Space:

- Ensure no obstacles are left in the area with 0.7m length left and right of the working to have the laser recognize the position of the workstation. Ensure the robot can rotate and adjust its posture with enough space where there are no other obstacles in 1.6 meters in front of the workstation.

Positioning:

- The workstation is fixed on the wall with a pylon (the pylon is on the back of the workstation, and screw holes for M8 expansion screws). Keep the wall strictly vertical to the ground. When the docking is in process, it may fail due to the forward or backward tilt of the workstation. The size of the pylon is shown in the right figure.

Warning tape:

- Post warning tape after workstation deployment, to remind pedestrians not to enter the warning tape area.



Reflective stickers

1. Stickers should be attached symmetrically and longitudinally along the central axis of the charging station.
2. The center spacing of the reflective stickers is 0.25m.
3. Length requirements:
 - the upper edge is aligned with the lower edge of the protruding part where the electrode is located.
 - the lower edge is aligned with the lower edge of the charging pile (close to it).
4. The direction is vertical, the paste is flat, and the phenomenon of folding and warping should be avoided.



Issues related to docking deployment SOP

<https://gaussian.yuque.com/docs/share/904ba703-87ef-4215-901b-e4d95e9eff5e?#>

2.8.3. Set a charging point in-app

1. Manually dock the robot to the charging pile:

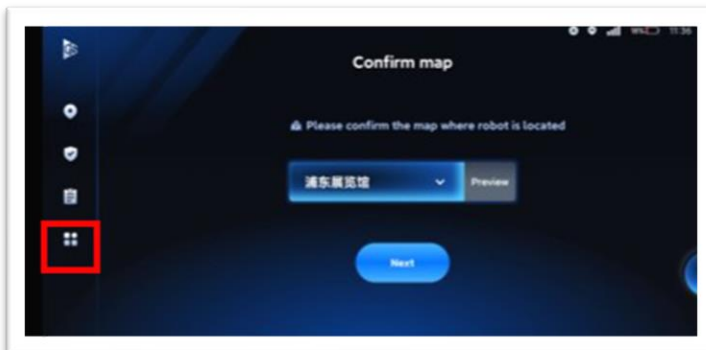
- a. Ensure that the robot is located precisely and make the back of the robot face the charging pile.
- b. Make their charging ports fully contacted.
- c. Then create a charging point by marking the current point.

2. Set the charging point:

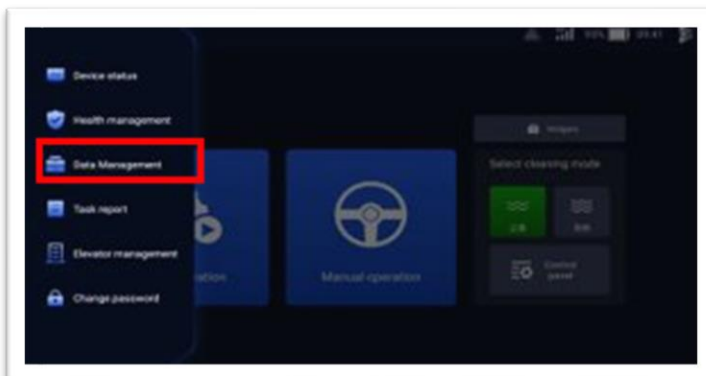
- a. Enter the following parameters:
 - i. User: admin
 - ii. Password: 314159.



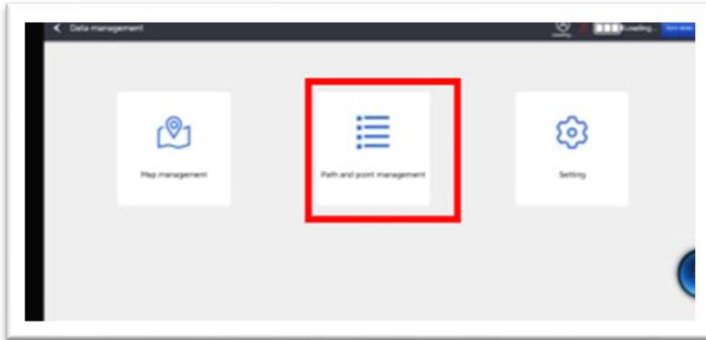
- b. Click the Menu on the left.



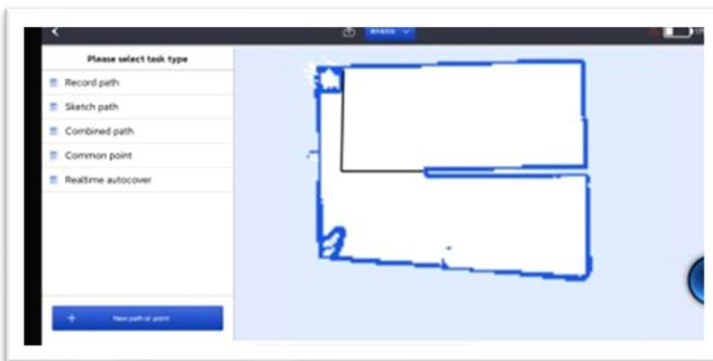
- c. Click "**Data Management.**"



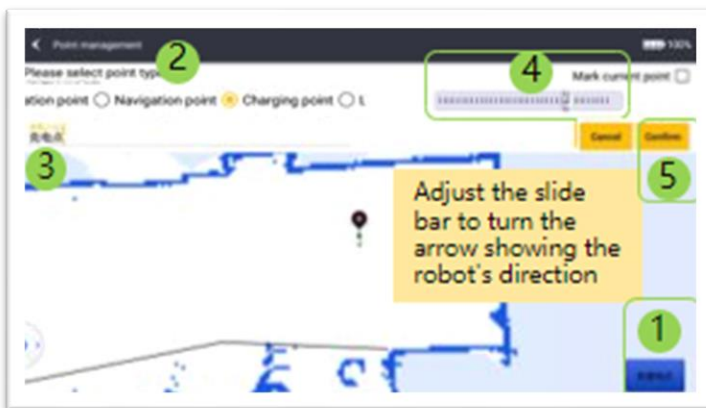
- d. Click "**Path and Point Management.**"



e. Select **"New Path and Point."**



f. Complete the creation of the point according to the serial number above.



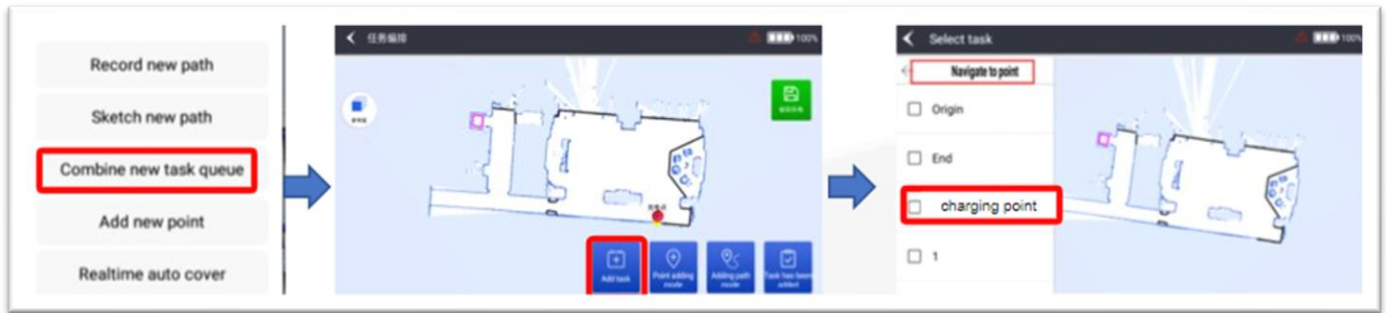
NOTE:

- After setting the charging point, when the power of the robot is down to **20%**, it will automatically go to the charging pile and dock itself for charging.

2.8.4. Deployment verification

1. Set up a combined task (only add the charging point to the combined task):

After completing the following operations, you will be able to execute the newly created charging task and test the function of auto-docking and charging.



- ① Select **"New Paths or Points"** → **"Combine New Task Queue."**
- ② Add tasks.
- ③ Select the workstation point created between the two

2. Make sure the charging is working:



- ① the charging indicator light of the charging pile turns **red**.
- ② the APP pop-up window shows "charging."
- ③ the lightning icon is displayed on the power screen.



