SLAMTEC Aurora

Visual laser integrated localization and mapping sensor

Instruction Manual

- More precise
- More stable
- More powerful

2024-11-15 V1.1

www.slamtec.com

Shanghai SLAMTEC Co., Ltd

Contents

1. Product Overview

Aurora is a newly created positioning and mapping perception sensor by SLAMTEC that integrates laser, vision, inertial navigation, and deep learning technologies. The sensor does not require external dependencies and can achieve indoor and outdoor 3D high-precision mapping with six degrees of freedom positioning capability upon startup. At the same time, the product is also equipped with a complete power builder chain, including graphical interaction software RoboStudio, SDK for secondary development, etc., to help users quickly build personalized applications and accelerate downstream product landing. The product has the following features:

- Fusion laser + binocular vision + IMU multi-source fusion algorithm, supporting external expansion (GPS/RTK, odometer, etc.)
- Provide indoor and outdoor 3D mapping and positioning functions
- Integrating AI technology to enhance 3D perception capabilities
- With a complete toolchain, support for client-side application expansion
- Industry-leading system stability

Aurora products provide customers with 3D mapping and positioning capabilities in an integrated form. It adopts the unique SLAM algorithm

of Laser-Vision-IMU fusion from SLAMTEC. Combined with visual and laser characteristics, it can perform map data fusion more than 10 times per second and draw up to one million square meters of map data. SLAMTEC provides a toolchain for secondary development, including visual interaction tools RoboStudio, C++ SDK, JAVA SDK, Restful API SDK, ROS SDK, etc.

2. Appearance introduction

2.1 Indicator light

Indicator light status description is as follows

Indicator light status	Explanation
Red long bright	Booting up
Yellow flicker	Startup complete, waiting for initialization
Yellow long bright	System initialization completed, waiting for mapping

Green long bright	Mapping
Red flicker	Device exception
Green flicker	Pause mapping

2.2 Button

Power button:

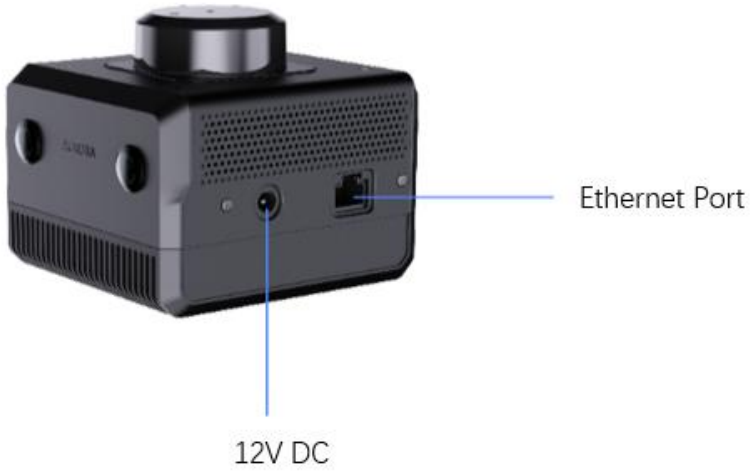
- Press and hold the power button for eight seconds, and the device enters standby mode
- In standby mode, short press the power button to turn on the device

Pause button:

- Short press the pause button to pause mapping; press it again to resume mapping

2.3 Ethernet

The Aurora Ethernet default configuration mode is static IP mode and the IP address is 192.168.11.1. Connect the computer to Ethernet, access the 192.168.11.1 through the browser, you can get the device information of Aurora, and configure Aurora simply.



2.4 WIFI

Aurora comes with a 2.4G/5G dual-band WiFi chip, which is configured as AP mode by default. After Aurora is turned on, a hotspot named "SLAMWARE-Aurora-xxxxxx" is automatically generated. The specific hotspot name can be found on the device label.

3. Mapping

3.1 Preparation work

Prepare a laptop and install RoboStudio's scalable robot management and development software (SLAMTEC) and AuroraCore-remote Visualizer (contact SLAMTEC support to obtain).

