U1

UVC disinfection robot user manual

Produced by Dual-Engines Technology (Hangzhou) Co., Ltd.

Futural robotics

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1、Introduction

This manual is a user manual for UVC robot product instructions, quick start guide, safety information and correct maintenance concepts. This manual is suitable for U1 model. In order to ensure your correct use, it is recommended that you read it carefully and Understand the entire manual.

2、Safety rules

Before using this product, please follow the following safety rules.

＊Before using this product, please read and understand the entire manual.

＊When installing the product, please follow the instructions strictly.

＊Please strictly follow the instructions when using the product, and do not use it with other products.

＊Strictly follow the instructions during the disinfection process.

＊For product safety during use, please memorize the safety protection mechanism of this manual (Chapter 8).

＊When using this product, please wear protective clothing for the personnel operating this product.

＊Please deliver the remote control to the administrator to ensure that the security protection mechanism is effectively activated during the use of this product.

＊When a fault occurs, please refer to 10.1 troubleshooting instructions in this manual.

＊Please refer to 10.2 maintenance instructions of this manual, and perform maintenance work regularly.

＊When operating this product, please ensure that the operator has the authority to operate the product.

＊Do not let this product be used by other operators who are not familiar with this product.

3、Product introduction

Futural U1 uses a smart chassis as a carrier and integrates an ultraviolet disinfection system. Combining the robot's intelligent movement and autonomous work characteristics, it realizes full-automatic and rapid UV disinfection in the whole area without manual intervention, reducing the intensity of manual work and the risk of infection.

The use of short-wave UVC ultraviolet rays for disinfection and sterilization can destroy the DNA and RNA of the germs in a few minutes, which can effectively achieve the killing effect. After testing, its disinfection mode can kill 99.99% of the spores on the surface of the environment (smooth surface, rough porous surface) and various multi-drug resistant bacteria.

It is suitable for biosafety laboratories, infectious wards, ICU wards, inspection departments, scientific research institutes, dust-free workshops, schools, food companies and other places that require space for regular disinfection.

In order to achieve this effect, please read and understand this manual thoroughly. According to the instructions provided in the manual, perform disinfection settings for the area to be disinfected, and conduct disinfection consultation with the technicians you contact before proceeding with disinfection.

In addition, the UVC robot can only be used for disinfection. Please do not use it in combination with other related products or accessories not provided in this manual, otherwise it will cause unnecessary safety hazards or cause a certain degree of damage to the product. If you fail to abide by the operation of this manual during use, the relevant warranty rules will be invalid, and the effective use of this UVC robot will not be guaranteed.

3.1、Product basic parameters

Components	Specification
Overall size	460×380×1722 mm
UV lamp	6 pcs
Ultraviolet radiation	360°
Radiation illuminance at 1 meter	600uW/cm^2
Sterilization rate	Kill 90 square meters in 10 minutes
UV power	330W
Type of battery	Lithium battery
Battery capacity	45Ah

Battery interface	24V
Charging method	Automatic / Manual
Charging pile charging time	2.5h（10%-80%）
Lidar	270°，10m
Ultrasound	7 groups
3D Camera	3D obstacle avoidance
PIR	Front and rear, cone angle 110°
Drive way	2 front wheel drive + 2 rear guide wheels
Maximum clearance width	1cm
Normal walking speed	0.76m/s
Walking speed in fixed point disinfection mode	0.76m/s
Walking speed in walking disinfection mode mode	0.036m/s
Minimum walking width	70cm
Charging time	0%-->100% 4.5hrs 25%-->100% 3.5hrs
One-time working duration with full power	2hrs

4、Robot installation and operation process

After receiving the robot for the first time, the initialization operation needs to be completed first. After the initialization operation is completed, the robot can be disinfected. In addition, please refer to 4.1 and 4.2 for the specific details of the initial operation process and the robot disinfection workflow.

Initial operation process --> Robot disinfection workflow

4.1、Initial operation flow

Install the charging pile --> install the robot --> turn on and off the robot --> log in to the tablet --> create a map --> modify the map --> mark and do a dot --> save the map

4.2、Robot disinfection workflow

There are two types of robot disinfection modes: "**Fixed-point disinfection mode**" and "**Walking disinfection mode**". In addition, you can plan "**Immediate disinfection task**" and "**Timed disinfection task**" according to the task schedule, because the U1 disinfection robot uses four kinds of disinfection the specific process is as follows:

(1) Fixed-point disinfection mode (Immediate disinfection task):

Add an immediate disinfection task --> select the disinfection location and task type --> go to the disinfection area/location --> count down to prepare for disinfection work --> start disinfection --> return to the charging station after the disinfection task is completed

(2) Fixed-point disinfection mode (Timed disinfection task):

Add a scheduled disinfection task -> select the disinfection location and task type --> go to the disinfection area/location after the scheduled time is up --> count down to prepare for disinfection work --> start disinfection --> return to the charging station after the disinfection task is completed

(3) Walking disinfection mode (Immediate disinfection task):

Add an immediate disinfection task --> Select the disinfection location and task type --> Go to the starting point of the disinfection point --> Disinfect at the starting point for 2 minutes --> Start planning a path along the disinfection point and disinfect while walking at a speed of 0.036m/s- -> Disinfect at the end for 2 minutes after moving to the end --> Return to the charging pile after

the disinfection task is completed

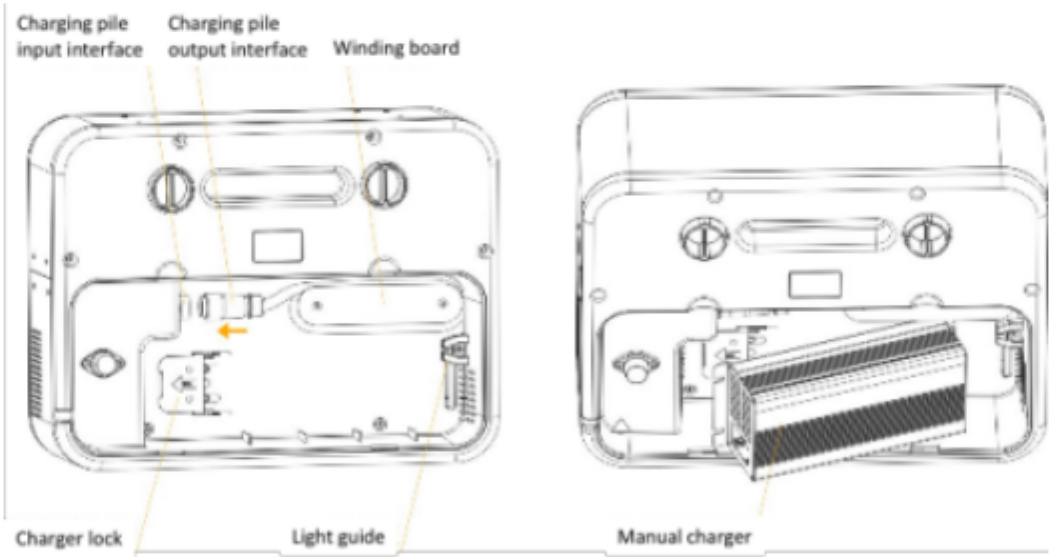
(4) Walking disinfection mode (Timed disinfection task):

Add an immediate disinfection task --> select the disinfection location and task type --> go to the starting point when the time is up --> disinfect at the starting point for 2 minutes --> start planning a path along the disinfection point while walking at a speed of 0.036m/s Disinfection --> Disinfect at the end point for 2 minutes after moving to the end point --> Return to the charging pile after the disinfection task is completed

5、Initial operation

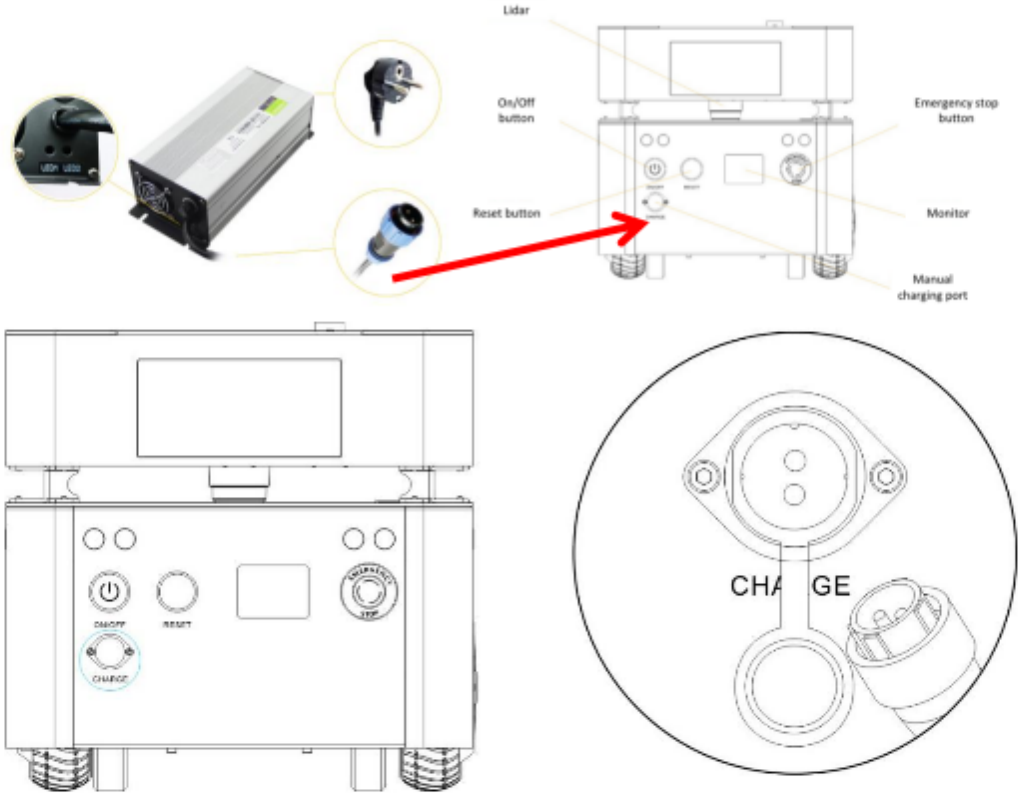
5.1、Robot charging

After the "**smart chassis**" and the "**charging pile**" are taken out of the package, it is recommended to remove the "**manual charger**" behind the charging pile and charge the smart chassis first.



Insert the "**manual charging head**" into the "**manual charging port**" of the smart chassis for charging. After the charging is completed, the subsequent initialization of the robot can ensure that the robot does not need to be recharged during the initialization process, thereby interrupting the

initialization work.



5.2、Install charging pile

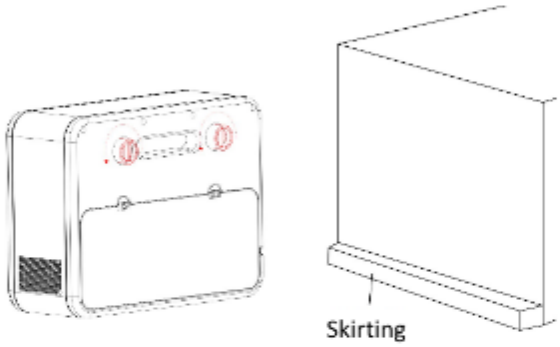
Place the charging pile in a suitable location, and plug it in after placement. The placement requirements are as follows:

（1）Please do not place any obstacles within a radius of 2.5 meters around the wall of the power supply. If there are obstacles in the selected wall area, please remove the obstacles to effectively ensure that the robot automatically recharges effectively.

（2）Please ensure that the ground and wall are flat, and place the charging pile against the wall. Please do not place it on an uneven place, it may shake the charging pile after installation, causing the automatic recharging work to not work normally.

This side is placed against the wall, and ensure that there is no obstacle in the surrounding 2.5 meters.environment.

（3）For walls with skirtings, please adjust the charging pile knob so that the back of the charging pile is close to the wall to increase the stability of the charging pile.

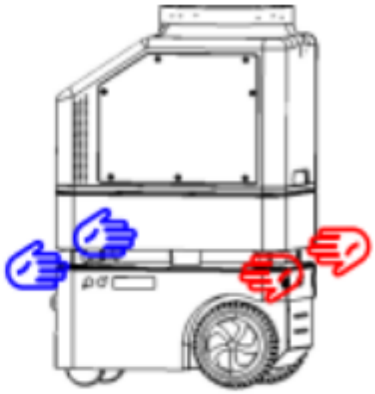


Note： If the robot is turned off and not in use for a period of time, please unplug the charging pile.

5.3、Install the robot

First of all, when moving the robot, for your safety, please follow the following regulations and carry it.

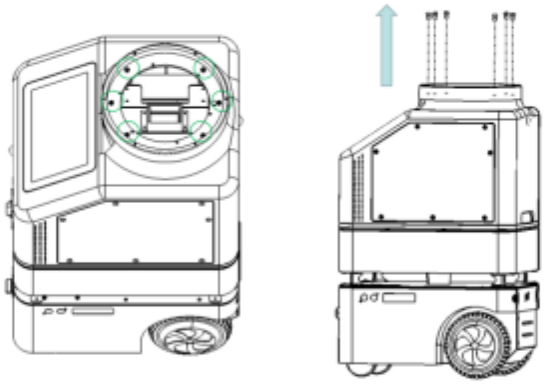
1. When carrying the robot, please indicate the position as shown in the figure below, grasp and lift it with both hands, and carry it by one person at the front and back (1 person in the direction of the red hand and 1 person in the direction of the blue hand).



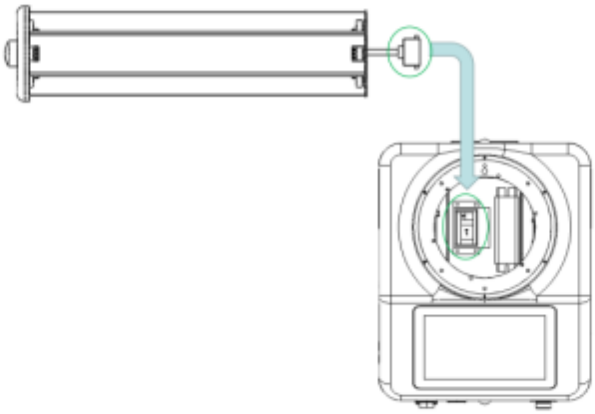
2. When carrying, please wear cotton gloves for carrying to prevent injury to your hands.

3. Please consider your physical condition when handling this machine. It is recommended that people with cardiovascular disease, physical injury or underweight, do not try to carry this machine, and do not carry it aggressively to avoid personal health damage.After transportation, follow the steps below to install it.

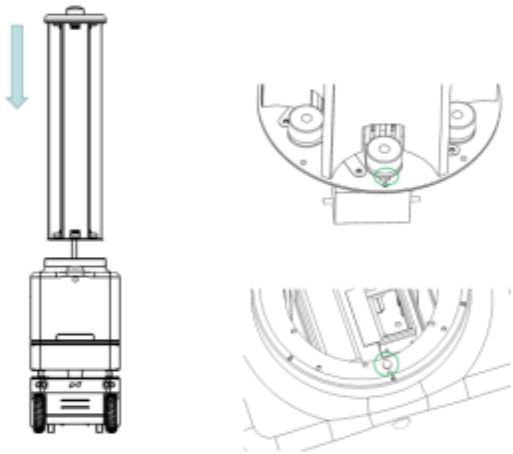
Step 1: Use the M5 hexagon socket tool in the box to remove the 6 bolts pre-installed on the top of the host.



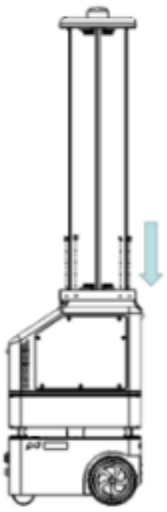
Step 2: Connect the movable wire harness connector on the side of the light box with the wire harness connector fixed in the main box



Step 3: Install the light box on the host vertically, insert the positioning hole at the bottom of the light box into the positioning post near the host number "4".