NOTE:

- Manual charging and auto charging cannot be used at the same time.
- Do not turn off the robot during charging.
- The QR code shall not be damaged or soiled.
- Do not put debris on both sides of the charging pile.
- Only one charging point can be set in the APP.
- The charging point can be added to the task queue and placed at the end of the task queue.
- The power supply of the robot cannot be switched off.

2.9. Debugging Preparation

2.9.1. Consumables

The consumables of GS-ECOBOT SCRUBBER 50 are listed below:

- rubber strip,
- filter cartridge,
- brush,
- floor pad,
- mop pad.

Before starting the test, ensure that the consumables are installed correctly.

The filter cartridge, plate brush, floor pad, and dust mop work well if they were installed correctly according to the specifications.



The rubber strip is special, pay more attention to it. Refer to the next page for the confirmation method.

Drop the squeegee down to the ground, manually push the GS50 robot forward, and check the contact between the rubber strip and the ground.

Best effect:

- ① Avoid the rubber strip being deformed, wavy, etc.
- ② Rubber strip evenly touches the ground with a best angle of 45°.

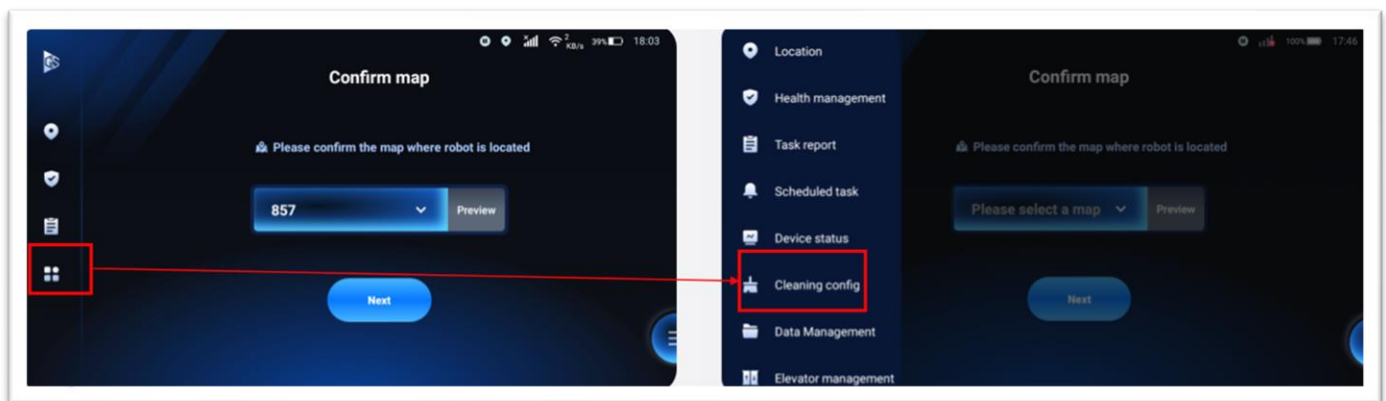
How to adjust the height of the squeegee:

- Use an open-end wrench to loosen the upper and lower nut, so that you can adjust the height of the casters.



2.9.2. Cleaning mode

1. Click the highlighted button on the left side of the main interface to open the navigation bar.
2. Click "**Cleaning Config.**"



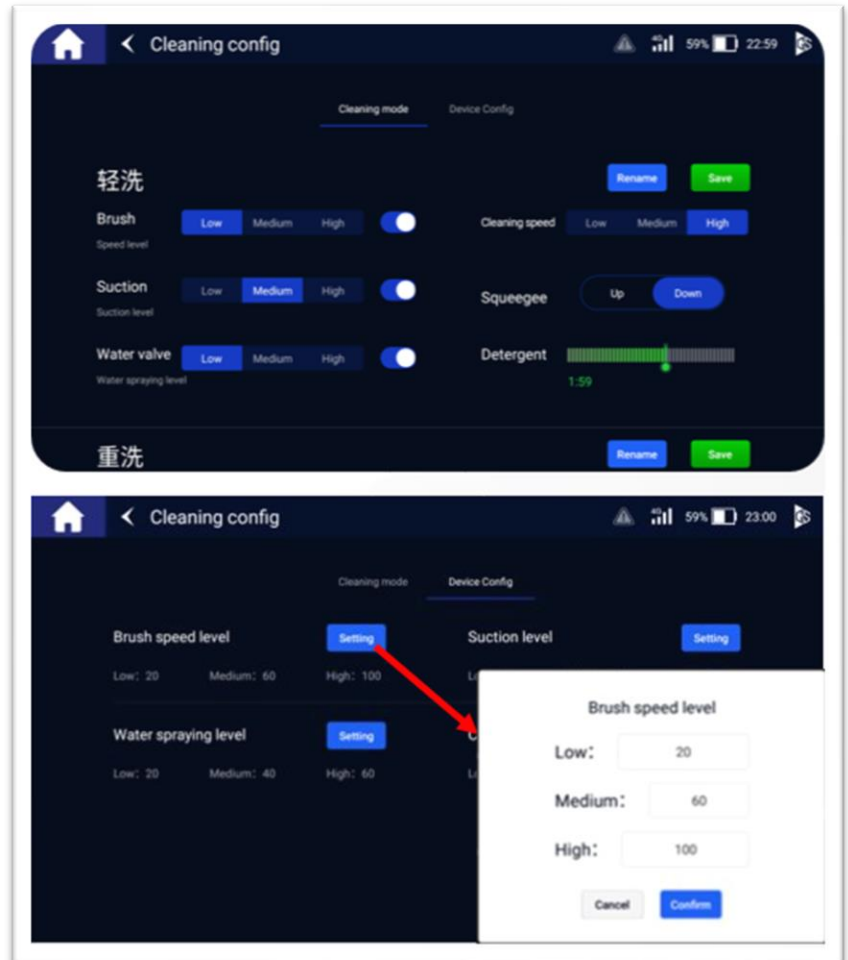
The following cleaning configuration can be applied to most ground surfaces.

Cleaning mode:

- **General cleaning**
 - Brush: medium
 - Cleaning speed: high
 - Suction: high
 - Squeegee: down
- **Deep cleaning**
 - Brush: high
 - Cleaning speed: medium
 - Suction: high
 - Squeegee: down
- **Dust mopping**
 - Brush: off
 - Cleaning speed: medium/high
 - Suction: off
 - Squeegee: down

Equipment level:

- **Rotating speed of brush:**
 - low: 40
 - medium: 60
 - high: 100
- **Level of suction:**
 - low: 40
 - medium: 60
 - high: 100
- **Level of spraying water:**
 - low: 20
 - medium: 30