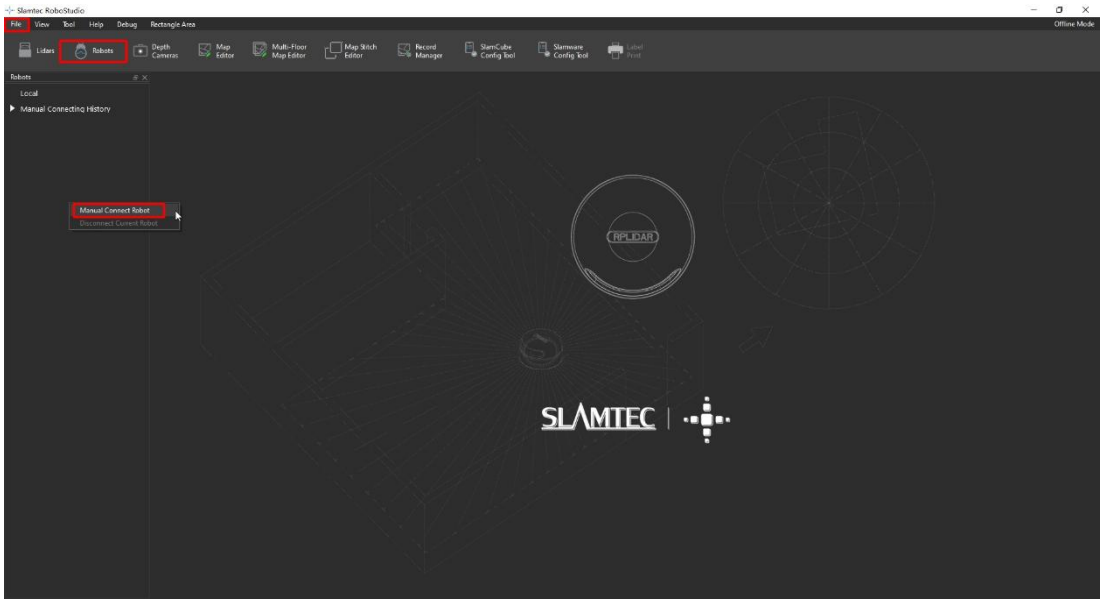
3.2 Aurora boots up

Use DC12V 2A power supply to power up the device.

3.3 Connect laptop to Aurora hotspot

3.4 Start RoboStudio

Start RoboStudio, click "File" - > "Robot", right-click on the blank space in the "Robot" navigation bar, and select "Manually Connect Robot".



In the pop-up window, enter "192.168.11.1" in the "IP Address" field and click the "Connect" button to connect the device.

3.5 Set scene policies

Select "Debug" - > "Scene Strategy", select the appropriate scene strategy in the sidebar, click "Settings", and then click "Restart Application".

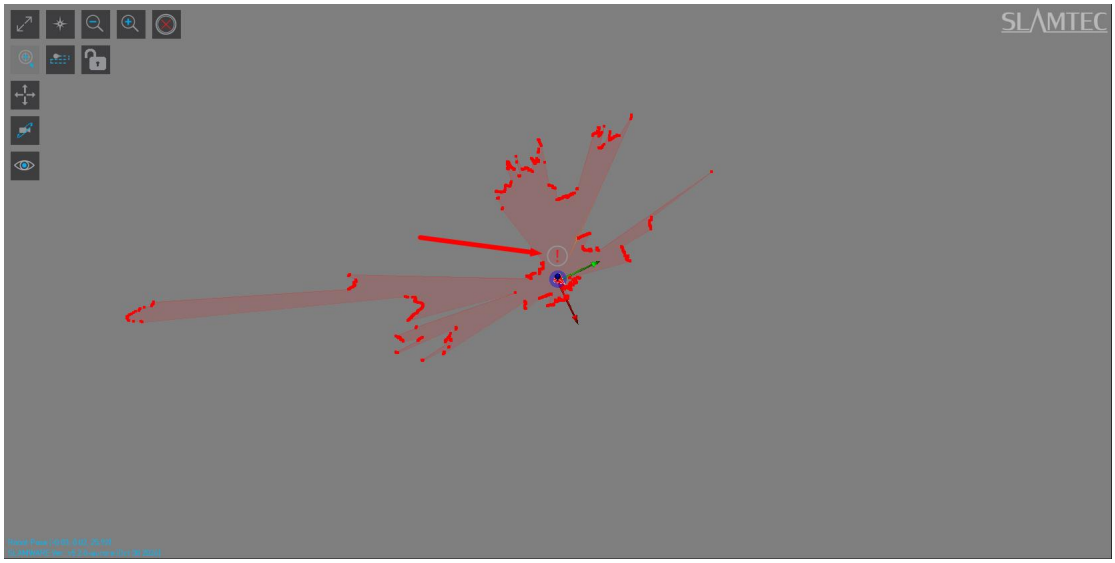
Scene strategy description:

Aurora supports two scenarios, and users can choose the appropriate scenario strategy according to the actual mapping scenario. The scenarios and their scenario strategies recommended by SLAMTEC are as follows.