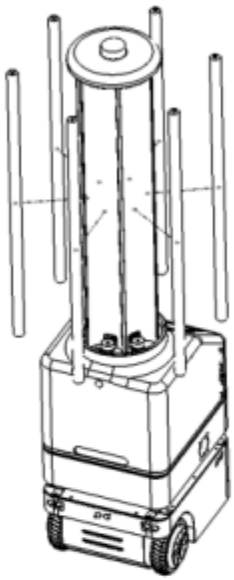


Step 4: Put the 6 bolts taken out in step 1 back to their original positions.



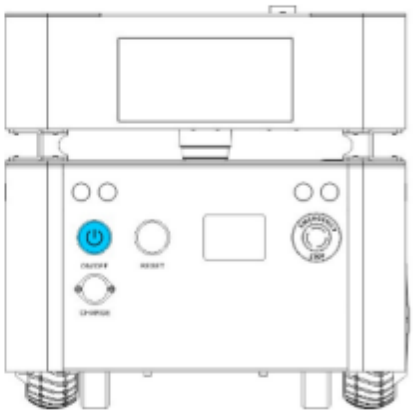
Step 5: Take 6 UV tubes packed in the box, put the upper and lower ends of

each tube into the lamp holders at the upper and lower ends of the same light box, and then rotate the tubes. When you hear two beeps, it means Installed in place.

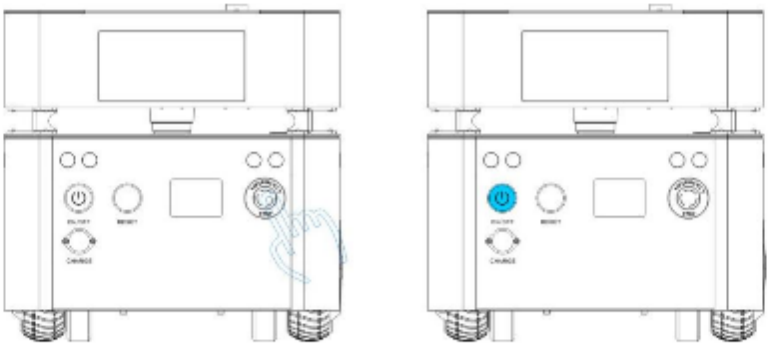


5.4、Robot power on and off (including other button instructions)

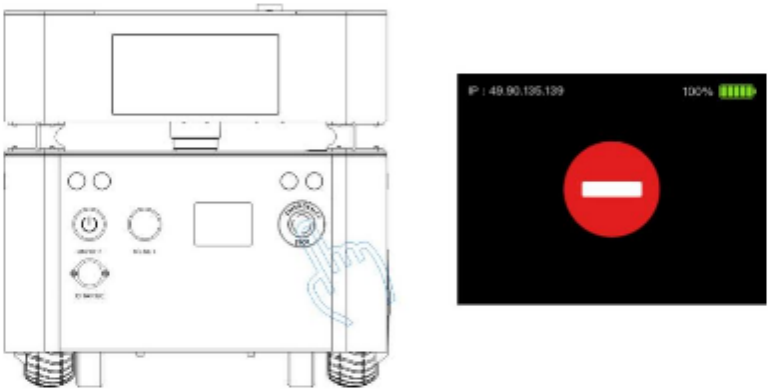
（1）**Power on：** Press the ON/OFF button to indicate that the iris is illuminated, which means normal startup. After normal startup, the screen will display as shown below.



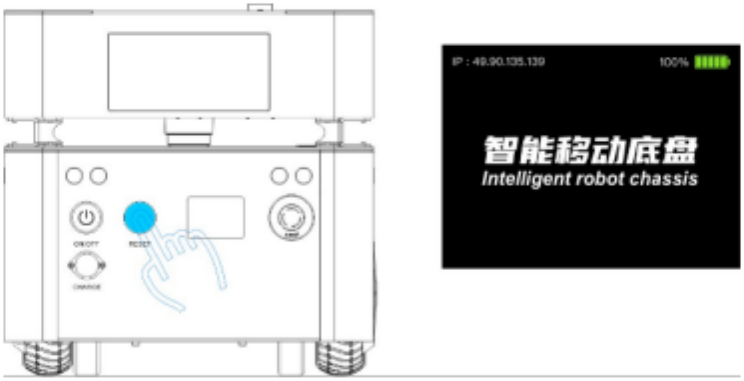
（2）**Power off：** Press the STOP button first to stop the robot, then press the ON/OFF button, release to complete shutdown。



(3) **Pause**: Press the STOP button, the machine stops moving, and the screen displays as follows.

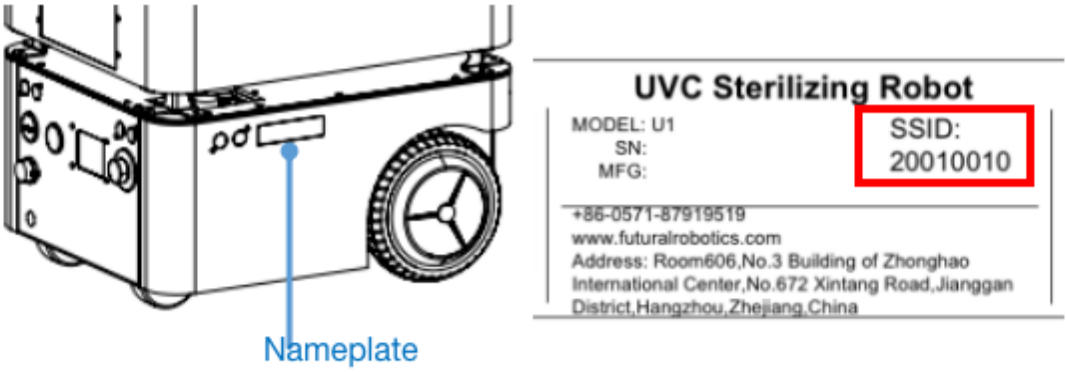


(4) **Unpause**: You need to press the STOP button first, and then press the RESET button to release the emergency stop. After resetting, the screen will display as shown below.



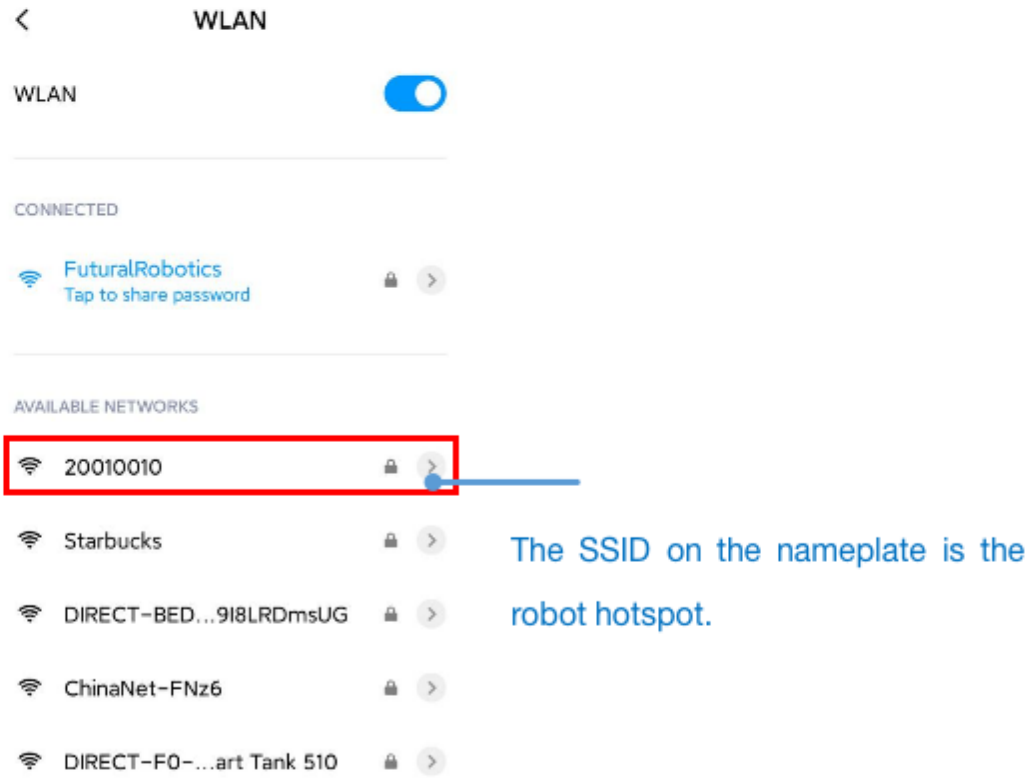
5.5、Use tablet to connect robot hotspot

After the robot is turned on, please also turn on the attached tablet. After the tablet is turned on, please turn on the WiFi to connect to the robot hotspot. The steps are as follows: "Turn on the tablet --> System settings --> WLAN".

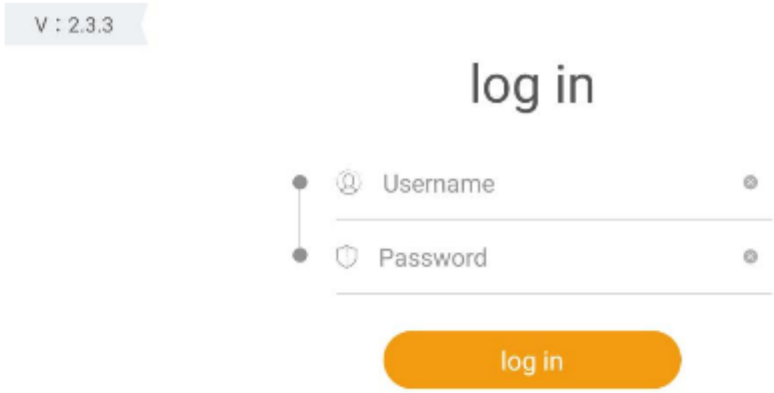


The robot hotspot needs to check the SSID on the nameplate (as shown in the picture above, each SSID is unique and different), and then find the corresponding SSID in the WIFI list of the system on the tablet, which is the hotspot (as shown in the picture below, the SSID on the nameplate will be displayed WIFI list), you need to enter a password when you click to connect, the password is as follows:

Password：@futural



5.6、Log in to the tablet app



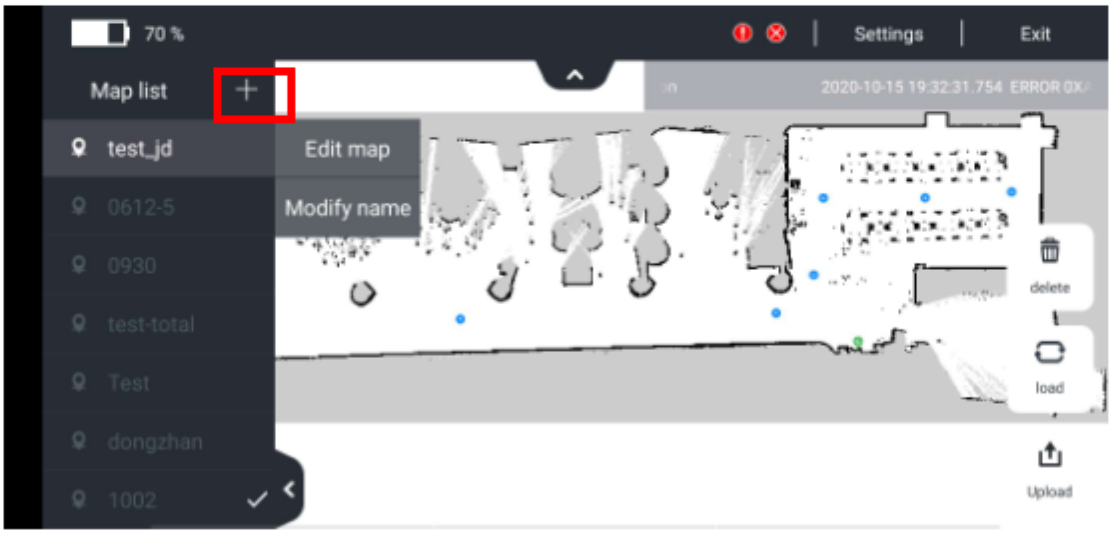
After turning on the tablet, click to open the "Futural Robotics" APP.

After you finish opening the APP, you will enter this login page, follow the prompts to enter your login name and password, and click login after entering.

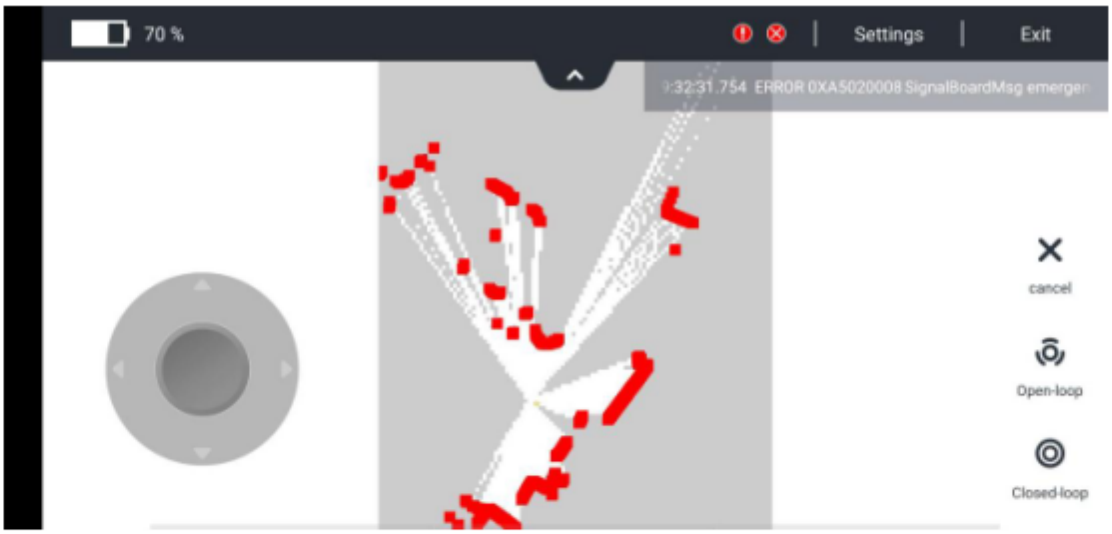
Login name: admin

Password: Robot

5.7、Create a map



After logging in, you will enter the interface above, click on the "+" on the left side of the map list to start building the map.



On the left is the joystick, which can control the walking of the robot, and the map will be scanned during the walking process.

The white area that appears during the scanning process is the completed scanning area, and it is walkable without obstacles.

During the scanning process, the black lines or areas that appear are obstacles or walls, which are areas that the robot will not walk and avoid later.

When the entire mapping is scanned, you can select "Open-loop mapping" and "Closed-loop mapping", and the map will be generated after selection. The difference between open-loop mapping and closed-loop mapping is introduced as follows:

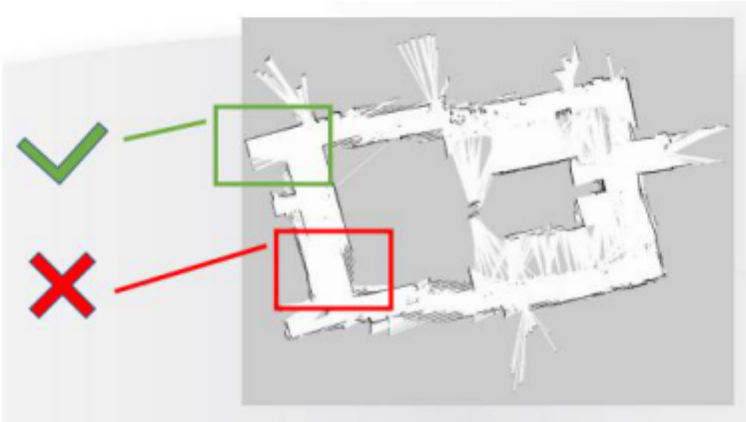
- **Open-loop mapping:** Different from closed-loop mapping, it belongs to the map type with lower similarity, and you can choose to use open-loop mapping.
- **Closed-loop mapping:** the built map has a high degree of similarity, such as a circular map, as long as the starting point to the end point of the robot mapping is the same, please select closed-loop mapping.

