Hypersen Technologies Co., Ltd.

LiDAR PC software

User Manual

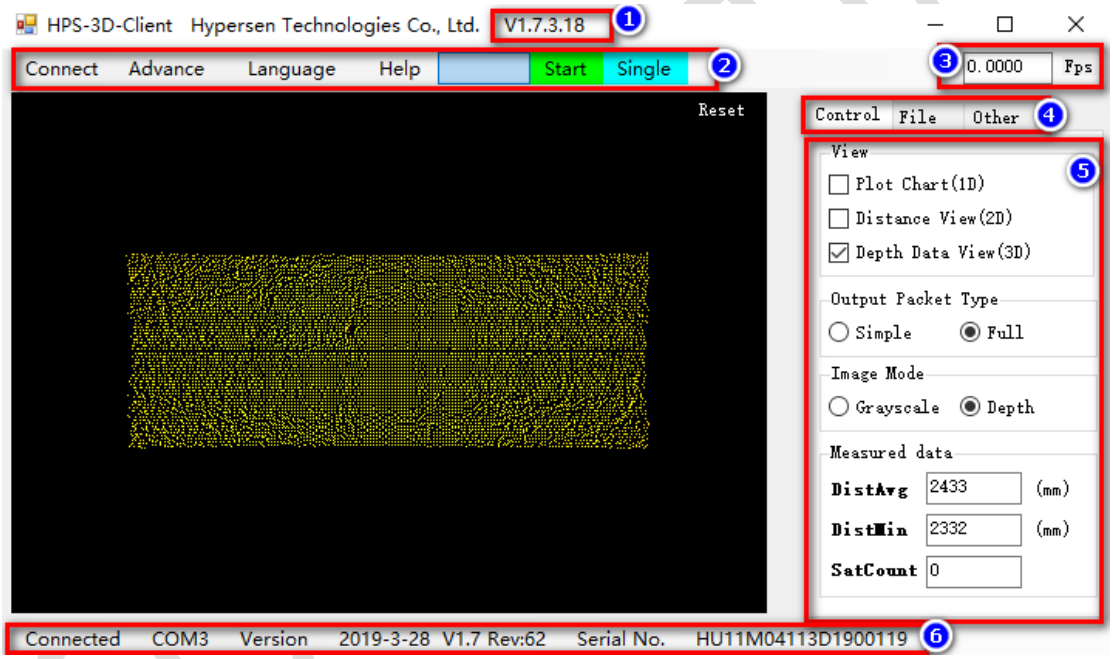
Content

1. Software introduction

1.1 General

The PC software is used to test the LiDAR produced by Hypersen Technologies Co., Ltd. and set LiDAR parameters.

1.2 Main interface



1）PC software version number

2）Menu

Connect: To connect or disconnect device.

Advance: Advanced Features Settings tab, includes the following features: save to user profile, clear user profile, restore factory profile, save to client profile, load client profile, edge noise filter (edge detection enable), ROI settings, other advance setting, etc.

Help:The Help tab includes company information, firmware update, client software version number, and device information.

3）Frame rate display

4）Control tab:

Includes view selection, file saving, and other features (mainly obstacle extraction);

5）Display view control:

Includes Plot Chart(1D), Distance View (2D), Depth Data View (3D).

Output Packet Type: Includes Simple data packet (depth data not included) and Full data packet (includes depth data for very single pixel).

Image Mode: Includes Grayscale mode (display only gray signal amplitude, does not include measured distance value) and depth mode (measure distance result value).

Measured data: Display data measured, includes average distance, minimum distance and saturated quantity display.

6）Device connect status tab

Includes current connection status, connection port number, current device version number and device serial number.

