Vacuum 40 Deployment Manual

Technical Services and Operation & Maintenance Center | Kong Kailing | Oct. 2022

Keep Exploring
Keep Innovating

Revision Record

Rev.	Revised Content	Revised by	Revision Date	Reviewed or not	Approved by	Approval Date
V1.5.0		Kong Kailing	Oct. 2022	Yes	Bai Yongqiang	Oct. 2022

Contents

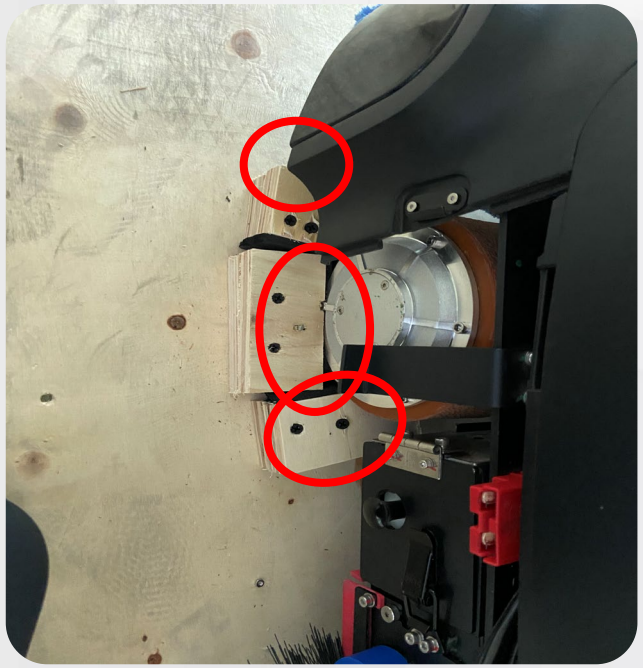
1. Unpacking and Acceptance

Please examine the outer packaging, appearance and functions of the machine after receiving the package, take photos and keep them if there is any exception and contact a service representative and submit JIRA;

Tools for unpacking: electric handheld drill (crosshead.M5) or cross screwdriver

①Unpack the parcel box and use an electric handheld drill to remove all screws carefully and take down wooden boards.

② Take down the wedge-shaped board on one side of the wooden box with the electric handheld drill.



③Take down the wooden blocks that fix the rear wheels and take out accessories shipped with the machine in the box.

1. Unpacking and Acceptance

④ Place the wedge-shaped board next to the pallet and back the machine down to the floor.

⑤ Remove the outer package of the machine, examine the vacuum’ s appearance and contact the relevant department in time if the appearance has been damaged or smeared.

1. Unpacking and Acceptance

销售发货清单

版本	A	
修订号	0	
页码	1/2	
上海高仙自动化科技发展有限公司	受控状态	

合同编号：GSSZYZ2019112701　　发货日期：2019年11月29日
客户名称：苏州言志清洁系统有限公司　　收货联系人：翁正芳 13812656248
客方地址：苏州工业园区现代大道999号现代大厦1楼

类别	序号	物料描述	规格型号	数量	单位	选择	随车方式
整机	1	Ecobot Scrubber 50E	洗地尘推二合一	1	台	√	
	2	机器序列号	GS-AS-0000-0006-0030-0231				
	3	刷盘	9寸	2	个	√	装车
	4	针钩盘	9寸	2	个	√	附件
	5	百洁垫	红色245mm	2	个	√	附件
	6	过滤芯	50μ	1	组	√	装车
	7	过滤芯	25μ	1	组	√	装车
	8	滤袋	Ø130*300mm	1	个	√	附件
	9	滤筒扳手		1	把	√	附件
	10	通讯模块	EC20（含中联通SIM卡）	1	个	√	装车
	11	尘推布		1	个	√	附件
	12	充电器	云阳	1	个	√	装车

收货注意事项：

请您确认物品完整性，收货2个工作日内请核对发货清单（控制盒及配套发出的所有产品，是否有遗漏或破损），并在该送货收单上签章并扫描回传给送货单位，若超过2个工作日（以快递送达时间开始计算）尚未回传，则视为正常收货。

送货单位:上海高仙自动化科技发展有限公司　　收货单位及签收人：

（签字盖章）　　（签字盖章）

上海高仙自动化科技发展有限公司
Gaussian Automation Technology Development Co.,Ltd.
地址：上海浦东新区丹桂路899号1栋318室
Rm.318,Build 1,No.899 Dangui Road,Pudong District,Shanghai

产品合格证

Product Quality Certificate

编号 No：GS-AS-0000-0006-0030-0231

产品名称：自动驾驶洗地机
Product Name：Autonomous Scrubber

型号：Ecobot Scrubber 50
Model No：Ecobot Scrubber50

检验员：刘志坚
Inspector：Zhijian Liu

检验日期：2019-11-29
Inspection Date：2019-11-29

制造单位：上海高仙自动化科技发展有限公司
Manufacture Unit：Shanghai Gaussian Automation Technology Development Co., Ltd

本产品经检验合格，准予出厂。
This product has passed all inspections and tests,it has been certified.

质量管理部签发
Released by QM

姓名 Name　　日期 Date　2019.11.29

QC 2019.11.29 PASS

⑥ Check the Sales and Shipping Documents and whether the accessories are complete, invite the customer to sign his/her name after verification and conformation; examine whether the Certificate of Compliance has been shipped along with the machine and make sure whether its information has any exception.

2. Power-on Test

(1) Turn off the air circuit breaker, turn on the vacuum with the key and check whether the machine can start normally.

Check whether the air circuit breaker is off in front of the robot

Horizontal installation of the air circuit breaker

The breaker is turned off in this photo

Vertical installation: the breaker will be off when turned up; horizontal installation: the breaker will be off when turned left

(2) Enter the "admin" account and password, access the APP's main interface, check whether the screen and the menu are functional, and make sure the machine's power state (please charge in time to ensure that the vacuum won't be off during deployment if the battery is running low).

Contents

1. Field Investigation

(1) Application in Different Scenarios

① Applicable scenarios: hard flat ground made of carpets and epoxy resin, marble, terrazzo, floor tiles and other materials.

② Inapplicable scenarios: basements, outdoor squares, community roads, glass floors and other large indoor and outdoor scenarios; and the ground with standing water, household food waste, etc.

(2) Floor flatness: -1.5cm ≤ flatness ≤ 1.5cm.

(3) Passage width: the minimum straight passage width is 80cm (without a room for turnaround), and the minimum a narrow passage width is 130cm (with a room for turnaround).

(4) Passage slope: climbing is not recommended in the automatic mode while the slope shall be **≤8°** in the manual mode. (For the vacuum, a slope with an angle of 8° is passable but non-operable, while a slope with an angle of 4° is passable and operable)

(5) Laser detection: laser scanning of black, highly reflective, transparent or fine (2.5cm) obstacles may be unclear. Stickers shall be added to improve scanning quality.

(6) Fall prevention: fall prevention is required at areas with fall risks, such as downward step ladders, up/down escalators, slopes, hollowed sewers, etc.

2. Communication with the Client

(1) Operating area: observe the entire scenario with the client, take photos of or record the field conditions in the memo on the phone throughout the process, and output the following contents independently:
① Select the best mapping path;
② Find a suitable starting point for mapping;
③ Decide whether to use the compulsory closed-loop function, based on the complexity of terrain;
(2) Cleaning modes: dust mop, vacuum, vacuum + dust mop, disinfection, etc.;
(3) Cleaning time: turn on the DND mode and set timed tasks if operations are prohibited or started during a certain period;
(4) Machine placement: arrange places where the machine is cleaned and maintained, where it shall park after operations, where it is charged and where it is kept in its idle state;
(5) Conditions on site: learn about the frequency and key areas of environmental changes, and circumvent the following situations by adjusting the deployment path and methods.

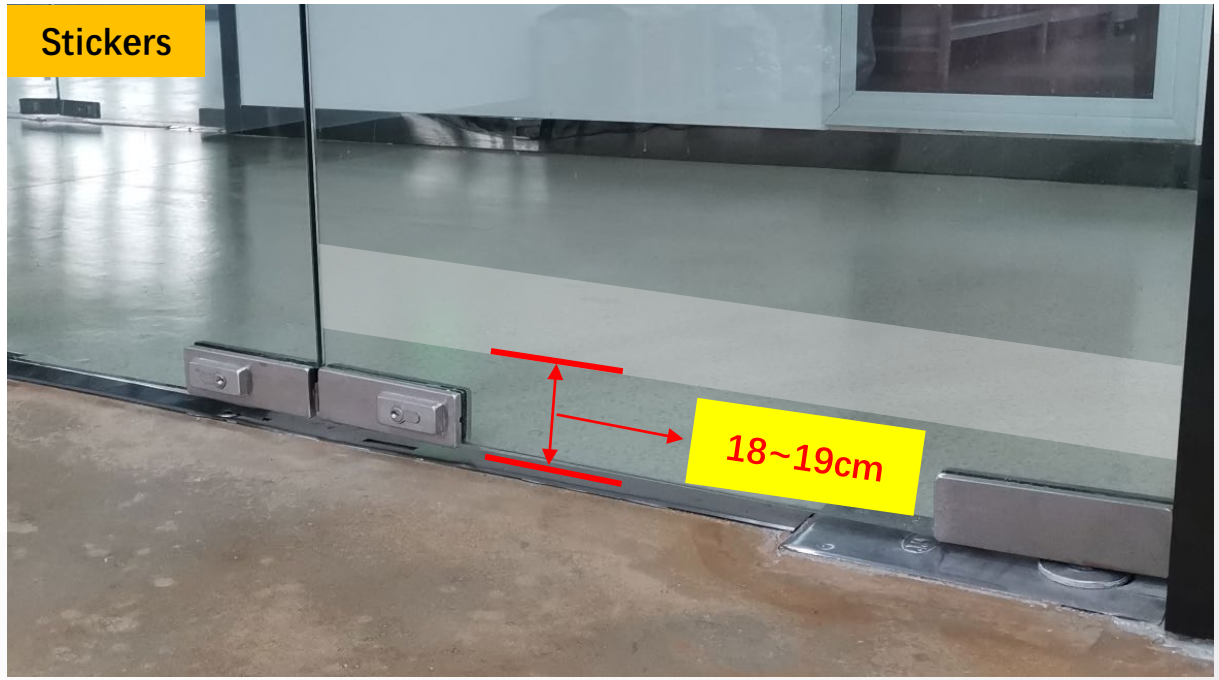
Such as: the opening and the closing directions of glass doors, changes of exhibition stands, shelf changes, steps, escalators, etc.

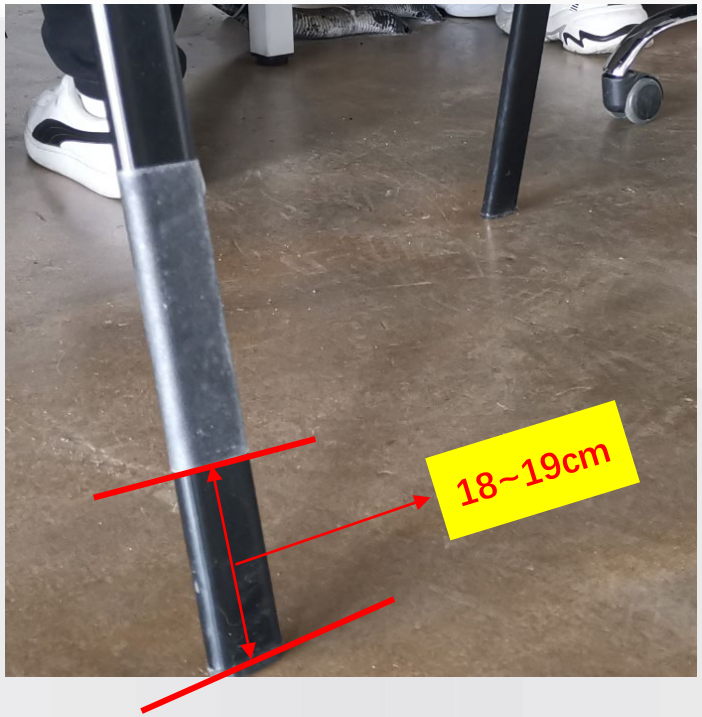
(6) Sticker deployment: communicate with the client, use the stickers provided by us at all place with risks if possible;
(7) On-site assistance: require assistance from persons appointed by the client for temporary needs of charging, site borrowing or provisional opening of a fire door, etc.

3. Solutions for Common Environments

Apply stickers under the following circumstances:

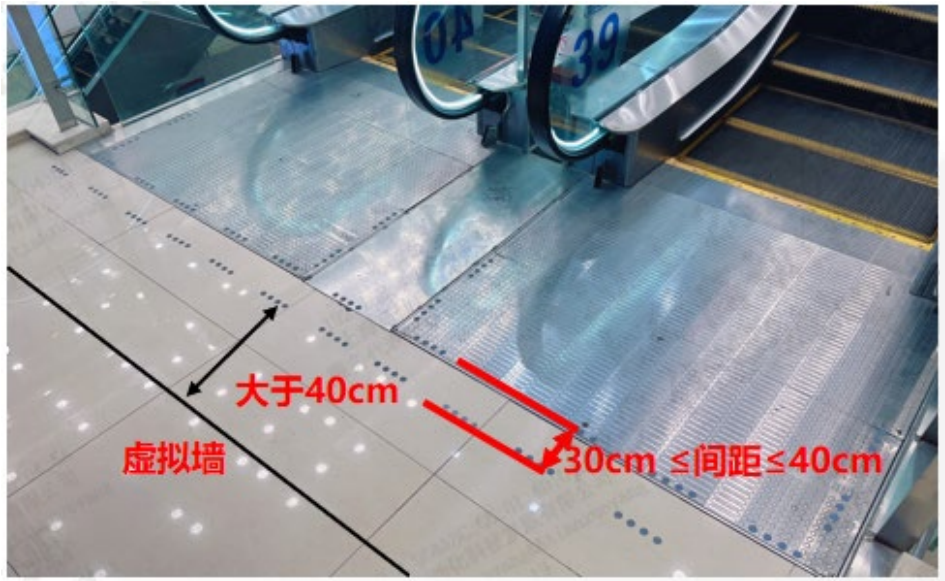
Apply stickers 18-19cm above the ground for laser scanning is prone to miss black/highly reflective/transparent/fine obstacles (with the diameter of 2.5cm).





3. Solutions for Common Environments

Fall prevention: apply infrared stickers to escalators (up/down), downward step ladders, and other areas with fall risks.



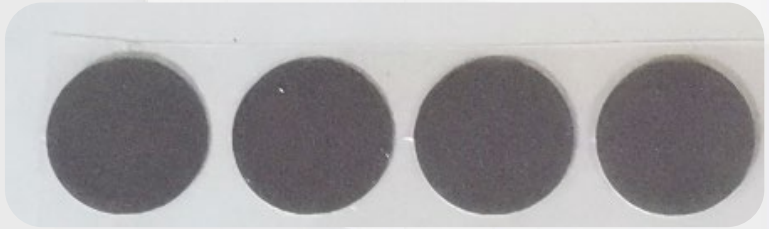
Apply two rows of infrared stickers at least 50cm away from the risk area as presented in the above photo.

Note:

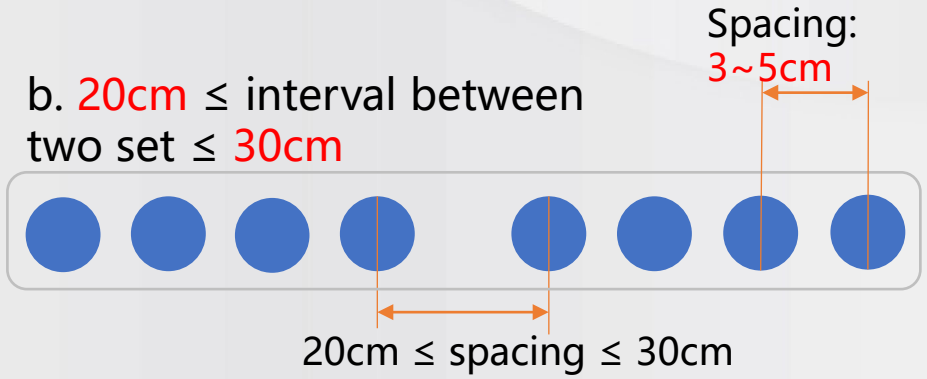
a) Apply them in alignment
b) Replace damaged ones in time
c) Check the abrasion of stickers regularly and replace damaged ones in time
d) Deploy stickers behind the virtual wall as the last line of defense; deploying stickers in front of the wall will influence both edge cleaning and machine operations since the vacuum will identify infrared stickers at first.
e) Remove the outer film packaging after applying infrared stickers.

Rules for stickers:

a. Real infrared stickers, with a set of 3 to 4 dots



b. 20cm ≤ interval between two set ≤ 30cm

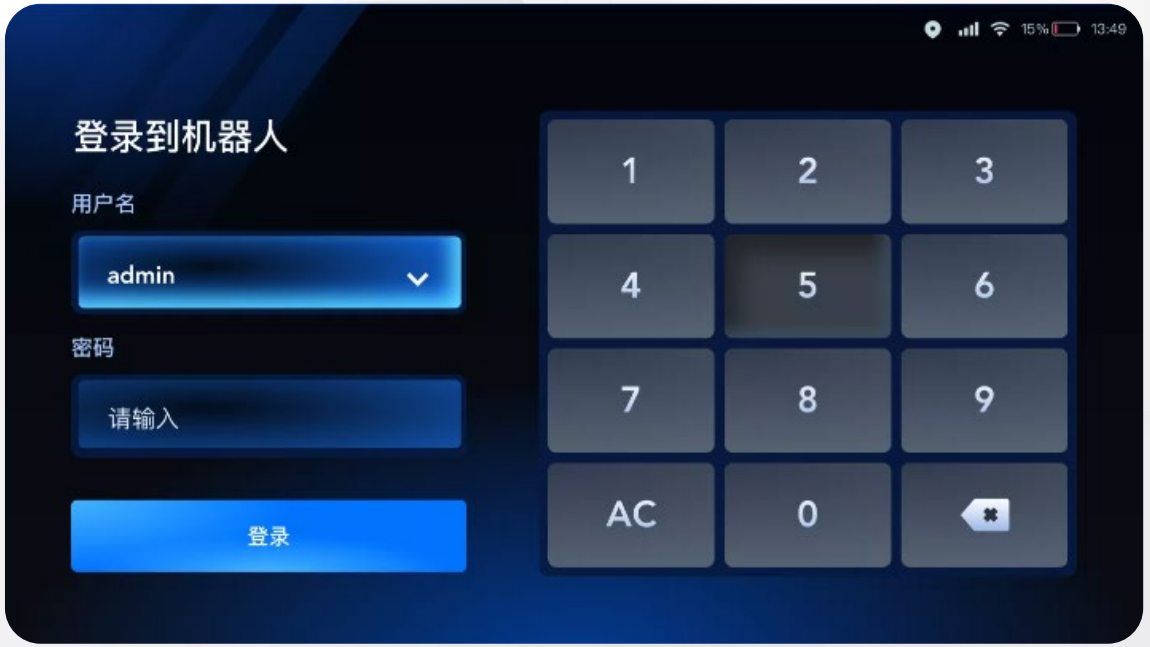


Contents

1. App Login

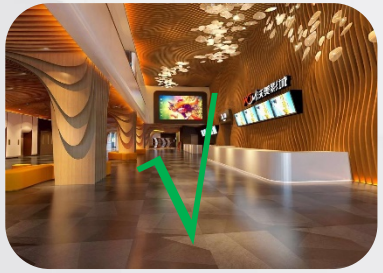
(1) Insert the key, turn it “ON” to start the machine

(2) Select admin user, enter password 123456, and then log in to the APP’s interface



2. Mapping | Choosing a reasonable starting point

(1) Select a reasonable starting point before mapping;
(2) Turn the machine to a right direction (parallel or perpendicular to the main wall) before mapping to reduce jaggies in the map and improve the passability of narrow passages.
(3) Start mapping at corners or places where surroundings are distinct as shown below, avoid mapping at places where features repeat as far as possible;



2. Mapping | Physical positioning

Physically position the robot before mapping in the following scenarios:

(1) Long corridors, symmetrical environments, and highly similar surroundings;