Abnormal closed loop is a condition of incomplete map construction. Closed-loop errors can cause map information errors, and human readability is greatly reduced. Inconsistent with the actual environment, a large positioning offset will occur near the abnormal position of the closed loop

during actual use, and even the positioning loss cannot be retrieved. The following figure shows that after the map is created, the starting point and current position in the closed-loop environment may be partially offset due to the different angles determined by the machine. Therefore, please select "closed-loop mapping" for this type of map to ensure that all closed-loops are normal .

When building a map, please avoid that the path of the map has been created. Please do not return to the original path to create the map again, which may cause duplication of the map, that is, ghosting.

Ghosting is a condition of inaccurate map results. The most common ghosting performance is that a wall in the actual environment becomes two parallel walls in the map. The ghosting will cause great interference to the navigation effect and cause positioning offset.



5.7.1、Mapping skills (important)

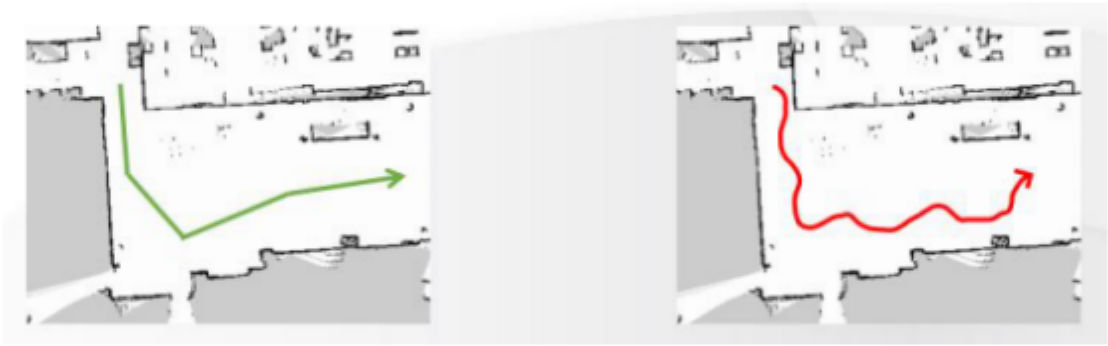
1. Choose places with obvious feature points and clean terrain as the starting and ending points. Examples of unobvious feature points include:

1) A corridor with very flat walls on both sides, the length of the corridor> the maximum distance measured by the laser;

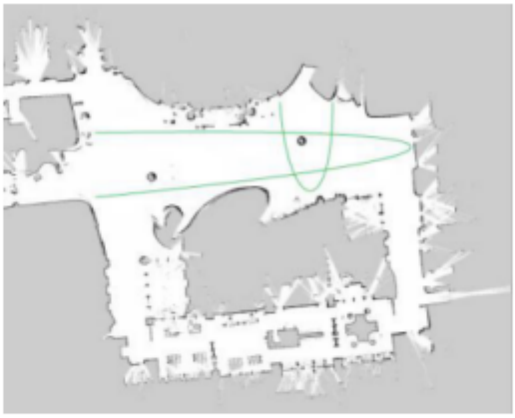
2) In the middle of the office corridor with many workstations.

2. When starting to build a map, it is recommended to adjust the robot's linear speed and angular speed to below 60%, and then control the robot to rotate slowly in place to clean the surrounding feature points, and then control the robot to walk.

3. When you can walk in a straight line, try to walk in a straight line. If you need to walk in an arc, you can replace it by a straight line and in-situ rotation.

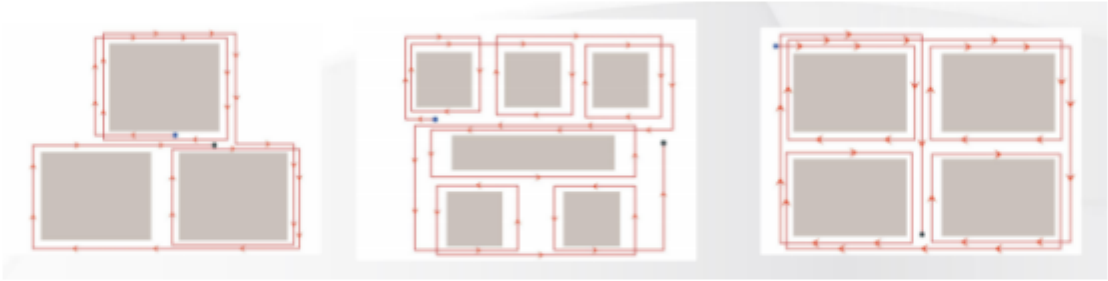


4. In a narrow area, you can walk in a straight line. Pay attention to the gap in the process of walking. You need to control the robot to slowly rotate 90° to face the gap to clean the characteristic points, and then slowly turn back to continue scanning; the open area follows the U-shaped route (Picture below) Walking.



5. Control the robot to walk slowly, always observe whether the laser matches the terrain, if it does not match, stop and wait for the laser data to match the actual terrain before continuing.

6. First a small closed loop and then a large closed loop.



7. The robot should not be too close to the wall (>0.5m).

8. The operator should try not to be too close or too far away from the robot, too close will cause black spots on the map, and too far will cause unstable WIFI connection. A distance of 3 to 8 meters is suitable.

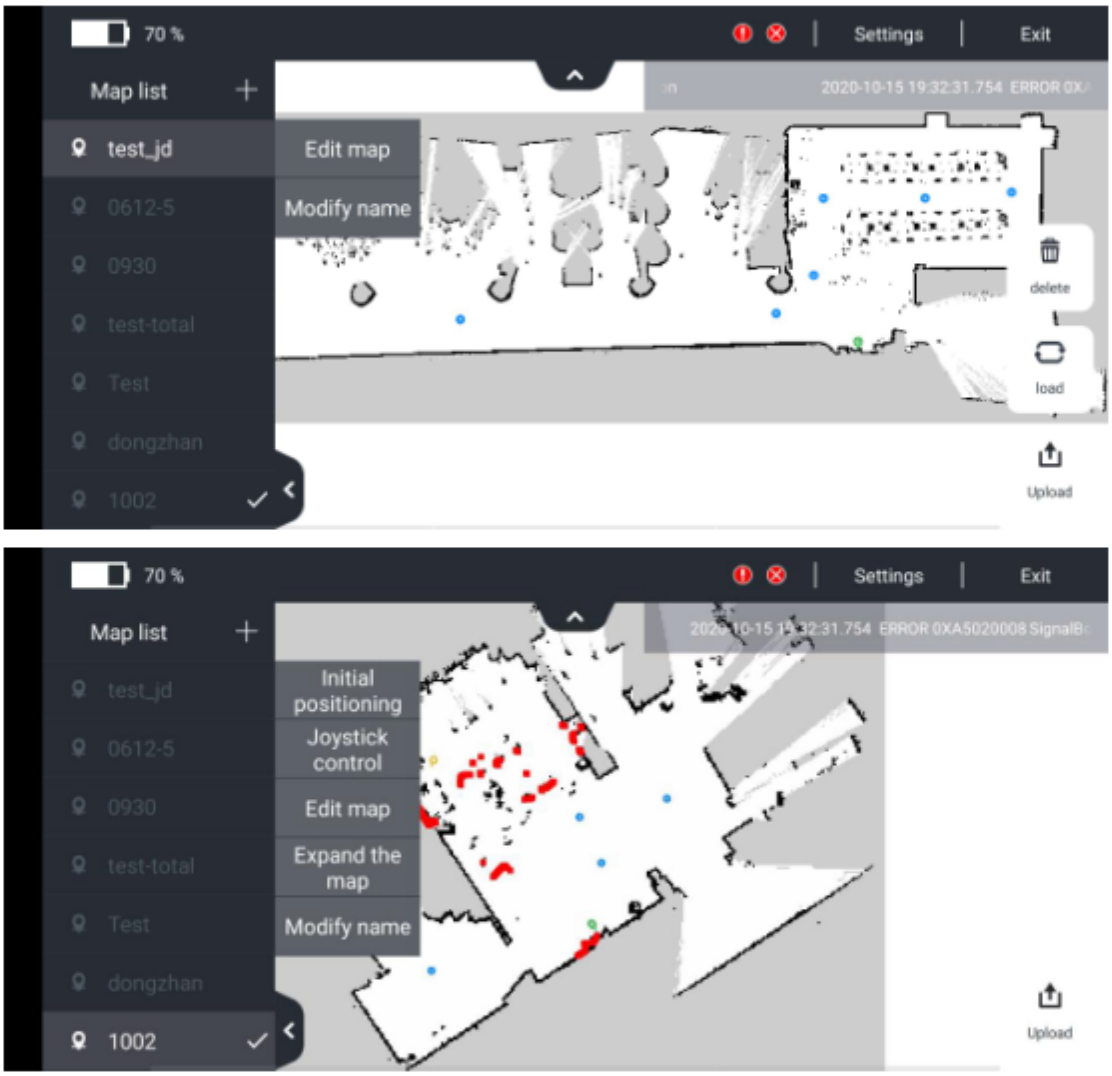
9. Don't close the loop in difficult to identify (such as walls, corridors without features).

10. If there are many closed-loop scenes in the scene, the consumption of computing resources will increase, and the real-time map status may not be displayed on the app. It is recommended to wait for the map information displayed on the app to be updated before finally saving the map. If the map is all updated after 3 minutes No more changes, you can finally save the map.

11. Do not move the robot after the robot reaches the end point. Just observe whether the map is clean and free of ghosting and matches the actual terrain.

If there is no obvious misalignment, the map can be completed. If there is a misalignment, please wait for a while. Algorithm Will be corrected. If the correction is not successful within 5 minutes, consider rebuilding the map.

5.8、Edit map



After the map is created, you can see the map list on the homepage. The map that has been created is displayed on the left side of the map list, but there will be missing scans during the map creation process, or in the case of special obstacles, manual operation is required to correct the pattern.

The above two pictures show two types of maps, ticked and not ticked. The ticked one is the default map of the system, and there are more options for

editing and control, while the unticked one is the general map library.

After the map is created, you can edit the navigation points, charging points and map errors. You only need to select "Edit Map". The available editing tools include "**Remove Obstacles**", "**Virtual Wall**", and " "**Charging point**" and "**Navigation point**".

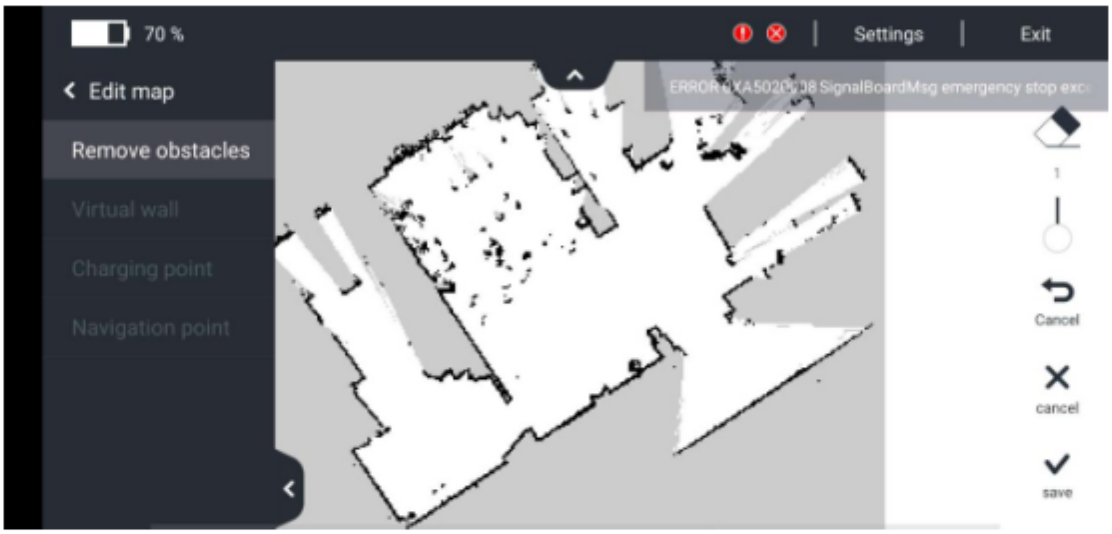
Please use "**Remove obstacles**" and "**Virtual wall**" to modify the map. "**Remove obstacles**" is to erase unnecessary areas, while "**Virtual wall**" can create a virtual wall. , After the establishment, the robot will default to the virtual wall being built as a wall, so the robot will not pass through the wall area during the mission.

Marking points are divided into "**charging point**" and "**navigation point**". The "charging point" is the location of the charging pile. If automatic charging is required, this point is necessary. The "navigation point" means that the robot will pass Or staying points, if you want to select disinfection points, these navigation points are the points that can be selected for disinfection.

5.8.1 Modify the map-remove obstacles

Generally, in the process of mapping, because there are moving objects on the route of the scan, which are regarded as obstacles, you need to use "remove obstacles" to remove them. Certain force majeure in the environment

(for example, there are many pedestrians) and the performance limitations of laser sensors can cause abnormal gray areas and black spots. This part of the area needs to be manually restored to a passable state to stabilize the navigation function.



The size of the noise removed can be removed by dragging the size with the tool. If you decide that the black spots on the image after removal are not obstacles, you can use Remove Noise to remove them. If you find an error in the cleaning process, you can click Cancel to go back, and you can return to the state before cleaning. After clearing, click save to save the revised map.

5.8.2 Modify map-virtual wall

The situation in the above picture is a complicated situation. The results of the scan during the mapping process will not be consistent with the actual situation, and the result is not identified as an obstacle, or when some areas do not want the robot to walk, you need to use the "virtual wall" function. The addition of obstacles and virtual walls. After adding, the robot will treat the virtual wall as a non-walkable obstacle.

The virtual wall needs to be drawn by touching the screen with your finger. After drawing, you can compare the actual scene and plan to confirm that it is correct, and then save the settings of the virtual wall. If you need to change, you can add a new virtual wall, and delete unnecessary virtual walls.

When the robot is building a map, if it encounters glass doors, reflective objects, or parts that easily absorb light sources, the judgment will be incorrect and no black areas or lines are generated. If there is no area judged to be unwalkable, please create a virtual wall to modify the map. In addition,

some walls will be mistaken as being in a passable state when scanning the picture. This part of the area needs to be painted with a virtual wall (the red circle area in the picture below is recommended to be painted with a virtual wall).

5.8.3、Marking dot-charging point

Click the "charging point" process, please follow the steps below.

1. There are two ways to move the robot near the charging pile.

＊Use the attached handle to operate the robot to move.

＊Press the emergency stop switch to push the robot to move.

2. After reaching the charging station, please press the emergency stop switch (if you have already pressed it, please ignore it), then align the charging pole piece on the robot with the charging pole piece of the charging station, and push the robot to make the charging pole pieces at both ends touch.

3. After contact, release the emergency stop switch.

4. Press the RESET button.

5. Connect the attached PAD to the robot hotspot.

6. Open the Futural Robotics APP on the attached PAD.

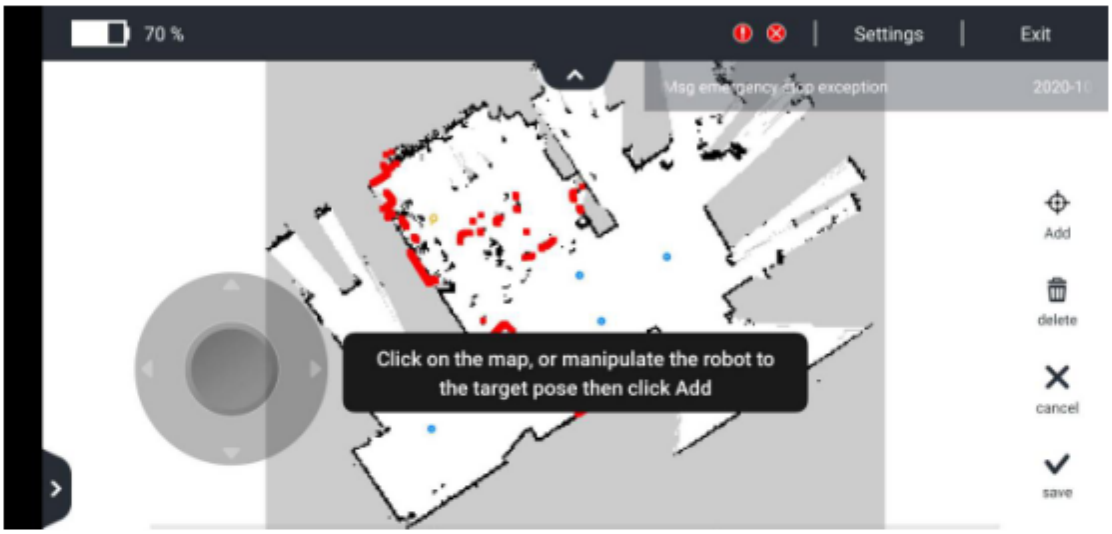
7. Log in.