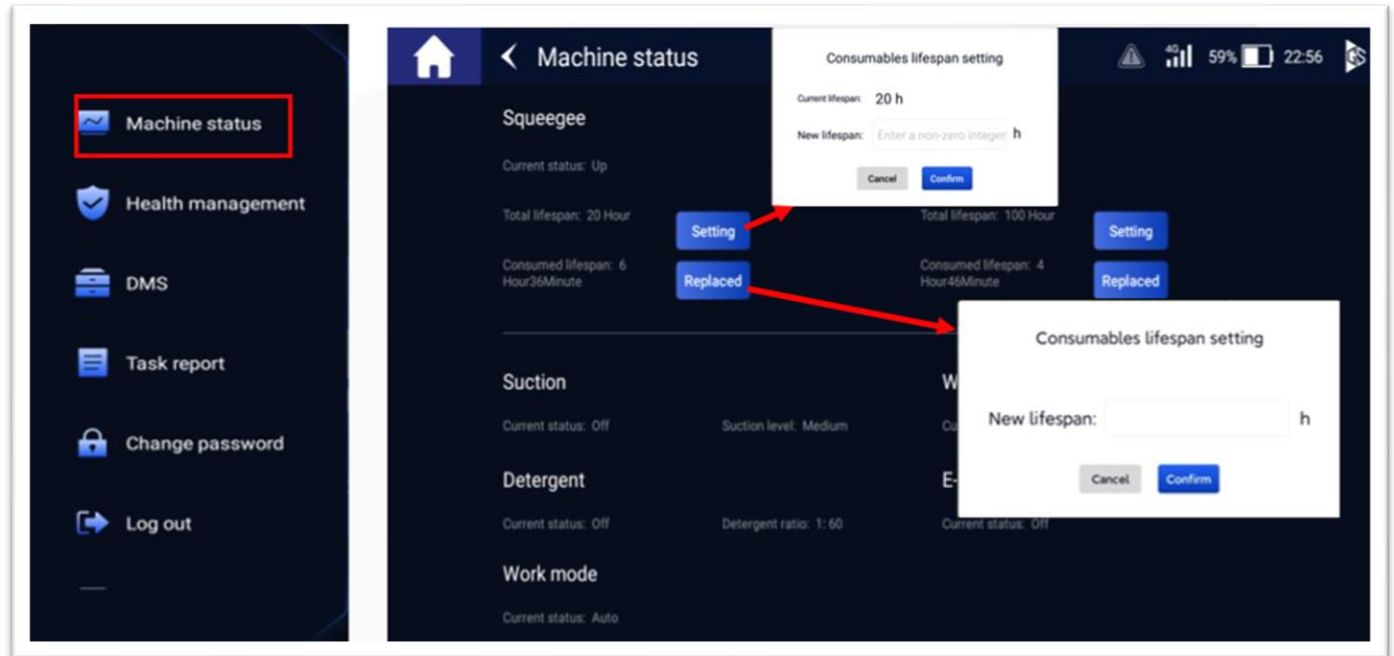
| Ground Type | Cleaning Speed | Brush speed | Water Level | Suction level | Brushes | Mopping pad | Remarks |
|---------------------------------------|----------------|----------------|-------------|---------------|---------------------|-------------|------------------------------------|
| PVC ground | Medium or high | Medium | Low 15~25 | 80~95 | White fur (0.25m m) | N/A | Recommended to only use a dust mop |
| Epoxy floor | Medium or high | Medium | Low 15~25 | 80~95 | White fur (0.25m m) | N/A | Recommended to only use a dust mop |
| Marble floor | Medium or high | Medium or high | Low 15~25 | 80~95 | White fur (0.35m m) | Red | N/A |
| Terrazzo floor | Medium or high | Medium or high | Low 15~25 | 80~95 | White fur (0.35m m) | Red | N/A |
| Floor with small square bricks | Medium or high | Medium or high | Low 15~25 | 90~100 | White fur (0.35m m) | Red | N/A |
| Cement floor | Medium or high | Medium or high | Low 25~35 | 90~100 | White fur (0.35m m) | N/A | N/A |
| Wooden floor | Medium or high | Medium or high | Low 15~20 | 80~100 | White fur (0.25m m) | N/A | Recommended to only use a dust mop |
| Rubble ground | N/A | N/A | N/A | N/A | N/A | N/A | Not recommended |

2.9.3. Consumables lifespan

1. Click the ">" button on the left side of the main interface and get into the first option **"Machine Status"**.
2. If the ground is marble, PVC, epoxy floor, and other smooth ground, set the lifetime of the brush to 800 and the water-sucking strip to 500.
3. If the ground is rough, set the life value of the brush to 600 and the water-sucking strip to 400.
4. Use the default value for the filter, no need to change it.

Parameter Definition & Meaning:

When the usage time of consumables reaches the lifetime, the APP pop-up window appears to remind a customer to check the status of consumables and clean or replace them.

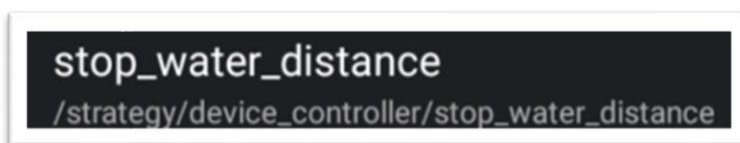


This parameter is for reference only and mainly serves as a reminder.

If the consumables were replaced, please click the **"Replaced"** button.

2.9.4. Stop water distance

Location:



Data Management/Settings/Advanced Settings/ecobot settings/View Parameters/strategy/device_controller/stop_water_distance (meter)

Logic:

- Stop spraying water at a certain distance from the endpoint (functional areas such as speed bump/carpet area).
 - If the ground is marble, PVC, epoxy floor, and other relatively smooth ground, it is recommended to set the stop water distance as **25~30** m.

- If the ground is rough, it is recommended to set the stop water distance as **10~15** m.
- In addition, the “stop water distance” affects the speed bump area and carpet area.

2.9.5. Keep suction on

After the robot reaches the endpoint, it keeps suction on and keeps the squeegee touching the ground to avoid the backflow of wastewater left on the ground.

How to adjust:

- Lift the squeegee after T1 s lapse and stop the suction after T2 s lapse once the squeegee is lifted.

Configuration parameters:

Location:

Data Management/Settings/Advanced Settings/ecobot Settings/
ViewParameters/device/scrubber/

- T1: keep_squeegee_suction (T1 default value: **60s**)
- T2: keep_suction (T2 default value: **30s**)

Scrubbing mode:

- If you think it is too much, you can manually modify it. It is recommended that both items should not be less than **10s**.

Dust-pushing mode:

- ① In dust-pushing mode, both of the 2 parameters shall be set to 0 (software version < commercial complex MVP.)
- ② The default value is 0 as long as the water spray button is turned off in the cleaning configuration (software version ≥ commercial complex MVP.)

| | |
|--|-----|
| keep_flush_water | 300 |
| /device/scrubber/keep_flush_water | |
| keep_squeegee_suction | 60 |
| /device/scrubber/keep_squeegee_suction | |
| keep_suction | 30 |
| /device/scrubber/keep_suction | |

Relationship between water stopping distance and keeping suction ON:

- In the normal automatic task, the water stop is triggered before reaching the endpoint, and the robot stops at the same place when reaching the endpoint triggering the delay – **“turning off suction and lift squeegee up”**.
- If an emergency stop was pressed in the task, it will directly trigger the delay.

2.9.6. Anti-falling function verification

Manually push the robot slowly to the area where there is a risk of falling after the infrared sticker was placed and robot positioning was done. Then open the config of infrared stickers in APP: **/strategy/ir_sticker_enable** and check whether anti-falling can be triggered.



Fig. 1

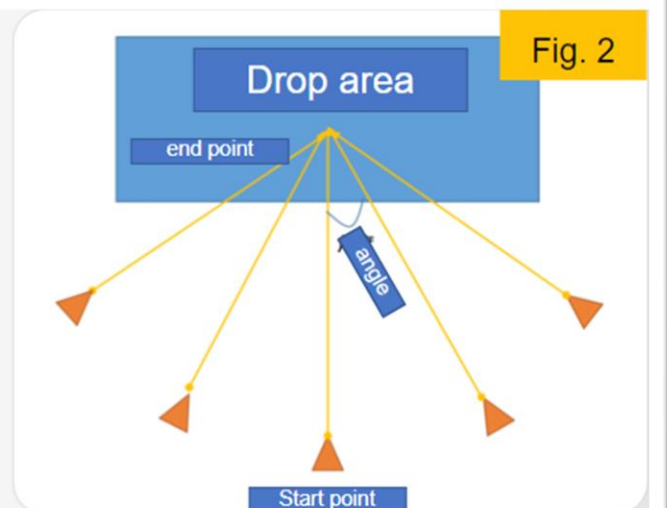


Fig. 2

1. As shown in Figure 1 on the left, slowly push the robot near the escalator or steep stairs to check whether the APP pop-up displays an alarm of falling risk.

2. You need to move the robot to the risk area from different directions according to the method shown in Figure 2 to check whether the anti-falling can be triggered normally.
3. If it was not triggered at some certain angle, please contact an AROS service engineer for more information.

2.9.7. Cleaning effectiveness

To confirm the Scrubber 50 robot's cleaning effectiveness:

1. Perform cleaning tasks manually, and remove artificially created dirt (wastewater/cola, etc.) on the path routes.
2. Push the robot forward and observe the cleaning effectiveness.
3. Or perform auto-tasks, record a teaching mode (with turning routes), or draw a path manually.