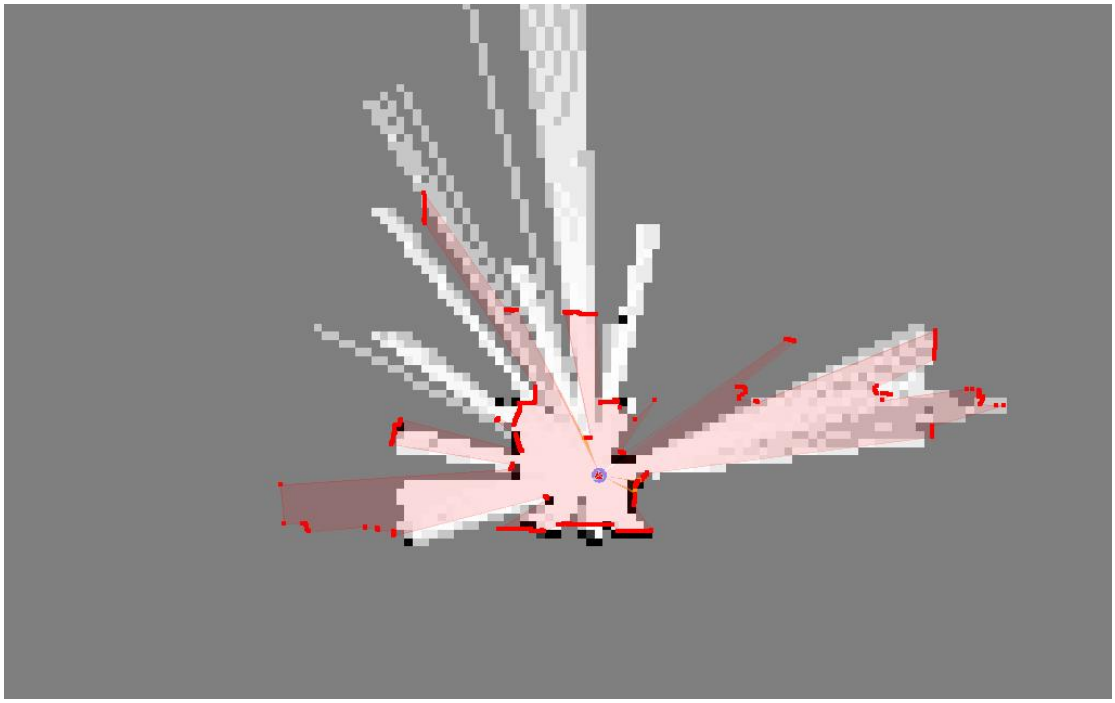
Typical scenario	Scene features	Strategy
Office buildings, offices, government centers, medical institutions, hotels	Laser observation is relatively abundant, and there are many similar scenes in the environment, which are prone to erroneous closure problems.	Indoor (default)
Large parking lots, shopping malls, subway stations, high-speed rail waiting halls, large government centers, medical institutions, hotel lobbies Typical outdoor scenes, parks, streets, lawns, circular stadiums, gymnasiums	The scene is wide, the scene area is large, and it is easy to exceed the laser observation range. The overall observation is relatively sparse, the environment is changeable, and there are various terrain adaptations.	outdoor

3.6 Initialize Aurora

Point the Aurora camera at a place with more features. Click Robostudio - > "SLAM" - > "Clear Map". After clearing the map, an "exclamation mark" will be displayed on the RoboStudio interface. Keep the device stationary and wait for initialization to complete.



After initialization is complete, the exclamation mark disappears, the map is displayed, and the indicator light turns green.



Note:

- During initialization, ensure that the equipment is as stable as possible.
- During initialization, Aurora should target areas with more features within 2-3 meters, avoiding environments with fewer features such as open plains, refractive environments such as large areas of glass, and areas with more dynamic objects to ensure sufficient initialization features and obtain better data results. After standing still for 3 seconds and waiting for the system to successfully initialize, move the device and enter the working state.