8. Select the corresponding map and click "Edit Map".

9. Click "Charging Point".

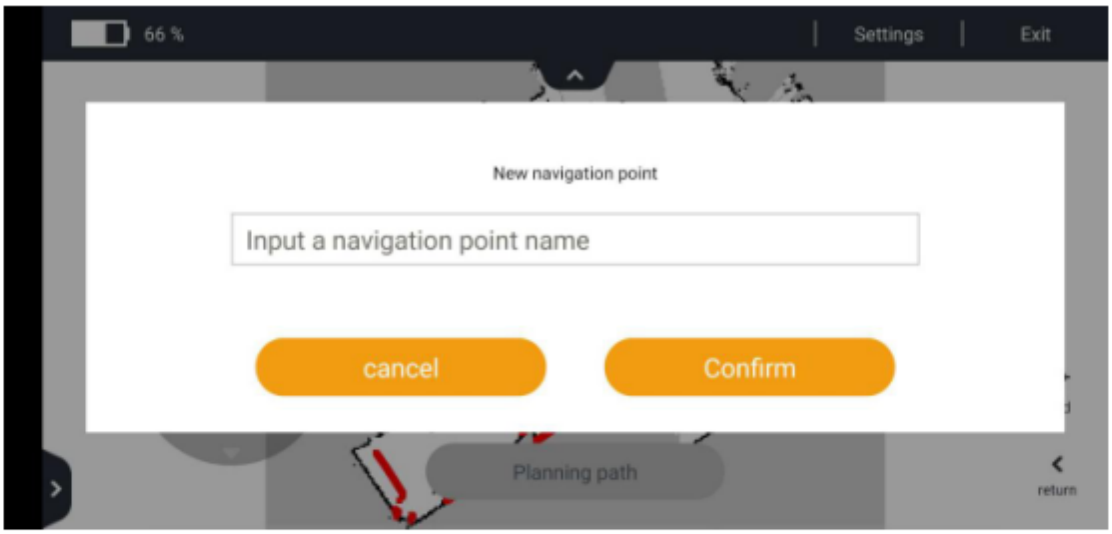
10. Click "Add" and click "Save" to complete the charging point management.

Note: Only one charging point can be established per map, and multiple charging points are not supported.



5.8.4、Marking dot-navigation point

The navigation point construction logic is the same as the charging point. You can still use the virtual handle to control the robot to the location that needs to be disinfected, click Add, enter the corresponding navigation point name, and click OK to complete the navigation point creation.



In addition, in general scenarios, it is recommended that the linear distance between the navigation point and the navigation point is 2.5 meters. The shorter the distance, the shorter the disinfection time (the minimum single point disinfection time of the robot itself is 10 minutes). In addition, the disinfection point needs to be at least 0.5 meters away from obstacles and virtual walls. For the corresponding table of the specific navigation point distance and disinfection duration for the scene, please refer to the following table (the other table is the same as in the appendix 10.4).

Type of disinfection	Distance between navigation point and navigation point (m)	Time for disinfection of single navigation point (minutes)

General bacteria	0.3	0.09
	0.5	0.14
	1	0.35
	1.5	0.73
	2	1.18
	2.5	1.77
	3	2.49
	3.5	3.09
	4	3.88
	4.5	4.76
	5	5.75
Bacterial spores	0.3	0.88
	0.5	1.35
	1	3.51
	1.5	7.34
	2	11.82
	2.5	17.73
	3	24.88
	3.5	30.86
	4	38.76
	4.5	47.62
	5	57.47
Fungal spores	0.3	5.4
	0.5	8.12
	1	21.05
	1.5	44.05
	2	70.92
	2.5	106.38
	3	149.25
	3.5	185.19
	4	232.56
	4.5	285.71
	5	344.83

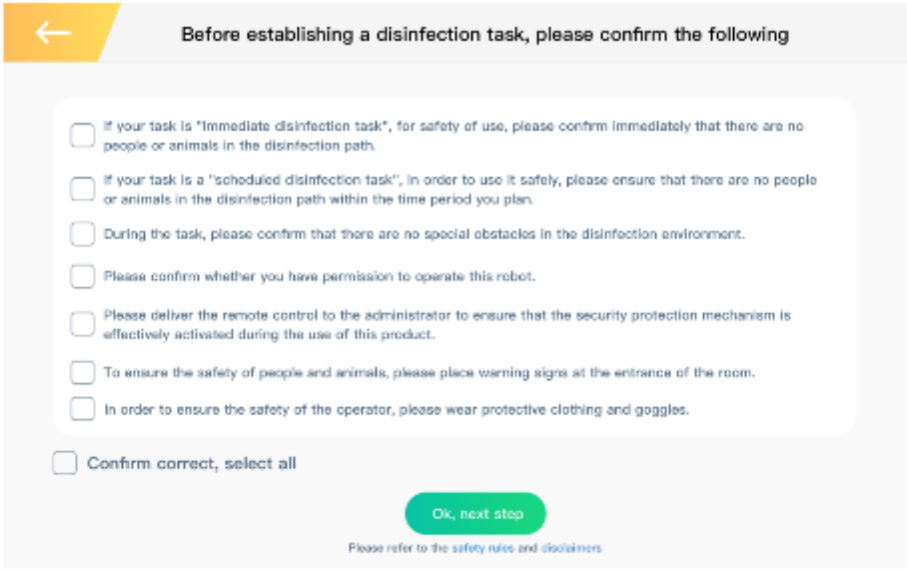
6、Start using the robot

The scope of work on the PAD side is to plan disinfection maps and establish navigation points, while the software control on the robot side covers all disinfection-related tasks, including "**New disinfection tasks**", "**Disinfection records**", "**Data statistics**" and "**Settings**". class.

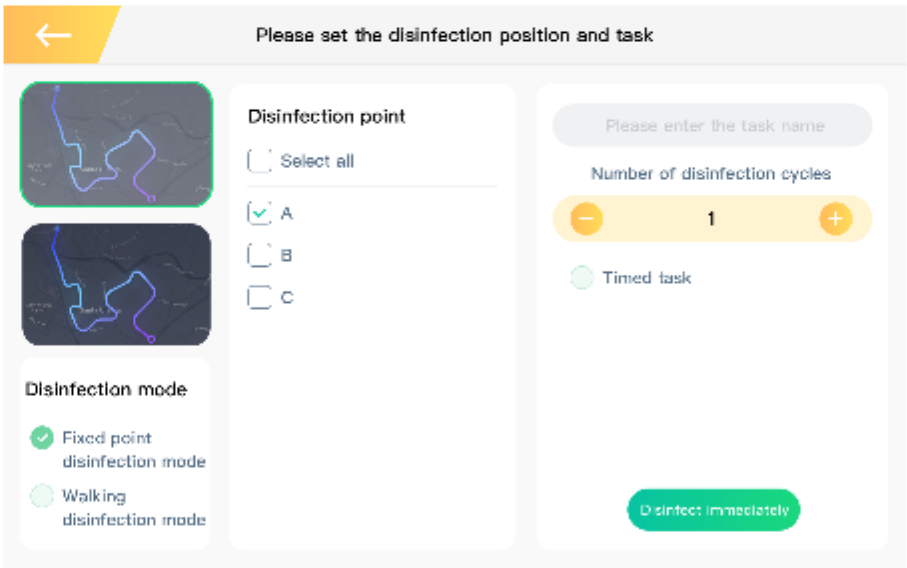
6.1、New disinfection task

To create a disinfection task, please click "New Plan" at the upper right corner of the homepage. The newly added plan is divided into two modes: "**Walking disinfection mode**" and "**Fixed point disinfection mode**", and can be scheduled according to the scheduled time "**Immediate disinfection tasks**" and "**Timed disinfection tasks**" can be selected according to the needs of on-site disinfection. Please refer to 6.1.1 for the description of the fixed-point killing mode, see 6.1.2 for the description of the walking kill mode, see 6.1.3 for the description of the immediate disinfection task (Fixed point disinfection mode), and see the description of the immediate disinfection task (Walking disinfection mode) 6.1.4. Please refer to 6.1.5 for the timed disinfection task (Fixed point disinfection mode), and see 6.1.6 for the timed disinfection task (Walking disinfection mode).

After clicking on the new plan, you will enter the confirmation page. This page is to effectively ensure the overall safety of use. For the safety of use, remember to read the specifications carefully and implement them. When all items are confirmed and checked, click the "OK, next step" button.



After clicking "OK, next step", you will enter the page for selecting the disinfection location and task. Please select the corresponding disinfection location and task according to the usage scenario and situation. The default map is selected as the default map on the far left. If you choose other Map, when clicked, you will be prompted to replace the preset map on the PAD side.



Next, you need to select the desired disinfection mode. The disinfection mode is divided into "Fixed point disinfection mode" and "Walking disinfection". The two disinfection modes are introduced below.

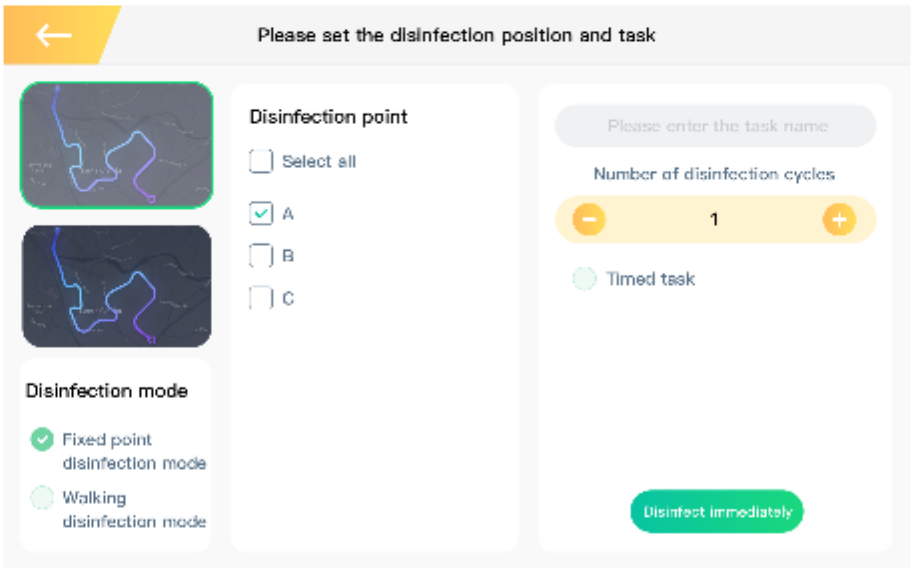
6.1.1、Fixed point disinfection mode

Fixed point disinfection mode means that when the robot performs a task, it will perform disinfection for a fixed period of time (the default is 10 minutes) according to the disinfection point you choose, and when it walks to the corresponding point, after disinfecting a disinfection point, Only after moving to another disinfection point, the disinfection work for a fixed time will continue. When all the disinfection points are disinfected, the entire task ends.

6.1.2、Walking disinfection mode

Walking disinfection mode means that when the robot performs a task, it will plan a disinfection path according to the disinfection point you selected, and then walk at a speed of 0.036m/s while turning on the UV light for disinfection. When the path is completed, the entire task Just ended.

6.1.3、Immediately disinfect tasks (select fixed point disinfection mode)

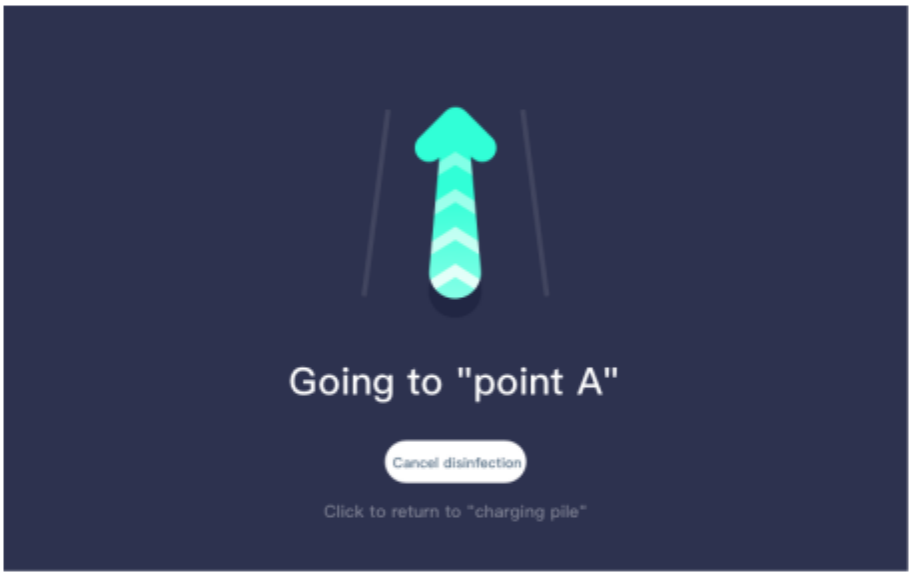


After selecting the "fixed-point disinfection mode", turn to the right to select the disinfection location (the location of the point is the navigation point established by PAD for the map), and the rightmost is to fill in the name of the

disinfection task and the number of disinfection cycles. After all the above selections and settings are completed, click "Disinfect Now" to start the disinfection task. This task type is "Immediate Disinfection Task (select fixed-point disinfection mode)".

After the robot receives the immediate disinfection task, it will immediately go to the first disinfection point and prompt you to the target location of the robot.

Note: If you find that the task setting is wrong at this time, you can click "Cancel Disinfection" to cancel the action at this time. After the robot receives the cancellation action, it will return to the charging station.



When the robot reaches the designated navigation point, it will start to count down for 45 seconds. After the countdown is completed, it will monitor whether there are people or animals at the same time. If people or animals are found, the UV lamp will not be turned on for disinfection. When there are no people or animals, the UV lamp will be turned on for disinfection after the countdown is completed.

In addition, during the preparation phase, the robot will voice announcements and flashing warning lights to inform that it is preparing for disinfection.

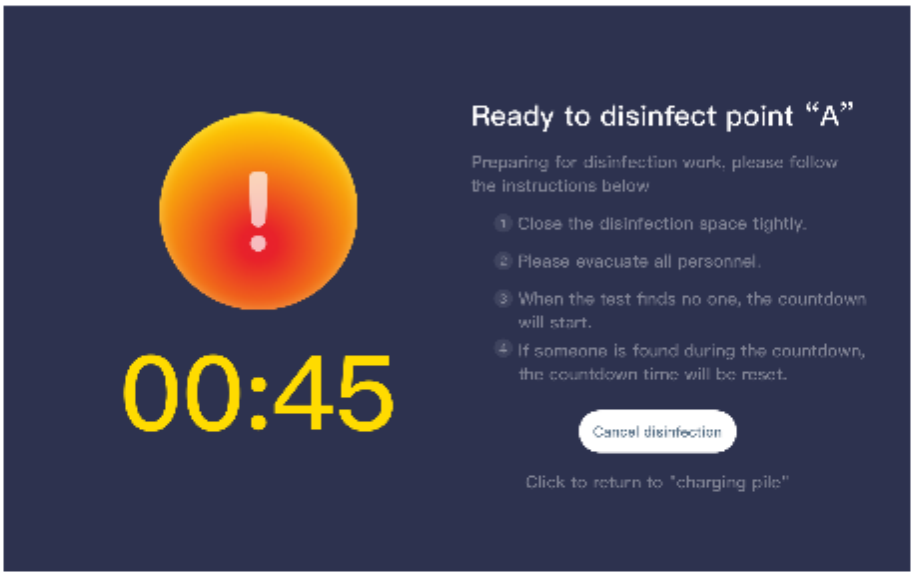
The following are the precautions when preparing for disinfection:

＊Please close the space to be disinfected.