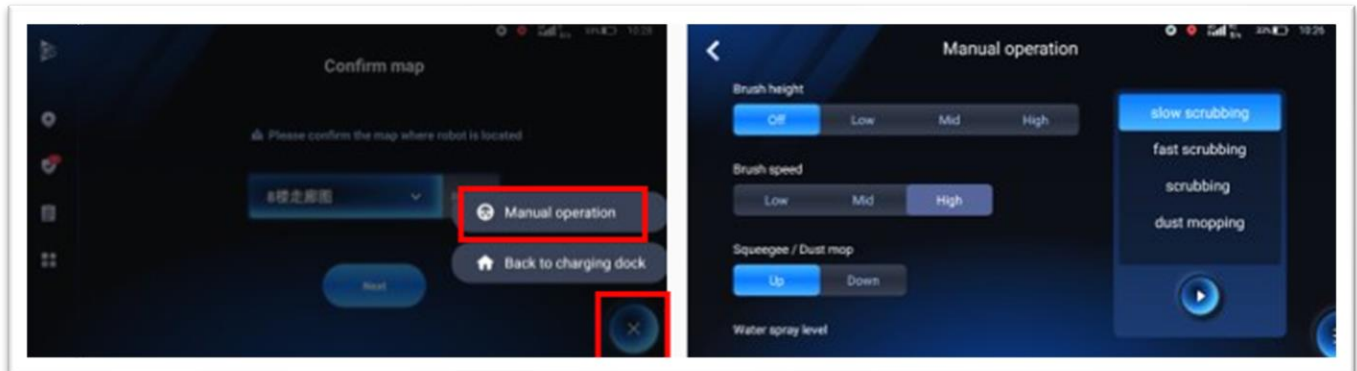
After cleaning, the ground is clean without water stains, and the dirt can be cleaned off normally.



If there are stains left after cleaning, the robot needs to be readjusted and checked.

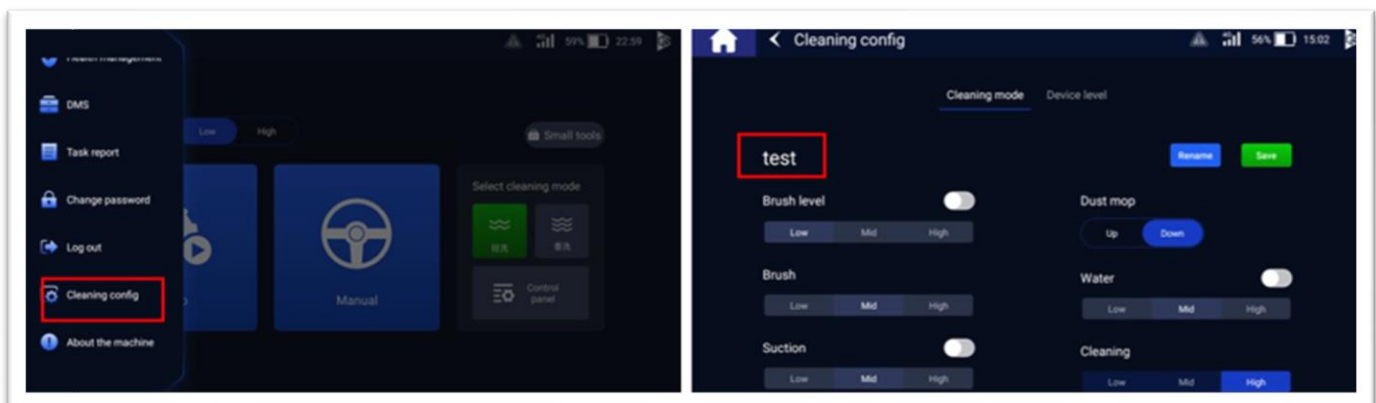


If the cleaning effectiveness is not acceptable, adjust the squeegee, check the suction settings, etc., accordingly.

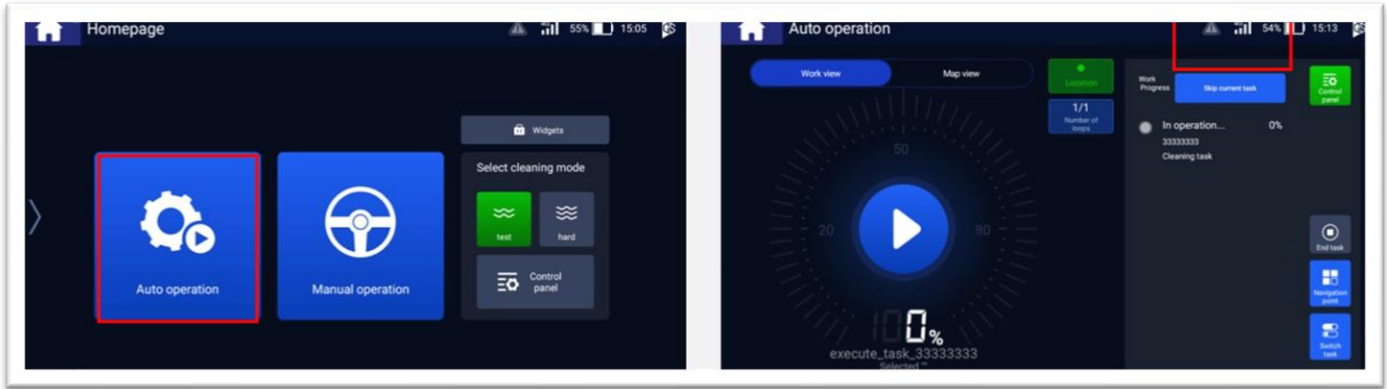


2.9.8. Test run

1. Access "**Cleaning Configuration**" and name it a Test Run.
2. Turn off the Brush, Suction, and water valve, lift the Dust Mop, and set the appropriate Cleaning Speed.
3. Click "**Save**" to exit.



4. Select "**Test Run**" in "**Cleaning Mode**", and then click "**Auto Operation**" to start the task (all effective paths for deployment).
5. You only need to run the outer ring in Coverage Path. If there is no problem, directly click "**Skip**" to skip the current task.
6. If you encounter problems, take photos, or record issues with your mobile phone, and resolve them later (solutions: modify the virtual wall, redraw the path, reset the points, etc.).



2.9.9. Scheduled task

Communicate with customers whether scheduled tasks are required before the robot handover and help them to complete the setting.

Scheduled task-setting steps:

1. Select "**Scheduled Task**" on the left menu → select "**New**" → enter the "**New Task**" interface.



Time:

- Select the time when the scheduled task is triggered.

Maps:

- Select the map on which to perform cleaning tasks.

Task:

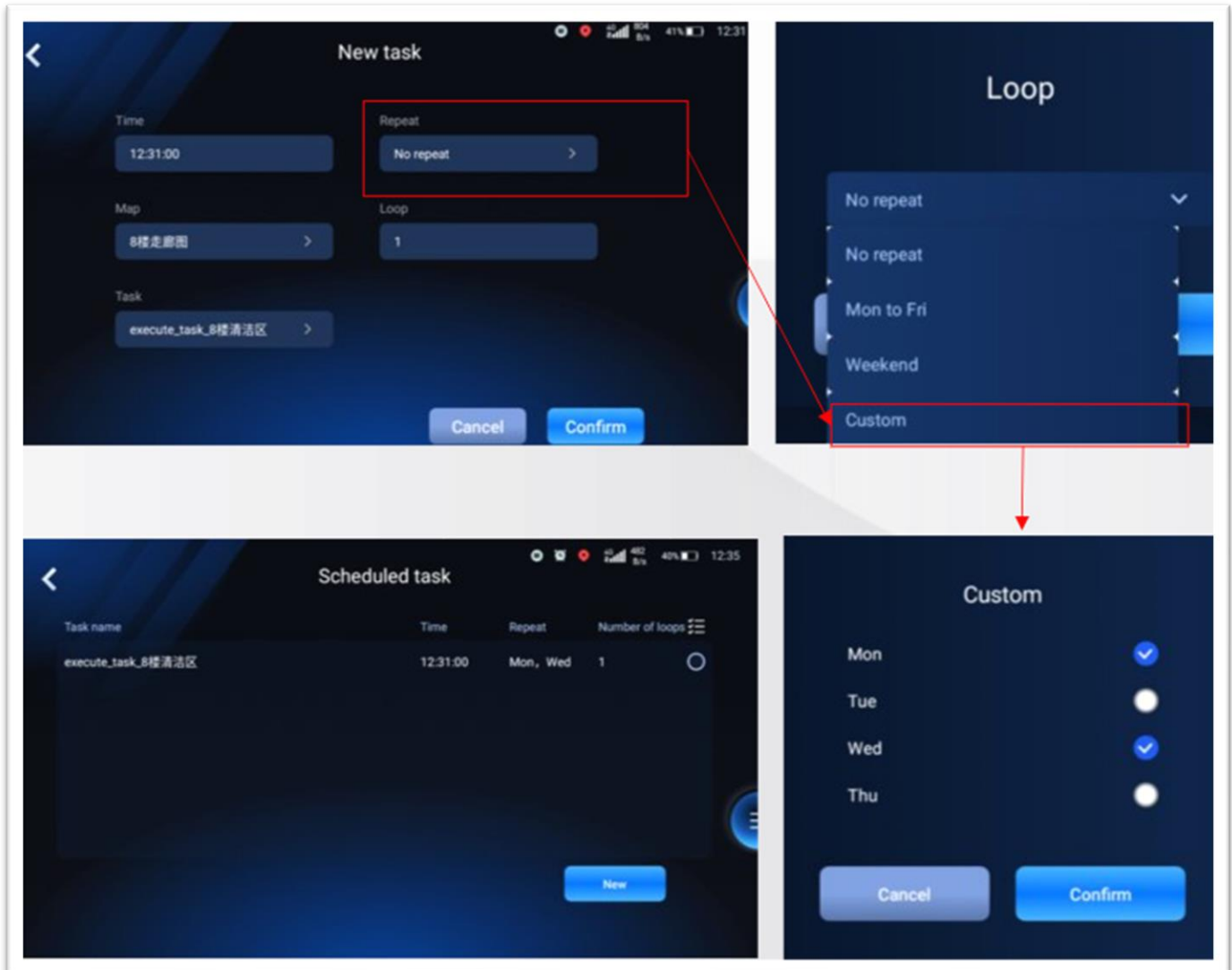
- Select the task to perform.