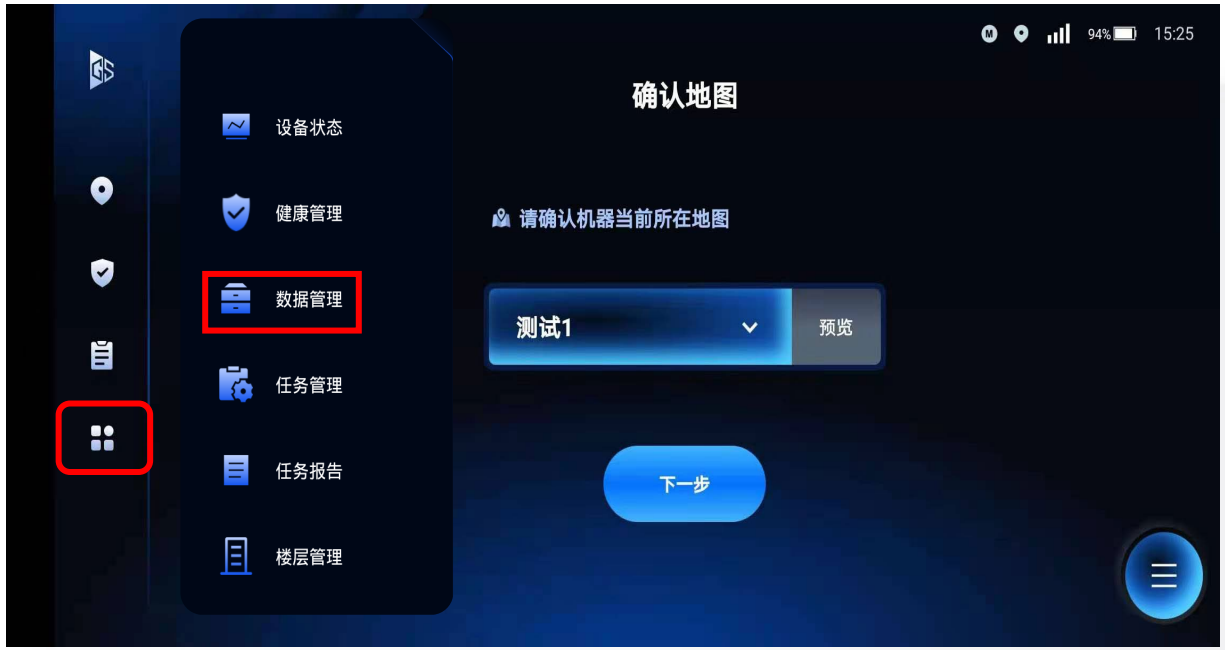
(2) Some special terrains requiring the vacuum to operate in large circles;

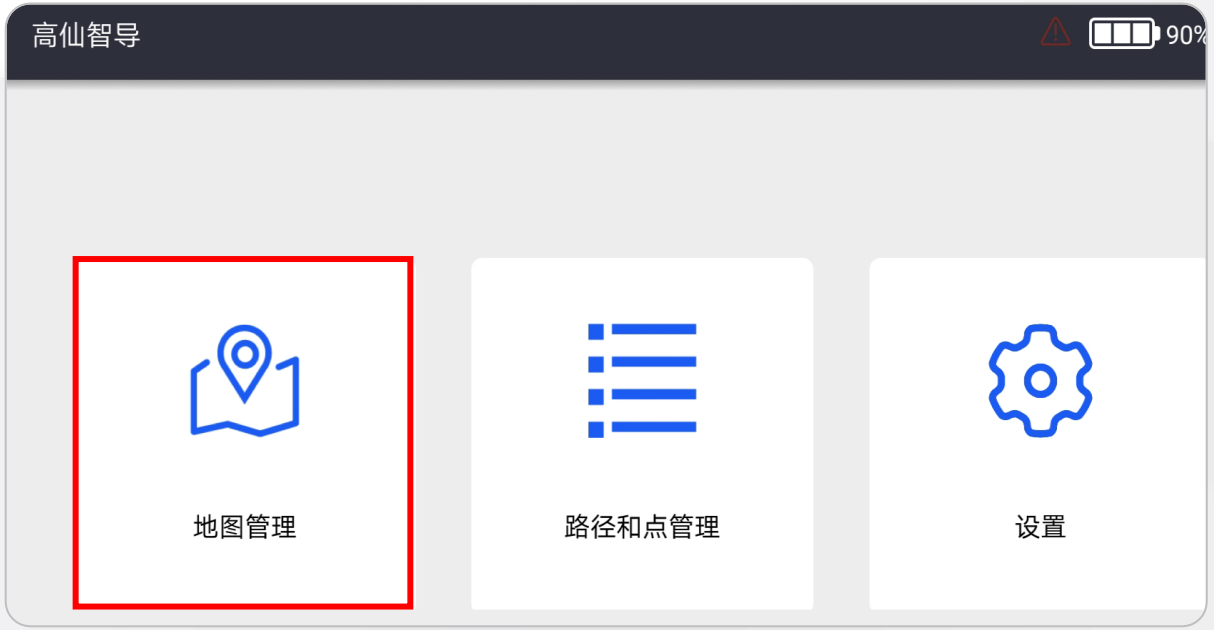
(3) Simple scenarios with many areas of distinct features not requiring compulsory closed-loop operations.

Mark the left and right wheels (with tapes or markers) to physically position the robot within 1m of a reasonable starting point before mapping;

2. Mapping | Accessing the mapping interface

(1) Click the left button and select “**Data Management**”;
(2) Click “**Map Management**” to access the mapping interface;





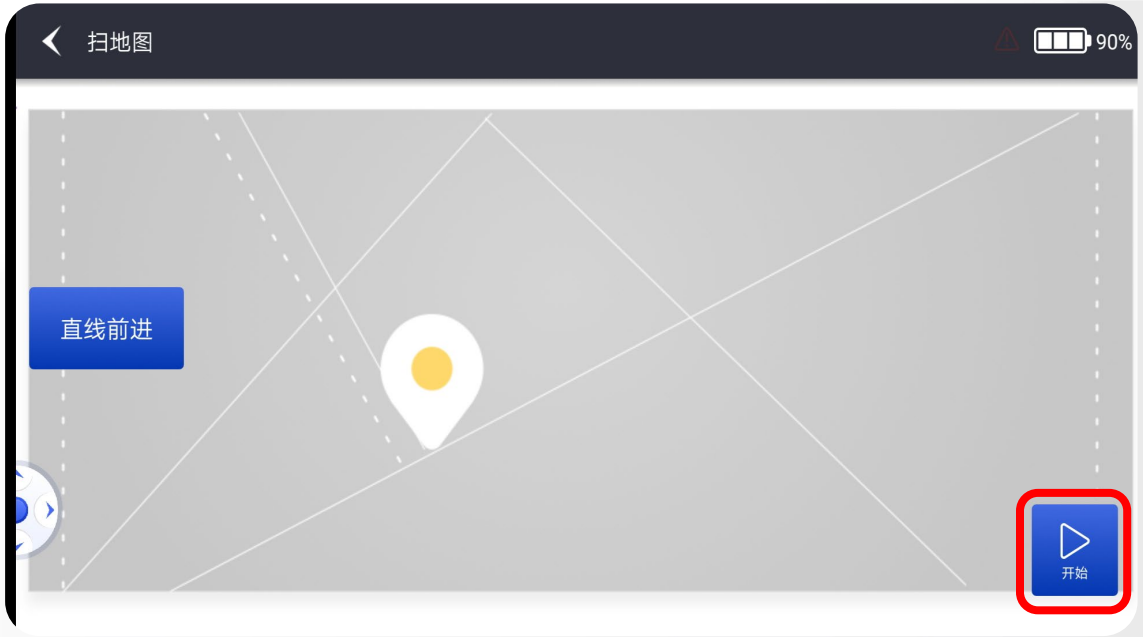
2. Mapping | Creating a map

(1) Click “**Scan a New Map**”;

(2) Click the “**Start**” button again;

(3) Name the map;

(Name the map as needed for client-friendly use)



Note:
①Indicate the number of floor if there are multiple floors for client-friendly use
② Indicate the operating area if there is only one floor
③ Name the map through communication with the client and obtain his/her consent

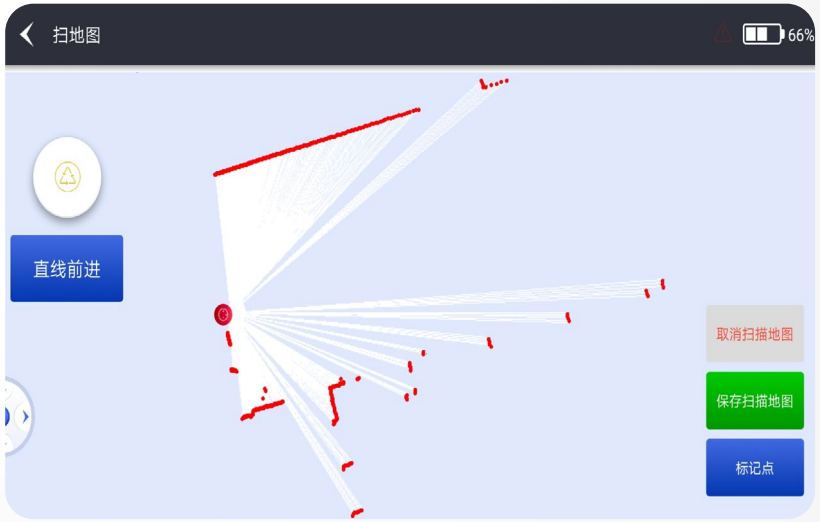
2. Mapping | Creating a map-path control

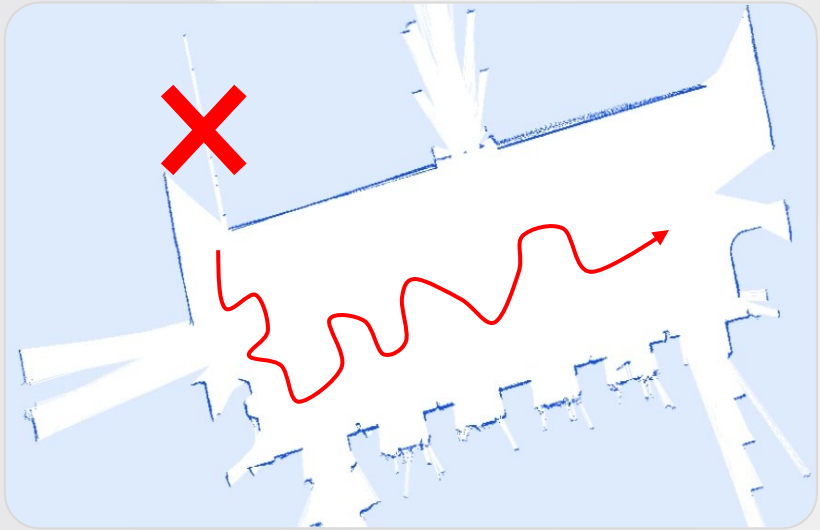
Observe the mapping state through the tablet after starting mapping

(1) Control the robot to move smooth and straight without curve paths, after starting mapping;

(2) Make sure the robot rotates slowly in situ (with the angular speed less than 20°/s) and move straight when it rotates or turns;

(3) Make sure the robot moves straight at a speed slower than 1m/s;





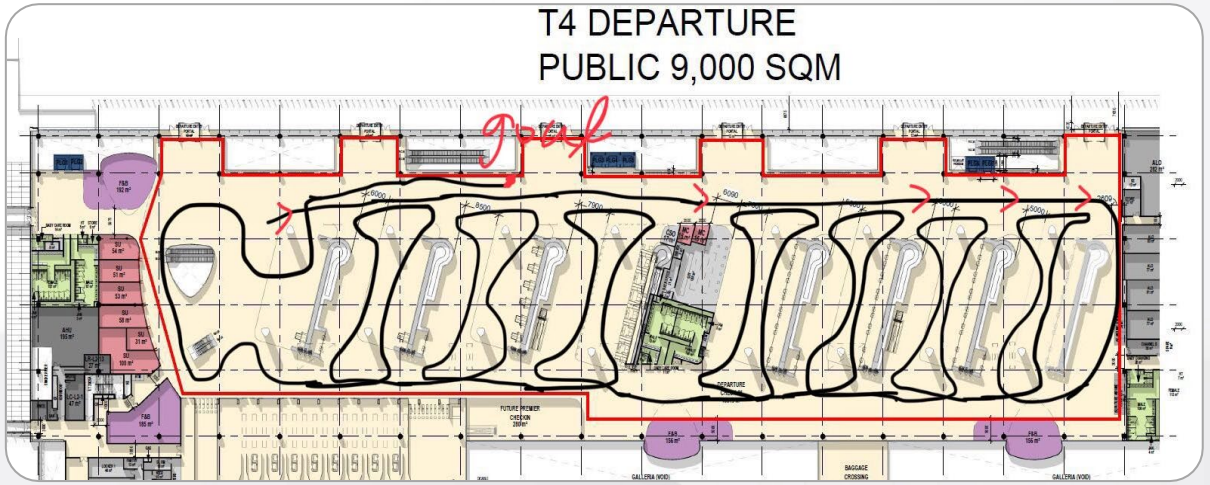
2. Mapping | Creating a map-mapping tips

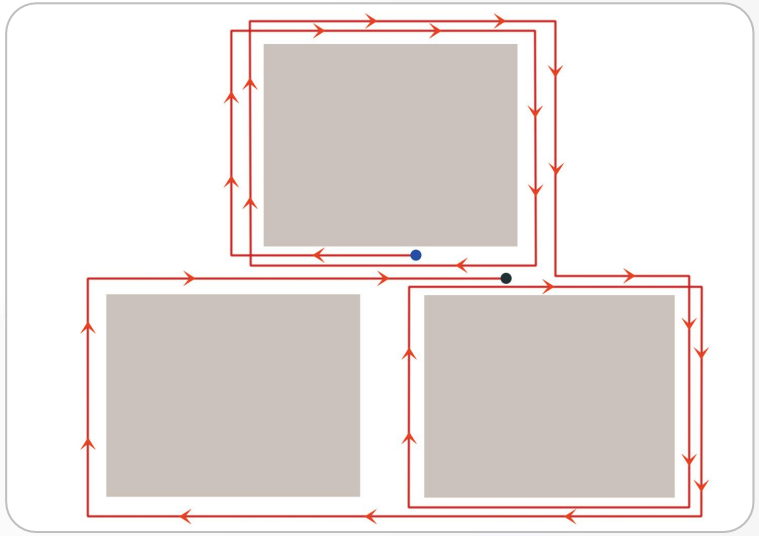
Make sure closed-loop operations are conducted during mapping in the following methods:

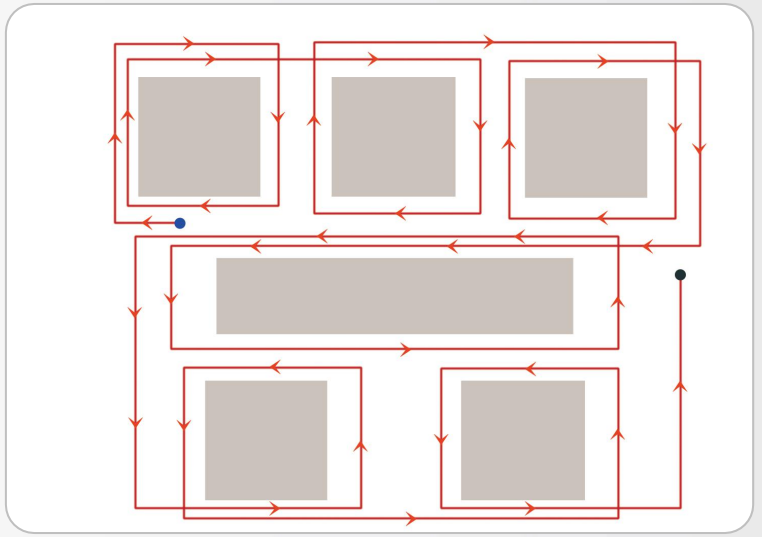
(1) Reasonably select a mapping path (small closed-loop operations at first and then large closed-loop operations);

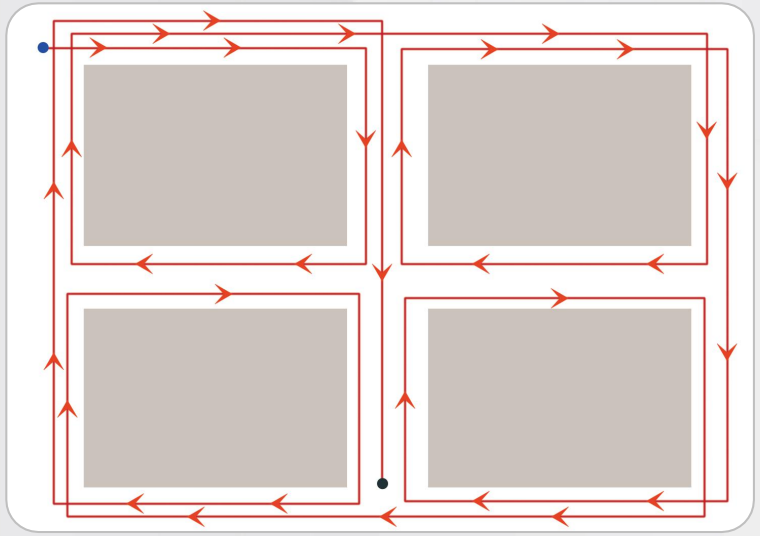
(2) Make sure the robot maps all places to be cleaned;

(3) Don’ t repeat mapping an obstacle;









2. Mapping | Compulsory closed-loop operations (usually not required)

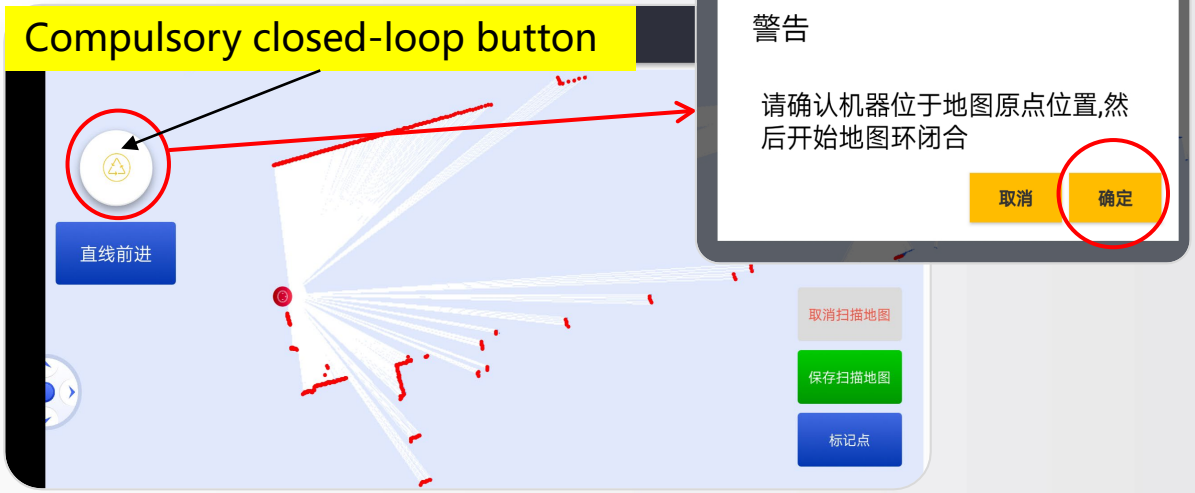
(1) Move the robot to this position after mapping under the closed-loop circumstance

a. Jump to the next page if compulsory closed-loop operations are not required for the state of map is normal;

b. Carry out the following steps if drawing overlapping and distortion still exist after 5 minutes;

(2) Click the compulsory closed-loop button on the APP’ s interface

(3) Steps: Click the compulsory closed-loop button → Click OK → Prompt successful closed-loop operations



Effects of closed-loop operations are as follows

2. Mapping | Confirming/Saving a map

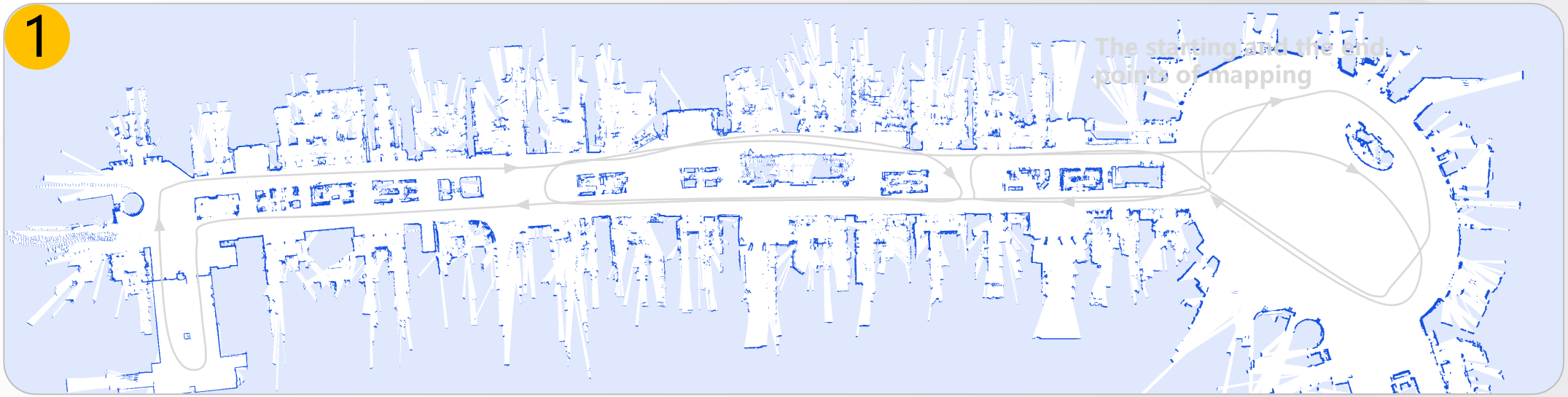
Carry out a basic check and save a map after mapping:

a. Try the compulsory closed-loop function (by reference to the pervious page) if obvious drawing overlapping exists at the end and the starting points

b. Conduct supplementary mapping if any area is missed nearby the end point

c. Map the operating area again if distortion and drawing overlapping exist in the map due to wrong closed-loop operations, which cannot be fixed

Note: The finally saved map may differ slightly from the one displayed throughout the mapping, so it is recommended to double-check the map’ s quality after saving (by reference to the next page)



2. Mapping | Checking a map’ s quality (crucial)

Examining a map’ s quality

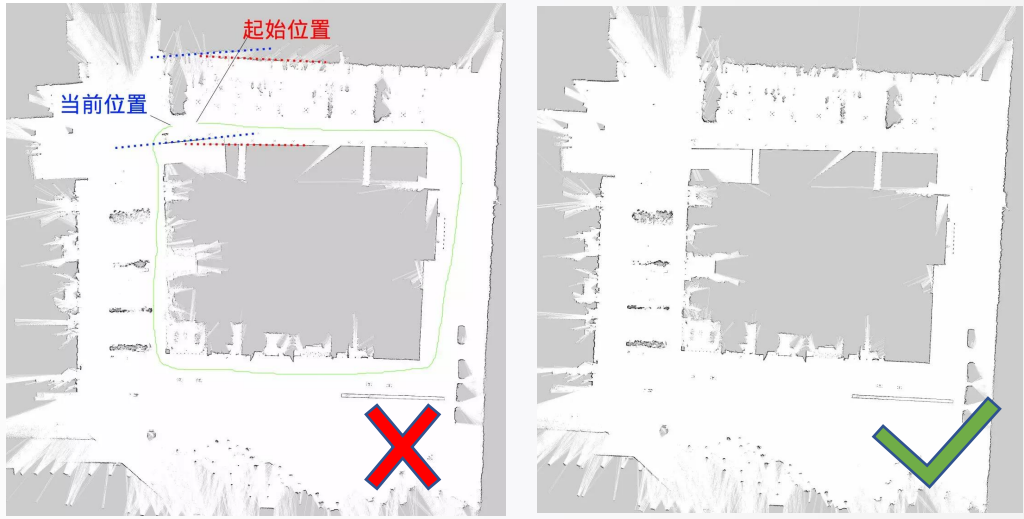
Use the original map edit function to delete the part and extend mapping if any local error exists. Map the operating area again if distortion exists in the overall structure.