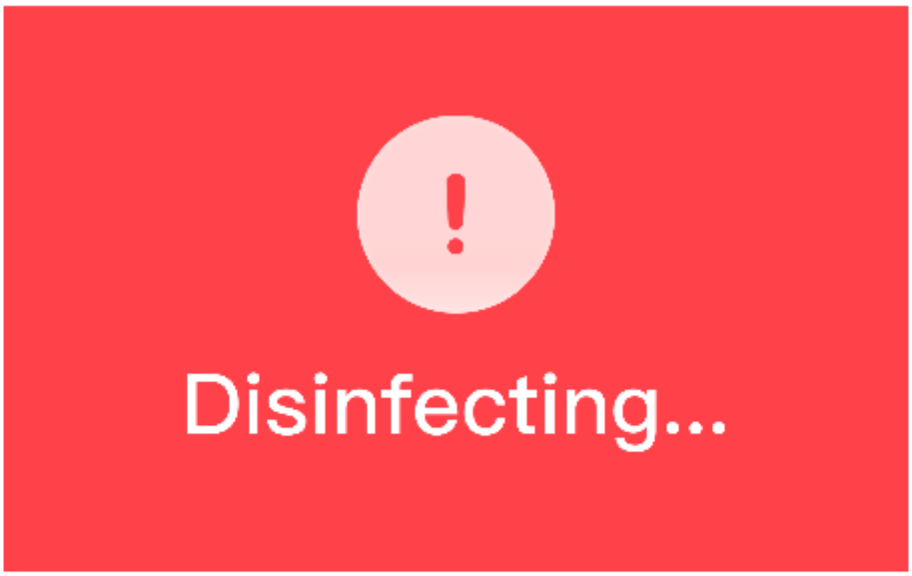
＊All personnel are requested to evacuate.

＊The default countdown second is 45 seconds.

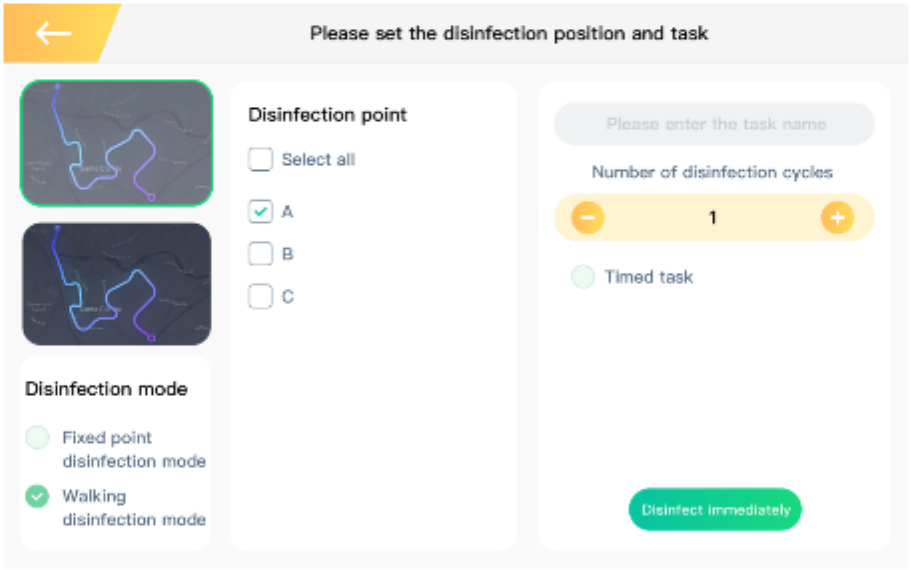
＊If you find that the task setting is wrong at this time, you can click "Cancel disinfection" to cancel the action at this time. After the robot accepts the cancel action, it will return to the charging station.



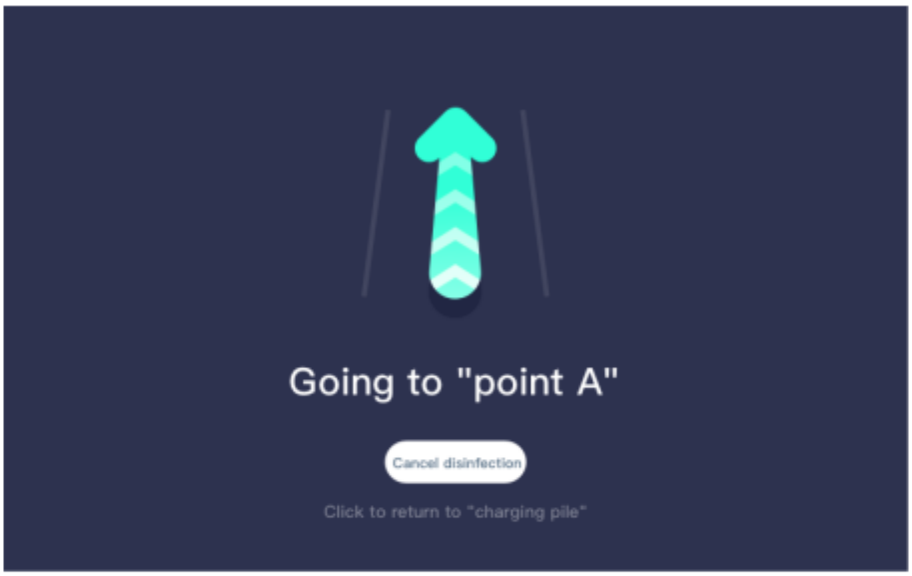
After the countdown is over, the robot starts to perform disinfection work. During the disinfection process, a voice announcement and a flashing warning light will inform that the disinfection work is in progress. The default disinfection time for each disinfection position is 10 minutes. If you need a longer disinfection time, please refer to 6.4.1 for setting changes.



6.1.4 、 Immediately disinfect tasks (select walking disinfection mode)

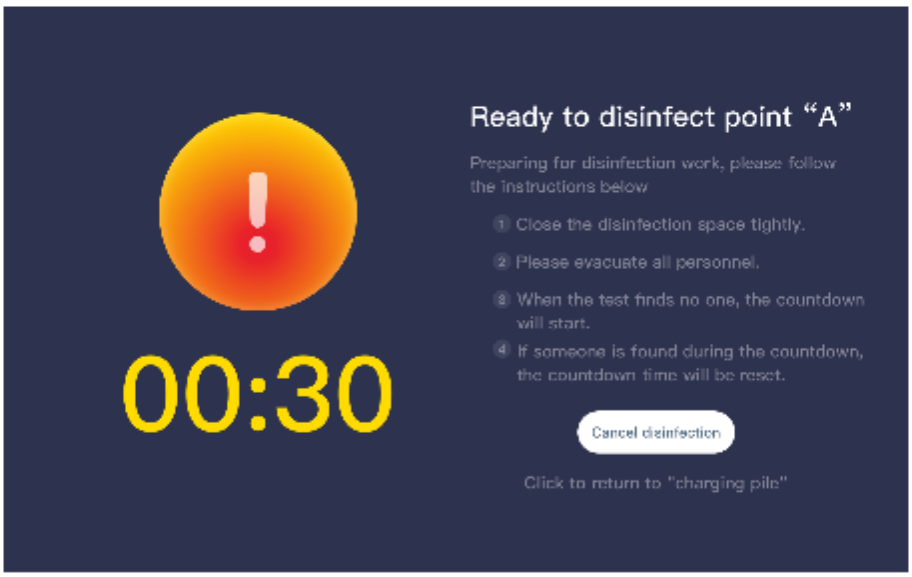


After selecting "Walk and Kill Mode", turn to the right to select the disinfection location (the location of the point is the navigation point established by PAD for the map), and the rightmost is to fill in the name of the disinfection task and the number of disinfection cycles. After all the above selections and settings are completed, click "Disinfect Now" to start the disinfection task. This task type is "Disinfect immediately (select the mode of killing while walking)"



After the robot receives the immediate disinfection task, it will immediately go to the first navigation (disinfection) point and prompt you to the target location of the robot.

Note: If you find that the task setting is wrong at this time, you can click "Cancel Disinfection" to cancel the action at this time. After the robot receives the cancellation action, it will return to the charging station.



When the robot reaches the designated first navigation (disinfection) point, it will start a countdown of 30 seconds. After the countdown is over, it will start disinfection while walking. In addition, during the preparation phase, the robot will voice announcements and flashing warning lights to inform that it is

preparing for disinfection.

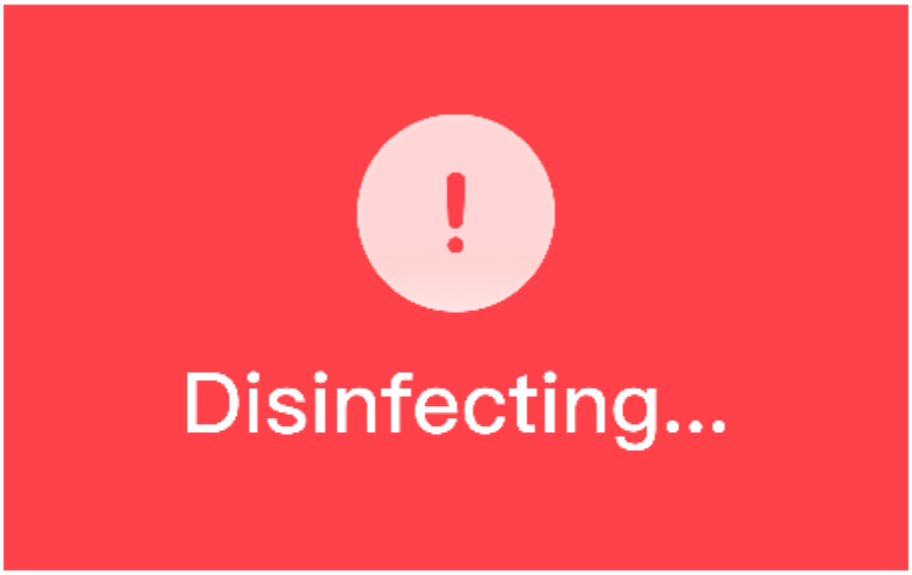
The following are the precautions when preparing for disinfection:

＊Please close the space to be disinfected.

＊All personnel are requested to evacuate.

＊The default countdown second is 30 seconds.

＊If you find that the task setting is wrong at this time, you can click "Cancel disinfection" to cancel the action at this time. After the robot accepts the cancel action, it will return to the charging station.

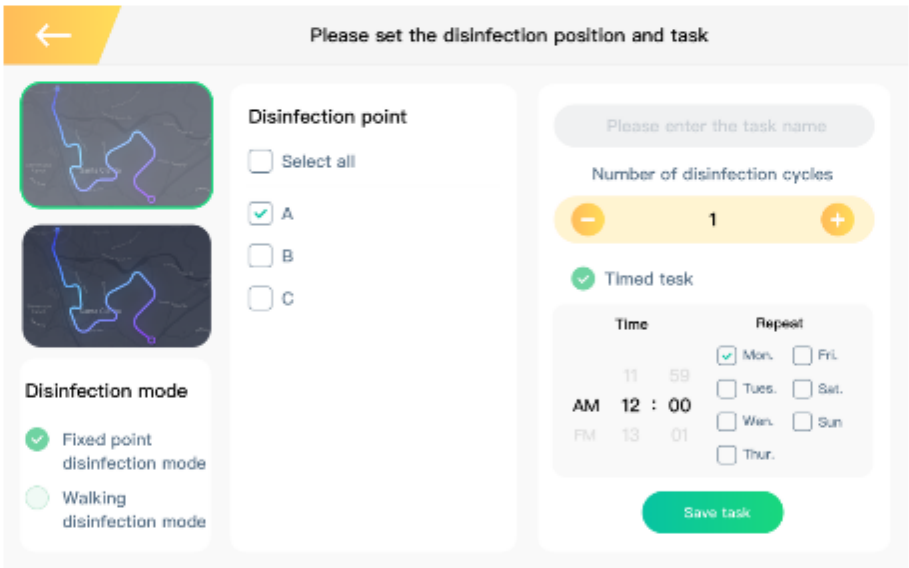


When the first navigation point is disinfected for 2 minutes, it will intelligently plan the path according to the navigation point you set, and the robot will follow the path at 0.036m/s, and the UV light will be turned on for disinfection. At the same time, during the disinfection process, the robot displays "disinfecting", and the voice broadcast prompts the user "disinfecting, please leave".

In addition, when the robot reaches the last navigation (disinfection) point, it will stay at that point for 2 minutes to disinfect, and after 2 minutes of disinfection, it will move back to the charging pile to end the disinfection task.

6.1.5、 Timed disinfection tasks (select fixed point disinfection mode)

The timed disinfection task is the same as the immediate disinfection task. To set the timed disinfection task, click "Add Plan" on the home page, and set the disinfection mode, select the disinfection area and location, edit the task name and select the number of disinfection cycles. The only difference is that the scheduled disinfection task needs to check the "timed task" button. After checking, you need to select the time and repeat cycle. After the above settings are completed, select the save task to complete the scheduled disinfection task setting. Therefore, if you select "Fixed point disinfection mode" and check the "timed task" button, the task executed is "**Timed disinfection task (Fixed point disinfection mode)**".



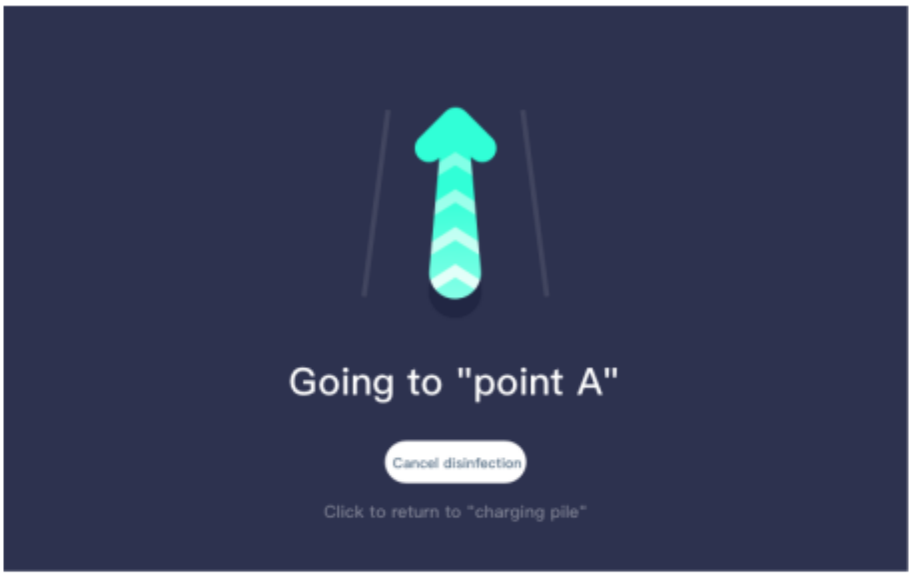
After the scheduled disinfection task is saved, it can be viewed, edited and deleted on the home page.

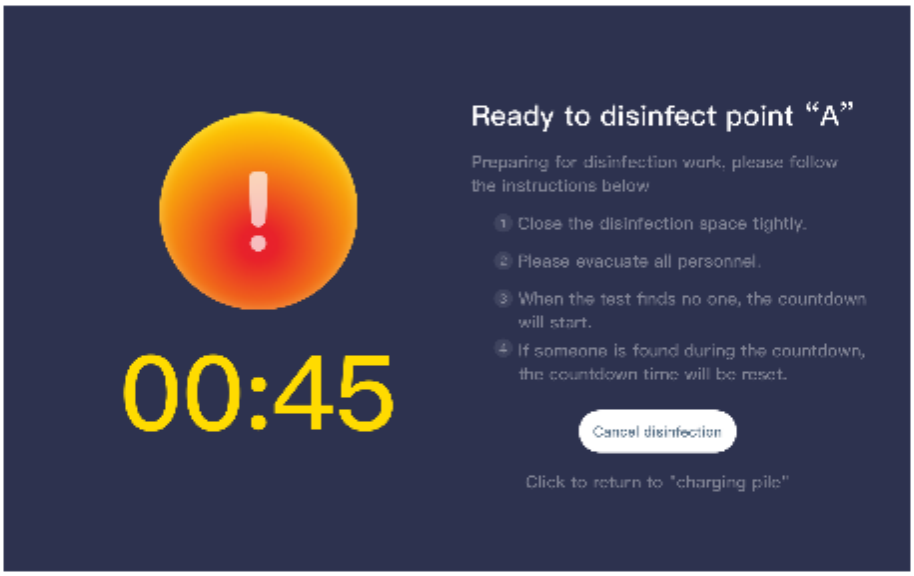
The set timed disinfection task will automatically execute the disinfection task when the start time is reached. The process of executing the disinfection task is equivalent to the immediate disinfection task (fixed-point disinfection mode). The only difference is that the execution will start when the scheduled time is up.