Repeat:

- There are multiple modes to choose from (non-repeat, Monday to Friday, weekends, custom).

Customization:

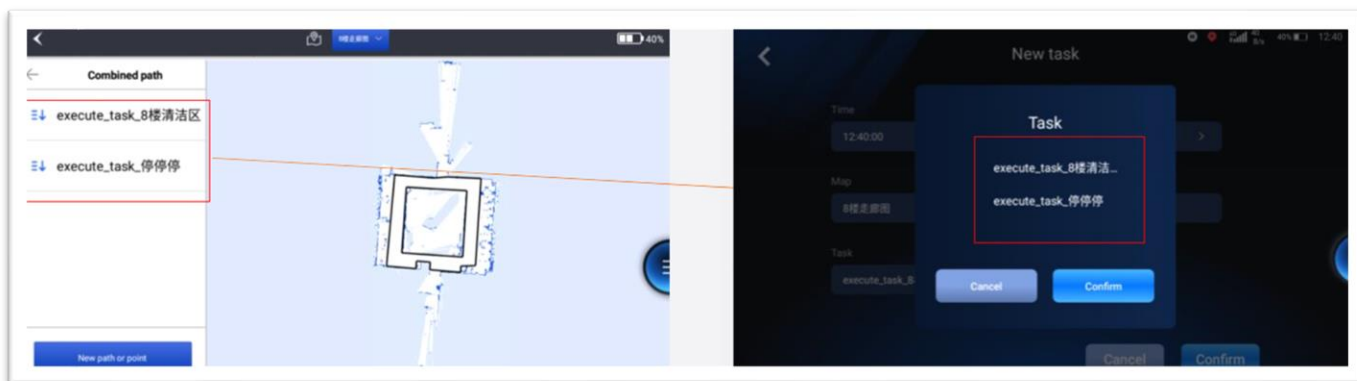
- Freely choose the date when the scheduled task needs to be executed.



After creation, you can delete and edit operations.

Cleaning Mode:

- You cannot change the cleaning mode operations in the scheduled task.
- You can only add combined tasks and select the appropriate cleaning mode in task combination.



2.10. Application Deployment Scenarios

2.10.1. Office buildings | Rules on path

Generally, only the "Real Time Auto Cover" path + "Teaching Mode" is deployed in office building scenarios (If the width of the passage is less than 1.3m, please use the path in "Teaching Mode".)

As the figure below shows, for the Wangjing SOHO complex of three curvilinear asymmetric skyscrapers, three paths in "Real Time Auto Cover" (**green area**) need to be created for A/B/C [They are divided into several regular paths, which improves the cleaning efficiency and meet the logic of cleaning business needs.]

"Teaching Mode" was used in **yellow** areas.

- For ① and ②, the "Teaching Mode" is used because the width of the passage is only 1.5m.
- For ③ and ④, to make area A more regular, the "Teaching Mode" was decided to be used for the remaining two small areas.



NOTE:

- It is not recommended to deploy the path for a passage less than 95cm, and the "Teaching Mode" is used for a passage less than 1.3m.
- The "Real Time Auto Cover" shall be used for other places.

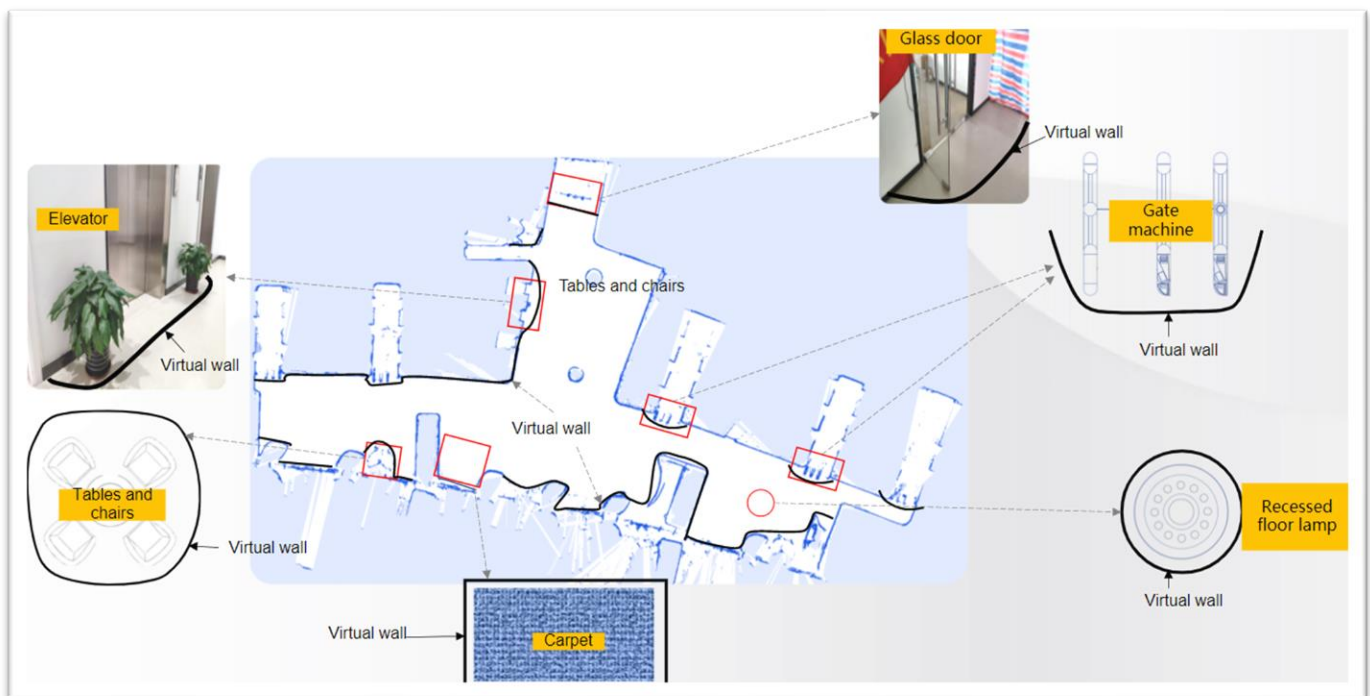
- Recommended number of paths deployed with "Real Time Auto Cover": one path every 50 meters.
- In the "Teaching Mode", the obstacles should be bypassed. If the obstacles were scanned in the map, the "Real Time Auto Cover" will automatically bypass them

2.10.2. Office buildings | Solutions & precautions

After the path deployment, virtual walls need to be drawn, and the following obstacles need to be treated with virtual wall drawing:

- Flowerpots,
- glass doors,
- turnstile,
- Recessed Ground Lights,
- carpets (most on rainy days),
- tables and chairs,
- elevator entrances,
- stairs, etc.

Virtual walls/stickers are required in these locations to avoid danger.



1. The irregularly shaped guide platform of the floor - a virtual wall needs to be drawn to bypass it.



2. Thin and frequently-moved exhibition stand - a virtual wall needs to be drawn around it.



3. Garbage cans or billboards in staircases - virtual walls needed to bypass them.



4. Virtual walls and infrared stickers are required in the location of escalators. Virtual walls should be **1-1.5m** away from the escalator.



5. Virtual walls are required to bypass some glass POP stands with irregular shapes. Notice the position of the virtual wall and if they were temporarily positioned.