2. Software installation

Unzip "Release.rar" to any directory, first install the two necessary driver files, one is the virtual serial port driver and the other is .NET Framework (version 4.6.1 or any above version). After the installation is complete, you can run the client software (HPS-3D160 directory under HPS-3D160.exe)

3.Device connection and software startup

Communication ports wiring diagram is shown as below:

HPS-3D160-U/S

Cable color	Signal name	Signal type	Description	Remark
Red	VCC	Power	Power, connect to DC +11 ~ 24V	The product with different
Black	GND	GND	Power ground	

Blue	OUT	I/O	Optocoupler isolated output terminal	communication interface has different definition for DATA+ and DATA- terminals.
Blue/White	IN	I/O	Optocoupler isolated input terminal	
Purple/White	COM	I/O	Optocoupler isolated COM terminal	
Purple	GND	Digital	Signal ground	
Orange	DATA+	Digital	USB D+ / RS-232 TX	
Orange/white	DATA-	Digital	USB D- / RS-232 RX	
Shield layer	SHIELD	-	Cable shield layer，internal part connects to product outer shell	

HPS-3D160-L

Cable color	Signal name	Signal type	Description	Remark
Red	VCC	Power	Power, connect to DC +11 ~ 24V	The product with different communication interface has different definition for DATA+ and DATA- terminals.
Black	GND	GND	Power ground	
Blue	DATA-	Digital	TXN(-)	
Blue/White	DATA+	Digital	TXP(+)	
Orange	DATA-	Digital	RXN(-)	
Orange/white	DATA+	Digital	RXP(+)	
Purple	COM	I/O	Optocoupler isolated ground terminal	
Purple/White	OUT	I/O	Optocoupler isolated output terminal	
Shield layer	SHIELD	-	Cable shield layer，internal part connects to product outer shell	

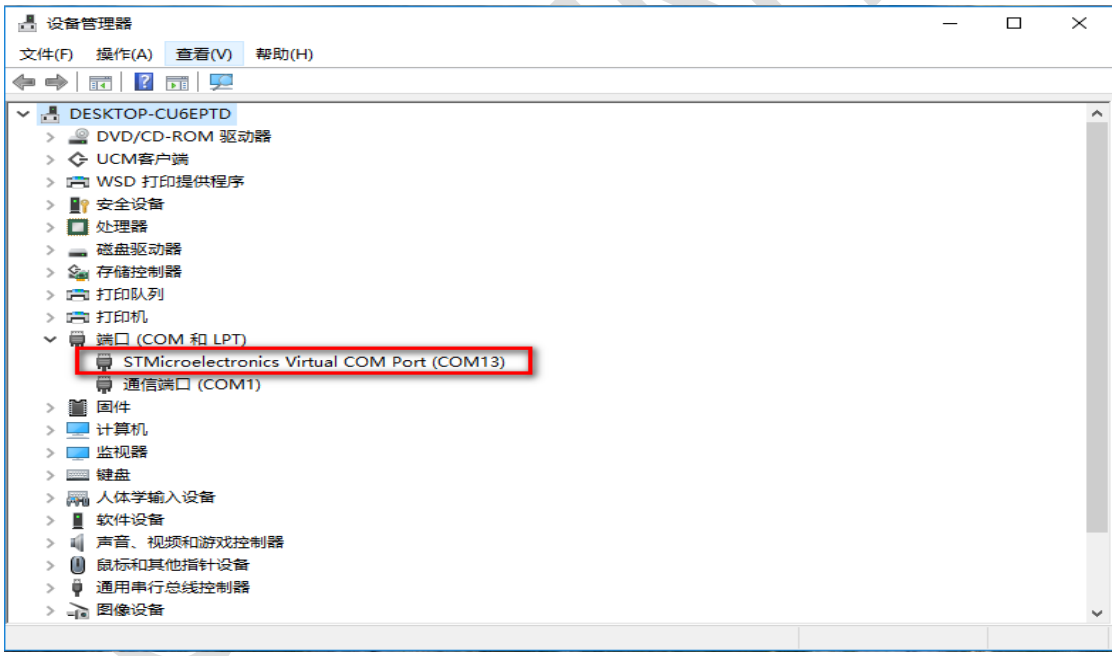
HPS-3D160-I

Cable color	Signal name	Signal type	Description	Remark
Red	VCC	Power	Power, connect to DC +11 ~ 24V	The product with different communication interface has different definition for DATA+ and DATA- terminals.
Black	GND	GND	Power ground	
Blue	OUT1	I/O	Optocoupler isolated output terminal 1	
Purple	OUT2	I/O	Optocoupler isolated output terminal 2	
Pink	OUT3	I/O	Optocoupler isolated output terminal 3	
White	IN1	I/O	Optocoupler isolated input terminal 1	