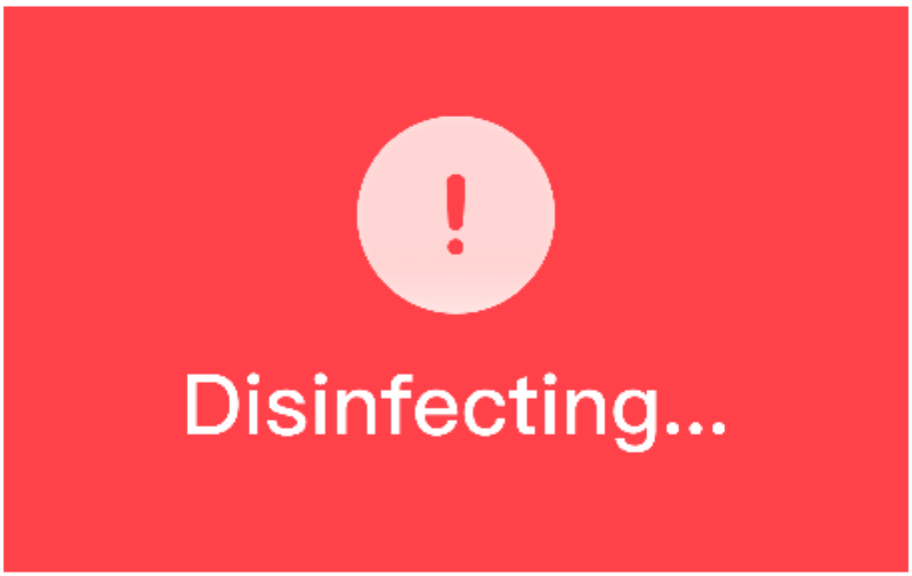
When performing a task, it will first go to the first navigation (disinfection) point. After reaching the navigation (disinfection) point, perform a countdown to prepare for disinfection, and immediately start disinfection after the countdown is completed.

Times disinfection task (fixed-point disinfection mode) disinfection task flow when the set time schedule arrives:

＊Go to the disinfection navigation (disinfection) point --> Countdown to prepare for disinfection (default 45 seconds) --> Start disinfection --> Return to the charging station after the disinfection task is completed

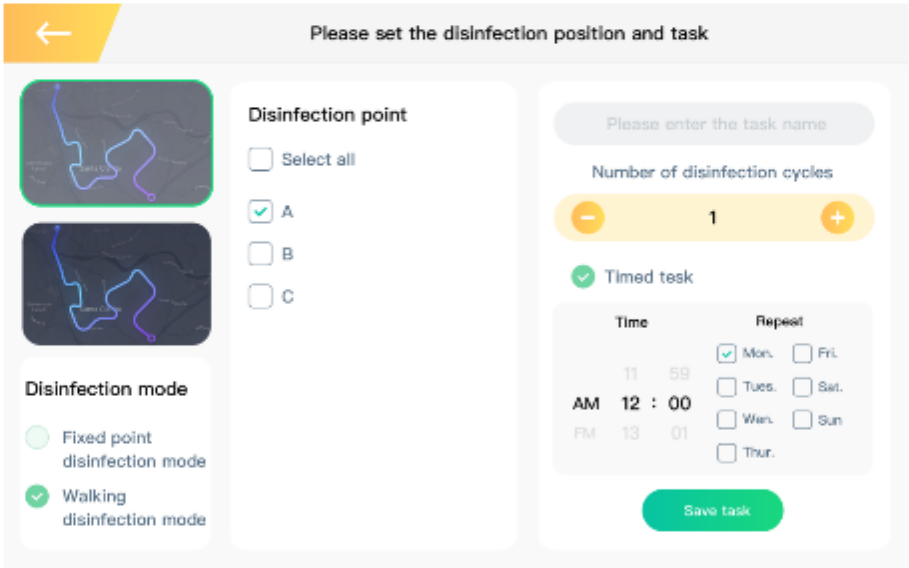

Going to "point A"
Cancel disinfection
Click to return to "charging pile"


00:45
Ready to disinfect point “A”
Preparing for disinfection work, please follow the instructions below
1 Close the disinfection space tightly.
2 Please evacuate all personnel.
3 When the test finds no one, the countdown will start.
4 If someone is found during the countdown, the countdown time will be reset.
Cancel disinfection
Click to return to "charging pile"


Disinfecting...

6.1.6 、 Timed disinfection task (select walking disinfection mode)

The timed disinfection task is the same as the immediate disinfection task. To set the timed disinfection task, click "Add Plan" on the home page, and set the disinfection mode, select the disinfection area and location, edit the task name and select the number of disinfection cycles. The only difference is that the scheduled disinfection task needs to check the "timed task" button. After checking, you need to select the time and repeat cycle. After the above settings are completed, select the save task to complete the scheduled disinfection task setting. Therefore, if you select "walking disinfection mode" and check the "Timed task" button, the task executed is "**Timed disinfection task (Walking disinfection mode)**".



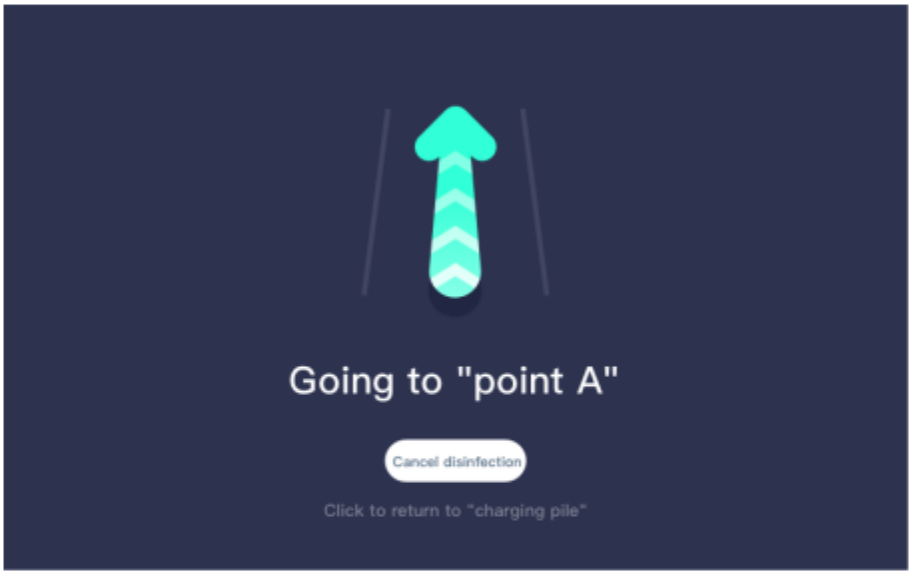
The set timed disinfection task will automatically execute the disinfection task when the start time is reached. The process of executing the disinfection task is equivalent to the immediate disinfection task (killing while walking), the only difference is that the execution will start when the scheduled time is up .

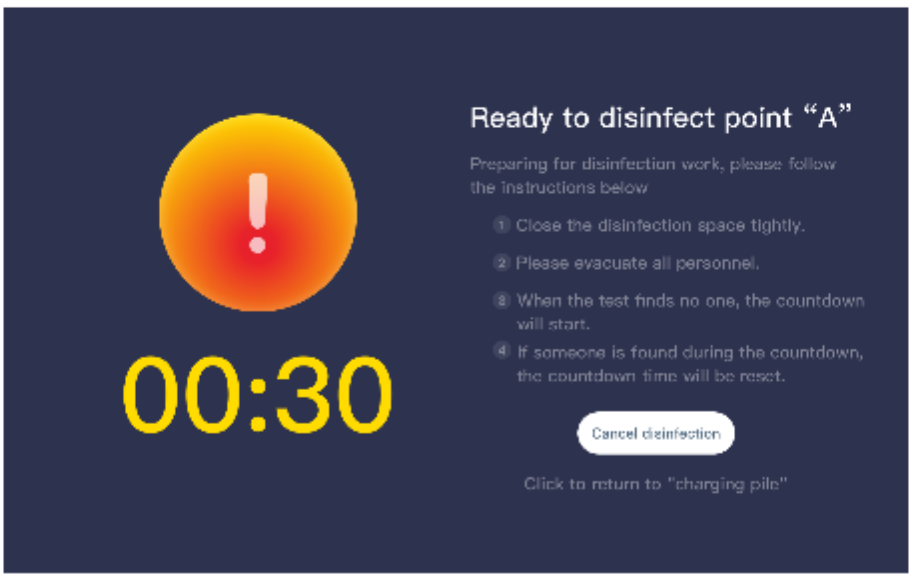
When performing a task, it will first go to the first navigation (disinfection) point. After reaching the navigation (disinfection) point, perform a countdown

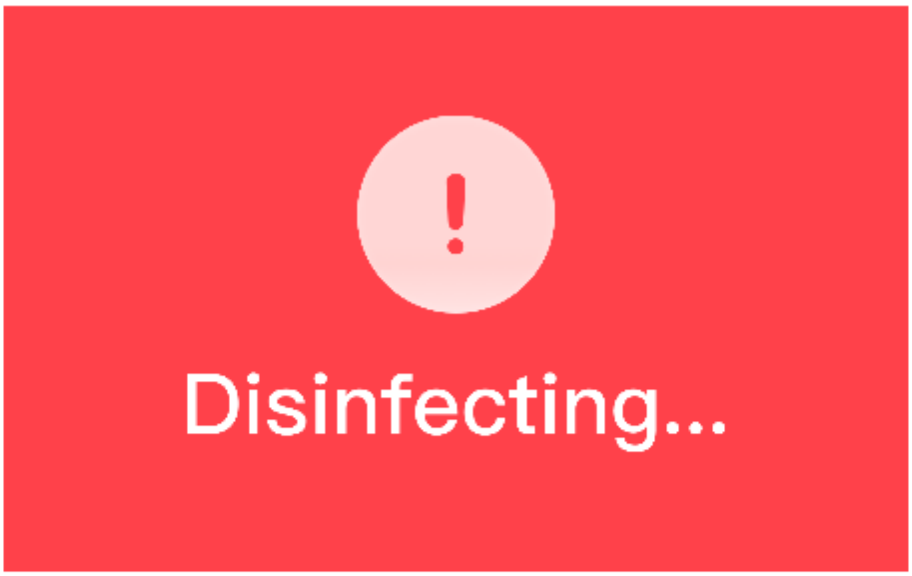
to prepare for disinfection, and immediately start disinfection after the countdown is completed.

The disinfection task flow when the scheduled time of the scheduled disinfection task (walking disinfection mode) arrives:

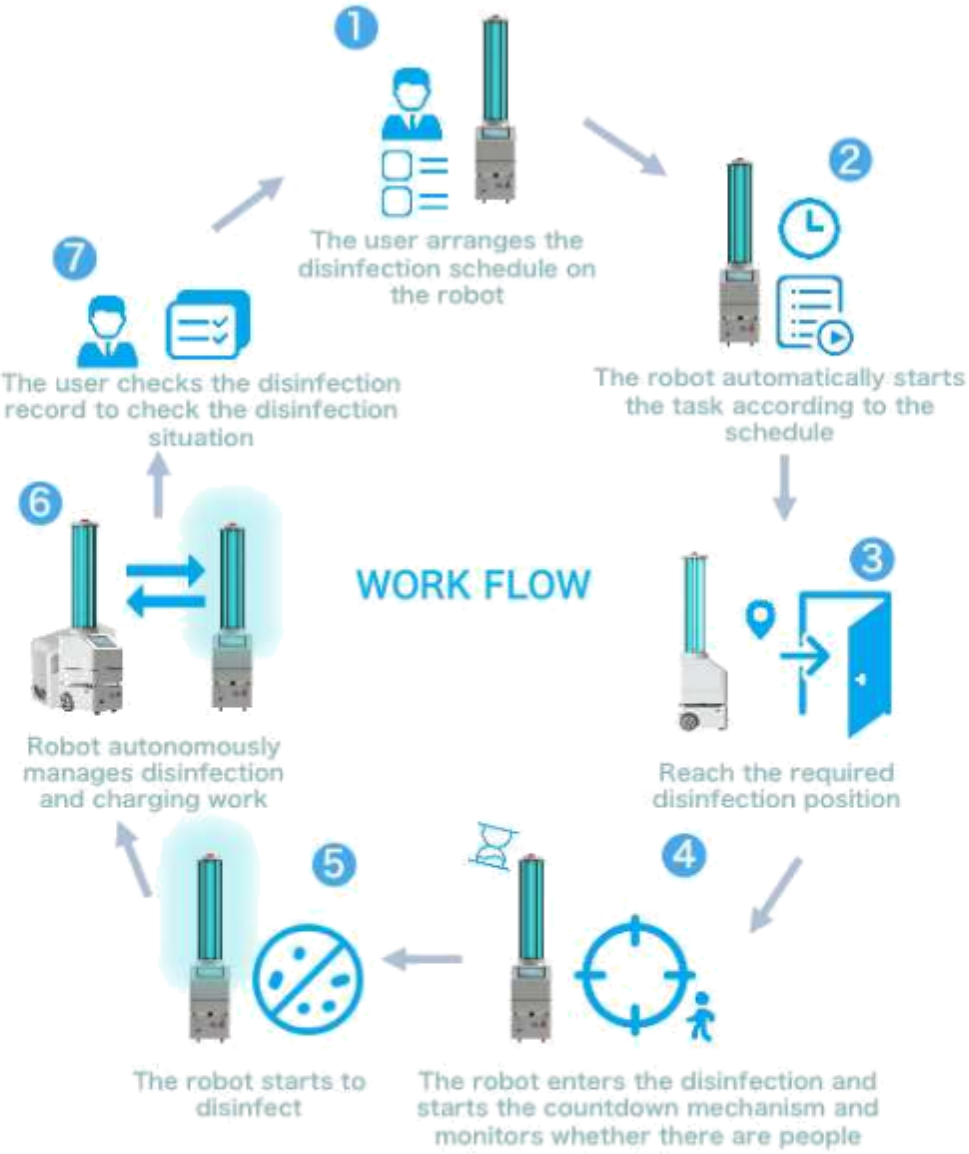
＊Go to the first navigation (disinfection) point --> Count down to prepare for disinfection (default 30 seconds) --> Start disinfection for 2 minutes --> Disinfect while walking along the disinfection planning path --> Reach the last navigation (disinfection) Point) --> Stay for disinfection for 2 minutes --> Return to the charging pile after the disinfection task is completed





