MRDVS



S11 dToF RGBD Camera
User Manual

Version： V2.2

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Revision Record

Version	Date	Instructions
V2.0	2026-03-30	Updating parameters, structure, etc.
V2.1	2026-04-08	Improving the description of application scenarios
V2.2	2026-04-23	Modifying the maximum detection range

Term explanation

Terminology	Explanation
Depth	Depth video streams are similar to color or black-and-white video streams, where each pixel has a value representing the distance from the camera, that is, 'depth'.
FOV	Field of view, used to describe the range of angles from which a camera images a given scene, mainly includes horizontal field of view (HFOV), vertical field of view (VFOV), and diagonal field of view (DFOV).
IR	Infrared (IR) communication is a wireless communication technology for transmitting data, and this product mainly focuses on near-infrared band imaging
SoC	System-on-chip for processing image data, depth settlement, application algorithm operations, and other functions
dToF	By directly measuring the time interval from the emission to the reception of the light pulse, calculate the distance of the object using the flight time of the light. Light pulses are emitted and received at very short intervals (typically nanoseconds), and the distance is measured by measuring the time difference of the pulses
iToF	The depth information of the target object is obtained by indirectly calculating the light flight time by measuring the phase difference of the modulated light signal
IMU	Inertial measurement unit , a sensor device used to measure the three-axis attitude Angle (or angular rate) and linear acceleration of an object
SLAM	Simultaneous localization and mapping

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1 Product Overview

1.1 Product Introduction

MRDVS S11 is a fully solid-state RGBD camera based on dToF technology, specifically designed for mobile robots. It offers two interfaces: Ethernet port and USB port. Its core capability is to achieve real-time depth perception with a maximum accuracy of 1 cm within an outdoor range of 0.1-6 meters [1] (typical). It can simultaneously output depth data, RGB images, and IR (infrared) images, providing a cost-effective and stable visual solution for the core functions of mobile robots such as obstacle avoidance, spatial perception, and modeling. In addition, we offer custom MIPI interface modules. Their core performance parameters are the same as those of the standard products, but there are differences in hardware configurations such as communication interfaces, size, and power supply methods, which can meet the integration requirements in different scenarios.

Note [1]: The maximum indoor detection distance can reach up to 10 meters.

1.2 Functional Features

- **dToF depth sensing technology:** Directly measures the time it takes for the laser signal to travel to and from the target object to calculate distance. Compared with iToF, it has higher accuracy (≤1cm), a wider effective detection range (0.1-10m), and stronger outdoor resistance to ambient light interference.
- **Simultaneous output of multiple data:** Depth map, RGB map and IR amplitude map can be output simultaneously, with no delay in data acquisition.
- **All-solid-state structure design:** No mechanical moving parts, compact size (90×25× 25mm), light weight (about 130g for the network port model, about 90g for the USB model), better shock resistance and stability, and customizable MIPI interface modules available upon request (33×18×13mm).

1.3 Application Scenarios

Application Scenarios	Description

Cleaning robot	Ground obstacle detection
Industrial mobile robots	AGV/AMR
Service robot	Sales assistants, delivery
Home companion robot	Environmental perception
Special robots	Low temperature, wet conditions



Figure 1 Application scenario

2 Specification Parameters

S11 Camera	**Ethernet**	**USB**	**MIPI**
Usage environment	Indoor/Outdoor	Indoor/Outdoor	Indoor/Outdoor
Depth technology	dToF	dToF	dToF
Laser wavelength	940nm	940nm	940nm
Depth ranging Range	0.1-6m (outdoor) Reflectivity: 10%-90%	0.1-6m (outdoor) Reflectivity: 10%-90%	0.1-6m (outdoor) Reflectivity: 10%-90%