6. The revolving glass door, where a virtual wall shall be drawn at an interval of 30cm to not affect people walking.



7. Some office buildings have pop-up ground sockets, which must be bypassed by virtual walls.



2.10.3. Hotels | Rules on path

The environment of the hotel is similar to an office building with a special point: a lot of tables and chairs.

Use real-time auto-cover + teaching mode to deploy the path.

Use teaching mode for the passage where the width is lower than **1.3** meters.

As shown in the figure - a hotel lobby: teaching mode is only used in **yellow** areas.

Use real-time auto-cover in other areas. Separate the whole area into several regular small areas. Area separation improves cleaning efficiency.



NOTE:

- It is not recommended to deploy a path for passages **<95cm**.
 - Use teaching mode for passage **≤1.3**.
 - Use real-time auto-cover for other areas.

2.10.4. Hotels | Solutions & precautions

1. There are large flowerpots, exhibition stands, billboards, etc., in the lobby. Confirm their position with customers in advance and use virtual walls to isolate them.



2. Some hotels have revolving glass doors or curved doors. They need to be isolated by virtual walls.



3. There are meetings, dining areas, etc., in the hall. Draw proper virtual walls for the chairs inside these areas.



4. People crowd around the reception. Talk to the customer in advance, a space of 40-50cm should be reversed.



5. There are special-shaped artworks in some lobbies, safety distance should be reversed, and draw virtual walls for them.



6. There might be stairs or escalators on the first and second floors, draw virtual walls for them.



7. There are trash cans or other obstacles In the elevator hall. Confirm with customers in advance and draw virtual walls for them.



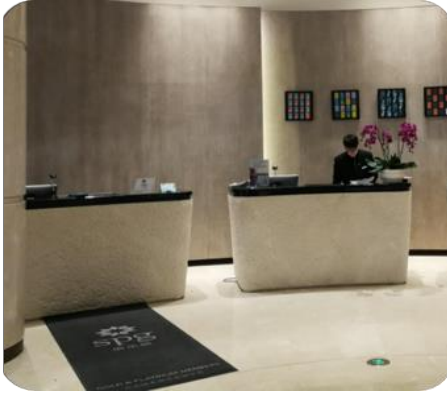
8. Confirm with customers in advance for the dining timeline in the dining area. Set up “do not disturb” mode to avoid the peak busy hour.



9. Draw virtual walls for low obstacles as well.



10. There must be carpet in the hotel. Talk to customers and set the different cleaning modes on the other map for the carpet area, especially on a rainy day.



11. There might be some fire hydrants that are kept open. Draw virtual walls for them to avoid the robot getting into an unknown area.

Draw highlighted areas for permanently fixed obstacles, like pillars or walls.

- ① Do not introduce other movable obstacles into the area when drawing the highlighted area.
- ② For the lobby, just draw highlighted areas for corners and pillars. **Do not draw highlighted areas for an aisle.**



NOTE:

- Two maps (name them a "rainy day" and a "fine day") are needed for rainy and non-rainy days. Set different cleaning modes for carpet areas on a rainy day.
- For the area with chairs, reverse space for chairs movement to avoid scratching with feet of chairs.
- For multi-floor deployment, the landmarks on the different floors should be set in a place 2 meters away from elevators.
- If the pedestal of the stands is big, it is better to reserve enough space for the stands to avoid scratches.
- Reserve enough space for busy reception.
- Use teaching mode for the aisle of guest rooms. Reserve enough space for U-turns at the end of the aisle.
- Draw virtual walls for flowerpots, exhibition stands, and billboards.
- The customer needs to return the chairs in the meeting room before the robot starts the cleaning task.

- During map scanning, gently turn the robot for 270° to have a laser scan of all the features of the doors of guest rooms. Then turn it back and move forward. Reason: laser can just scan objects at a range of 180°.
- For a long aisle, it is recommended to scan a section of the aisle and save the map in place with obvious features. Then, use the map extension to continue scanning the map.



NOTE:

- Scan the long aisle only **once**, do not scan it back and forth.

- When there is ghosting or deviation, check whether the laser is installed horizontally. Level the laser via its leveler and scan the map again. If it still does not work, calibrate the laser, and try again. If fail again, submit it in JIRA.
- Draw virtual walls for the doors that could be opened in aisles. The virtual wall expands, so draw them a little inside the actual walls. Check and adjust virtual walls in the test run.
- Draw virtual walls for glass walls around the cleaning area to avoid lost locating or robots getting into other areas. Do not place the virtual wall too close to a glass wall.
- Draw virtual walls for objects with black pedestals. Sensors (laser) cannot detect them.
- Do not combine the transition area with the ceramic tile area or carpet area into one task. Set cleaning tasks for them separately.
- The height of the roller brush :
 - wool carpet: make a roller brush just touch the wool carpet. Improper height might damage the wool carpet.
 - other carpets: adjust the height based on real situations to ensure cleaning effectiveness. Just touch is recommended.
- **Suction level:** Run the robot for 20 minutes and check how much debris was collected in the trash box and adjust the level gradually. The less power consumption, the less noise there is. But ensure hair and debris can be sucked into the trash box.

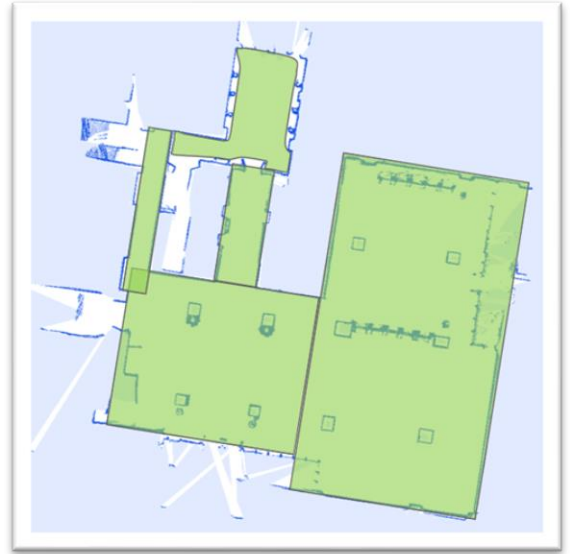
2.10.5. Schools | Rules on path

A robot is used to clean the halls in teaching buildings. They are similar to office buildings.

Use real-time auto-cover + teaching mode to deploy the path.

Use teaching mode for the passage that width is lower than **1.3** meters.

As shown in the right figure, there is no passage narrower than 1.5 meters in the teaching building. Use real-time auto-cover for all areas (area separation improves cleaning efficiency).



NOTE:

- It is not recommended to deploy a path for passages <95cm. Use teaching mode for passages ≤ 1.3 .
- The halls of the teaching building are not large, we just need to separate the hall into several regular areas and deploy paths for them.

2.10.6. Schools | Solutions & precautions

School environment:

1. There might be carpet in the halls, or carpet will be placed on rainy days. Draw virtual walls for these carpets in advance.



2. Draw virtual walls for upward stairs. For downstairs, both virtual walls and infrared stickers are needed.



3. There are art booths in some halls, please draw virtual walls for them (keep a 30cm distance).



4. There might be flowers, please draw virtual walls and display zones for them.



5. Some carpets are placed diagonally. Confirm with the customer if it is placed in the long or short term.
- a. Short-term: use "record path - virtual wall" as a solution as well as set up the second map while explaining to the customer when to use the 2nd map.
 - b. Long-term: draw virtual walls and ask the customer not to move them.



6. Talk to the customer and fix the position of the one-meter fence, then draw virtual walls for them. If there is any movement, contact the AROS support team in advance.



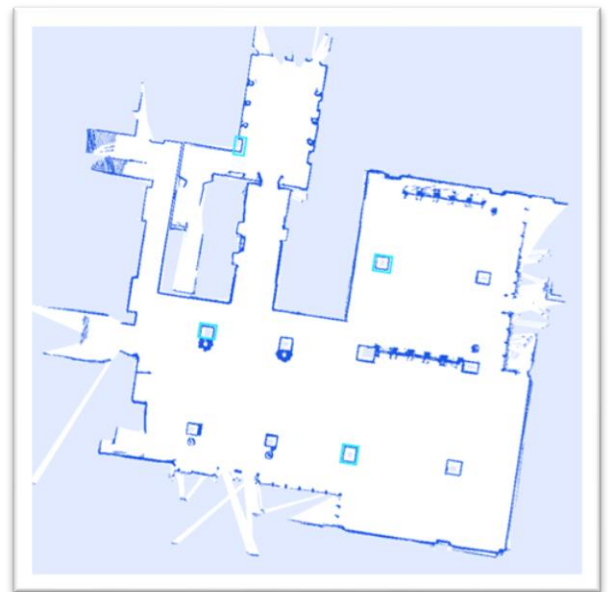
Draw highlighted areas for permanently fixed obstacles, like pillars or walls



NOTE:

- Do not introduce other movable obstacles into the area when drawing highlighted areas.
- Interval: 15-20 meters for each.
- The school environment is stable. Drawing several highlighted areas is enough.