3.7 Start mapping

After initialization is complete, you can proceed with mapping.

Route planning and advice:

- Ensure as many observations as possible during the scanning process.
- Try to avoid scanning new areas as much as possible, and you can take a certain loop.
- Avoid the impact of dynamic objects as much as possible.
- Walk as many closed-loop loops as possible.
- Do not repeat the closed-loop area to reduce memory consumption.

Notes on mapping:

- Please clear the map before preparing to create a complete new map, otherwise the map optimization engine cannot be guaranteed to take effect.
- Keep the equipment level. Generally, the equipment should not be tilted more than 20 degrees as much as possible.
- Keep the equipment stable and avoid significant shaking. Sudden

stops or movements will affect the accuracy and effectiveness of mapping to a certain extent.

- After the loop returns to the starting point, keep the robot moving, take more overlapping paths, and do not stop moving immediately.
- After returning to the origin of the loop, if the map is not closed, continue walking until the loop is closed.
- When creating maps with your hand, walk at a normal walking speed. When encountering spaces with fewer features or narrow spaces, or when turning, it is recommended to slow down.
- When scanning indoor scenes involving multiple rooms or floors, please open the indoor door in advance. When passing through the door, scan slowly and stay on the side of the door for a period of time to ensure that the features on both sides of the door can be scanned at the same time. If the door is not open during scanning, slowly turn around before approaching the door, turn the instrument away from the door, turn your back to open the door, and enter slowly.

In and out

- It is necessary to enter and exit sideways to ensure that the laser and vision have a common field of vision before entering, and better connect the data.
- Entering and exiting a confined space: After scanning a confined space, it is necessary to observe whether the reference objects are sufficient and whether the structural features are obvious during the scanning process.

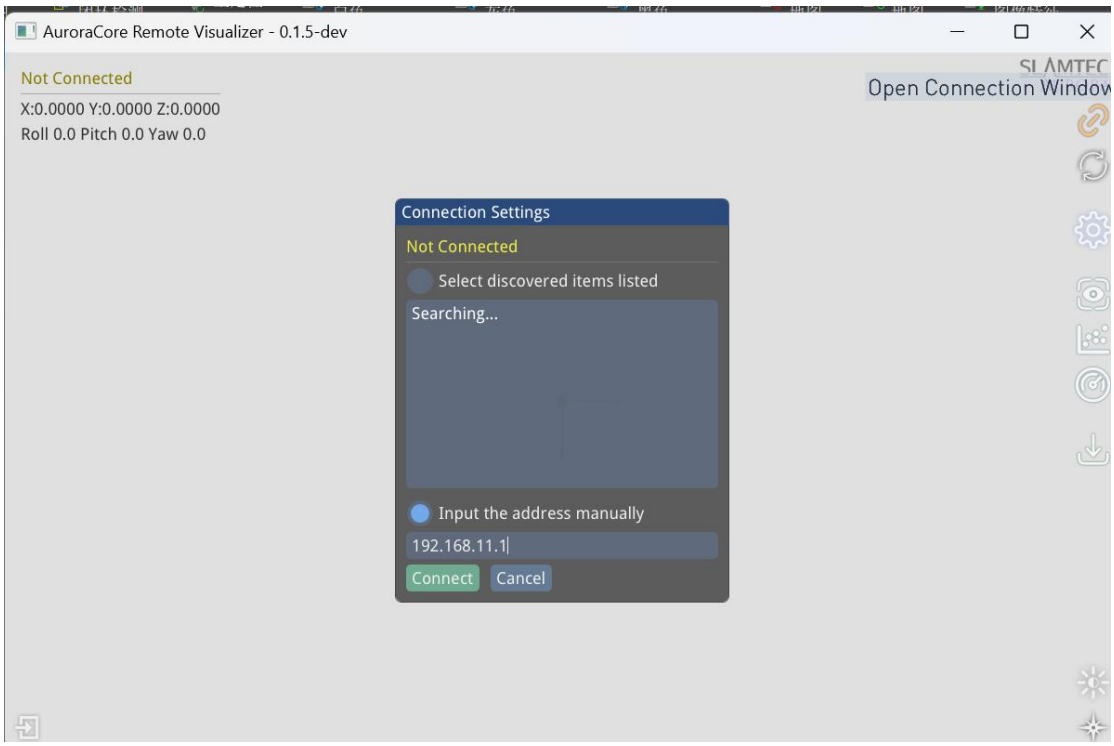
If the above two conditions are not met, when exiting, try to align the perspective with areas with good structured features as much as possible, while avoiding excessive perspective switching.