Ranging accuracy	1cm	1cm	1cm
Output data	Depth (point cloud) map /RGB map /IR (amplitude) map	Depth (point cloud) map /RGB map /IR (amplitude) map	Depth (point cloud) map/ IR (amplitude) map
Depth resolution/frame rate	240×96@max. 20fps/10fps (typical)	240×96@max. 20fps/10fps (typical)	240×96@max. 20fps/10fps (typical)
Depth FOV [1]	56 ° ×140 °	56 °× 140 °±3 °	56 ° ×140 °± 3 °
RGB resolution/frame rate	1280×1080@max. 20fps/10fps (typical)	1280×1080@max. 20fps/10fps (typical)	N/A
RGB FOV [1]	120 ° ×110 ° ± 3 °	120 ° ×110 ° ± 3 °	N/A
RGBD alignment	Support	Support	N/A
Data Interface [2]	Ethernet	USB	MIPI
Operating temperature	- 20 ℃ ~ 60 ℃	- 20 ℃ ~ 60 ℃	N/A
Storage temperature	- 40 ℃ ~ 70 ℃	- 40 ℃ ~ 70 ℃	N/A
Time synchronization	PTP	PTP	N/A
Protection class	IP54	N/A	N/A
Eye safety	CLASS I	CLASS I	CLASS I
External dimensions	90×25×25mm	90×25×25mm	33×18×13mm
Weight	About 130g	About 90g	<10g
Power consumption	< 4W (average) 13W (peak)	< 4W (average) 13W (peak)	≤2W (average) 8W (peak)
Power supply mode	12V~28V DC	5V USB3.0 power supply	3.3V/5V DC
Software environment	C/C++/ROS SDK	C/C++/ROS SDK	C/C++/ROS SDK
System Support	Windows 7+, Linux, Arm Linux/ROS	Windows 7+, Linux, Arm Linux/ROS	Windows 7+, Linux, Arm Linux/ROS

Anti-light interference	100 Klux	100 Klux	100 Klux

Note [1]: Both the depth FOV and the RGB FOV have a tolerance of ±3°.
Note [2]: Modules with MIPI interface are also available.