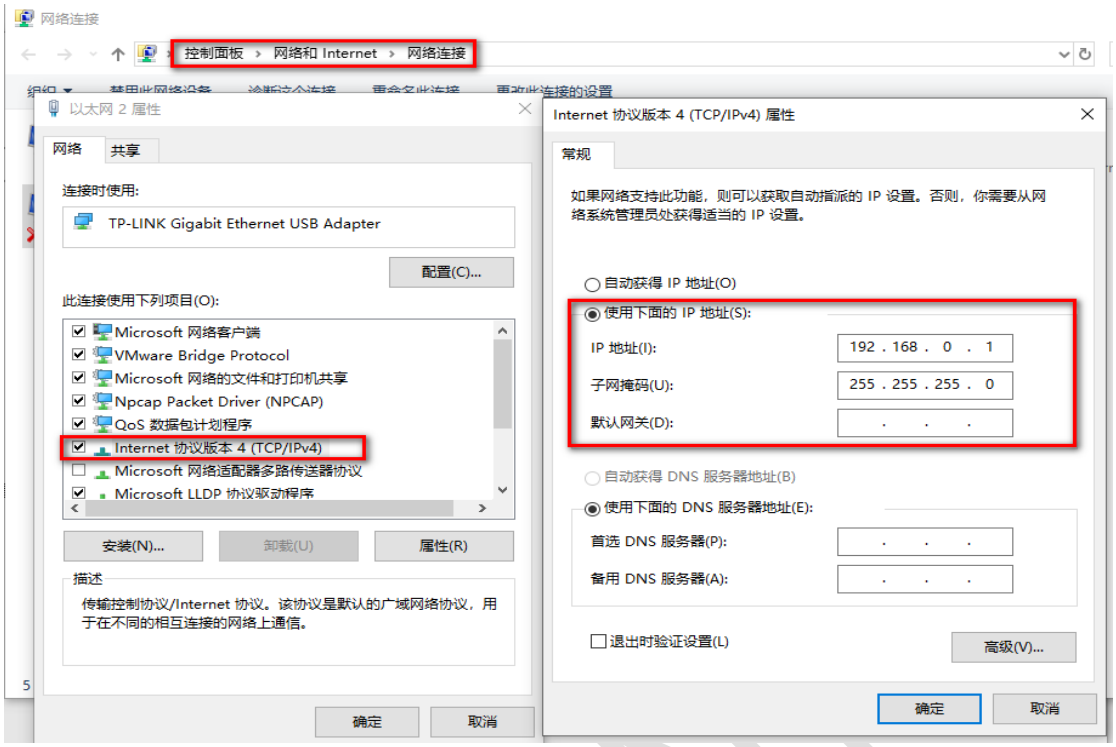
Orange	IN2	I/O	Optocoupler isolated input terminal 2	
Yellow	IN3	I/O	Optocoupler isolated input terminal 3	
Green	COM	I/O	Optocoupler isolated COM terminal	
Transparent	GND	Digital	Signal ground	
Brown	DATA+	Digital	USB D+ / RS-232 TX	
Gray	DATA-	Digital	USB D- / RS-232 RX	
Shield layer	SHIELD	-	Cable shield layer, internal part connects to product outer shell	

Note:

The sensor needs external 12V power supply. If the other transmission interfaces need to be grounded, they can be connected by purple (GND). When USB or RS232 are connected to the PC, open the device manager, and confirm whether the driver is installed. The following is the example of a success installation.



For Ethernet version, when connected, you need to modify the IP address of the PC (the default IP address of the sensor is 192.168.0.10). Example as shown below.



Run client software after the connection is successful.

The software currently supports USB, RS232, Ethernet and other communication interfaces. To run the software, you need to set the communication interface and parameters, and then click to connect.