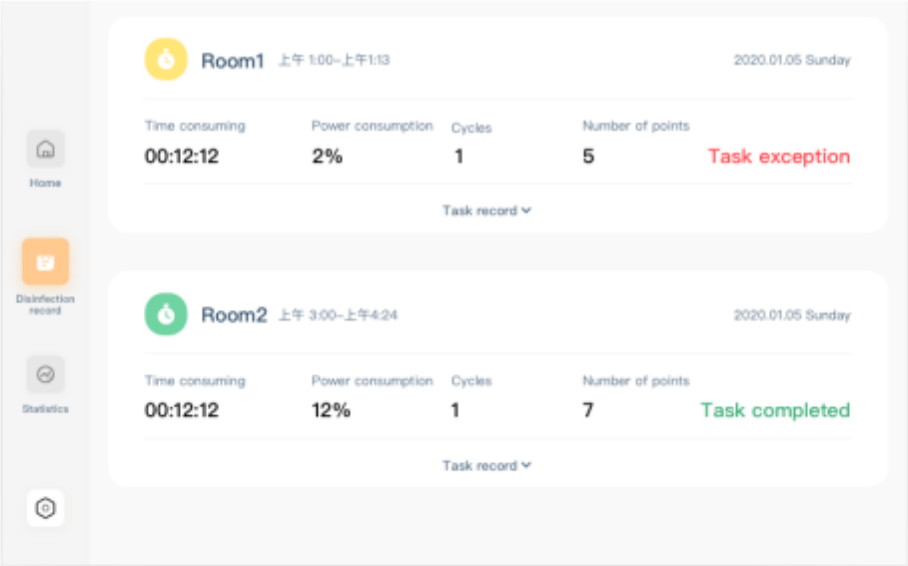


6.2、Disinfection process

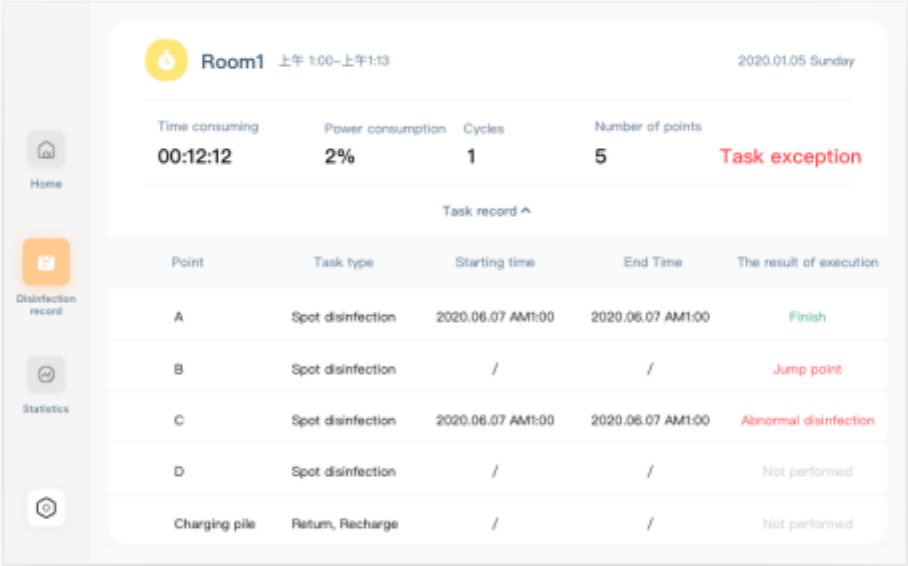


6.3、Disinfection record

The disinfection record will record each disinfection situation for you, and you can judge from the disinfection record whether the task performed each time is normal.



Each disinfection record will record the task record in detail, and display the results of the execution. You can also check the task record and troubleshoot the abnormality that occurred (for troubleshooting, please refer to 10.1).



6.4、Statistics

The statistical data mainly shows the disinfection use time, cumulative disinfection time and the number of cumulative disinfection tasks of the six ultraviolet lamps.

It is worth noting that the service life of each lamp tube is 2000 hours. If it exceeds this service life, the disinfection effect will be reduced, so please remember to replace the lamp at this time. After the lamp is replaced, please click "Reset", the statistics will be reset to zero and start to calculate the lamp disinfection statistical time for you again.

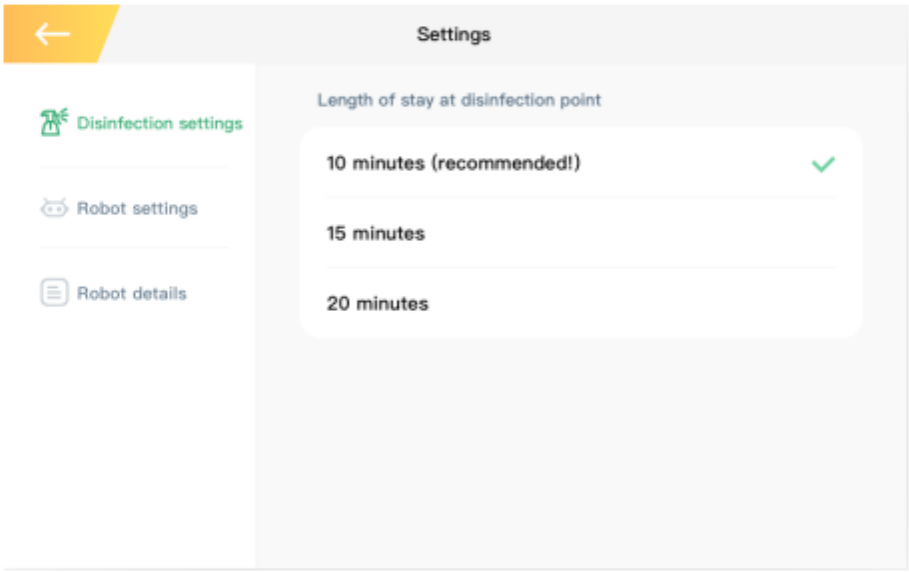
In addition, the label of the lamp can correspond to the upper edge of the lamp of the robot, and the upper edge of the lamp will display the number, which is convenient for you to replace the lamp, and you can calculate the disinfection time corresponding to the corresponding numbered lamp.

6.5、Seetings

The settings are divided into "**Disinfection settings**", "**Robot settings**" and "**Robot details**"

6.5.1、Disinfection settings

The disinfection setting part is set for the "**Disinfection point disinfection duration**". Each time the robot performs a task, it will stop at the disinfection point and start disinfection, and will stop and disinfect according to the set disinfection duration. The recommended disinfection time is 10 minutes, and you can adjust the disinfection time at the disinfection point according to the scope and situation you want to disinfect.



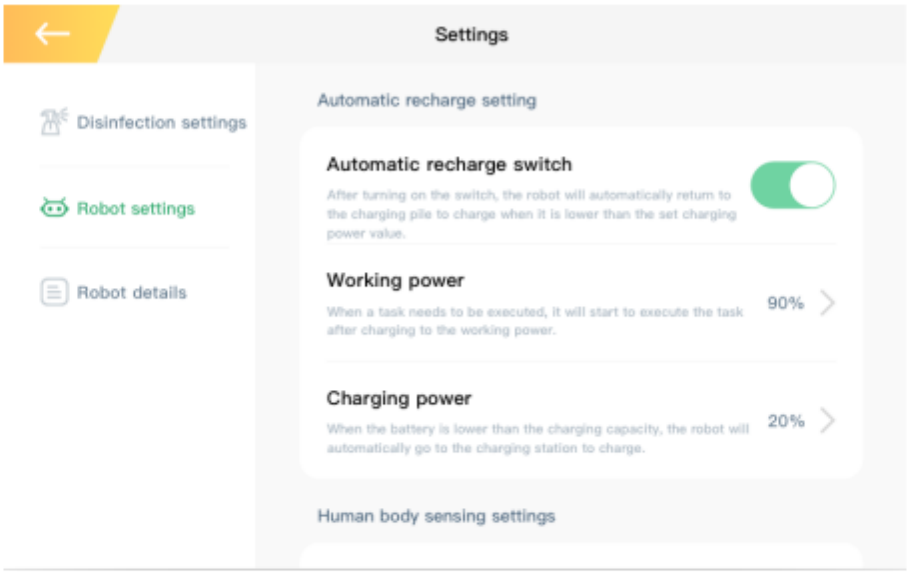
6.5.2、Robot settings

The robot settings are divided into "**Automatic recharging settings**" and "**Human body induction settings**".

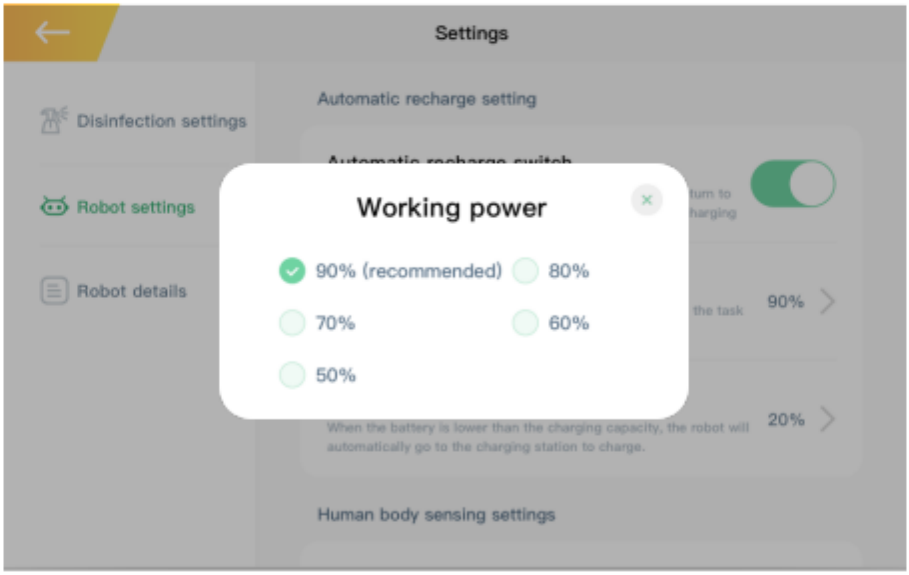
The automatic recharging setting is divided into "**Automatic recharging switch**", "**Working power**" and "**Charging power**". The detailed setting function description is as follows:

＊Automatic recharging switch: The automatic recharging switch is divided

into two states: "**on**" and "**off**". When the automatic recharging switch is turned on, the robot will automatically return to the charging pile to charge when the amount of charging power is lower than the set value .

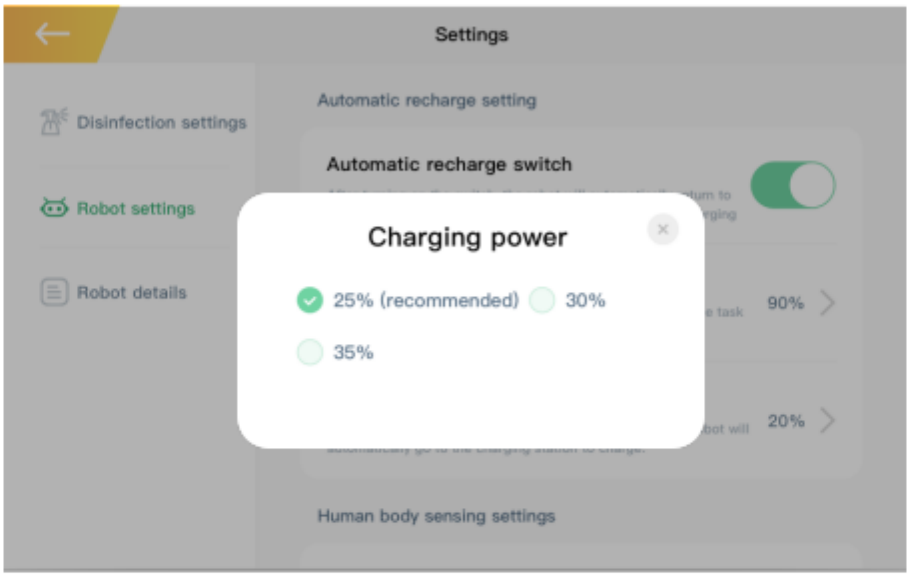


＊Working power: The purpose of setting working power is that when there is a task that needs to be executed, the work will start after being charged to the working power. The power percentage setting of working power is divided into five values: 90%, 80%, 70%, 60%, and 50%. The recommended working power percentage is 90%.

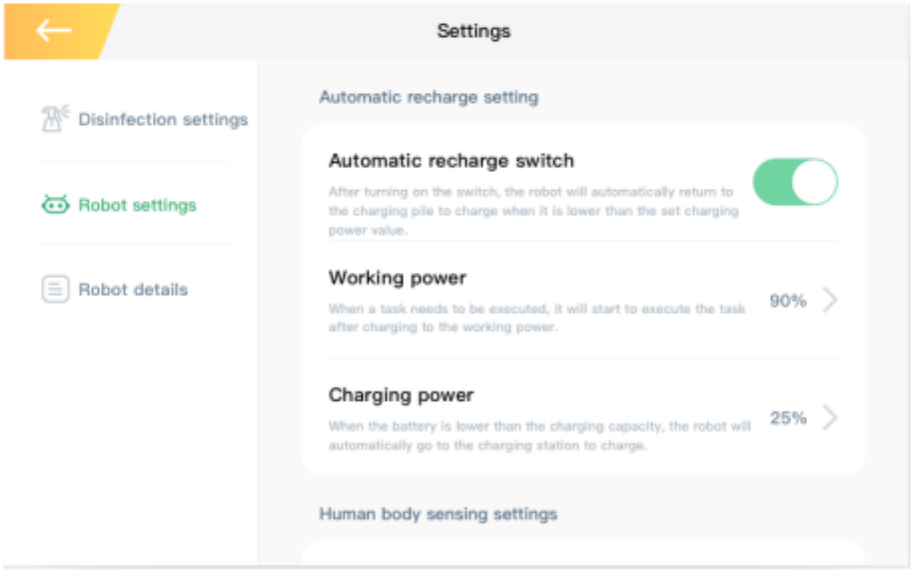


＊Charging power: The purpose of charging power setting is that when the battery power is lower than the charging power, the robot will automatically

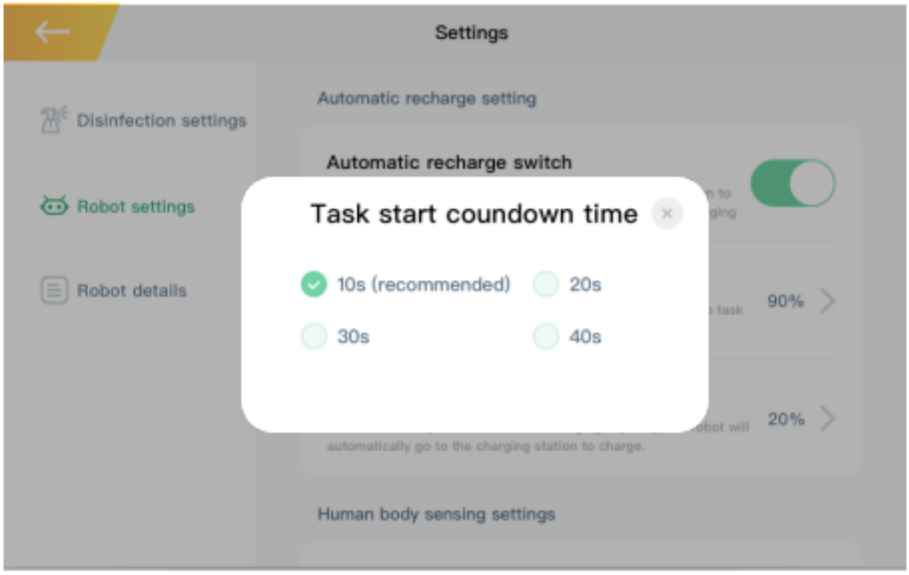
charge to the charging station. The charging power percentage setting is divided into 25%, 30% and 35%, and the recommended charging power percentage setting is 25%.



＊Human body induction switch: After the human body induction switch is turned on, when someone is found during the task, the task will be suspended immediately.