Example of mapping route

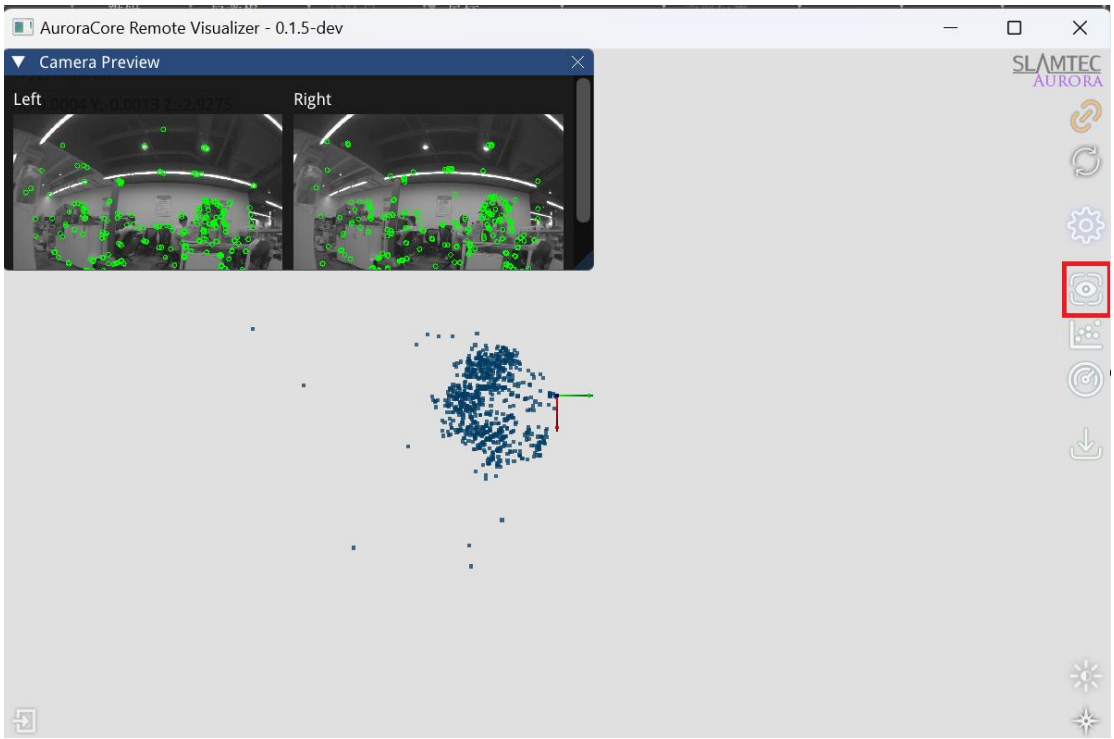
3.8 Run AuroraCore-remote Visualizer

AuroraCore-remote Visualizer can be used to view visually generated trajectories and point clouds.

1. Double-click aurora remote to run AuroraCore-remote Visualizer. In the pop-up window, enter the IP 192.168.11.1 in the "Manually Enter Address" field, and then click the "Connect" button to connect the device.