Note: A map’ s quality issues can lead to risks of random operations. That means the machine may be functional during trial operations, but lose positioning or be stuck during subsequent operations

Focuses:

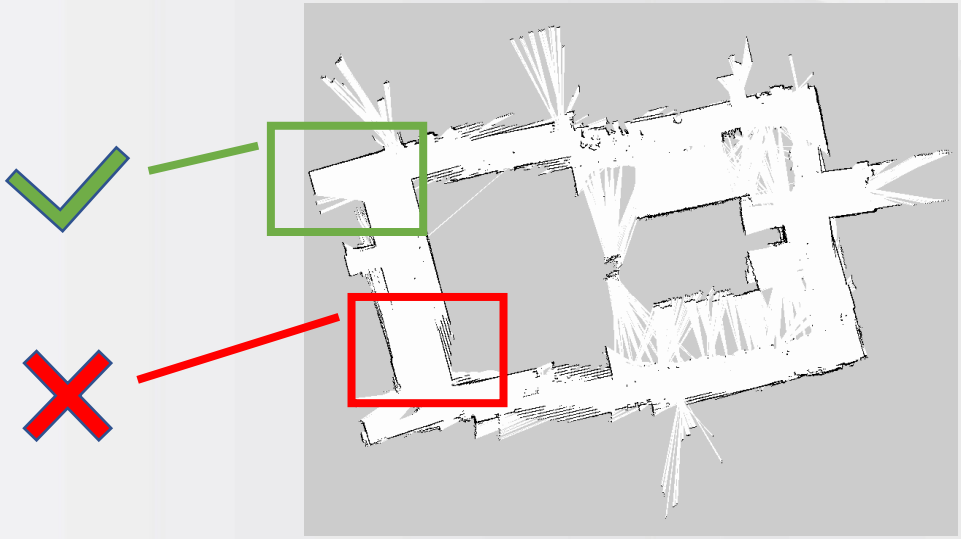
Conditions of closed-loop operations

Closed-loop operations refer to an overlap of the same area mapped at different times by the robot. False or missed closed-loop operations can lead to wrong map information and produce large positioning offset and jump during machine operations, resulting in machine jamming or lost positioning



Conditions of drawing overlapping

Drawing overlapping indicates an imprecise map. The most common drawing overlapping situation occurs when a wall in reality becomes two parallel and similar walls in the map. Drawing overlapping greatly interference with the navigation, causing jumping positioning, jamming, etc.



2. Mapping | map extension

Extend a map under any of the following circumstances:

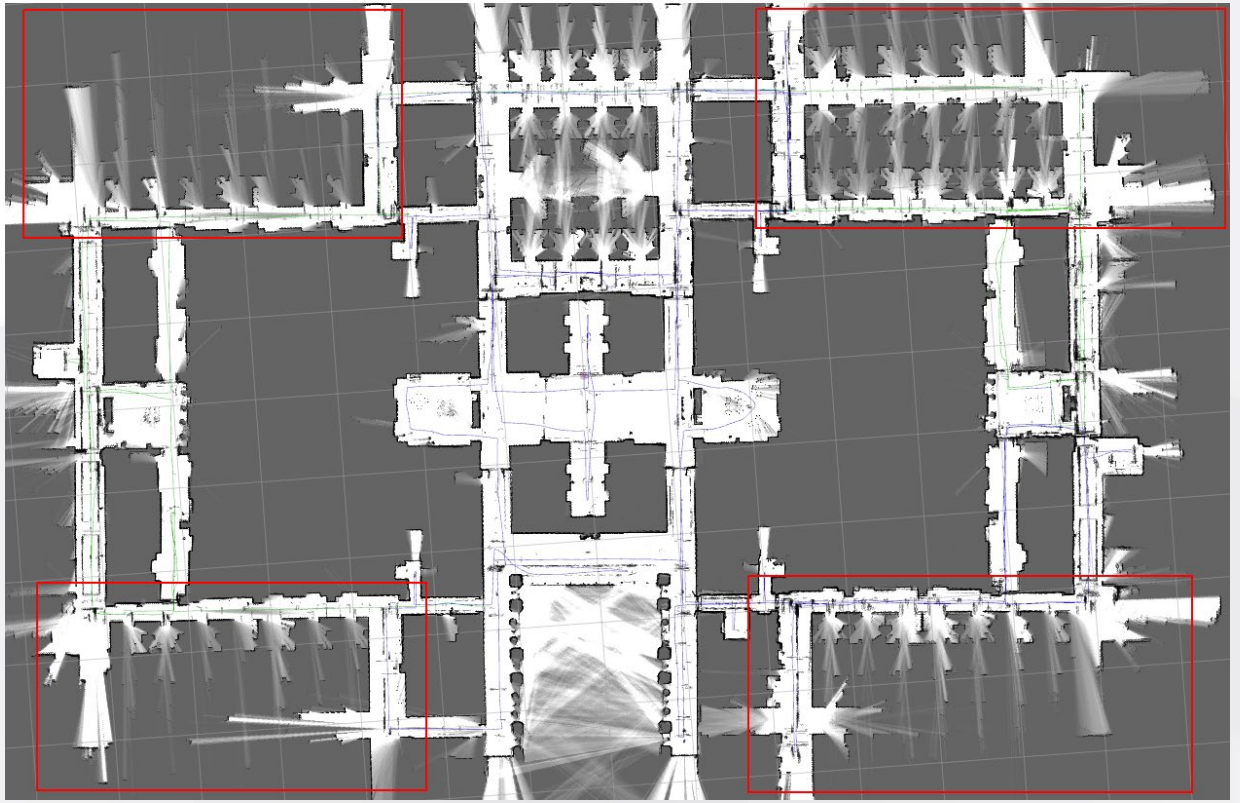
1. Add a new operating area which is not covered throughout the initial mapping
   (Make sure obstacles in the original map are complete even though lasers scanned the area)
2. Significant changes in the environment occur, especially displacement of large obstacles caused by renovation and furniture rearrangement
   (Delete the area' s map with the original map edit function and extend map in this case)
3. The operating area is too large to be mapped at one time, so the map can be extended for several times to improve the success rate
   (Note that the final map cannot exceed 7,000m^2, otherwise the robot will not operate stably even if all the operating area is mapped;
   Multiple maps shall be created at sites with oversized areas and separate tasks shall be set up)
   a) It is recommended to map the main structure and make sure it is complete and undistorted if different areas are connected as shown in the photo on the upper right corner, and to detail each area
   b) It is recommended to extend different areas in order if these areas are connected as shown in the photo on the lower right corner

Application method:

1. Choose the map to expand in the map list, and click "Map Extension" on the lower right corner

Note:

1. Select a suitable starting point when extending a map, the same as mapping
2. Carry out small closed-loop operations at first and then large closed-loop operations, and save the map after making sure that no drawing overlapping/distortion exists
3. Successfully position the robot on the initial map, move it to the main path, click APP and start extending the map; make the robot run for over 10m on the initial map and extend the map at designed areas in line with the closed-loop rules



a) Map the main area and all the corridors used for connection as presented in the above photo, and separately extend the map to the four corners within the red frames

b) Map three areas in order from right to left, make sure the map has favorable quality each time and restore its original state with "Map Recovery" before extension if the extended map has poor quality

3. Map Editing

Map edit provides 13 buttons as follows:

Virtual wall editing

--Floor light editing

Slope marker

Original map editing

Carpet area

Deceleration zone

Display area

Highlighted area

Elevator area

Siren sounding area

No fall risk area

Temporary carpet area

Temporary exhibition stand area

Glass wall

3. Map Editing

Definitions of edit buttons:

Editing mode	Description	Shapes available	Remarks
Virtual wall editing	Forbid the robot from passing, mainly use for marking areas where lasers fail to scan to avoid the robot accidentally colliding in the above areas and causing danger. Such as stores and fragile goods	Line segment/polygon/circle	**Black** line
Slope marker	Improve the thresholds of obstacle height and risk prevention triggering. The machine will slow down when passing this area and the equipment will be normally turned on.	Polygon	**Dark blue** line
Original map editing	Empty the area: box select to empty the selected area when modifying noise and obstacles on the original map.	Polygon	Area surrounded by **black** lines
Carpet area	Preferably avoid this area, turn off the equipment to pass the area if there is no other way and restart the machine after passing It is recommended to avoid carpet areas with virtual walls to elude unknown risks; no more graphic explanations in the following content	Polygon/circle	**Green** line
Highlighted area	Highlighted areas, or key positioned references, are features selected on the map that are fixed and immobile, such as walls and partitions, for marking. Cover the fixed features as far as possible with the highlighted areas, and make sure the highlighted ones are not overlarge to avoid introduction of nonfixed areas. The robot will give more weights to the features of the highlighted areas to reduce the interference of frequently moving nonfixed features in positioning.	Polygon/circle	**Cyan**

3. Map Editing

Definitions of edit buttons:

Editing mode	Description	Shapes available	Remarks
Elevator area	Use the function only at a place where elevator control is equipped, that is, the place of cabin	Line segment/polygon/circle	**Purple** line
Siren sounding area	The robot will continue to sound the siren when it reaches this area for warning - not supported yet	Polygon	**Light brown** line
No fall risk area	Indicate that this area has no fall risk, so the risk prevention function is not triggered Common environments: glass bleachers, glass floor, etc.	Polygon	**Greyish-green** line
Temporary carpet area	In this area, only a machine with carpet ultrasound installed can work. The robot judges the conditions within a temporary carpet area when it reaches here, 1. The robot will mark this area as a carpet area and will trigger a mechanism to lift the corresponding equipment over the carpet when carpet ultrasound detects a carpet here. 2. The robot will perform tasks in this area as normal if carpet ultrasound detects no carpet here	Polygon/circle	**Green** line
Temporary exhibition stand area	The robot will judge the conditions within a temporary exhibition stand area when it reaches here. It will automatically avoid a temporary exhibition stand within the detection area if there is any; and operate as normal if there is no stand within the detection area.	Polygon/circle	**Grey** line
Glass wall	Mark areas with glass walls to filter the glass refraction noise, reduce unsmooth operations of the robot due to noise	Polygon/circle	**Light blue** line

3. Map editing | Virtual wall editing

Edit a virtual wall: create a virtual wall for isolation if there are glass walls/stools and other irregular/translucent/fragile objects, as well as steps.

(1) Click “Reference Layer” and “Virtual Wall” to check the previously added virtual walls.

(2) Drag the buoy to a suitable position on the touch screen, click “**Add New Point**”, move the buoy to the next target position and click “**Connect the Point to**”, to generate a black line;

-> The line is the virtual wall, which can end at any time, regardless of the number or length

(3) Draw multiple lines as far as possible since these lines can be deleted and redrew at any time if there is an error

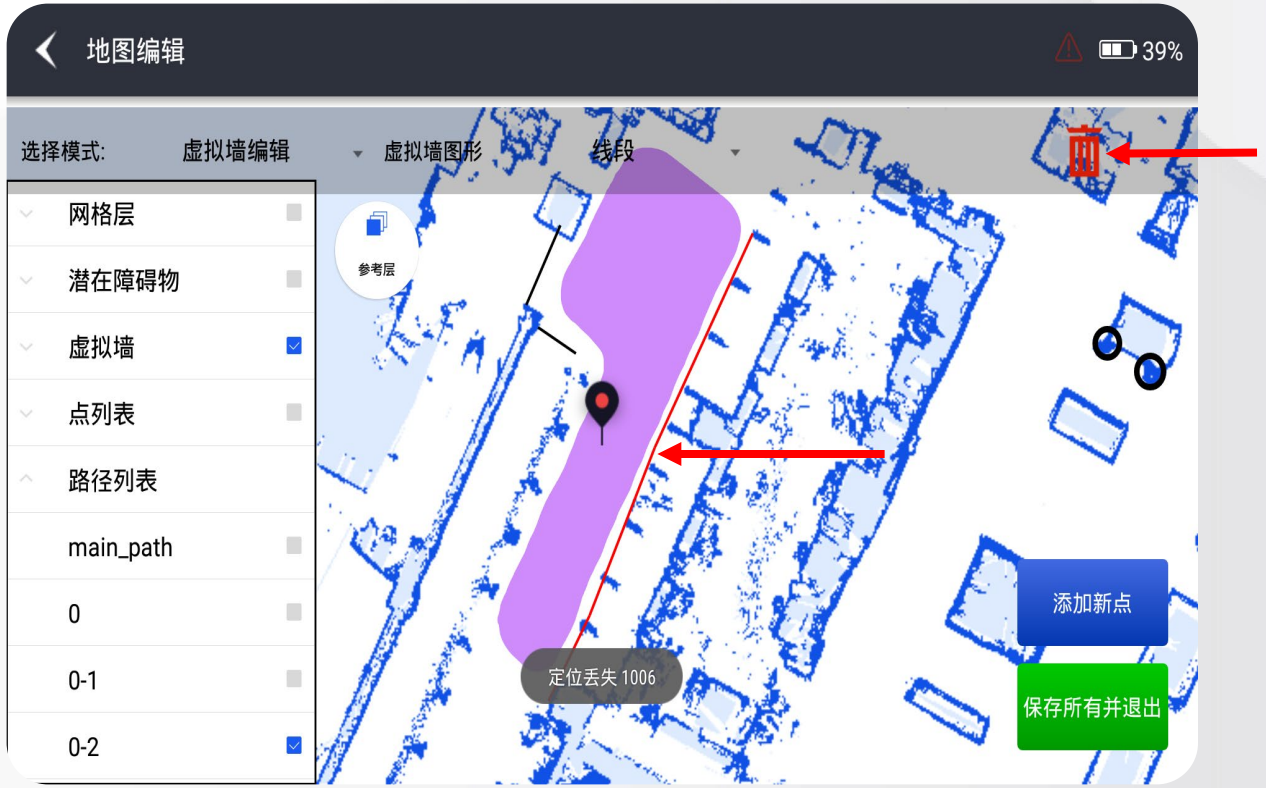
(4) Select "Save All and Exit" -> OK on the lower right corner after building the virtual wall.

3. Map editing | Virtual wall editing

Delete a virtual wall:

Click the virtual wall that needs to be deleted and the red delete button on the upper right corner when the virtual wall changes from **black** to **red**, to delete the virtual wall.

Select the virtual wall → and click delete



3. Map editing | Virtual wall editing

Steps to draw virtual walls in special areas:

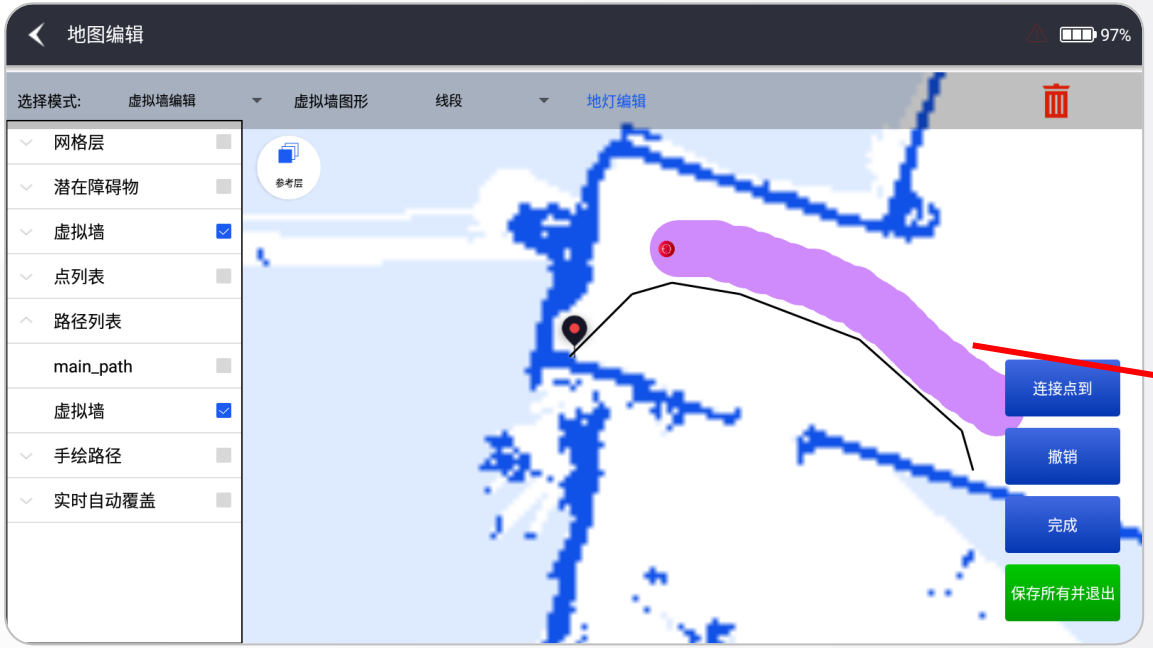
In the case of glass doors, bosses and other scenarios whose profiles are hard to map, we shall resort to other ways to draw virtual walls:

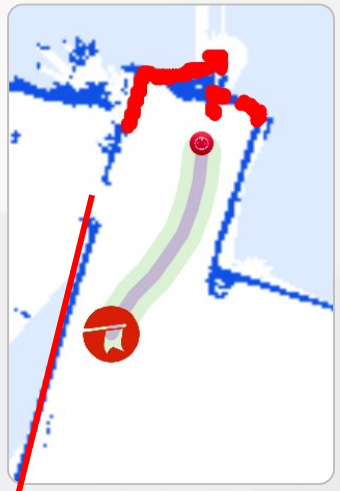
(1) Walk next to an obstacle on the Teaching Mode and draw a path after mapping

(2) Return to the interface of map edit, open the reference layer and check the tutoring path