3 Product Structure

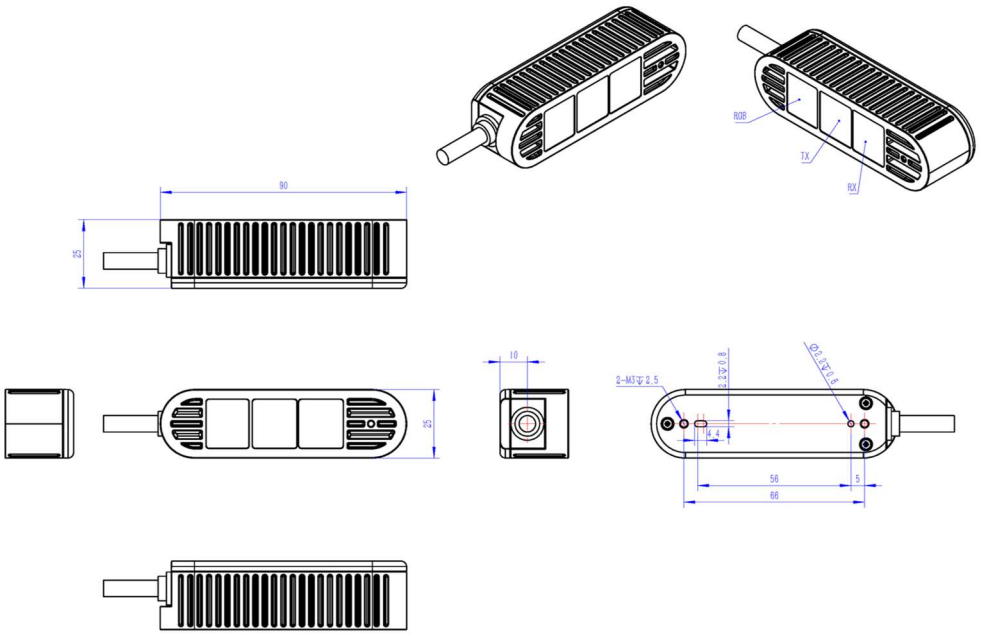


Figure 2 Size diagram of the S11 network port model

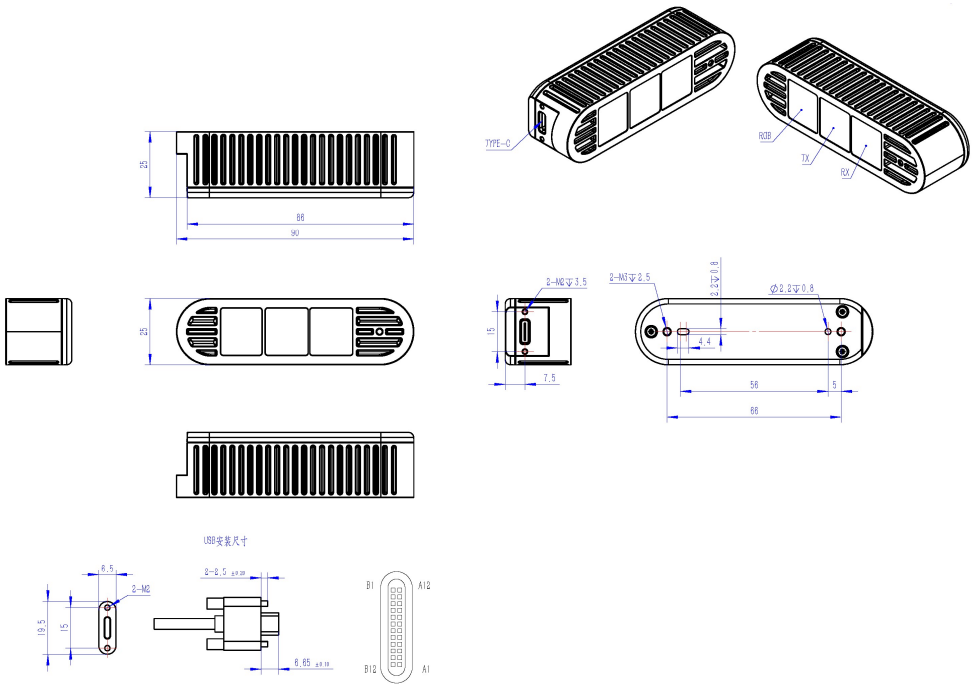


Figure 3 S11 USB size diagram

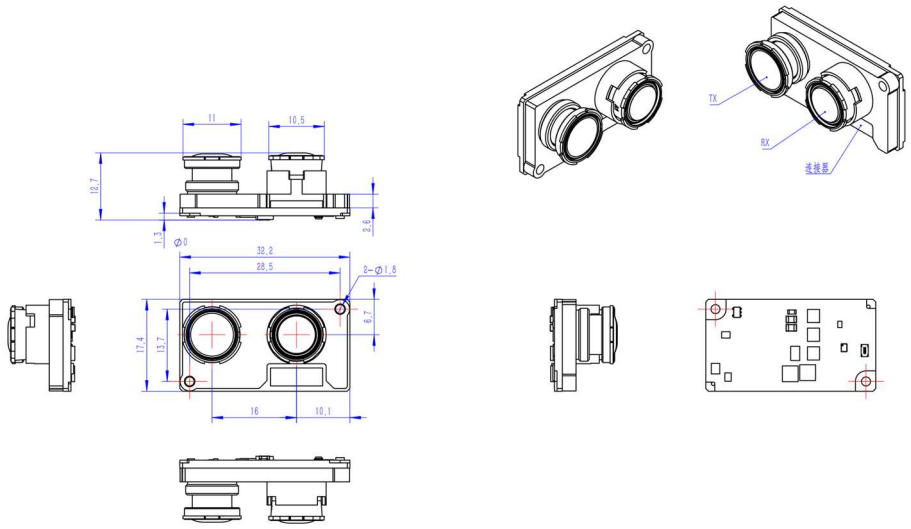


Figure 4 The size diagram of the 140° S11 MIPI module

4 Camera Integration Guide

4.1 Camera detection range

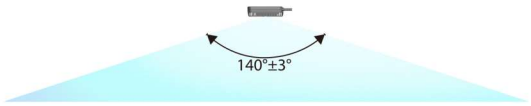


Figure 5 2D view of the S11 140°×56° camera field of view

4.2 (Important) Installation Notes

4.2.1 Recommended installation methods

When installing the 3D vision camera, special clearance treatment must be applied to the illustrated clearance area, and no objects are allowed within that area. If an object intrudes into the space, it will directly cause interference to the device's point cloud data, and then lead to a series of problems such as picture noise, false stoppage, and abnormal data.

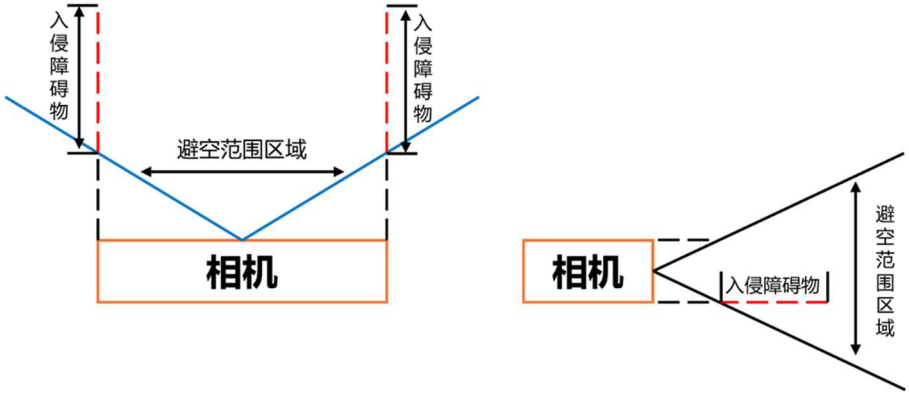


Figure 6 Schematic diagram of the camera's evasive range area

4.2.2 Causes of camera anomalies

If the camera is installed in an improper environment, it may interfere with core working principles such as time-of-flight measurement and triangulation, thereby causing a series of usage anomalies. The reasons are as follows:

1、Improper hardware installation: Physical occlusion and field of view (FOV) trimming

Structural frame, ribs, etc. intrude into the sensor's nominal field of view, or are installed eccentrically or with too small an opening, causing the field of view to be trimmed and the sensor to misidentify the structural component as the target. Typical manifestations include fixed blind spots, false close-range distance measurement, and field of view compression, which can lead to device obstacle avoidance missed detection, path misjudgment, and reduced perception reliability.

2、Optical interference: Near-field infrared crosstalk and reflection

This is the most common cause of failure, where the narrow installation space causes abnormal reflection crosstalk of infrared light, mainly in three categories:

First, the inner wall reflection causes multipath interference. Infrared light is received after being reflected multiple times by the inner wall of the structural component, causing the detection time to change and the calculated distance to distort.

Second, strong reflective surfaces cause local failure. Mirror-like reflection occurs in high-gloss smooth materials (polished metals, mirrors), resulting in local signal failure to receive or overexposure saturation.

Third, strong reflection of close-range structures causes high light pollution. When the distance between the sensor and the structural component is less than 10cm and the material is bright and smooth, the strong reflected light causes the receiver to saturate. The iToF camera phase is disrupted by highlights and cannot calculate the flight time. Such disturbances can cause data distortion, accelerate receiver aging, and affect the core functionality of the device.

3、Optical interference: Interference from optical Windows

Interference caused by the material and cleanliness of optical Windows such as the protective glass in front of the sensor is mainly divided into three categories:

First, multiple reflections cause artifact interference. Reflections on the inner and outer surfaces of the window create artifacts that mix with the effective signal, resulting in depth map gimmings, flying spots, and lidar point cloud duplication

Second, contamination and fogging cause a decrease in the signal-to-noise ratio. Closed Spaces can cause fogging and dust accumulation on Windows, making it impossible for sensors to recognize effective signals

Third, mismatched materials cause signal attenuation. The signal may not penetrate ordinary glass or acrylic, resulting in global data loss. Window interference can lead to increased measurement errors, damage to the lens, and increased maintenance costs. Replacing high-transparency glass can improve the situation.