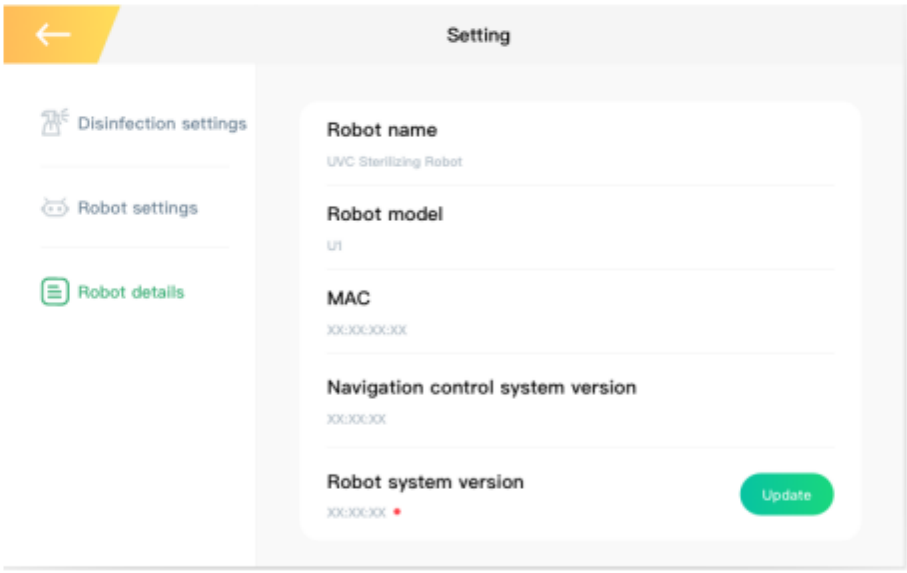


＊Task start countdown time: When the task is about to start, it will enter the countdown timer. The countdown time is 10 seconds, 20 seconds, 30 seconds and 40 seconds. When the countdown is completed, the robot starts to perform the task.



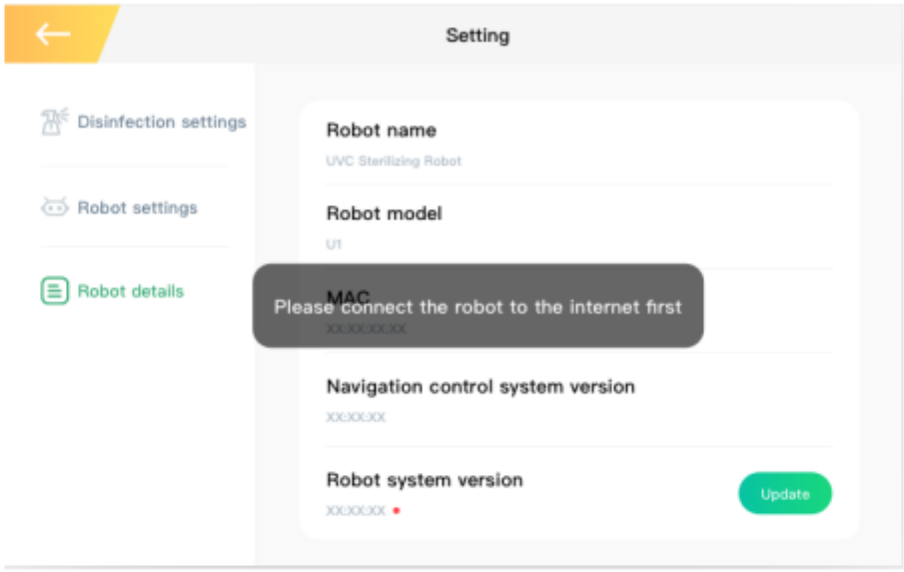
6.5.3、Robot details

Robot details include "**Robot name**", "**Robot model**", "**MAC**", "**Navigation control system version**" and "**Robot system version**".

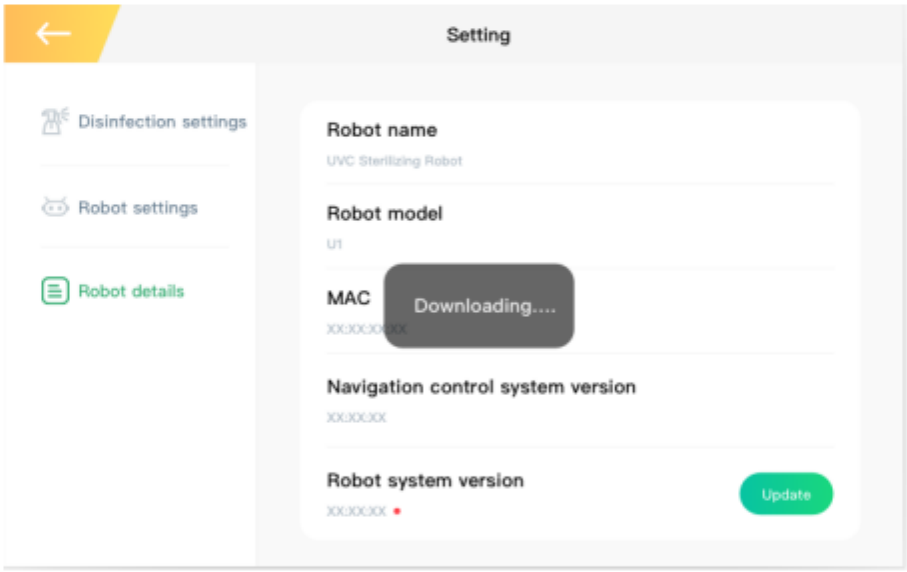


＊Robot system version: The version of the robot system will be monitored. When there is a new version, a red dot reminder will be displayed, and you can click the "Update" button to update the system version. When the robot is not connected to the Internet, when you click "Update, you will be prompted to connect to the Internet, please refer to 6.5.4 for the Internet

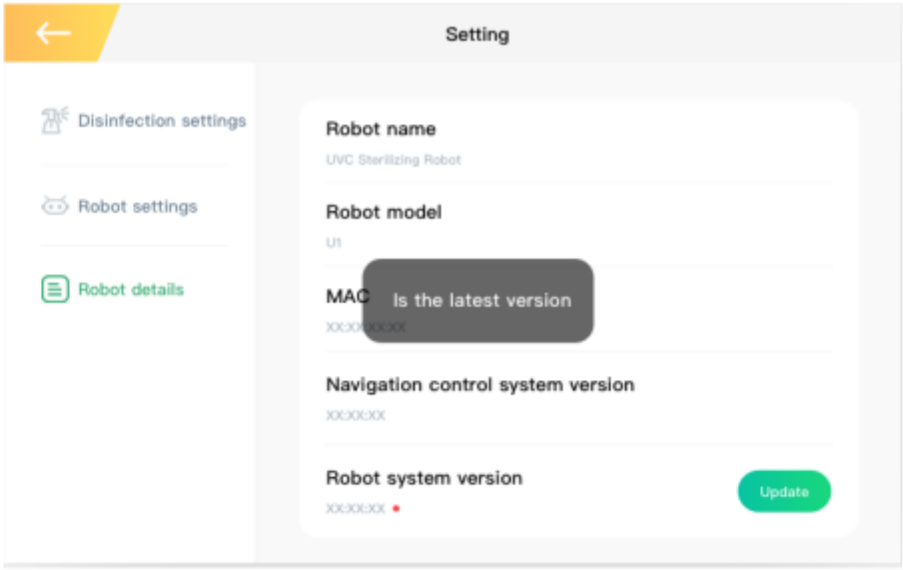
connection operation).



When the robot is connected to the Internet and the version needs to be updated, it will download when you click Update.



When the robot is already the latest version, clicking update will display to inform you that it is the latest version.



7、Automatic recharge

First of all, the automatic recharge switch can be set in the settings (see 6.4.2). When the automatic recharge switch is turned on, the robot will automatically recharge according to the following logic.

＊Automatic recharge logic for scheduled disinfection tasks－

	Power is lower than charging power	The power is between the charging power and the working power	Power is higher than working power
No task	Automatic recharge	Stay at the charging point	Stay at the charging point
Task in progress	Recharge after the task is suspended, and perform the task after charging to the working power	Continue the task	Continue the task
Scheduled tasks are ready to be executed	After charging to the working power, perform the task	Start execution task	Start execution task

＊Automatic recharge logic for immediate disinfection tasks－

	Power is lower than charging power	The power is between the charging power	Power is higher than working power

		and the working power	
No task	Automatic recharge	Stay at the charging point	Stay at the charging point
Task in progress	Recharge after the task is suspended, and perform the task after charging to the working power	Continue the task	Continue the task
Start an immediate disinfection task	It cannot be started, and the immediate disinfection task can be started until the charge exceeds the charge capacity.	Start execution task	Start execution task

8、Security protection mechanism

8.1、Software protection mechanism

＊Task error can be cancelled:

When the disinfection task is in progress, there are two situations to cancel the task. The first is to click the cancel button when the task goes to the disinfection point. The second is when the task is ready to be executed, you can click the button to cancel the task in the countdown screen that appears.

＊Countdown mechanism:

When the disinfection task is ready to be executed, it will enter the countdown, and there is no need to worry about the disinfection work when it reaches the disinfection point. During the countdown process, you can evacuate people and leave the disinfection point. After the countdown, you can start disinfection.

8.2、Hardware protection mechanism

＊Human body detection:

After the human body induction detection is turned on (need to turn on the human body induction switch, please refer to 6.5.2), it will monitor the existence of a person during the disinfection and after the countdown of the task to be performed.

When a person appears during the disinfection process, the robot will stop disinfection and enter the countdown status page. After the person leaves, it will reset the countdown seconds and count down. After the countdown, the robot will start disinfection.

8.3、Forced stop mechanism

Remote control:

In the event of an abnormal failure, or when you want to cancel the robot action in an emergency shutdown task, you can use the remote control provided in the accessory kit. After pressing the shutdown button, the upper half of the robot can be turned off.

9、Accessories instructions

9.1、Joystick

The joystick is used to control the robot, and the robot can be controlled without the cumbersome PAD login.

When the joystick is in the normal power-on state of the robot, insert the joystick receiver into the "Nevigation" hole of the robot. After connecting, just

press the A button and press the front, back, left and right keys to operate the robot control.

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9.2、Protective suit

The protective clothing is used for setting disinfection and other tasks. The left picture is used for wearing on the body, and the right picture is used for eye protection. After the wear is confirmed, the immediate disinfection setting can be performed.

9.3、Remote control

The remote control is used in the disinfection process and needs to stop the robot immediately. You can press "Off" to turn off the robot's UV lamp. On the contrary, press "ON" to turn on the UV lamp (it will not be turned on immediately after pressing, but the UV lamp can be turned on smoothly when the task is executed next time).

Note: In order to prevent forgetting to use the remote control to turn on the UV lamp switch, which will cause the UV lamp to not turn on in the subsequent tasks, please make sure to press the Will not be opened, only when the next task is executed).

10、Appendix

10.1、Troubleshooting instructions

1.What should I do if the robot fails halfway?

First confirm whether the robot is turned on. If it is not turned on, please try to turn it on and press the RESET button. If it cannot be turned on, please confirm whether it is dead, if it is dead, try using a hand charger to charge it. After successfully booting, you can use the handle to control the robot to the charging pile and re-plan the disinfection task.

If the fault is halfway for many times, and it has not been effectively solved, please try to contact after-sales personnel.

2.The robot cannot walk and the wheels will not move?

Please confirm whether the emergency stop switch is pressed, if it is pressed, release it to unlock it.

3.The robot cannot be turned on?

Please check if charging is required. Check whether the machine process is correct.

4. What should I do if the ultraviolet rays of the robot are not turned on normally?

Please follow the steps below to check.

＊Check whether the UV lamp is well installed.

＊ Check whether the life of the UV lamp has been exhausted, if it is exhausted, please replace the UV lamp.

＊ Check whether the installation base of the ultraviolet lamp is loose or damaged.

＊If none of the above conditions exist, please try to turn off the "PIR Switch" in the settings of the robot. After turning it off, please execute it normally. If the light is still not turned on, please contact after-sales service and inform the situation.

10.2、Care instructions

This chapter requires careful reading. It is recommended that you use Futural U1, which requires simple routine maintenance work once a week. The work content is as follows:

1. Please use the handle to connect the robot, and listen to whether there is any abnormal sound when walking. If any abnormality is found, please contact after-sales personnel.

2. Please check whether there is any damage on the appearance of the robot. If there is related damage, please contact after-sales personnel.

3. Please check the disinfection records, check the detailed records of robot

tasks this week, and check whether there are any abnormal tasks. If the records show abnormalities, please contact after-sales personnel.

4. Please check whether the UV light bulb is broken. If this happens, please ensure that the room is ventilated for more than 20 minutes before removing and replacing it.

5. Clean the plastic body and UV lamp of the robot. Remember not to wipe the reflector behind the UV lamp with any objects, otherwise the reflection effect will be poor and the disinfection function will be lost.

6. Please wipe the provided tablet.

7. Please wipe the handle provided.

8. If the robot is turned off and not in use for a period of time, please unplug the charging pile.

Note: Do not use alcohol or any highly corrosive chemical products for wiping. It is recommended that you use cleaning fluid.

10.3、FAQ

1. How to charge the tablet?

A: Please use the provided MicroUSB cable for charging.

2. Why does Futural U1 not automatically charge?

A: First, please confirm whether a charging point has been established. When you have not established a charging point, you cannot perform any tasks, and Futural U1 cannot be charged. Second, please confirm whether you turn off the automatic charging switch in the robot software. You can check and change it in the robot software. Third, please confirm whether your charging point and the position of the charging pile are the same. If they are inconsistent, Futural U1 cannot perform automatic charging. Fourth, if you find the above conditions are correct, Futural U1 still does not perform

automatic charging, please contact after-sales personnel.

3. Is there a time limit for the automatic charging of Futural U1?

If you turn on the automatic charging function, you can 7*24 hours without managing the charging time. As long as the Futural U1 is lower than the charging power you set (20% by default), it will automatically charge.

4. Why does Futural U1 count down when performing tasks?

For safety, Futural U1 will enter the countdown timer start state when it reaches the required disinfection point when performing tasks. During the countdown process, it will monitor whether anyone exists. If someone is found, the countdown will be suspended and wait until no one is there. The countdown time will be reset to start the countdown, and during the entire countdown process, when no one is detected and the countdown is completed, Futural U1 will turn on the UV lamp for disinfection. All this is to protect personal safety.

In addition, Futural U1 has an audible warning reminder, the purpose is to effectively let people around know that the disinfection is in progress, and ensure that everyone is not close.

5. Can the scheduled disinfection task be cancelled?

Yes, you can delete tasks in the task list on the homepage.

6. After the task is started, I find that this is not the task I want and can be terminated immediately?

There are two ways to terminate. Corresponding to the situation at that time, I will give you the following suggestions.

＊If Futural U1 is going to the disinfection point or is in the countdown work, there is a button in the interface to stop the robot disinfection work.

＊If the Futural U1 is being disinfected, it is recommended that you do not stop it in the past. Please use the attached remote control to press Close to close the disinfection work.

7. How do I know if Futural U1 disinfection is successful?

You can click the disinfection record on the robot side, there will be a detailed disinfection record in the record, and you can check whether the disinfection is normal.

8. When should I replace the UV lamp?

It is recommended that you use the UV lamp for disinfection for 2000 hours before replacing the UV lamp immediately to ensure the disinfection effect. After the replacement, please click the corresponding UV lamp reset button in the statistical data on the robot side, so that the robot can recalculate the disinfection time of the UV lamp for you.

9. What can the emergency stop switch do?

After pressing the emergency stop switch, the Futural U1 can not walk.

10. Where can Futural U1 be used for disinfection?

Futural U1 is suitable for biosafety laboratories, infectious wards, ICU wards, inspection departments, scientific research institutes, dust-free workshops, schools, food companies and other places that require space for regular disinfection.

11. Why does the PIR feel a little abnormal sometimes?

Because the PIR is mainly based on infrared for identification, if there is something with strong infrared radiation around, there will be certain circumstances that cause the PIR false alarm. For example: camera, microwave oven.

10.4、Appendix

Comparison table of various bacterial navigation points and disinfection time:

Type of disinfection	Distance between navigation point and navigation point (m)	Time for disinfection of single navigation point (minutes)
General bacteria	0.3	0.09

	0.5	0.14
	1	0.35
	1.5	0.73
	2	1.18
	2.5	1.77
	3	2.49
	3.5	3.09
	4	3.88
	4.5	4.76
	5	5.75
Bacterial spores	0.3	0.88
	0.5	1.35
	1	3.51
	1.5	7.34
	2	11.82
	2.5	17.73
	3	24.88
	3.5	30.86
	4	38.76
	4.5	47.62
	5	57.47
Fungal spores	0.3	5.4
	0.5	8.12
	1	21.05
	1.5	44.05
	2	70.92
	2.5	106.38
	3	149.25
	3.5	185.19
	4	232.56
	4.5	285.71
	5	344.83

10.5、Contact details

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