(3) Draw a virtual wall according to the expansion area and save it

(4) Delete the tutoring at the end



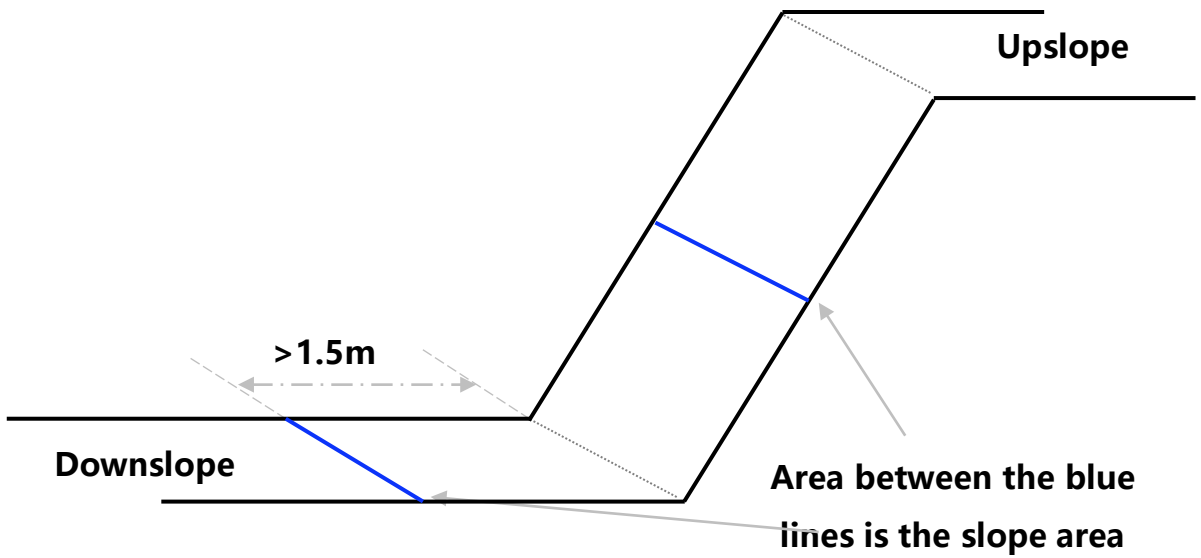


3. Map editing | Slope marker

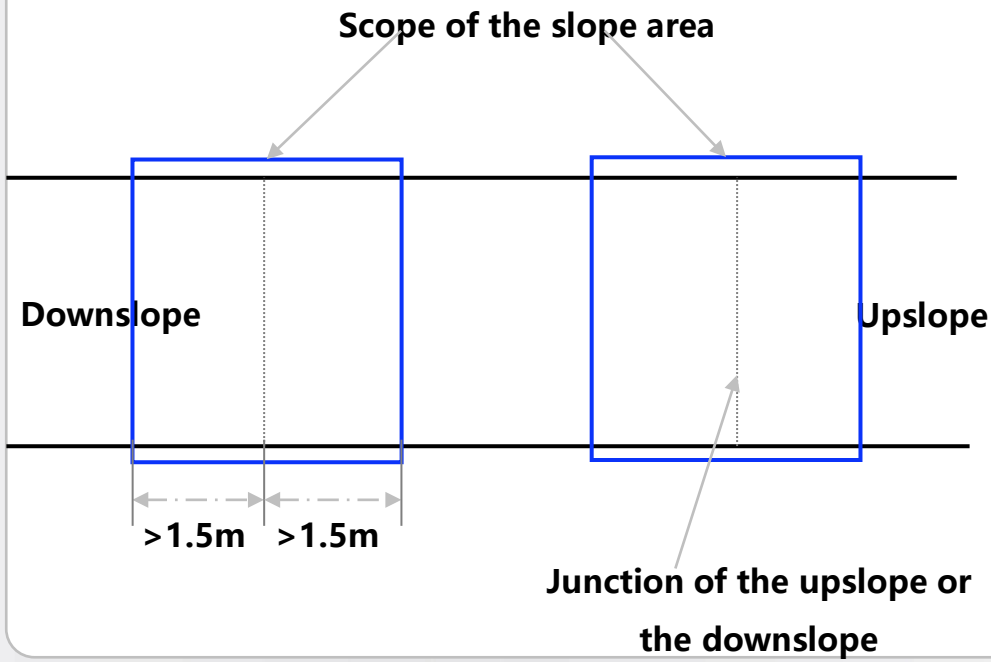
(1) The robot can intelligently identify a slope when moving up and down the slope. The user can design their own robot response logic, such as deceleration, based on robot application requirements.
(2) Markers for an area shall be applied in the junction of the upslope or the downslope, and it is unnecessary to mark the entire slope;

- The entire slope can be included if it is shorter than 4m;
- It is recommended to include obstacles that the robot doesn’ t have to avoid in a slope area if the slope area is used for delineating the passable region;

Axonometric drawing



Top view



3.Map editing | Original map editing

(1) Box select to empty the selected area when modifying noise and obstacles on the original map;

(2) Currently recommend to use “Empty the Area”, and forbid the use of “Fill the Area”, which can be substituted by virtual walls.

Note: Don’t delete solid walls, only irrelevant noise

Steps:

Select the mode → original map editing → find the noise area → box select the noise area by pressing “Connect to Point” → click “Done” → select “Empty the Area” → and click “Save All and Exit.”

3.Map editing | Highlighted area

Position: fixed and unchanging objects, such as pillars, walls and corners;

Note: ① Don’ t introduce other movable obstacles in highlighted areas; ② create a highlighted area each 15m to 20m;

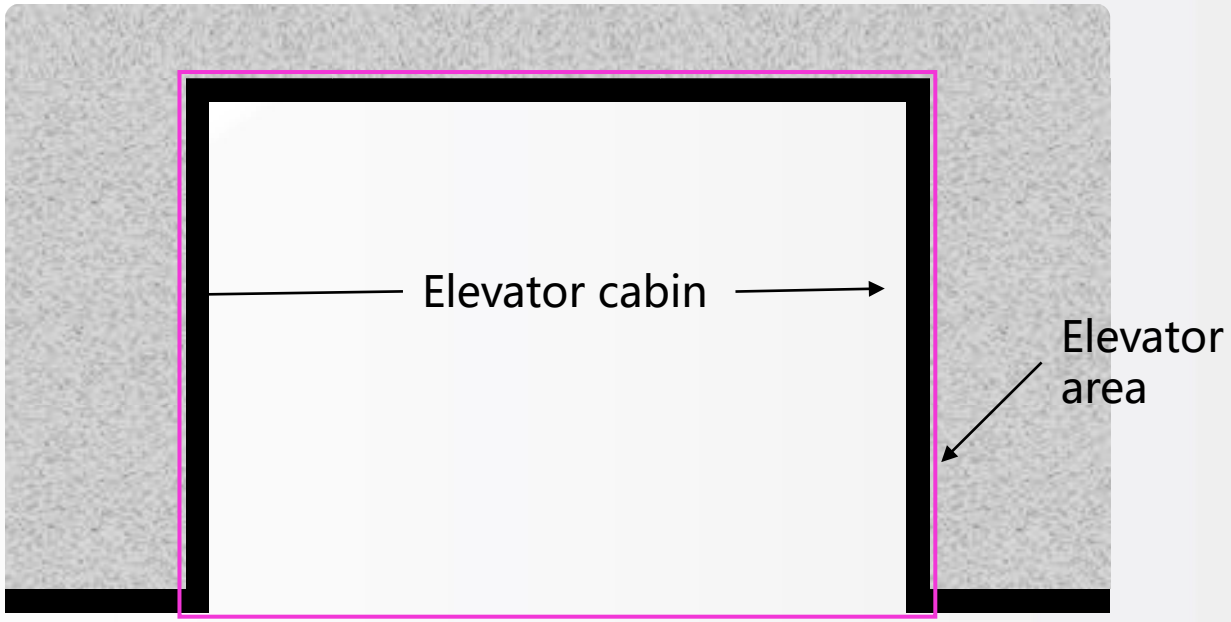
Steps to draw a highlighted area:
Add a new point → connect the point to another point until the target is surrounded, generate a highlighted area within the cyan box at the time, and click “Save All and Exit” at the end

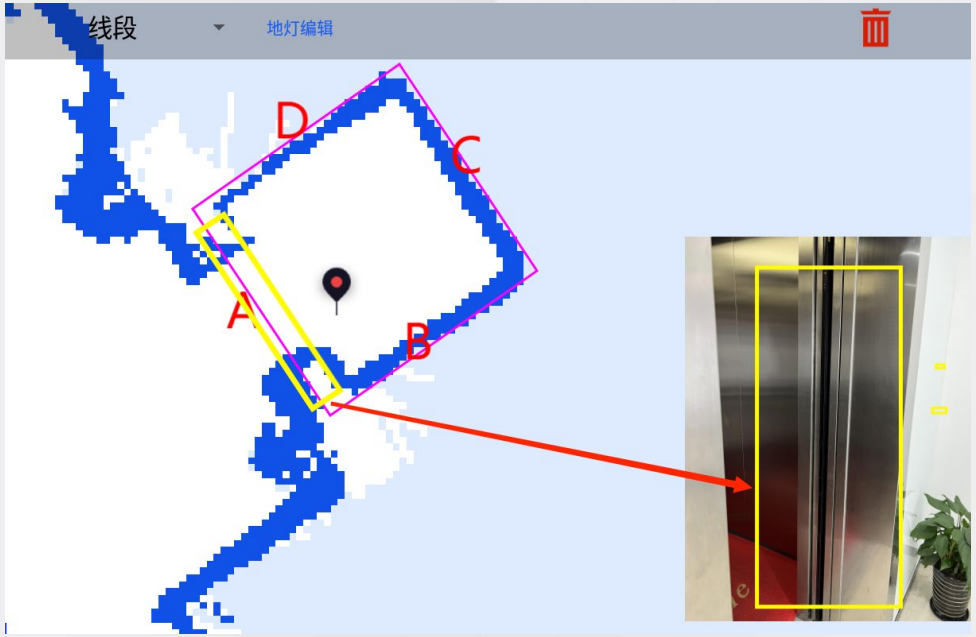
3.Map editing | Elevator area

(1) Modify the map with the original map edit function if the elevator door or cabin has noise to ensure that noise doesn’ t exist in the door or cabin
(2) Include the entire elevator when drawing an elevator area based on the elevator’ s profile, that is, four sides of A, B, C and D
(3) Side A is the elevator door of which the middle shall not have noise, and the user can edit after mapping. Side A shall indicate the middle of the elevator door as presented in the following photo; to easily and automatically generate an elevator point in the middle of the elevator door which is the crucial basis for the position where an elevator point is generated. The elevator point may deviate on the map, but it is generated according to the actual elevator door.

Position: mark an elevator area according to the border of the elevator mapped, which perfectly includes cabin in the elevator area

Note: Side C of the elevator area on each map shall be in line with the elevator’ s profile and lines shall not be drawn too close or far





3.Map editing | No fall risk area

Deployment rules at a site with real fall risks:

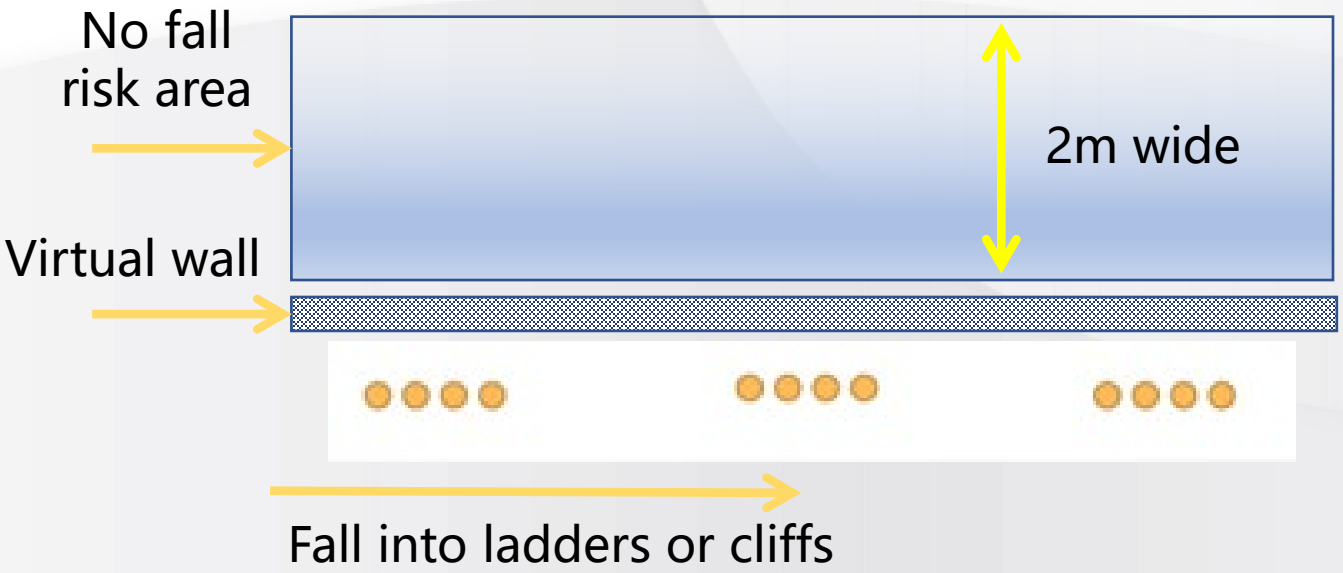
Separate an operating area of the machine and a falling area with a virtual wall which is drawn away from the falling area as far as possible (at least over 0.5m)

Role of the no fall risk area: the robot automatically ignores fall risks identified in this area and doesn’ t trigger the fall prevention function when passing.

Application scenarios: the robot will detect the external falling areas when it is inside glass doors and windows, or fire doors that may be opened

Note: make sure to separate a “no fall risk area” and an external real falling area with a virtual wall

Set the area within 2m inside a door or window as a no fall risk area, as presented in the right photo



3. Map editing | Temporary carpet area

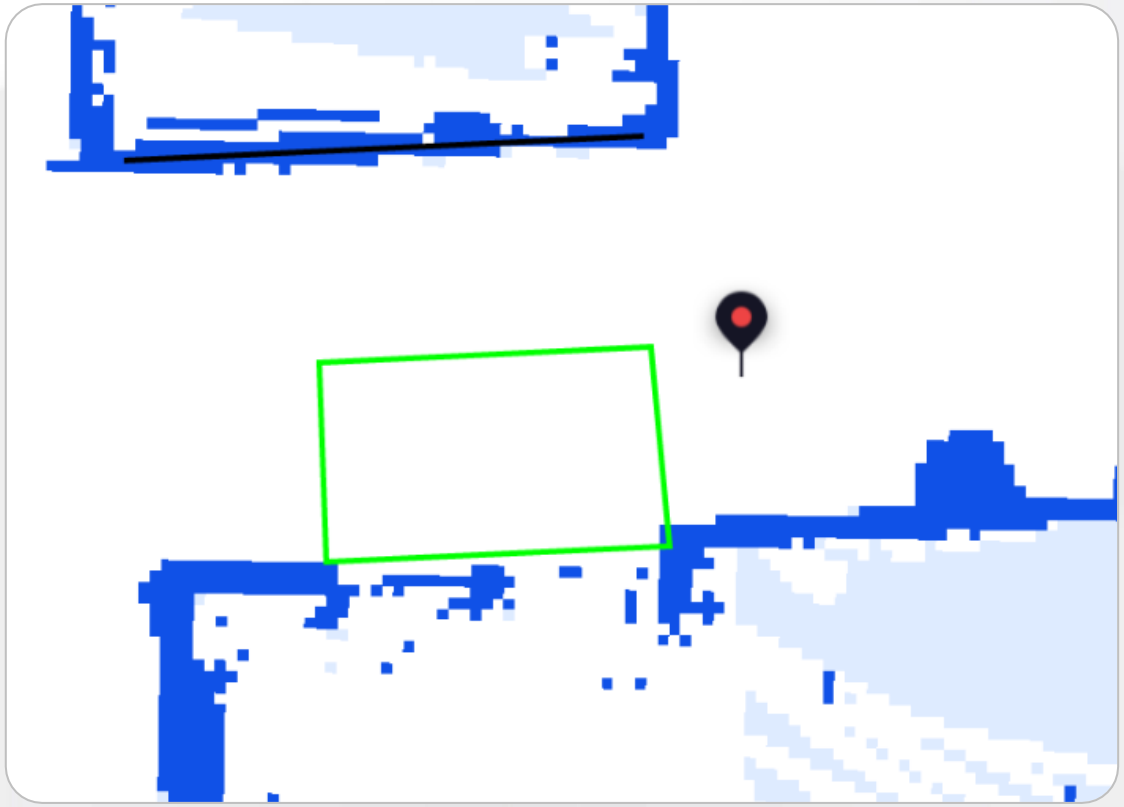
(40 is temporarily not used)

(1) The robot judges the conditions within a temporary carpet area when it reaches here,

(2) The robot will trigger a mechanism to lift the corresponding equipment over the carpet when there is a carpet on the detection area.

(3) The robot will perform tasks in this area as normal if there is no carpet on the detection area;

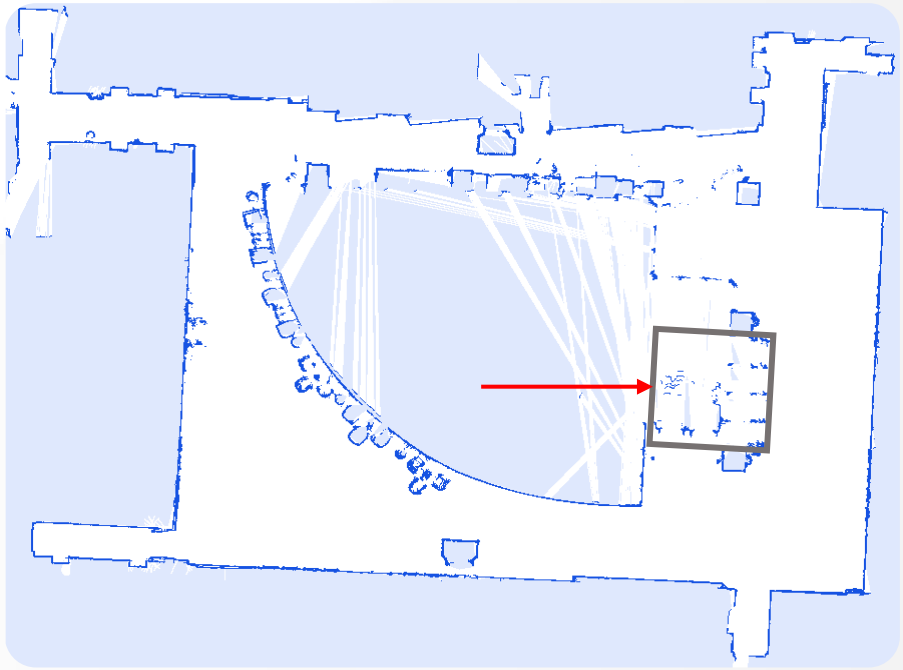
Note: Only a machine with carpet ultrasound installed can work and virtual walls are recommended to avoid carpet areas.



3.Map editing | Temporary exhibition stand area

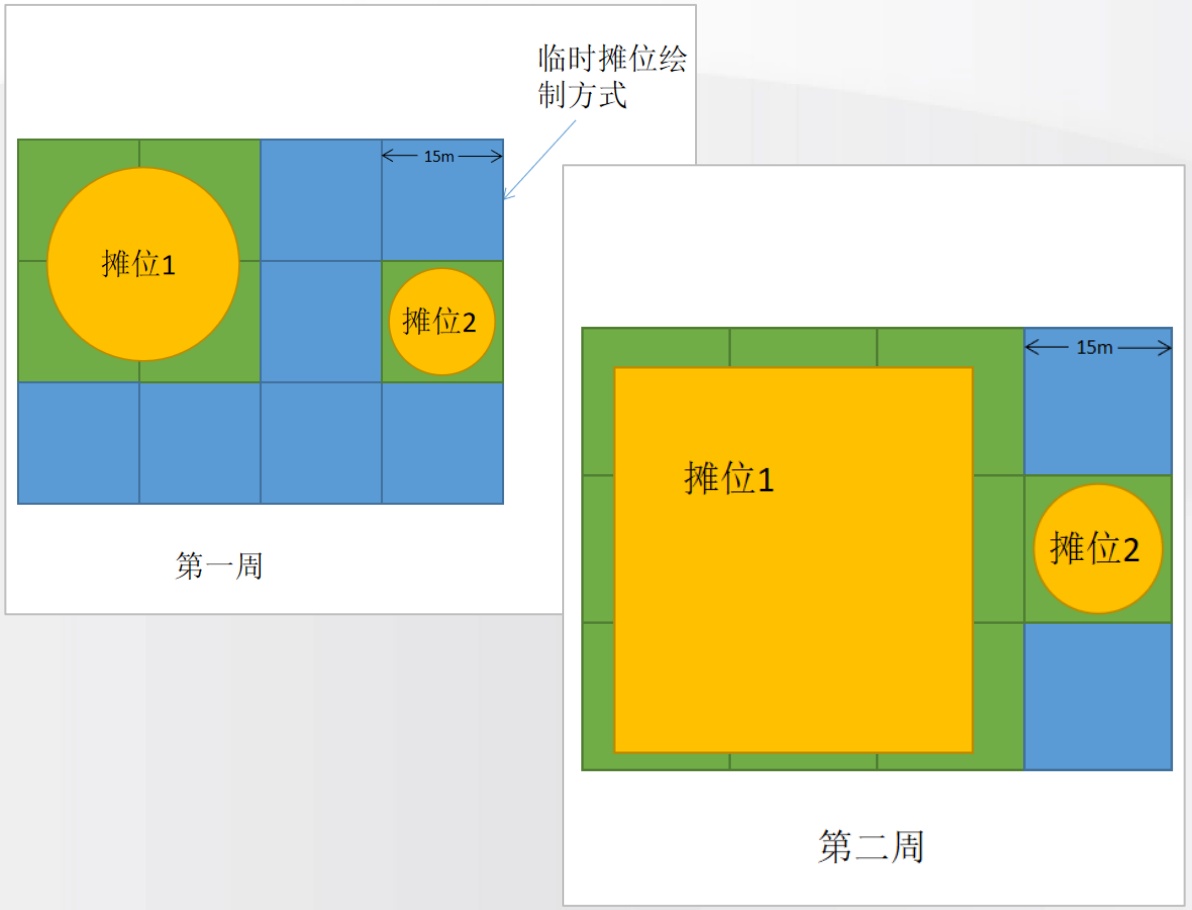
Temporary exhibition stand area: draw temporary exhibition stand areas for temporary placement of exhibition stands and activity areas;

Explanation: Such areas will be forbidden if the robot detects many obstacles; the robot can judge intelligently, and enter such areas for cleaning if there are fewer obstacles;



Please draw large areas (an exhibition stand with equal side length >15m) according to the following steps

Splice multiple temporary exhibition stand areas

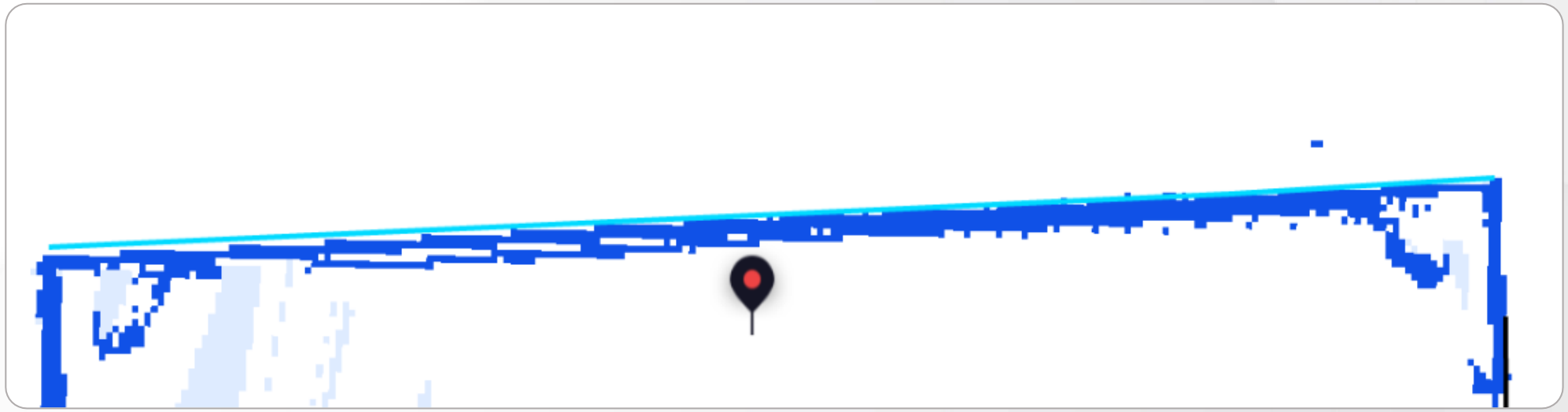


3.Map Editing | Glass wall

(1) Noise may be generated and trigger obstacle avoidance when the robot operates against a glass or a solid wall.