4、Other hidden influencing factors

First, installation stress: too tight snap causes lens micro-deformation, optical axis offset, and ToF camera optical axis offset causes distance deviation.

Second, thermal interference: Poor heat dissipation in confined Spaces, sensor temperature rise, thermal deformation of the window causes distance drift, which is prone to large-scale failure in the long term.

4.3 SDK

Refer to the MRDVS host computer user manual and SDK development guide.

4.4 Operating environment and reliability

Project		Specifications
Working environment	Temperature	-20℃-- 60℃
	Illumination	0KLUX--100KLUX
Storage environment	Temperature	-40℃--70℃
	Humidity	Relative humidity：Max 90% RH
Normal operating temperature rise		Exterior temperature rise <25℃
ESD grade		Contact discharge ±4KV，air discharge ±8KV
RE grade		Compliant with GB 9254 CLASS A specifications
Working life		3 years
Environmental certification		RoHS

5 Quick Use Guide

5.1 Connection Testing

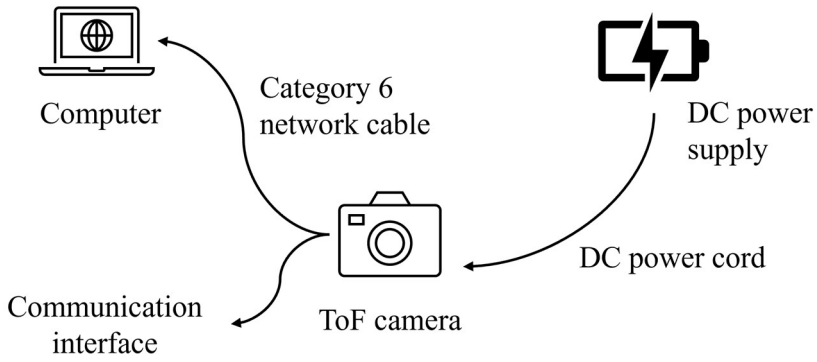


Figure 7 Schematic diagram of connection testing

5.1.1 Camera power supply

- Insert one end of the DC power cord into the camera's DC power interface and connect the other end to a 24V/2A DC power adapter.
- Observe the camera power indicator light. When the indicator light is blue and flashes slowly, it indicates that the power is on normally.

- If the indicator light doesn't light up or shows an anomaly (such as a constantly lit red light), check if the power interface is plugged in and if the power adapter is powered on.

5.1.2 Network configuration

- Connect the camera's communication interface directly to the computer's network port using a Category 6 cable
- The camera comes with a factory default of 192.168.100.82.
- Set your computer's IP to be in the same network segment as your camera and turn off your computer's firewall.

5.1.3 Running the software

- Run the accompanying upper computer software to obtain the camera image, check if the image is clear, without screen flickering or lag, and confirm that the connection is normal.
- Refer to the interface instructions or the LxCameraViewer upper
- computer software user manual for use.
- If you have any other questions, contact Maier Microvision sales or technical support for further assistance.

5.2 Interface Instructions

LxCameraViewer upper computer software supports opening and viewing on multiple devices, supports viewing depth map, intensity map, point cloud map, RGB map output, and supports reading and setting parameters such as basic camera functions and basic algorithm configuration. Users can view and save the image data of the camera, as well as detailed data of the configuration and algorithm within the camera through the software.

The initial interface of this software is divided into three major sections: the list bar (blue area No. 1), the menu bar (green area No. 2), and the image display bar (red area No. 4). Double-click in the menu bar area to maximize/minimize, and hold down the left mouse button and move the mouse to drag the interface.