1. Set the "do not disturb" warning for a busy time slot.
2. Draw temporary display areas as needed.
3. Draw virtual walls for flowerpot and one-meter-fence
4. Two maps (name them a "rainy day" and a "fine day") are needed for rainy and non-rainy days.
5. Set different cleaning modes for carpet areas on a rainy day.
6. Set "rainy day" and "fine day" tasks.
7. Draw virtual walls for elevators.
8. Draw virtual walls for any risks.
9. Draw virtual walls for all cleaning areas.



2.10.7. Hospitals | Rules on path

The most obvious feature of hotels is people are crowded. The environment is similar to an office building.

Use real-time auto-cover to deploy the path.

Use teaching mode for the passage that width is lower than 1.3 meters.

As the right figure shows, use teaching mode only in the **yellow** area (seating area).

Use real-time auto-cover for other areas. Separate the whole area into several regular small areas (area separation improves cleaning efficiency).



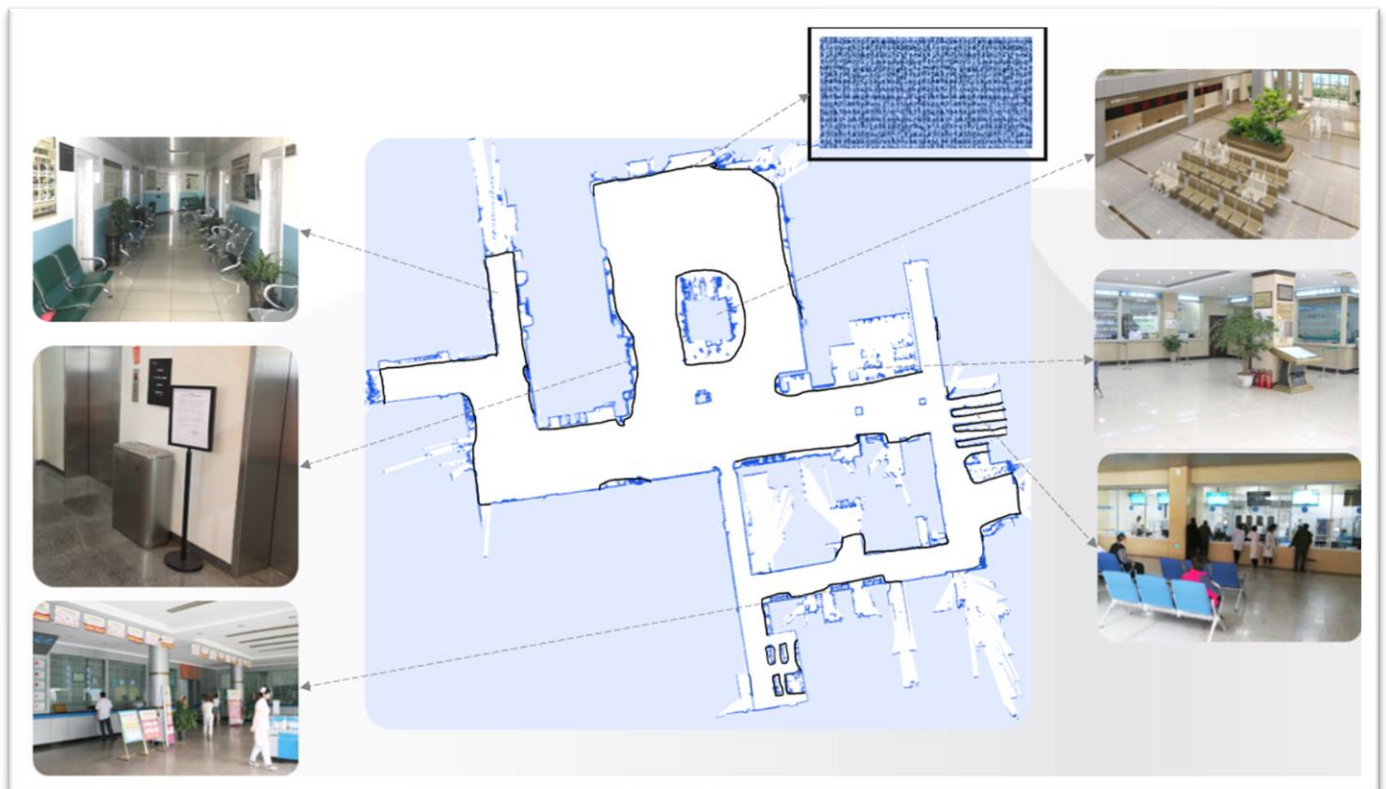
NOTE:

- It is not recommended to deploy a path for passages **<95cm**.
 - Use teaching mode for passage **≤1.3**.
 - Use real-time auto-cover for other areas.

2.10.8. Hospitals | Solutions & precautions

Draw virtual walls for the following obstacles after path deployment:

- flowerpots
- carpets
- long seats
- elevators
- billboards
- stairs.



1. Draw virtual walls in front of the gate machine to avoid crashes with people.



2. Draw virtual walls and deploy infrared stickers 1.3 meters in front of the escalator.



3. For the temporary area placing tables and chairs, draw a temporary displace zone for them.



4. There might be a bed in the aisle, create 2 sets of maps for customers, and have the operator select the proper task based on a real situation.



5. Channels for staff and emergencies should be avoided.



6. Suggest customers fix the position of billboards or other big obstacles in the halls. And draw virtual walls for them.



7. Draw virtual walls for the trash bin, flowerpot, or other obstacles as well.



Draw highlighted areas for permanently fixed obstacles, like pillars or walls



NOTE:

- Do not introduce other movable obstacles into the area when drawing highlighted areas.
- The hospital environment is stable. Draw several highlighted areas for corners or pillars.

1. Two maps (name them a "rainy day" and a "fine day") are needed for rainy and non-rainy days.
2. Set different cleaning modes for carpet areas on a rainy day.
3. Draw virtual walls for the carpet area.
4. When deploying the path in a public seating area, reserve enough space for seat movement to avoid scratching with the squeegee.
5. For multi-floor deployment, the landmarks on the different floors should be set in a place 2 meters away from elevators.
6. If the pedestal of the stands is big, it is better to reserve enough space for them to avoid scratching.
7. Avoid busy elevators, emergency channels, etc.
8. Virtual walls and infrared stickers are needed nearby stairs or escalators.
9. Draw a temporary display zone or display zone for any temporary areas.



2.10.9. Commercial complexes | Rules on path

A commercial complex is larger than an office building. But it is the same for deploying the path. Only use real-time auto-cover + teaching mode.

Use teaching mode for the passage that width is lower than 1.3 meters.

The right figure is a commercial complex: it is recommended to separate it into A/B/C/D 4 big regions, and 7 small areas.

Use real-time auto-cover for all **green** areas (area separation improves cleaning efficiency).

There are fewer passages narrow than 1.5 meters in the commercial complex. If there are some, use the teaching mode.