(2) The robot can intelligently filter irrelevant noise if a glass wall is drawn.

Prompt: Draw both a glass wall and a virtual wall if there is an actual glass wall (within 10cm)



3.Map Editing | Floor light area

Draw a floor light area to avoid damage to floor lights and equipment if there are floor lights or pop-up floor boxes.

(1) Select floor light edit, remind of positions, choose “**Matching**” if positions are normal or reposition lamps or boxes if positions have exception

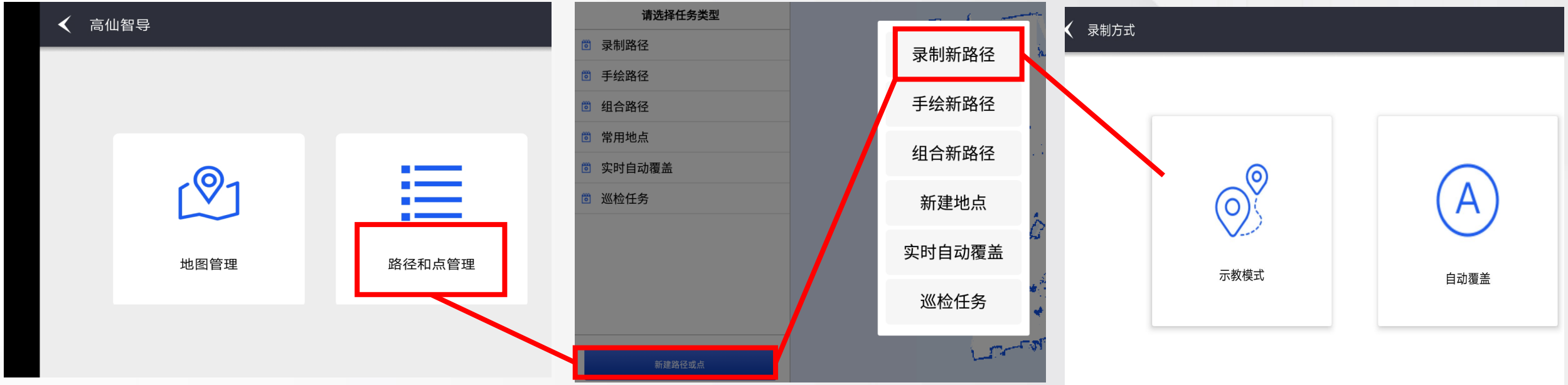
(2) Make the robot face floor lights, press its head against the middle of each floor light, click “Start Marking”, and save the data

Press the robot’s head against the middle of each floor light

4. Creating Paths

(1) Plan a path after map editing: Click “**Path and Point Management**” to access the following interface;

(2) Click “Add a New Path or Point” on the lower left corner to trigger a dialog on the right, click “Record a New Path”, access another selection interface, “Teaching Mode” & “Auto Cover”.



4. Creating Paths | Teaching Mode (40 is not recommended)

(1) Click “Record a New Path” to trigger a pair of selections on the right, choose **Teaching Mode;**

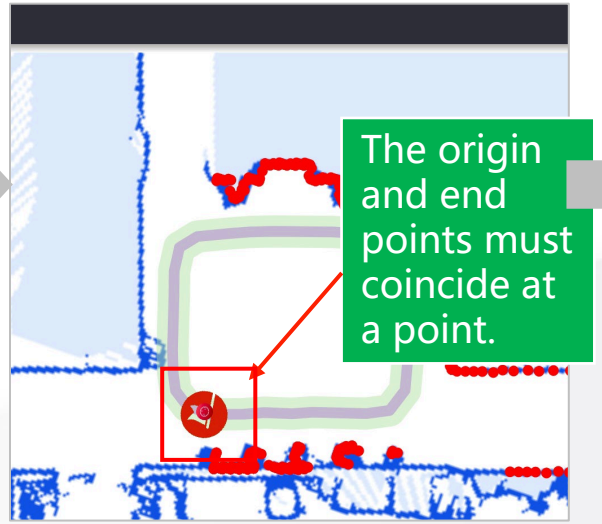
(2) Push the robot through areas to be cleaned, so that it will follow the operating path in its automatic mode.

(3) Make the path straight or cambered rather than curved;

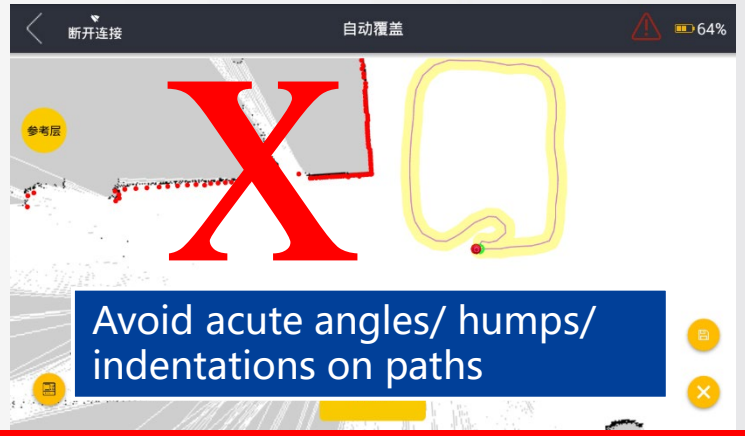
Teaching Mode → enter the path name → manually manipulate the robot to walk through the area to be cleaned → and save the data

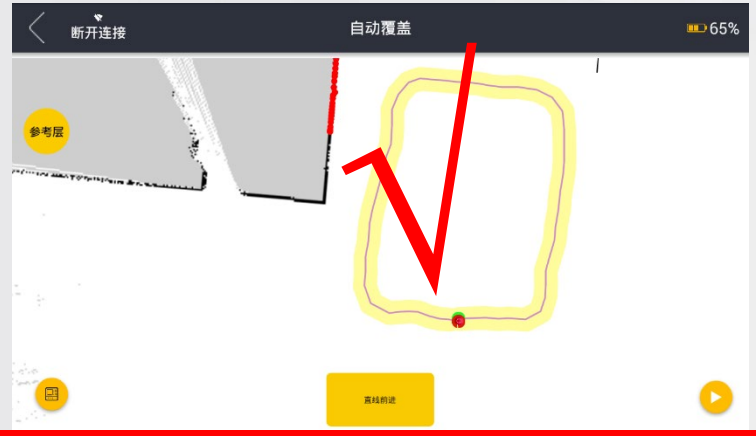
4. Creating Paths | Auto Cover (40 is not recommended)

Auto Cover → Enter the path name → Manually push the robot to record a closed area → Save the recording



The following two cases in which the coverage path recording is unfeasible shall be avoided.





Customers have certain requirements for path rules. Offline Auto Cover can be applied when there is no foot traffic or moving obstacles. But this function is not recommended.

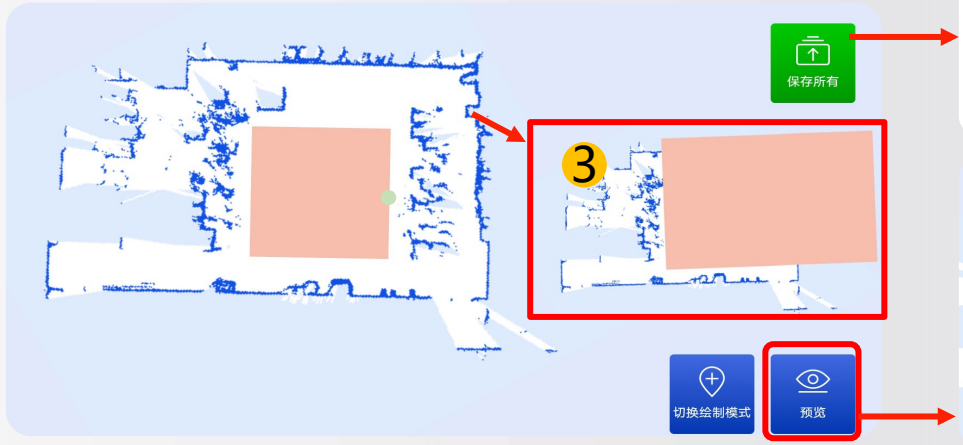
4. Creating Paths | Real-time Auto Cover

(1) Enter the data management page and select "**Path and point management**".

(2) Click “Real-time Auto Cover”

(3) Use two fingers to zoom in or out, rotate the square, or drag its four sides until it covers the area to be cleaned (the square can extend across walls and obstacles, which will not affect the generation of path)

(4) Click the "**Preview**" in the lower right corner to confirm that the path is right. Then, click "**Cancel preview**”. Next, click "**Save all**” in the upper right corner to return. Finally, enter the new path name.



4. Creating Paths | Real-time Auto Cover

(1) Enter the data management page and select "**Path and point management**".

(2) Click “Real-time Auto Cover”

(3) Click "Switch drawing mode" in the lower right corner;
(4) Create clean areas by dragging the floating button and adding points;
(5) Click the "**Preview**" to confirm that the path is right. Then, click "**Cancel preview**” . Next, click "**Save all**” in the upper right corner to return. Finally, enter the new path name.

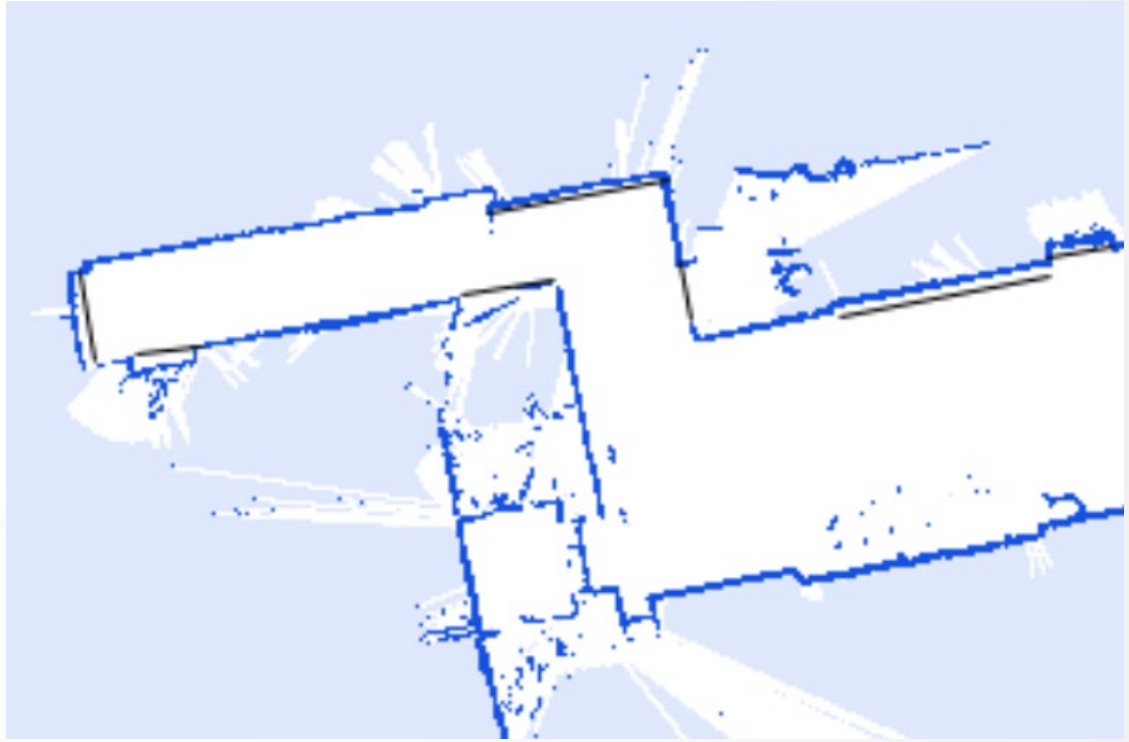
4. Creating Paths | Real-time Auto Cover and Virtual Wall Addition

Supported versions

Hanting Version II, eco_decision version No.: t5.116.6, and later versions

M - supermarket wall-follow cleaning Phase I - build1, eco_decision version No.: fxy5.100.0

The virtual wall can be drawn along the surface of the obstacle, or within a depth of 10 cm inside the obstacle, as shown by the green line in the figure below.



Artificial wall lines: Add a wall-follow command according to which the robot will do the cleaning along the virtual wall.

How to enable: In the hotel scene, this function is enabled by default. In other scenes, it’s required to click “data management -> settings -> advanced settings -> robot configuration -> view parameters -> strategy-> realtime_auto_cover-> use_virtual_wall_tracking” in the app, and then restart the machine.

4. Creating Paths | Real-time Auto Cover and Virtual Wall Addition

Set the distance from the virtual wall

Click “data management -> settings -> advanced settings -> robot configuration -> view parameters -> strategy-> realtime_auto_cover-> safe_distance. Change the parameter to adjust the distance (unit: m) of the robot shell from the obstacle. Then restart the machine after the modification.

Note

1. After the above two parameters are modified, they will be saved in “public/user_config.yaml”. Thus, the updated version will not be restored to default.
2. The parameter of wall-follow distance is applicable to adjust the distance of the robot from the virtual walls and wall lines.
3. Collision and stuttering will occur if the default distance from the wall is changed. If such a change is a must, please be sure to perform the test several times. The safe distance shall not be less than 0.04 m.
4. Enabling or disabling the function of cleaning along the virtual walls does not affect that along the wall lines. Both functions can be used at the same time. By turning off the function of detecting wall lines in the app, the wall- line-follow function can be disabled.
5. Before performing the task of cleaning along the edges for the first time, it is necessary to confirm whether the selection of the cleaning equipment is correct. The method of selecting the cleaning equipment can be found in this document: https://gaussian.yuque.com/docs/share/6a06d2bf-9d9c-4760-9c1e-036f11d3afb6?# 《50fusion根据清洁模式切换footprint方案文档》.
6. The wall lines cannot be automatically identified because of the indentations at the doors in the hotel, so artificial wall lines shall be drawn.
7. At the corner of the physical wall, the virtual wall with the function of artificial wall lines shall not be drawn. Otherwise, the machine will enter the wall-follow cleaning mode and collide with the wall when it makes a turn.

4. Creating Paths | Creating new locations

Point name	Definition	How to create	Remark 2
Landmark point	Point to locate the robot	Mark directly on the map, noting the arrow direction which points to the front of the robot	Recommended to create Be sure to communicate with the customer about the location to be created (ensure the location is stable, reliable and is easy to find)
Charging point	Points need to be created for automatic charging	Manually connect the robot to the charging pile, and directly mark the current point as the charging point (the charging point can only be used at the site with charging piles).	A charging point must be created if there exist charging piles, and only one charging point is permitted.
Maintenance point	Low power, an empty clean water tank or a full sewage tank will make the robot return to this point	Mark directly on the map, noting the arrow direction which points to the front of the robot. After the robot arrives at the maintenance point, it will wait for people to conduct the maintenance and click the button to continue the task.	A charging point must be created if there exists no charging pile or workstation. Priority: workstation > charging point > maintenance point
Navigation point	The point at which the robot automatically navigates its way to the target location.	Mark directly on the map, noting the arrow direction which points to the front of the robot	This creation is optional.
QR code point	Scan the QR code to automatically navigate and select tasks.	The QR code needs to be printed and fixed on the wall or ceiling (with the same height as that of the front camera). The front camera is oriented towards the QR code and points are created according to the prompts.	This creation is optional.
Elevator access point	It’ s not required to create this point manually. After the elevator control area is drawn, it will be automatically generated.		This point must exist in the elevator control area. You do not need to create it manually.
Initialization point	Not in use currently	/	This creation is optional.

4. Creating Paths | Creating new locations

(1) The colors of different types of points are different;

(2) The workstation and the charging point cannot be used at the same time;

(3) When the “Support initialization point” is selected, it needs to be built in the place where there exist characteristic values;

(4) In the elevator control scene, the landmark point shall be built at the entrance of the elevator on each floor;

① Click "Create new locations"

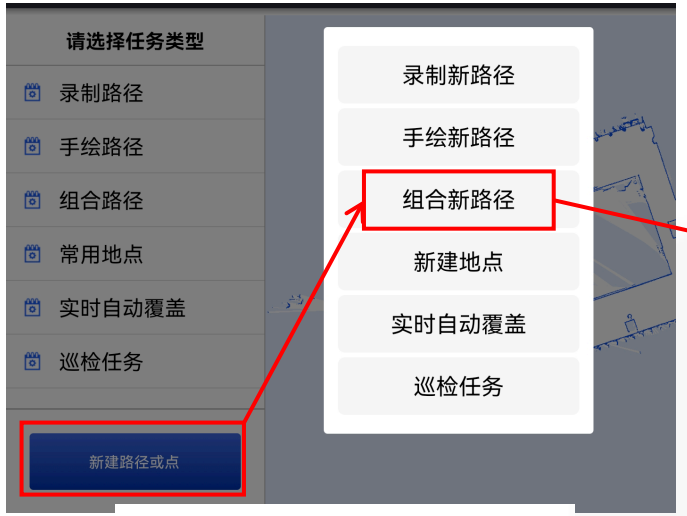
② Select the type of point you need, enter the name of the point below, adjust the angle through the slide and click “Confirm-> Complete creation”.

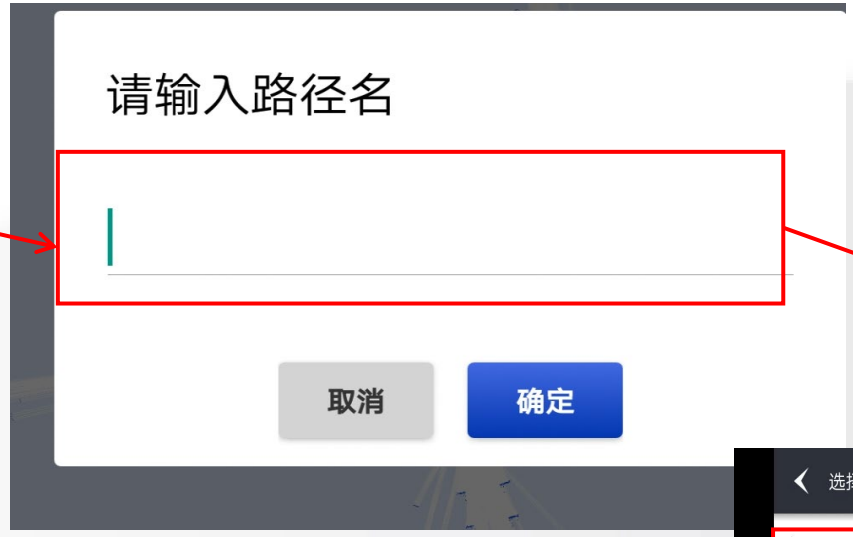
③ "Successfully added" will be displayed.