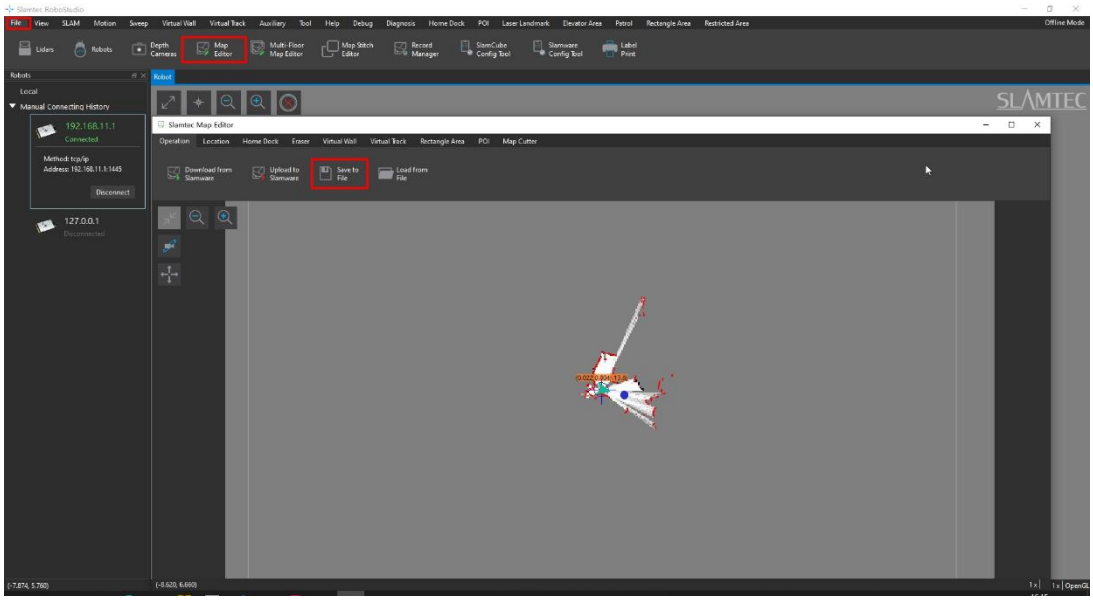


2. Click "Toggle Frame View" on the right toolbar to display the images and feature points observed by the camera



4. Save map

Click "File" in RoboStudio - > "Map Editor" - > "Save File" to save the map to your computer.