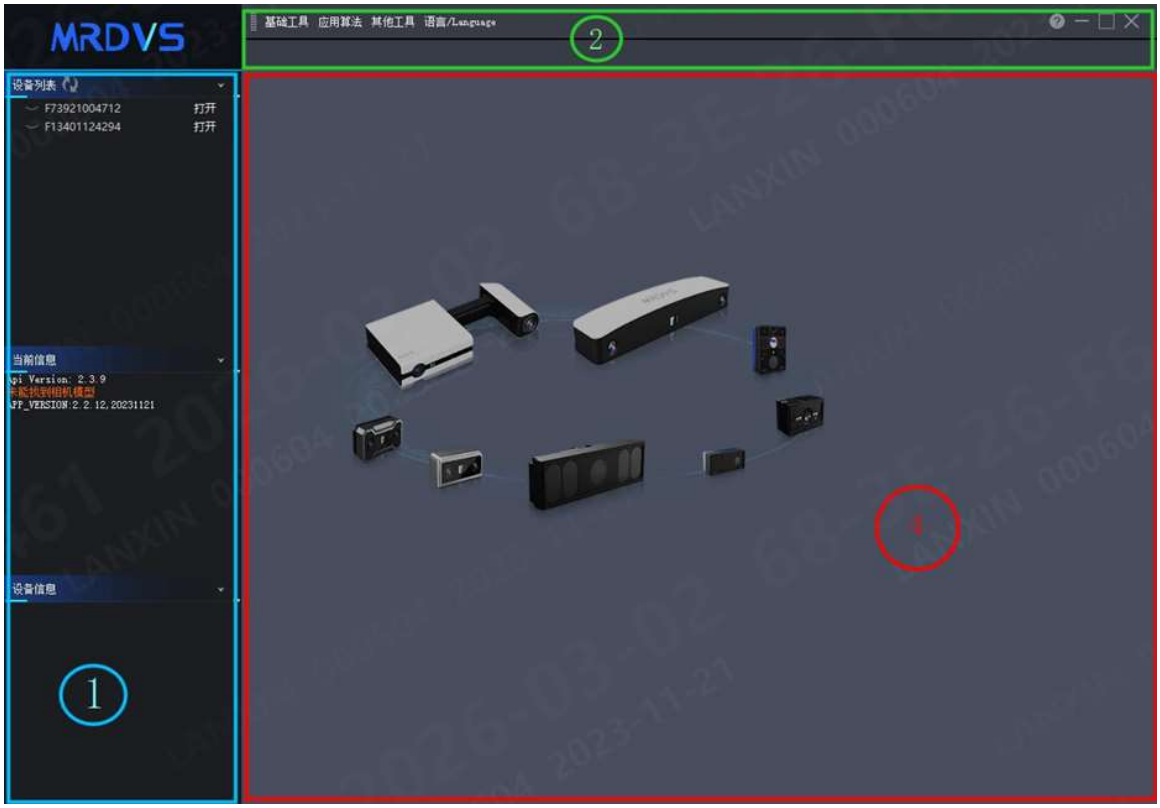


Figure 8 Overview of the software interface (Camera not turned on)

When the camera is turned on, there is an additional function bar on the right side of the interface (area 3), which can be accessed by clicking on the "Basic Tools", "Applied Algorithms", "Others" menu at the top. Among them, the basic Tools offer functions such as image display, 2D Settings, 3D Settings, filtering, etc.