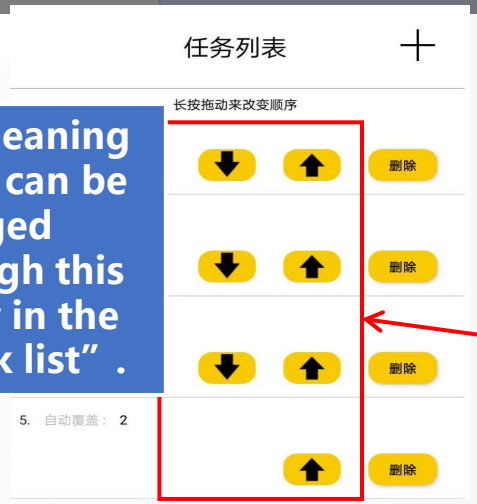
4. Creating Paths | Combining new paths

Click the "**Combine paths**" button - > Enter the name of the combined path - > Add cleaning paths - > Edit the order - > Save

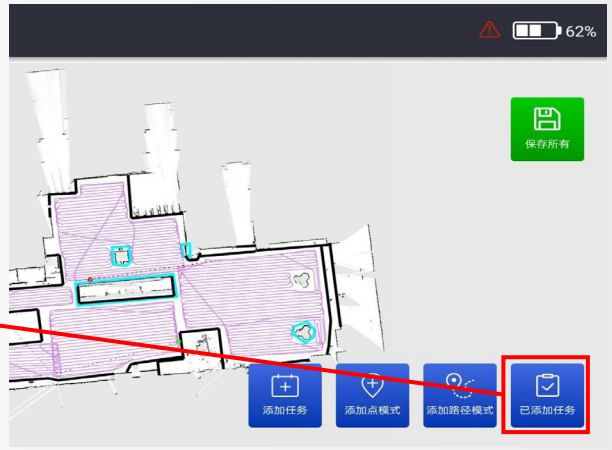
Note: At the end of each combination, a return-to-pile task needs to be added; If the robot and the pile are on the different floors, which makes such a task is unfeasible, a return-to-maintenance-point task shall be added.

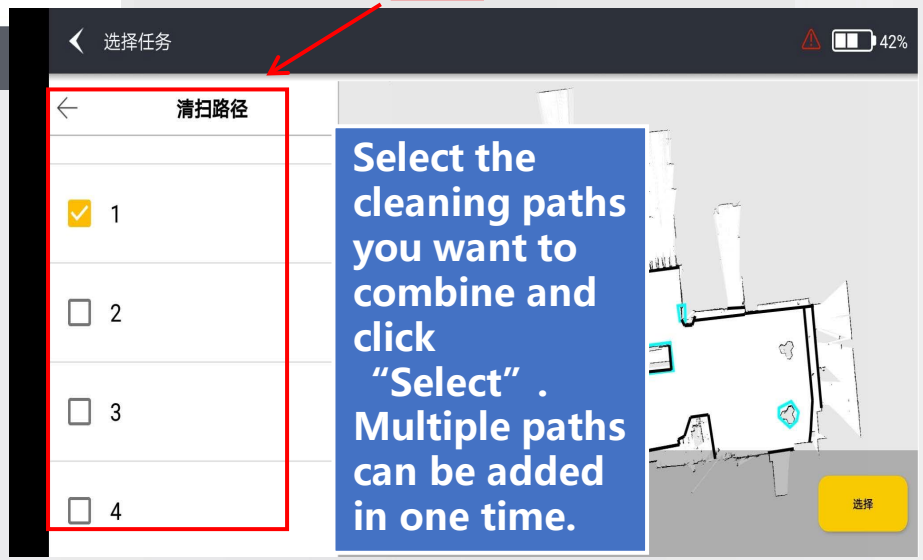






The cleaning order can be changed through this arrow in the "Task list".





Select the cleaning paths you want to combine and click "Select". Multiple paths can be added in one time.

4. Creating Paths | Combine paths Cleaning mode configuration

Select “Cleaning configuration” - > Cleaning mode, and complete the configuration of the two cleaning modes.

(1) Enter the “Combine paths” interface, choose a combined path and adjust it, and select the cleaning mode in the upper right corner.

(2) Click "Edit" in the lower right corner to enter the task edit interface

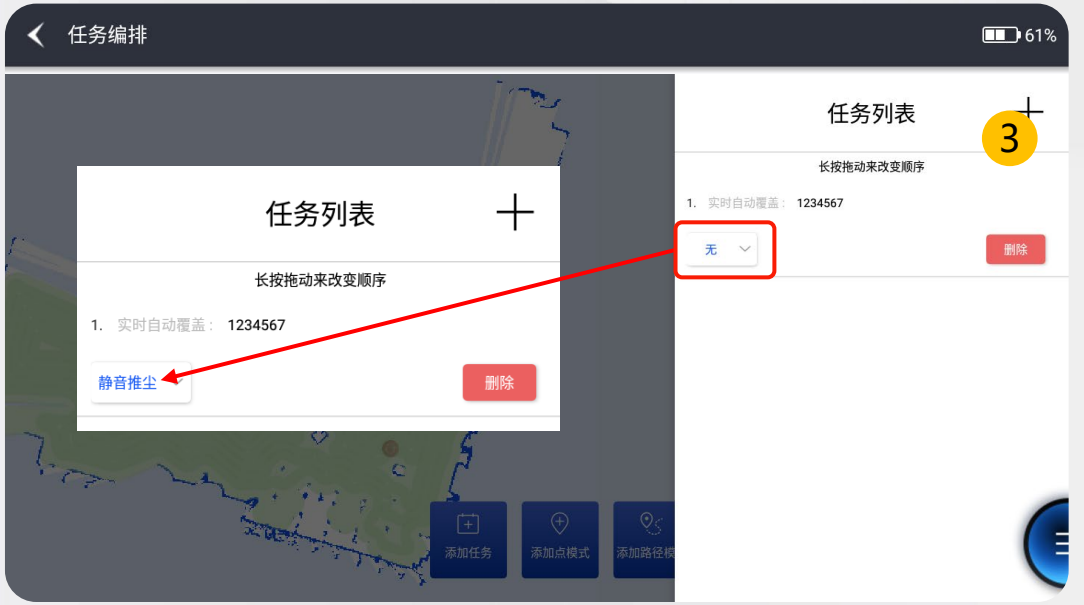
(3) The cleaning mode for one or more subpaths can be configured separately through manual adjustments.

(4) Save and exit

Logical interpretation:

•If one or more subpaths are configured with the cleaning mode, they will be independent of the cleaning mode of “Combine paths” when automatic tasks are performed.

•The cleaning mode of the subpath is given the highest priority, and the cleaning mode of combination tasks ranks second.



5. Deployment Notes

(1) Scanning and mapping

- To avoid the drawing overlapping /deformation, the turn shall be made in a very slow speed (not higher than 20 degrees/ second) during the scanning.
- The scanning shall be performed from the small to the large closed loops (only one large closed loop is needed in simple scenes). The closed loop is also required in the map expansion.
- If the quality of the image is poor, it' s required to perform the scanning again. This shall be noted because it will directly affect the positioning of the robot.
- For the areas with glasses, tables and chairs, it is recommended to paste the stickers in advance to improve the quality of the map and the automatic positioning of the robot.

(2) Path

- The Real-time Auto Cover path is recommended on the scene, while the teaching mode is appropriate for narrow passages (≤ 0.9 m).
- Obvious indentations/ humps shall not occur in the path. Otherwise, the automatically generated path will be cluttered, probably with white space.
- If a coverage path is recorded, the origin and the end points shall coincide at a point as much as possible, and the distance between the two points shall not exceed 2 meters.
- If the cleaning area is large (> 1000 ㎡) or irregular, it is recommended to divide the area into a number of relatively regular ones for Auto Cover.

5. Deployment Notes

(3) Map editing

- Be sure to draw virtual walls and highlight areas in the on-site deployment.
  ① The virtual wall shall surround the cleanable areas.
  ② The highlight area can be drawn at intervals of about 15~20 meters. Too many highlight areas are unnecessary.
- Be sure to remain the physical walls when editing the original map. Only the irrelevant noise can be removed.
- In the areas with a risk of falling, virtual walls must be drawn slightly away from such areas.
- The deployment of virtual walls shall be prior to that of paths, which will make it difficult for the two to interfere with each other.
- All functions are edited in the same way.
- All edited function areas are deleted in the same way.
- Function areas are displayed in different colors.

(4) Special environmental factors on the site

- Virtual walls need to be created for floors covered with mats, which helps avoid risks caused by the mats arched by the front wheels.
- Unless the customer can guarantee that the outlets are closed during the operation, the area with floor lights shall be created in the place where there are pop-up outlets on the ground.

Contents

1. Basic knowledge

(1) Automatic robot charging

a. When the battery of the robot drops to 20%, the robot will automatically leave for the pile and charge itself.

b. After a charging point is added to the combination task, the robot will automatically head for the pile and charge itself.

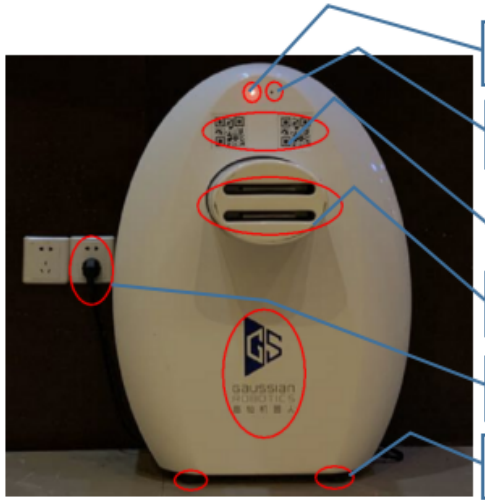
(2) Identification of charging piles

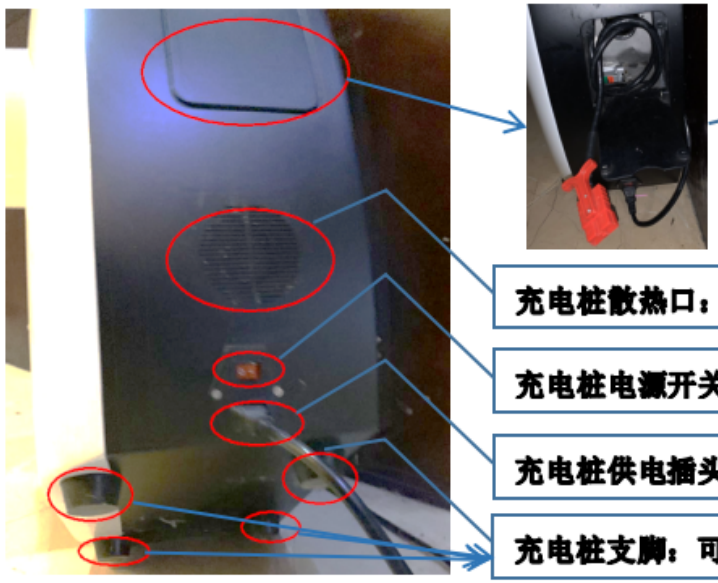
a. After the charging task is initiated, the robot will navigate its way to the front of the charging pile, and identify the appearance (length and width) with a laser.

b. If the location of the charging pile identified is not completely correct, the robot will make adjustments by moving to the left and right.

(3) Connection with the pile by stepping back and identifying the QR code

a. When the robot identifies the charging pile, it makes a 180-degree turn and steps back. At a distance of about 40 cm away from the charging pile, it will identify the position of the QR code with the back camera for the preparation of positioning the charging pile. After the accurate identification, the robot will adjust the angle and move back to connect with the pile.





2. Deployment requirements

(1) The workstation is perpendicular to the ground, and no requirements shall be met for the wall surface with reflective stickers. (The reflective stickers on the car with a number that is and comes after 678 are supported by Lanhai Laser)
(2) The space with a footprint of 0.7 m on the left and right sides of the charging pile shall be reserved, and no sundry things are allowed in such a space.
(3) No object with reflective materials is permitted within 0.6 m away from the charging pile
(4) The distance of moving the charging pile to the left and right shall be less than 10 cm.
(5) Begin with M line fusion: the reserved space in front is calculated from the wall. The space with a footprint of 1.6 m can be reserved.
(6) Ensure that the return-to-pile task is free from obstacles and connected with the task path.

3. Creating the charging point through the app

(1) Manually connect the robot to the charging pile: ensure that the positioning is accurate; make the back of the robot pointing directly to the charging pile (as shown in the figure below) so that the metal charging plates of the two are in close contact; create the charging point by marking the current point.

3. Returning to the main home screen

1 Floating window - select “Home” function: create detection-> click “Home” button-> add verification. If the current map is empty, the toast will display “the map of the robot is empty, please contact after-sales personnel”.
2. Recharging the robot with one button: the robot is capable of automatically heading for the workstation/ charging pile/ maintenance point, and apply the logic without a switch of the map by users.
3 Click “Where do you want me to go?” and the screen will display: the current position of the machine, and all the points on the current map, except those automatically generated during the scanning (origin, end and current points), and types of blocking points (charging point/ workstation/ maintenance point/ elevator waiting point/ call point/ QR code point).
4. The robot will automatically go to the point selected by users.

3. Creating the charging point through the app

(2) Set the charging point: After the setting of the charging point is completed, the robot will automatically reach the pile and gets charged when the battery reaches 10%.

① User: admin; password: 314159

② Click the left menu

③ Click “Data management”

④ Click “Settings”

⑤ Select a new path and point

⑥ Create points in the order of the figure above

4. Verifying the deployment

(1) Set the combination task (only the charging point added to the combination task): After the following operations are completed, the newly created combination task can be executed to test the charging function of the pile.

① Select "Create paths or points" -> Combine paths

② Add tasks

③ Select the created charging points

(2) Check whether the charging is normal: signs of charging: the indicator light of the charging pile turns red, the pop-up window of the app displays "under charging", and the battery icon has a lightning bolt.

Note:

1. Manual and automatic charging cannot be used at the same time.
2. The robot cannot be turned off during the automatic charging.
3. QR code cannot be damaged or soiled.
4. No sundries can be put on both sides of the charging pile.
5. Only one charging point can be created in the app.
6. Charging points can be added to the end of the task queue.
7. The air switch cannot be turned off, otherwise the robot cannot be charged.

Contents

1. Basic knowledge

(1) Ratio: hypochlorous acid disinfectant is recommended

(2) Working time: 2 h

(3) How to open the injection port: manually remove the atomizing nozzle

(4) How to inject liquid: After removing the atomizing nozzle, add a prepared disinfectant to the mist vent, and observe the height of the disinfectant to avoid an overflow due to too much disinfectant.

Disinfectant instructions

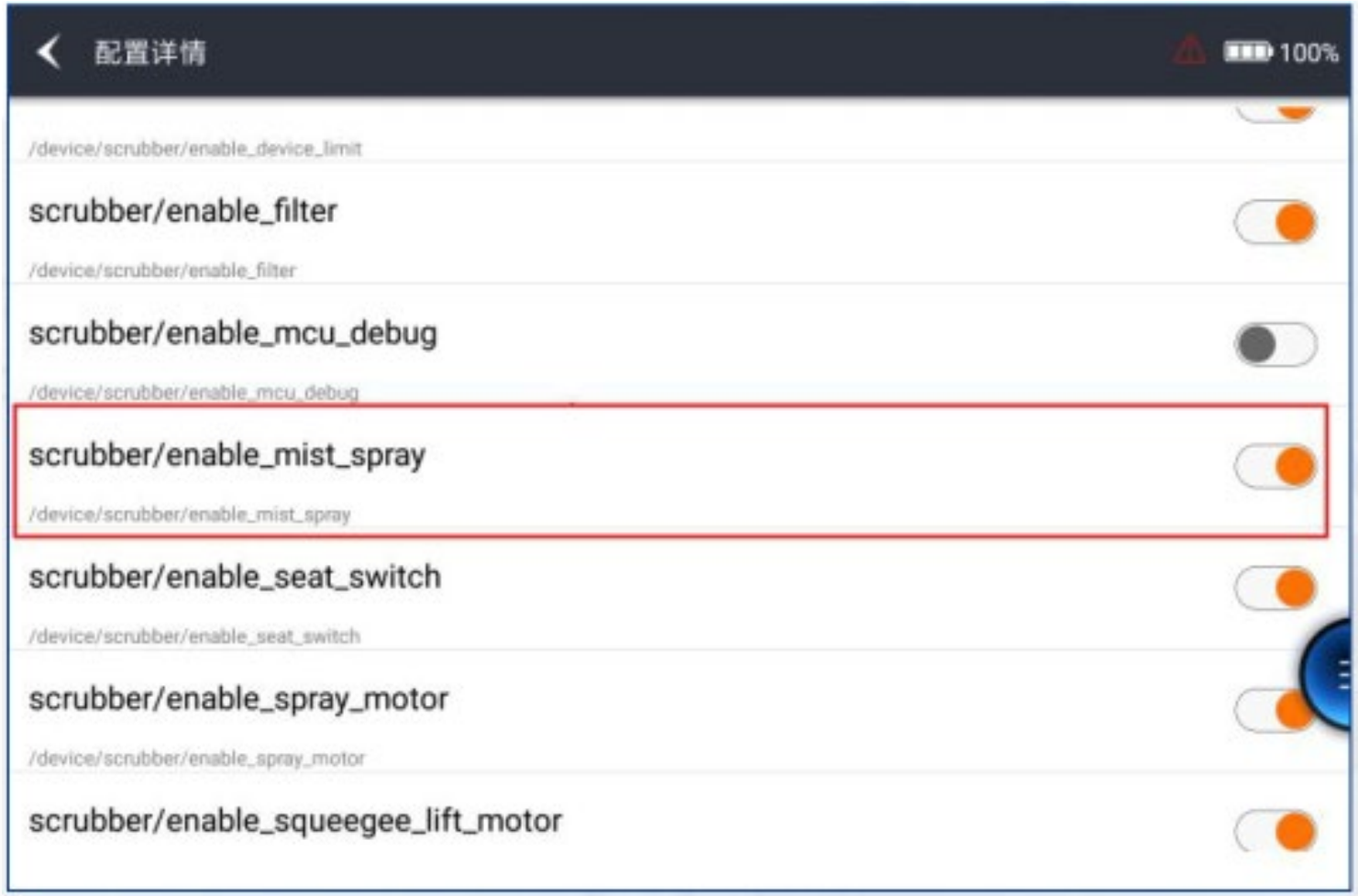
2. Aromatherapy backpack

(1) Aromatherapy solution is recommended

3. Running the deployment

1) Click Advanced parameters -> Scrubber/enable_mist_spray. This function is disabled by default, as shown in the figure below.

(2) After the "scrubber/enable_mist_spray" is turned on or off, the robot shall be restarted manually to complete the configuration.



3. Running the deployment

(3) After the "scrubber/enable_mist_spray" is turned on, the "Spray" function in the cleaning mode interface shall be enabled. This function can be enabled or disabled in the manual/ automatic cleaning modes.

(4) The "spray" function is enabled by default.

(5) If the "spray" function is not displayed, the "scrubber/enable mist spray" function may be disabled. In this case, the previous step needs to be completed first.

4. Note

(1) The spray system will work only when the "spray" function is turned on and the cleaning task is started.

(2) The spray is not restricted by turns and speed, and the speed is kept constant (0.6L/H).

(3) The "spray" function can only be in two states (on/ off). The amount and speed of spray cannot be regulated.

5. Warnings and troubleshooting

(1) The "scrubber/enable_mist_spray" function is enabled first, and then the "spray" function in the cleaning mode interface. If no disinfectant is added, a health warning will occur on the operation screen.

(2) The "spray" function is enabled and the task executed. If the liquid level sensor detects that the level of the liquid is low, the spray system will stop. And a warning that "20043 disinfectant has been used up" is displayed. In this case, it's recommended to stop the robot and add some disinfectant.

(3) If the "spray" function is disabled, no level detection of the disinfectant will be carried out. Empty disinfectant warnings will not be sent to users when non-sterilizing tasks are performed.

(4) The detection of low level shall not be affected by swinging water, and a warning will be sent only when a low level is continuously detected.

Aromatherapy function

1. In the cleaning configuration, the options of spray mode, and spray volume/ aromatherapy concentration have been added to different cleaning modes.
2. In the same cleaning mode, the sterilizing and aromatherapy functions cannot be enabled at the same time, that is, when the sterilizing function is enabled, the other is disabled, and vice verse.
3. When the sterilizing function is selected, the spray volume can be adjusted to medium or high volumes.
4. When the aromatherapy function is selected, the aromatherapy concentration can be adjusted to low, medium or high concentrations.

Extreme wall-follow cleaning (wall lines)

1. Curved-wall-follow cleaning: Because the map grids of the curved wall are not neat, Real-time Auto Cover may not cover all the areas. If there exists a long distance from the curved wall, then it is suggested to use the teaching path to cover the area. For walls with a large angle (within 2 meters and the angle changed by more than 30 degrees, that is, with a curvature of more than 0.25), a 0-cm distance cannot be achieved at present.

2. Artificial wall lines are drawn in most of Hanting hotels. If they are drawn outside the physical wall, a 0-cm wall-follow cleaning will not be achieved. Thus, it is necessary to move these artificial wall lines inside, or delete them, with only the virtual wall at the door reserved. If the original virtual wall is applicable, it can be retained. The virtual wall at the door must be retained and it shall be added if there exists none originally. If the robot rubs against the door frame, or its wheel gets stuck in the invisible threshold, overload of the motor will occur. Therefore, such cases shall be avoided. The virtual wall at the door shall be drawn in the way as shown in the figure below.

6. Starting up and running

Contents

1. Preparation for commissioning |
Confirm the consumables

The consumables of 40 vacuum cleaner are mainly divided into the following types:

Side brushes, roller brushes, ordinary mop pads, dust bags and HEPA

Before the test is started, it is necessary to ensure that the consumables are installed in place and according to the specifications, and thus can be used normally.