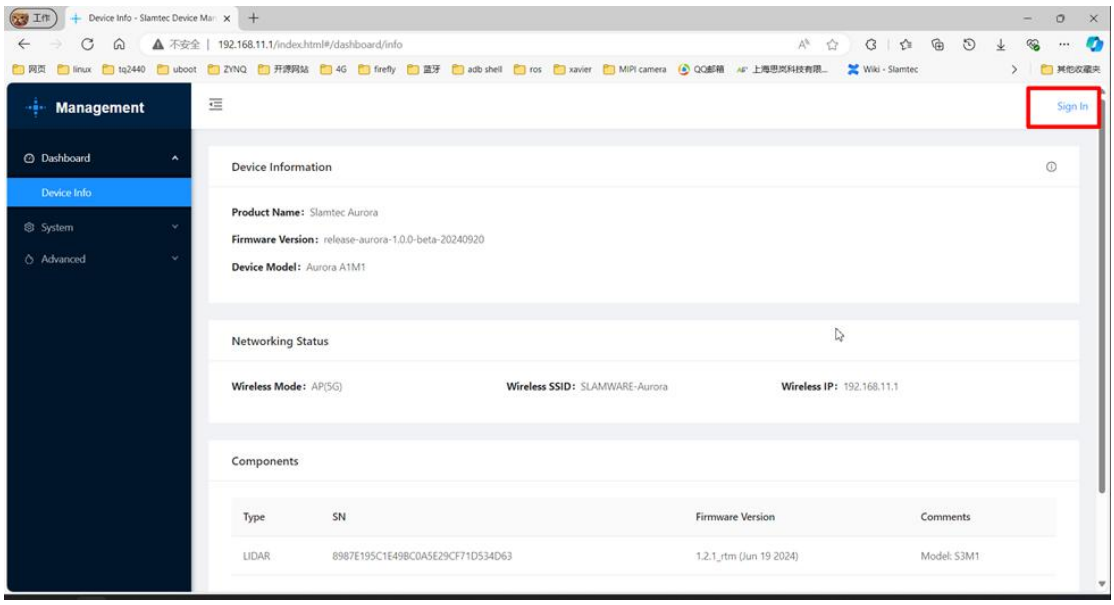


5. Firmware upgrade

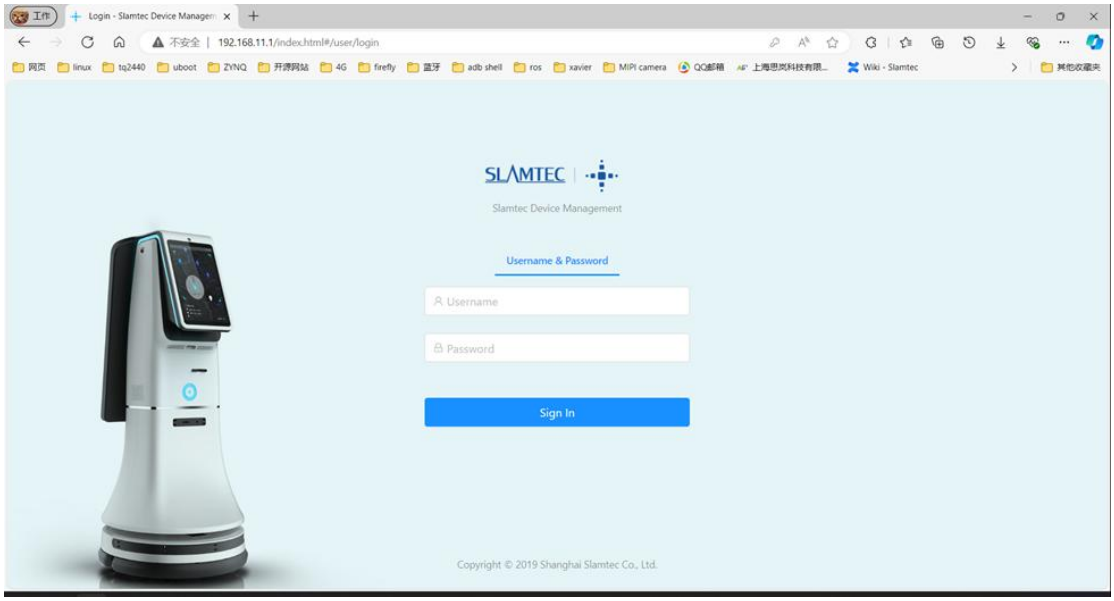
a. Power on Aurora device

b. Connect laptop to Aurora hotspot or Ethernet

c. Visit 192.168.11.1 browser and enter the following page

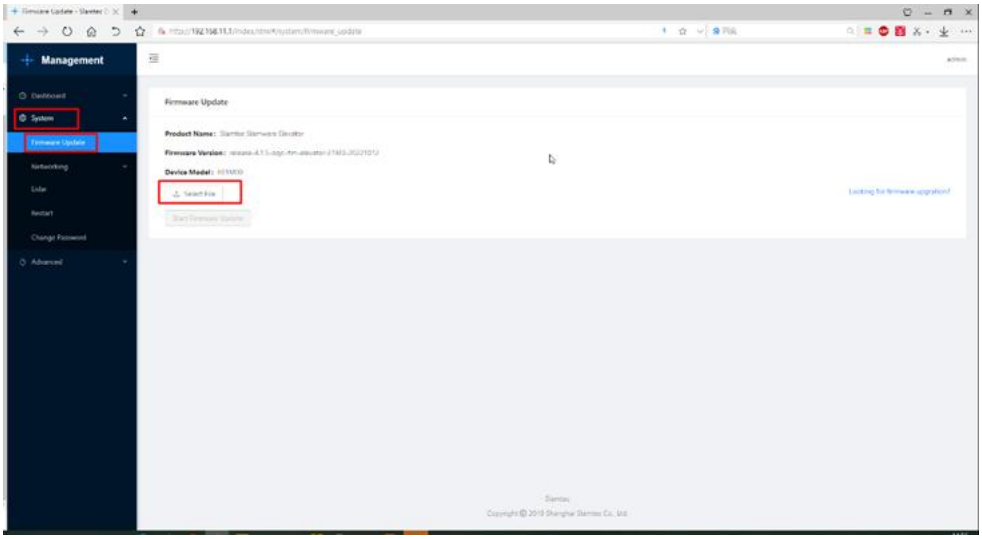


d. Click "Sign in" to enter the login page



e. Enter account： admin　password：admin111

f. Click "System" → "Firmware Update" → "Select File" to select the upgraded firmware



g. Click "Start Firmware Update" to start upgrading the firmware.

h. Wait for "success" to appear in the upgrade log, upgrade completed.

6. Notes

- Do not collide. Falling or colliding may cause device damage, resulting in abnormal operation or even complete damage to the device.
- Keep the Lidar and lens parts clean and tidy, do not touch them directly with your hands. You can use a cleaning cloth to clean the device.
- Ensure device heat dissipation. Please use a tripod during use and do not cover the heat dissipation part of the body.

7. Revised historical

Date	Version	Description
2024-10-11	1.0	Initial Version
2024-11-15	1.1	Refine the Document Layout