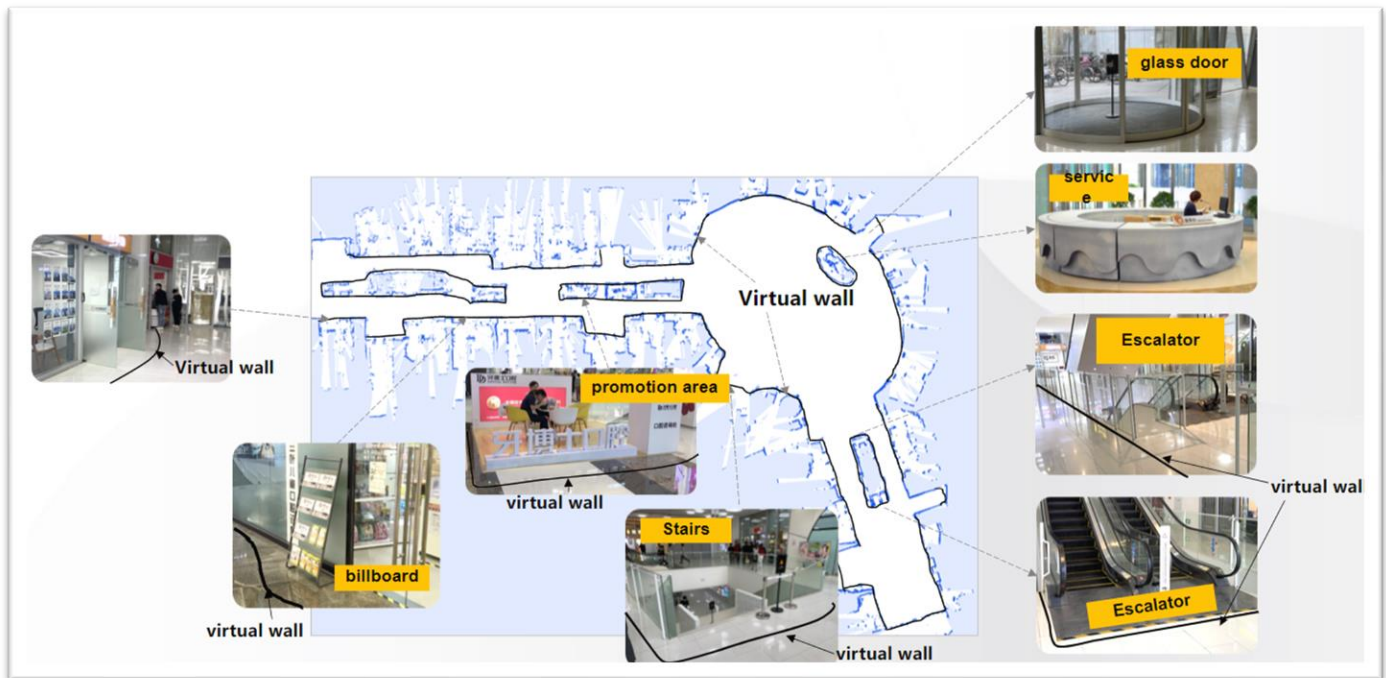
NOTE:

- It is not recommended to deploy a path for passages $< 95\text{cm}$.
 - Use teaching mode for passage ≤ 1.3 .
 - Use real-time auto-cover for other areas.
 - The dimensions for the real-time auto-cover area are **50** square meters each.

Draw virtual walls for the following obstacles after path deployment:

- glass doors
- escalators
- stairs
- billboards
- seats
- recessed ground lamps
- carpets
- revolving doors
- display booths, etc.

Deploy infrared stickers in any area with a falling risk (like escalators).



2.10.10. Commercial complex | Solutions & precautions

1. Virtual walls from glass rail. Infrared stickers for risk areas.



2. Glassdoor + carpet, reserve enough space and draw a virtual wall along the outer line.



3. Some billboards are specially shaped with glass. Reserve enough space to draw a virtual wall. Confirm if it is placed temporarily as well.



4. Virtual walls for floor guides.



5. Fix the position of the trash bin in the elevator hall. draw virtual walls 20-30cm in front of the elevator door.



6. Some receptions are specially shaped. Draw virtual walls along the outer line.



7. For the elevator hall with the glass door, talk to the customer in advance and set up the cleaning time. The glass door needs to be opened during the cleaning task.



8. Draw virtual walls for a one-meter fence. It is better to have customers fix their position



9. Draw a temporary display zone for the promotion area.



10. For the space under the elevator, we need to draw virtual walls based on the height of the robot.



11.Seat: deploy a virtual wall.



12.Blind track: deploy a virtual wall.

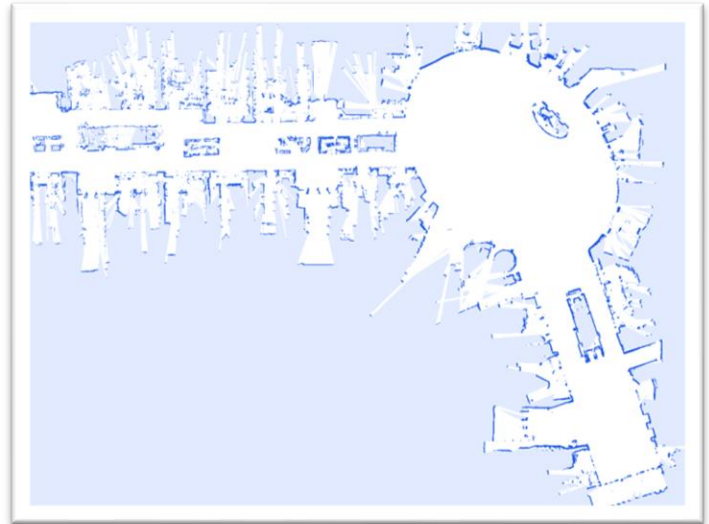


13.For this kind of scenario, it is necessary to draw a virtual wall and deploy laser and infrared stickers as well as highlighted areas.



Highlighted area

1. It is recommended to draw more highlighted areas in the commercial area because of its large environment.
2. Please refer to the right figure on how to draw highlighted areas.
3. Draw highlighted areas for unmovable objects, do not introduce other obstacles into these areas.
4. Do not draw several highlighted areas in one path.



NOTE:

- Reserve 1.5-2 meters for elevators to deploy virtual walls and infrared stickers.
- Reserve 0.5 meters for the escalator to draw virtual walls.
- Check the doors of each shop, reserve enough space for door opening, and redeploy laser stickers.
- Draw virtual walls for carpet area (+glass door especially).
- Draw virtual walls for all obstacles except real walls.
- Reserve a safety area for the robot under the escalator.
- Draw a temporary display area for any temporary areas.

3. APPENDIX: TECHNICAL SPECIFICATION

| Parameter Type | Parameter | Value |
|-------------------------------|--|---|
| ROBOTICS | Navigation Technology | Integrated Lidar-Visual SLAM |
| | 3D LIDAR | No |
| | Primary Laser detection distance | 25 m |
| | Laser scanning angle | 270° |
| | Secondary Laser detection distance (level) | No |
| | Secondary Laser detection distance (inclined) | No |
| | Depth Cameras | 3* Real sense camera |
| | Ultrasonic Sensors | Yes |
| | Anti-drop Sensor | by using an inclined laser |
| | Collision sensor | Yes |
| | Mapping Process | Easy onsite mapping (off-line, on-screen) |
| | Mapping Efficiency (e.g., 3,000 sqm) | 1 hour |
| | Map Editing | On-site, Off-line, On-Screen |
| | Single map coverage | Max. 30,000 m ² |
| | Dynamic Map updating | Yes, a maximum of 30% |
| | Minimum distance close to the wall | 7-10 cm |
| | Ability to detect thin poles and hanging obstacles | Able |
| | Dynamic path planning | Yes |
| | Obstacle avoidance strategy | slow down-stop-wait-bypass-replan path |
| | Start the task anywhere on the map | Yes |
| | Continue the previous task after interrupting/switching to manual mode | Continue from where it stopped |
| | Ability to work in complicated and dynamic scenes | Able |
| | Can detect obstacles higher than N cm | 10 cm |
| SOFTWARE & DIGITAL | Cloud Platform to check the statistics and monitor | Yes |
| | Task Reports and Alerts | Auto-generated and comprehensive email |
| | Mobile App | Yes |
| | Account with different access levels | Yes |
| | Scheduling function | Yes |
| | OTA | Yes |

| | | |
|----------------------------------|--|------------------------------|
| | Ability to work offline | Yes |
| | Manual mode | Yes, Push behind |
| | Adjustable cleaning mode | Yes |
| CLEANING PERFORMANCE | Working width | 50 cm |
| | Water absorption width | 72 cm |
| | Disc Brush RPM | 270 |
| | Cleaning down-pressure | 12,5/15 kg |
| | Number of main brushes | 2 pcs |
| | Optional Rolling brush | Yes |
| | Clean Water Tank Capacity | 24 l |
| | Recovery Tank Capacity | 18 l |
| | Filtration function | 4-stage filtration system |
| | Cleaning speed | 1.1 m/s |
| | Charging time | 1-2 hours |
| | Operation time | 2.5 hours |
| | Cleaning efficiency | 800-1200m ² /h |
| | Max. cleaning area/Charge | 2,000 m ² |
| KEY COMPONENTS AND OTHERS | Battery capacity | 24V / 40Ah Li-ion |
| | The weight of the body (including the battery) | 150 kg |
| | Warning lights | Yes |
| | Dimensions (mm) | 860 (L) X 700 (W) X 1030 (H) |