Note: The inside of the dust box shall be clean and free of sundries.

The dust bag shall be installed in place, with its interior fully expanded,

1. Preparation for commissioning |

Consumable threshold

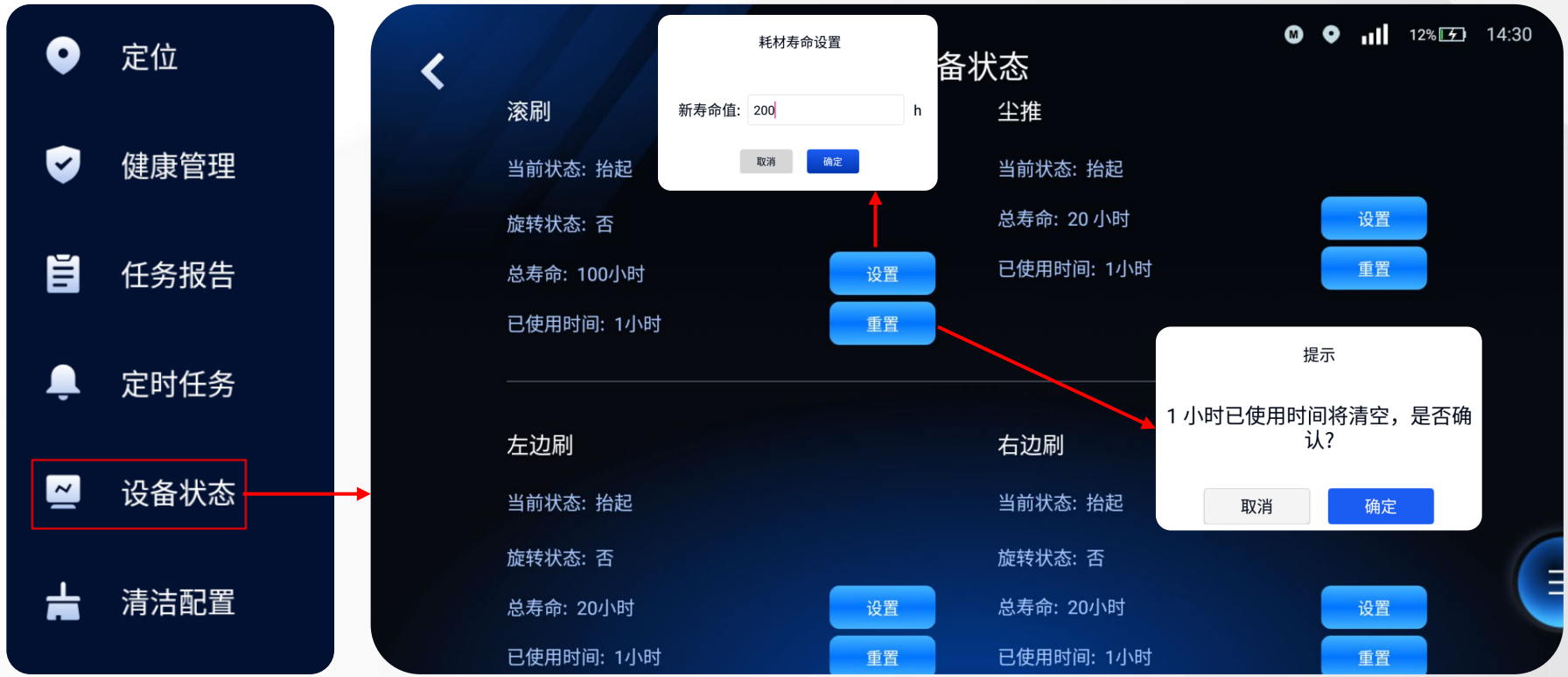
① Click the "Menu" button at the bottom left of the main interface, and select the first item "**Equipment status**".

(2) If the ground is made of marble, PVC, epoxy or other materials, and thus becomes smooth, the service life of the roller brush shall be set to 800, and the side and dust pushes to 500.

If the ground is rough, the service life of the roller brush shall be set to 600, and the side and dust pushes to 400.

(3) The parameter of the dust push, which needs to be cleaned every day, can be the default.

The definition of this parameter: If the accumulated usage time of consumables reaches the upper limit of the threshold, the pop-up window in the app will remind users to check the status of consumables, and clean or replace them.



This parameter mainly serves as a reminder, for reference only.

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

1. Preparation for commissioning | Cleaning mode

Click the "**Menu**" button in the lower left corner of the main interface to open the function menu. Then, click "**Cleaning configuration**".

1. Preparation for commissioning | Cleaning mode

For general ground, the basic parameters can be set as follows.

Cleaning mode:

Carpet cleaning → Side brush/ roller brush height: medium; suction power: enhanced; roller brush speed: high; cleaning speed: medium; dust push: lifted up;

Mute dust push → Side brush/ roller brush height: lifted; suction: turned off; roller brush speed: low; cleaning speed: medium; dust push: put down;

Equipment ratings:

Roller brush height: Low: 38 mm; medium: 34 mm; high: 28 mm;

(The reference point of the height (low, middle and high) is the ground, and the parameters are calculated based on the stroke of the actuator).

Side brush height: Low: 10 mm; medium: 6 mm; height: 2 mm;

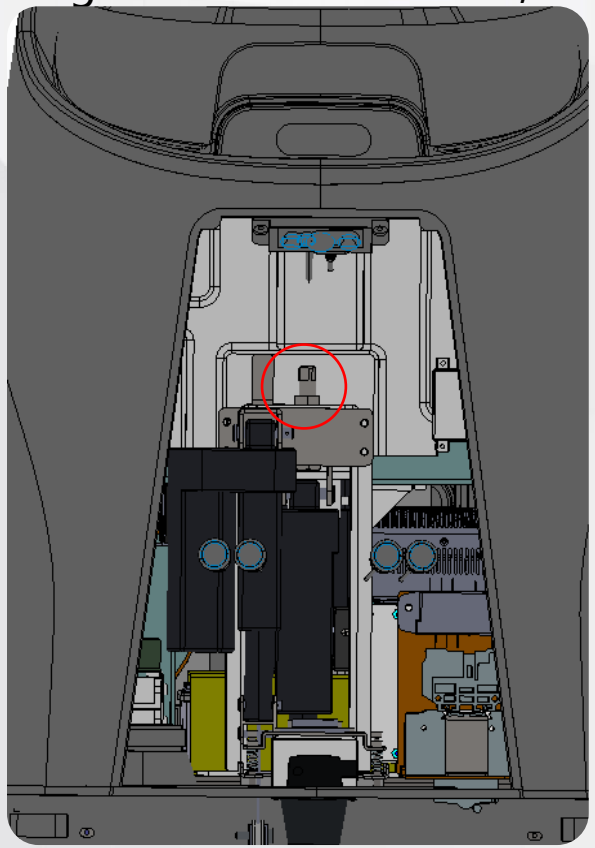
Suction power: Standard: 40%; enhanced: 60%; strong: 80%;

Cleaning speed: Low: 0.6 m/s; medium: 0.8 m/s; high: 0.9 m/s.

1. Preparation for commissioning |

Adjustment of roller brush height

- To achieve a good cleaning effect, it is recommended to adjust the "**Roller brush height**" to "**high**", and make the rubber just contact the ground or carpet when the roller brush goes down;
- If the rubber cannot touch the ground or the carpet after the parameter is set to “high”, it’s required to open the small front door, adjust the position of the bolts of the actuator, and the height of the roller brush;



2. Confirming the cleaning effect

40 is a vacuum cleaner and its suction power requires to be confirmed.

① Perform the cleaning task manually, and litter (scraps of paper/ cigarette butts, etc.) can be dropped on the path.

② Push the robot forward and observe the cleaning effect.

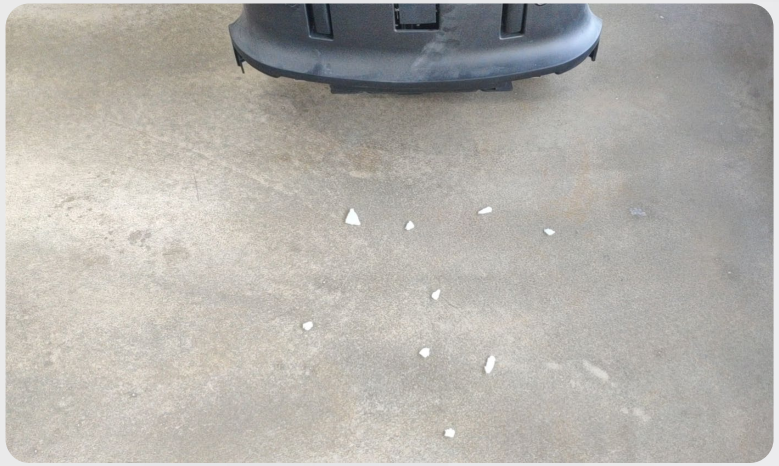
③ Or perform the cleaning task automatically by recording a teaching path (with turns) or drawing a path.

If the cleaning effect falls short of expectations, change the speed of the side/ roller brush, check the suction power, etc., and adjust

scraps of paper, rice grains, cigarette butts, etc..

After the cleaning, the ground is clean and free of trash which can be sucked normally.

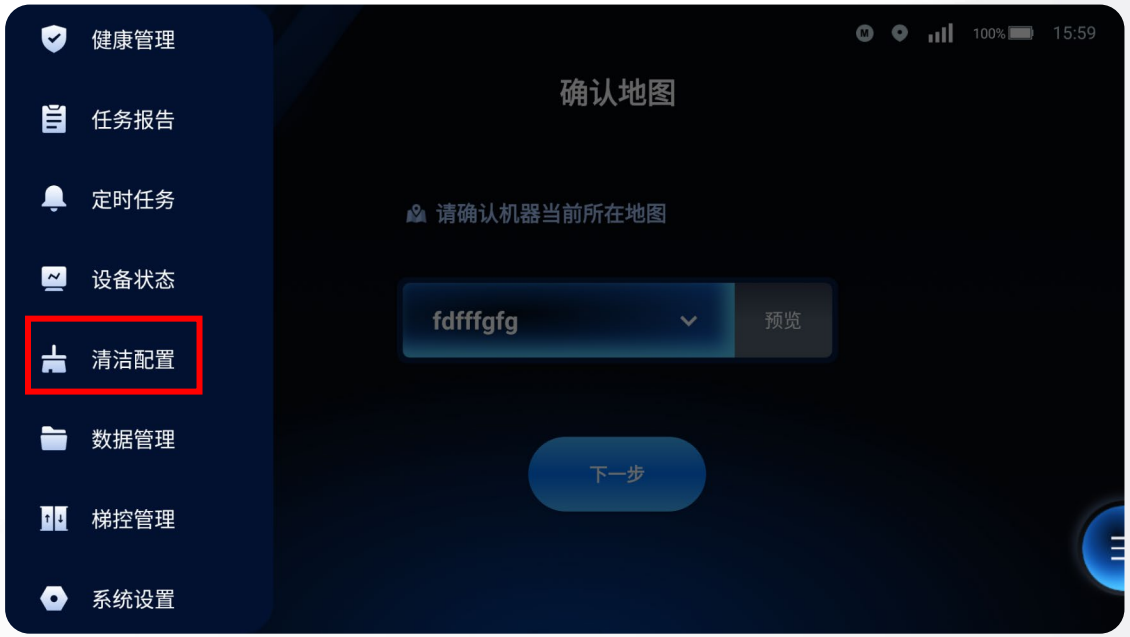
If trash remains on the ground after the cleaning, and adjustment and check are required.



3. Full-field test run

(1) Click "Cleaning configuration" to adjust the height of roller brush, side brush and dust push, suction power, and cleaning speed to normal values. Then click "Save" and exit.

(2) If the area is too large, it's recommended to reduce the suction power or stop the suction to shorten the time of the test run and ensure the battery life.

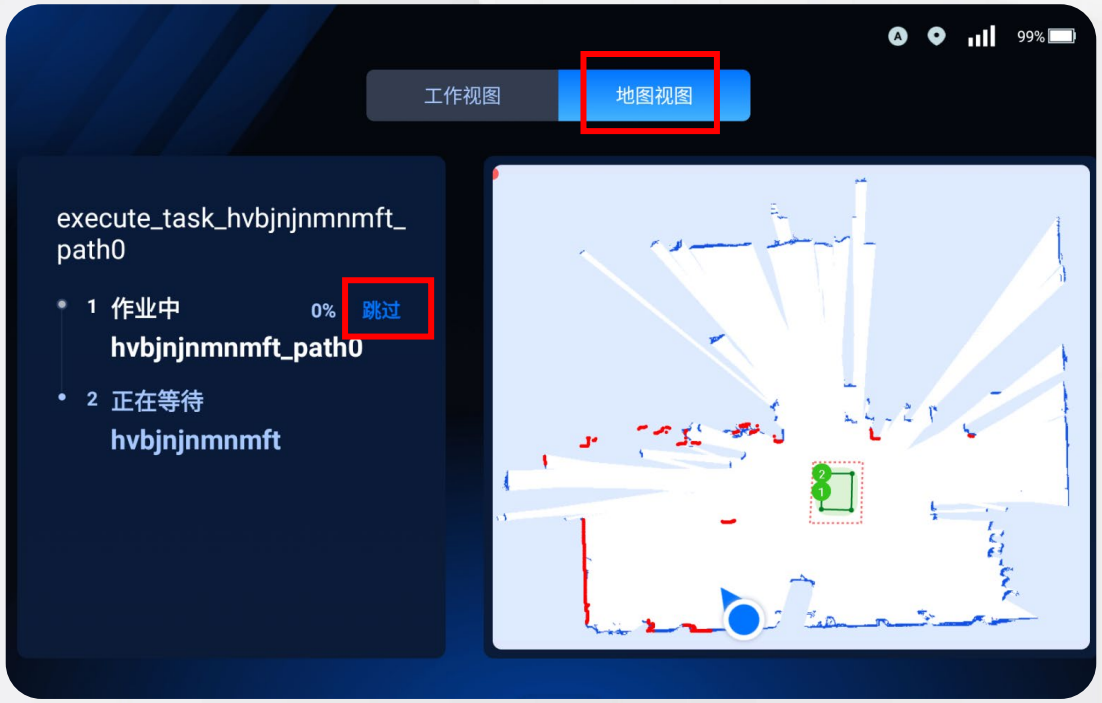


3. Full-field test run

(3) Cleaning mode Select the test run, then click “Automatic operation” to make the robot execute the tasks (all valid paths that have been created).

(4) Running the outer circle can cover all the paths. Click “Skip” in the "Map view" interface if there is no problem.

(5) When encountering problems, it’s recommended to take photos and record them in the phone, and deal with them (modify the virtual wall, redraw the path, reset the point, etc.) at a time later.



4. Schedule tasks

Ask the customers whether they need to schedule tasks before the product delivery. If yes, help them finish the setting.

How to create scheduled tasks:

1. Select “**Scheduled tasks**” on the sidebar, click “**Create**”, and enter the interface of “**Create tasks**”.

4. Schedule tasks

Time: Set the time when the scheduled task is triggered

Map: Select the map to perform the cleaning task

Task: Select the task to be executed

Repetition: Multiple modes are available (non- repetition, Monday to Friday, weekends, custom)

Custom: Users can select the date when the scheduled task is to be executed

After the creation is complete, users can perform the deletion or edit.

Contents

1. Office building scene| Path deployment rules

(1) In the office building, generally Real-time Auto Cover path + teaching mode are needed;
(2) If the width of the passage is less than 0.9 m, the teaching mode path shall be selected;
(3) Shown in the right figure is Wangjing SOHO: three Real-time Auto Cover areas (green areas) need to be built; [It is divided into several regular areas, which conforms to the cleaning logic of the scene, and can improve cleaning effect.]

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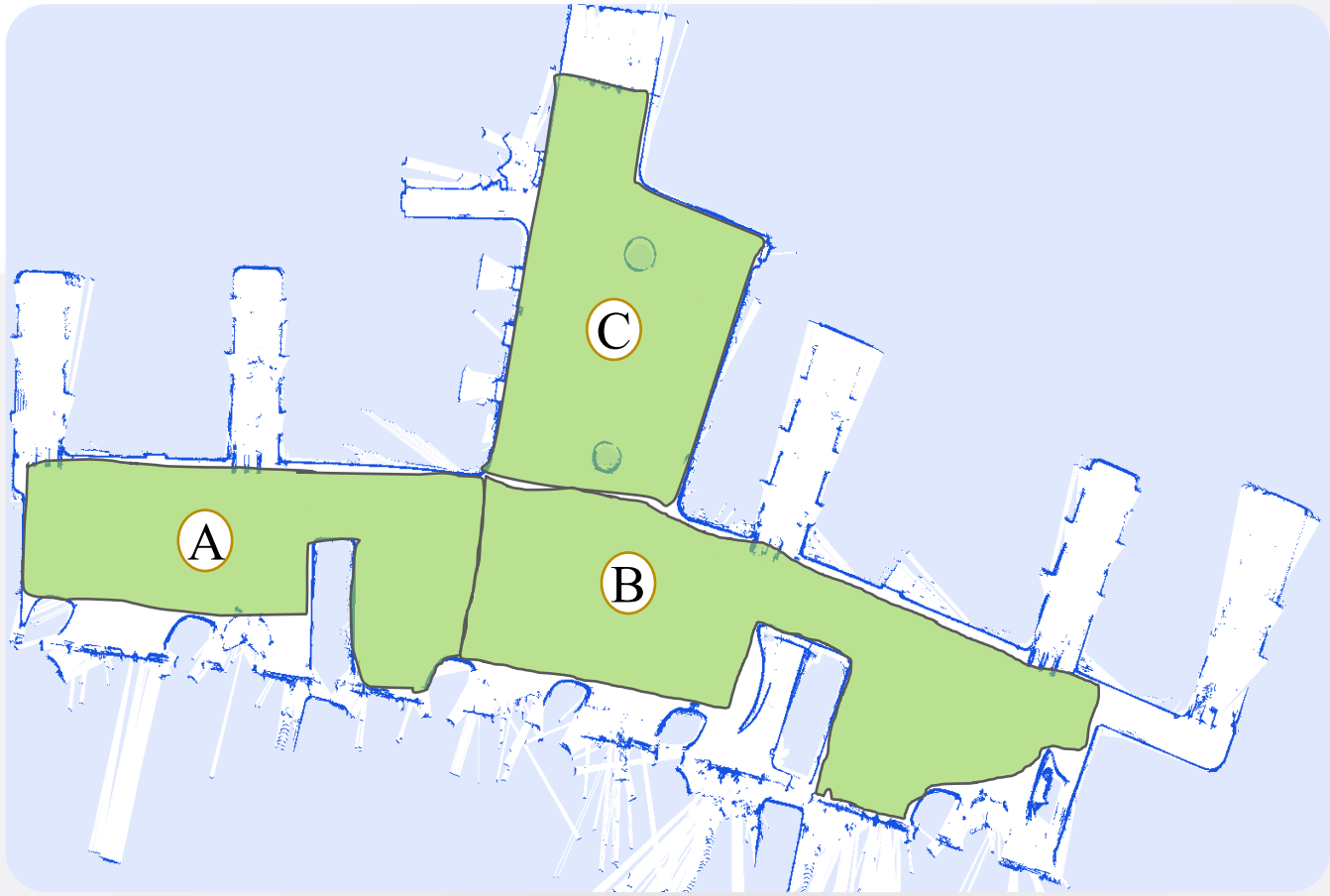
① The path is not recommended if its width is less than 90 cm. Other locations are automatically covered in real time.
② The number of paths to be automatically covered in real time shall be determined according to the actual situation on the site.
(3) Obstacles shall be avoided in the teaching mode. If obstacles are detected during the scanning, they will be avoided through the Real-time Auto Cover;