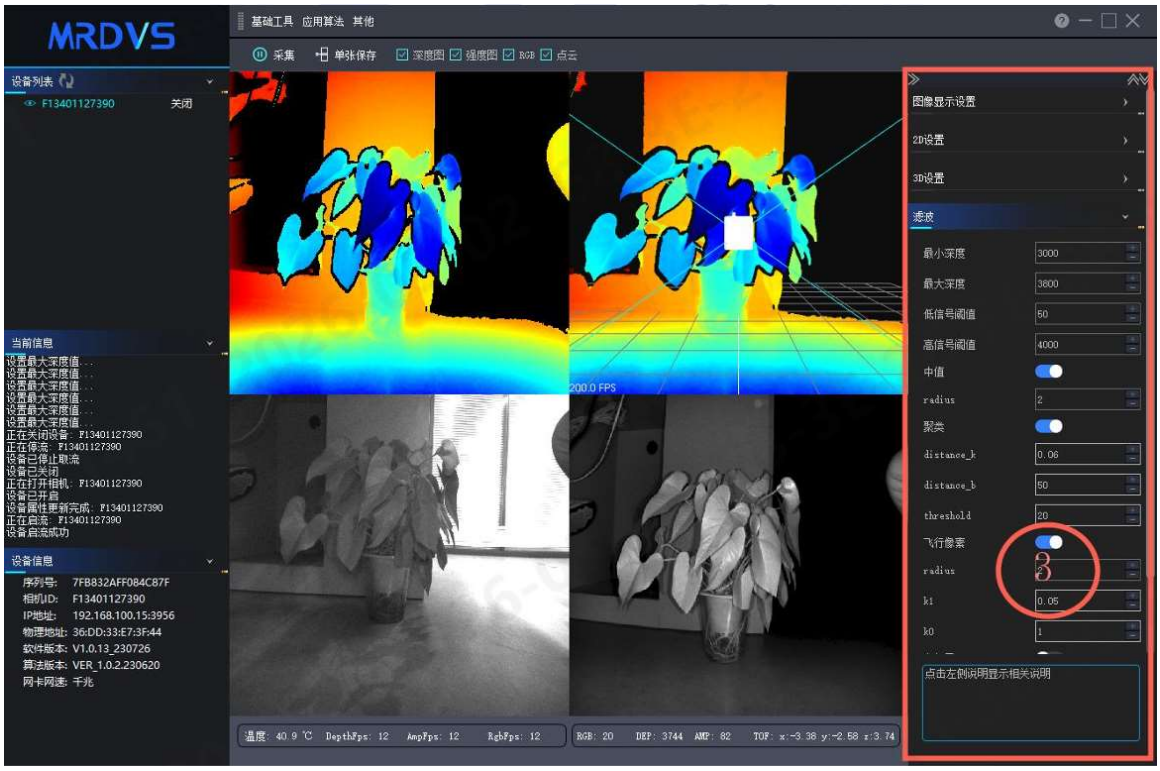


Figure 9 Overview of the software interface (Opening the camera)

The device list is located in the top left corner of the interface. Click the text [On] or [Off] to turn the camera on or off. The device list, located in the middle of the left side of the interface, shows camera information, software operations, operation results, and fetch results. Device information is located in the lower left corner of the interface, showing information about the devices currently selected in the device list.

Clicking the [Capture] button allows the device to start or stop capturing images. Once clicked, the button will be unavailable until the operation is completed. Click the 【Single Save】 button to save the image of the stream data that has been opened. Click the checkboxes of [Depth Map] [Intensity Map] [RGB] [Point Cloud] to open images in the desired format as needed.

For more detailed information, please refer to the LxCameraViewer software user manual.

6 Frequently Asked Questions

No.	Questions	Instructions
1	Clicking to open the camera has no response	It is necessary to check and turn off the firewall Settings to ensure that the camera communication is not intercepted
2	The host computer detects multiple IP addresses	Because there is an IP address conflict within the local area network, you need to manually select the correct IP address to open the camera
3	The data flow is unstable after the camera is turned on	It is recommended to use a gigabit cable to connect the camera. Using a 100-megabit cable may cause unstable initial data transmission
4	Software installation location	Default installation to the C drive may cause abnormal operation due to system permission restrictions. It is recommended to choose an installation directory with appropriate read and write permissions

7 Notes

This product emits invisible laser during operation. During use, it is necessary to avoid damaging the eyes.

The laser emitted by this product complies with Class 1 safety level. According to EN60825 requirements, it will not cause harm to the human body during normal use.

Getting more support

http://www.mrdvs.cn/
https://space.bilibili.com/3546755102672963
https://github.com/Lanxin-MRDVS/CameraSDK
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Official Accounts：