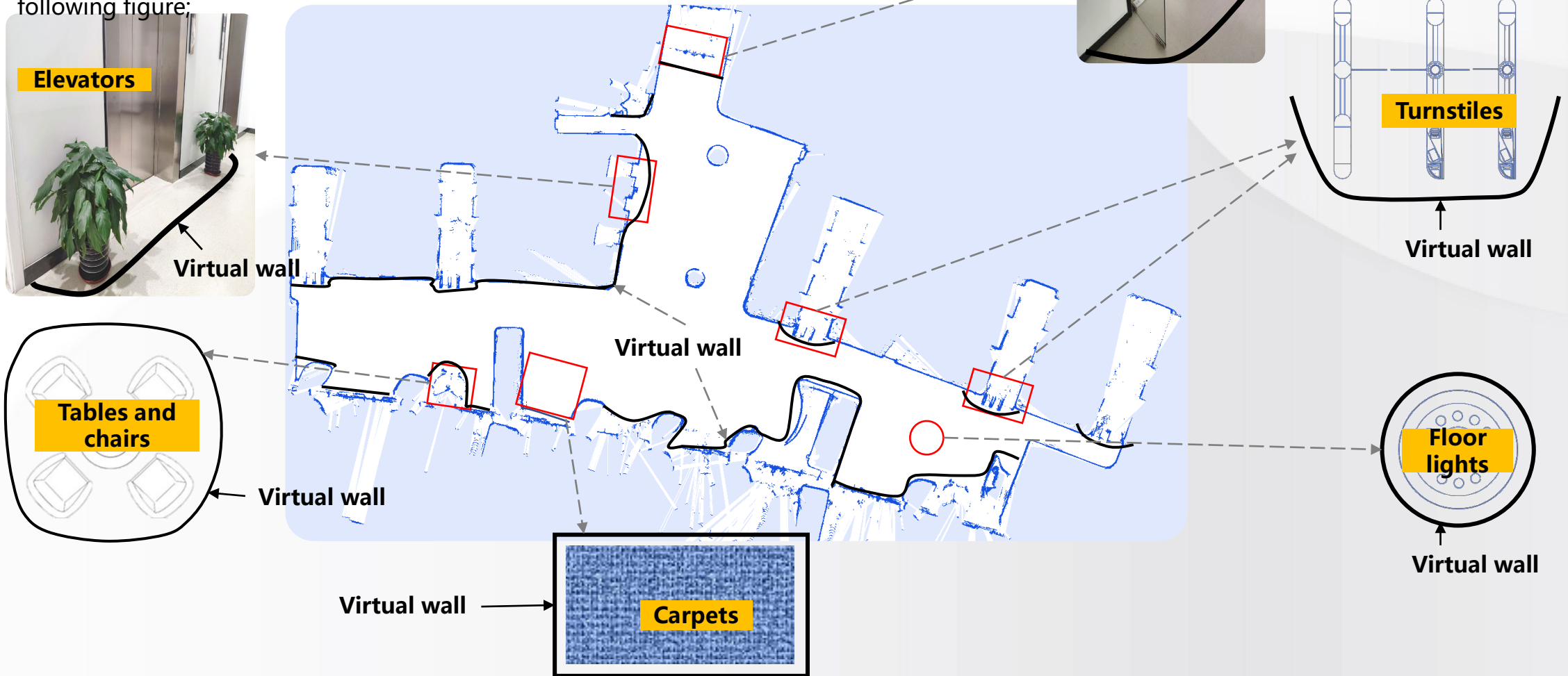


1. Office building scene| Treatment of the on-site environment

The virtual walls shall be drawn for the following obstacles after the paths are deployed:

Flower pots, glass doors, turnstiles, floor lights, carpets (mostly in rainy days), tables and chairs, elevator entrances, stairs, etc

To avoid danger, virtual walls shall be drawn or stickers pasted in these positions as shown in the following figure:



1. Office building scene| Treatment of the on-site environment

(1) The floor guide is irregular, so a virtual wall is required;

(2) The display stand is thin and frequently moved, so a virtual wall is required;

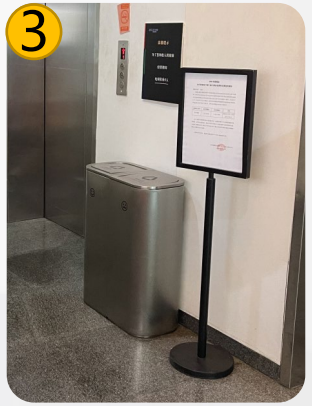
(3) Dustbins and bulletin boards in the landings shall be partitioned off by virtual walls;

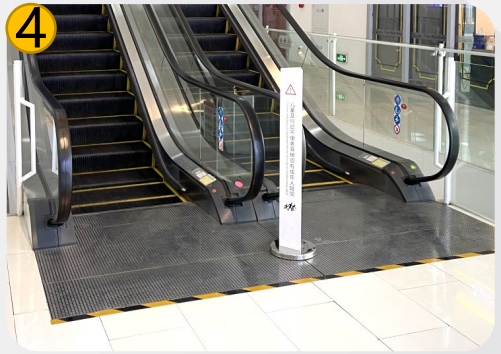
(4) The virtual wall shall be drawn around the escalator, with a distance of 1-1.5 m away.

(5) Some poster display stands are made of glass and irregular, so users need to note the distance of the virtual wall, and whether the stands are temporary;

(6) The virtual wall shall be 30 cm away from the glass revolving door to avoid any inconvenience to walkers.

(7) The virtual walls shall be drawn to partition off the pop-up outlets in some office buildings.





1. Office building scene| Treatment of the on-site environment

Draw highlight areas

Position: drawn where fixed objects lie, such as columns, walls, etc.

Note:

① Highlight areas shall not include any movable obstacle;

② Drawn at an interval of 15-20 m;

The office environment is relatively stable, only need to draw a few can

Note:

(1) Virtual walls shall be drawn 1-1.5 m away from the escalator.

(2) Virtual walls shall be drawn 0.5 m away from the elevator.

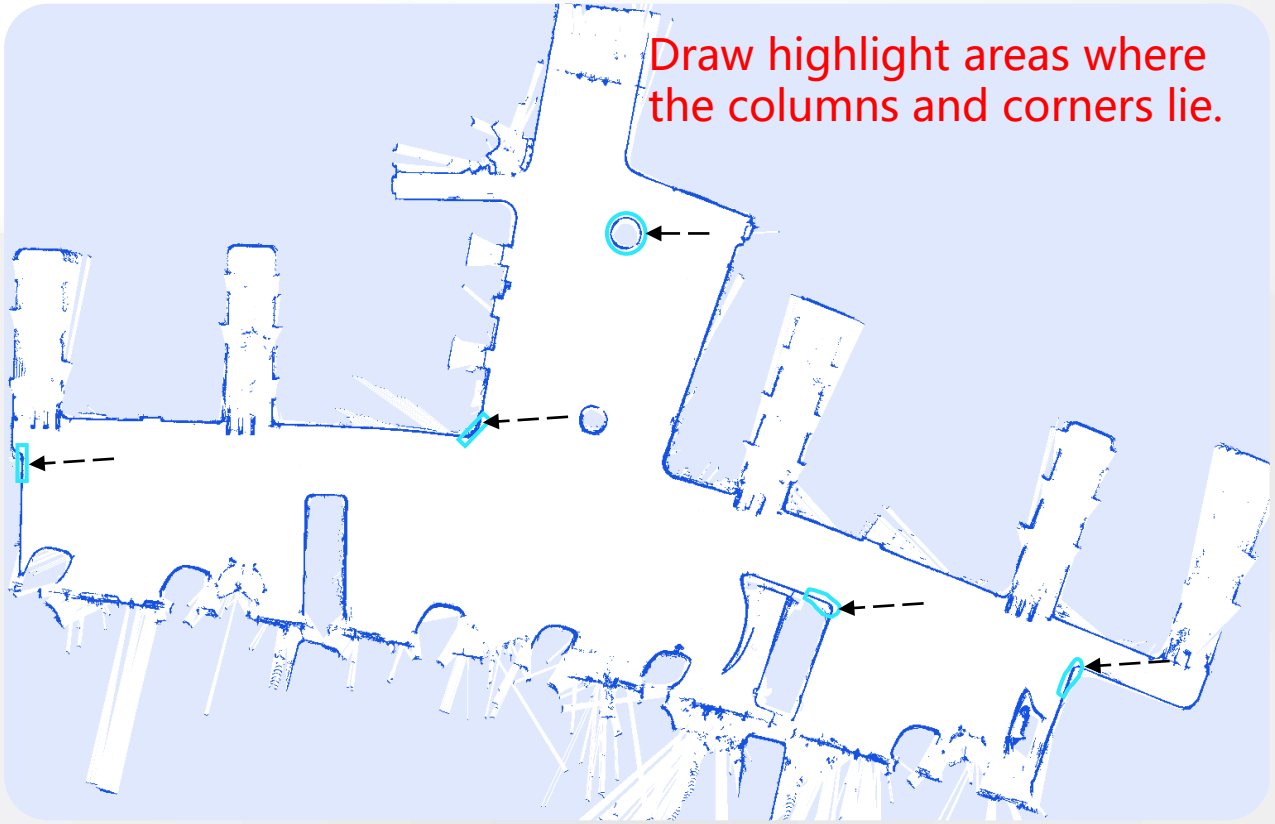
(3) Check the glass doors in the offices. The space for opening the doors outwards shall be reserved for laser stickers to be pasted.

(4) The areas against the wall shall be reserved for standing signs.

(5) Virtual walls shall be drawn to partition off the obstacles that are not physical walls.

(6) Select "Do not disturb" mode in the time period with heavy foot traffic.

(7) It is suggested to draw virtual walls in all cleaning areas to prevent the robot from reaching unknown areas.



2. Hotel scene | Select hotel mode

For a hotel scene and M line Hanting version, the "Hotel" mode in the “Settings” shall be selected;

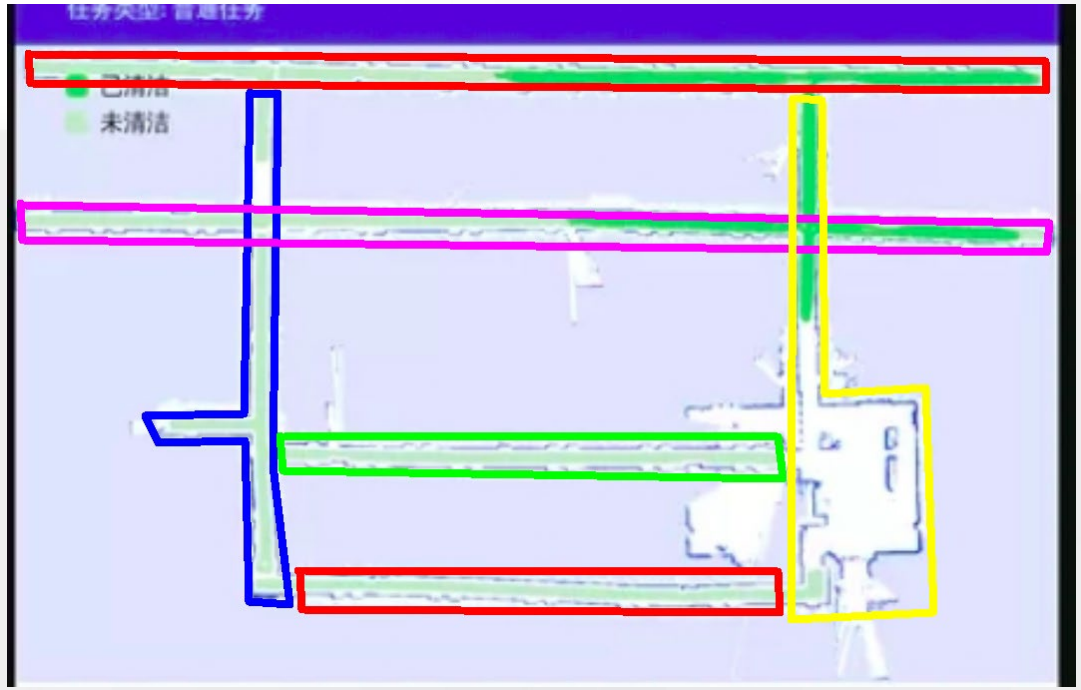
2. Office building scene| Path deployment rules

For corridors in the hotel, Real-time Auto Cover is preferred.

Deployment instructions

Refer to the right figure

- A Real-time Auto Cover task shall be created for each corridor.
- The polygon of the task shall not include the area where elevator is located, so as to prevent the robot from straying into the elevator;
- The shape of the task shall be as regular as possible (horizontal and vertical), which can reduce turns and improve efficiency;
- The area shall not be too large. The length of the sides shall not exceed 30 m to prevent the robot from running too far.
- The borders of the task shall be consistent with that of the area to be cleaned. Too many unknown areas and other inaccessible areas shall not be included.



2. Hotel scene| Treatment of the environment

(1) We shall ask customers about the fixed areas where they intend to put large flower pots, poster display stands, announcement boards, etc., and then draw virtual walls to partition them off.

(2) The glass revolving door/ arc door in the hotel shall be separated by a virtual wall;

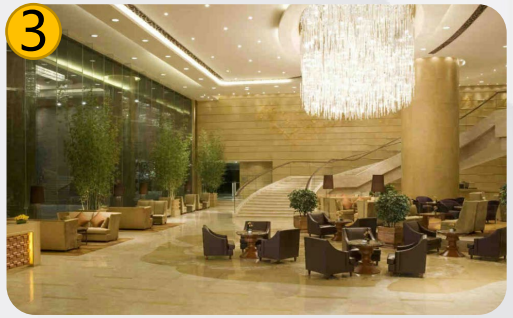
(3) The room for moving chairs shall be reserved for virtual walls when there exists a meeting area, dining area, etc. in the hall.

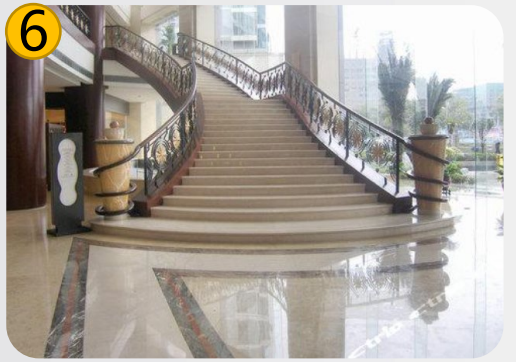
(4) Generally, there are many people checking in and out, and thus customers shall be informed to reserve an area with a footprint of 40-50 cm;

(5) For the hall with the artwork in an irregular shape, a safety distance shall be set and virtual walls drawn;

(6) If there exist stairs and escalators in the hall on the first floor, virtual walls shall be drawn. All the stairs on the second floor shall be separated by virtual walls;

(7) For the fireproof doors that are frequently opened, virtual wall shall be drawn to prevent the robot from entering the unknown area;





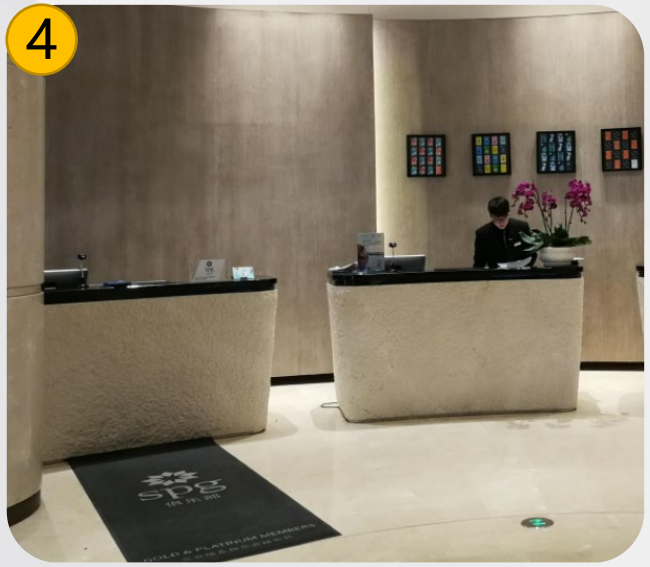
2. Hotel scene| Treatment of the environment

(1) Dustbins or other obstacles that may exist in the elevator hall of the hotel shall be separated by virtual walls. Customers shall be informed to put them in a fixed place.

(2) For the restaurant area of the hotel, daily dining time shall be determined and “Do not disturb” mode set to avoid the peak dining times (according to customers’ demands).

(3) The low obstacles in the hotel shall be separated by virtual walls.

(4) Carpets certainly exist in the hotel, especially in rainy days. Different cleaning modes shall be set by communicating with customers, or 2 maps prepared.



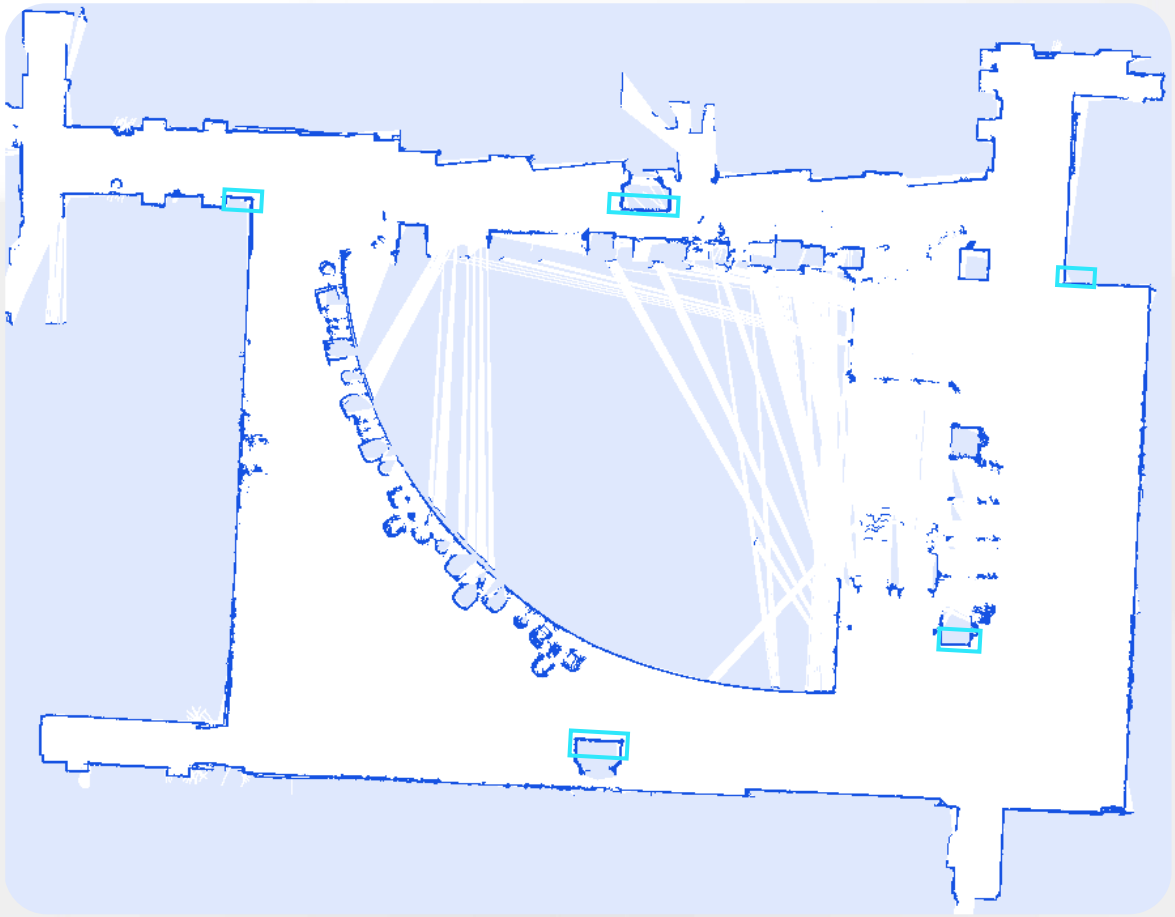
2. Hotel scene| Treatment of the environment

Draw highlight areas

Position: drawn where fixed objects lie, such as columns, walls, etc.

Note: ① Other movable obstacles shall not be included in the highlighted area;

② Only a few highlighted areas are required where the corners or columns are located in the hall of the hotel. No highlighted area shall be drawn in the corridor.



Note:

(1) If carpets are laid in rainy days, two maps with names of "Rainy days" and "Sunny days" shall be prepared. Different cleaning modes shall be set in the carpet area of the map for rainy days.

(2) The space for the movement of chairs shall be reserved in the seating area to prevent the robot from rubbing against chair legs.

(3) When the multi-layer map is deployed, the landmark points on different floors are set 2 meters away from the elevator door, which is easy for users to remember.

(4) The base of sign stand is large, so a mark shall be put or enough space reserved to prevent the robot from being hooked.

(5) A certain distance shall be set in the reception area.

(6) Vases, glass exhibition stands, glass doors, etc. in the hotel shall be separated by virtual walls.

(7) When the robot cleans the meeting room, customers need to put away chairs in advance.

2. Hotel scene| Treatment of the environment

(8) During the scanning performed in the place with obvious features (such as the doorway in the hotel), the robot shall be slowly turned 270 degrees, so that the laser can scan all the features in the doorway. Then the robot shall be rotated to the original direction. This is because the laser only has a range of about 180 degrees.

(9) For very long corridors, it is suggested to scan a section, save the map when the place with obvious features is scanned, enable the map extension function and continue the mapping.

Note: The long corridors can only be scanned once. Scanning back and forth is not permitted.

(10) If drawing overlapping or distortion occurs during the mapping, observe whether the laser is installed horizontally with the spirit level. If not, adjust its position, then continue the scanning. If still unfeasible, calibrate the laser. If it doesn't work, try to use JIRA.

(11) Draw a virtual wall on the door that may be opened in the corridor. Note that the virtual wall will expand. It’ s recommended to draw points inwards by referring to the physical wall. (When the robot performs the task, observe and perform the fine-tuning).

2. Hotel scene| Treatment of the environment

(12) It is necessary to draw a virtual wall around the outer glass wall of the cleaning area, so as to prevent the robot from entering this area when the position is lost. Note that the virtual wall shall not be placed too close to the glass wall.

(13) For objects with black bases, virtual walls shall also be drawn along the bases. The black objects absorb light and cannot be recognized by sensors.

(14) The transition area between tiles and carpets shall not be included in the task. The cleaning task shall be deployed on both sides of this area.

(15) Roller brush height: ①Wool carpets: The roller brush shall be made to just contact the ground. Too low a height will cause much wool to fall off. ② Other carpets: Adjust the height according to the actual situation. To ensure the cleaning strength, the height in which the roller brush just contacts the ground is recommended.

(16) Suction power: Run for 20 minutes, observe the accumulation of flock in the dust box, and gradually adjust it. Theoretically, the smaller the box is, the less power consumption and noise are. But it is necessary to ensure that flock can be sucked in the dust box in time.

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