4. Functions

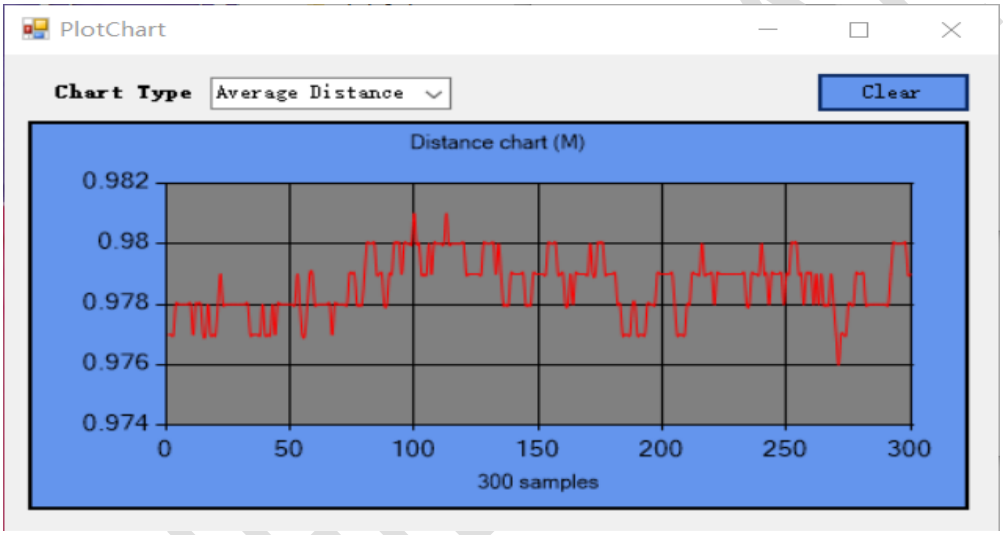
4.1 Main interface function description

After the device is successfully connected, the main interface will have a connected status indication and display the currently connected port number.

Main interface function introduction:

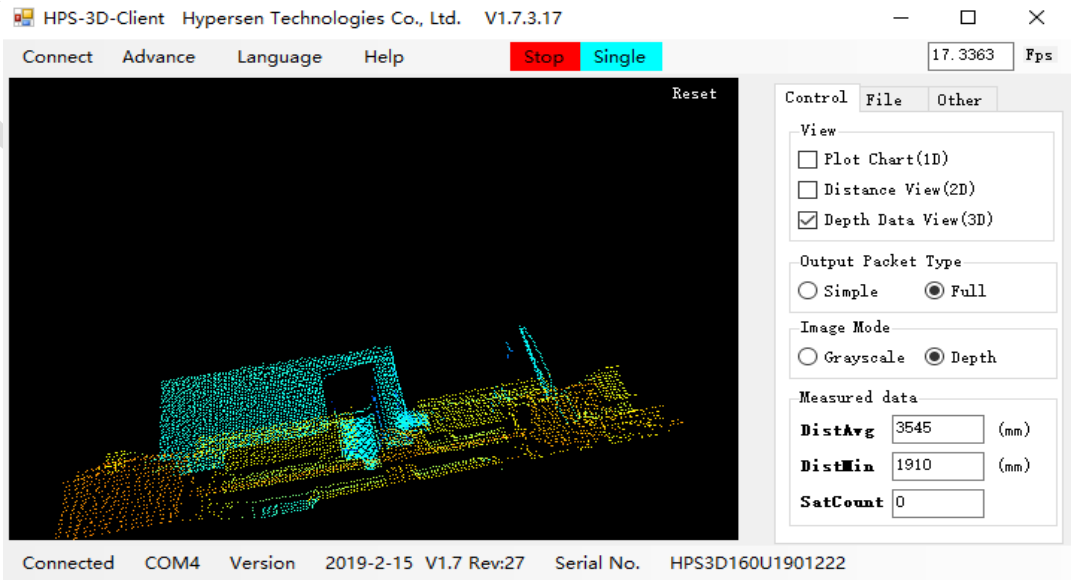
(1) Display view control:

Plot Chart(1D): It can display the average distance, the minimum distance, and the single pixel point and point cloud XYZ coordinate graph.



Distance View (2D): The pixel saturation values 65400 and 65500 are displayed in white, the signal amplitude low value 65300 is displayed in black, the invalid ranging value 65530 is displayed in black, and the remaining displays are displayed in red to blue according to the distance value (small-large).

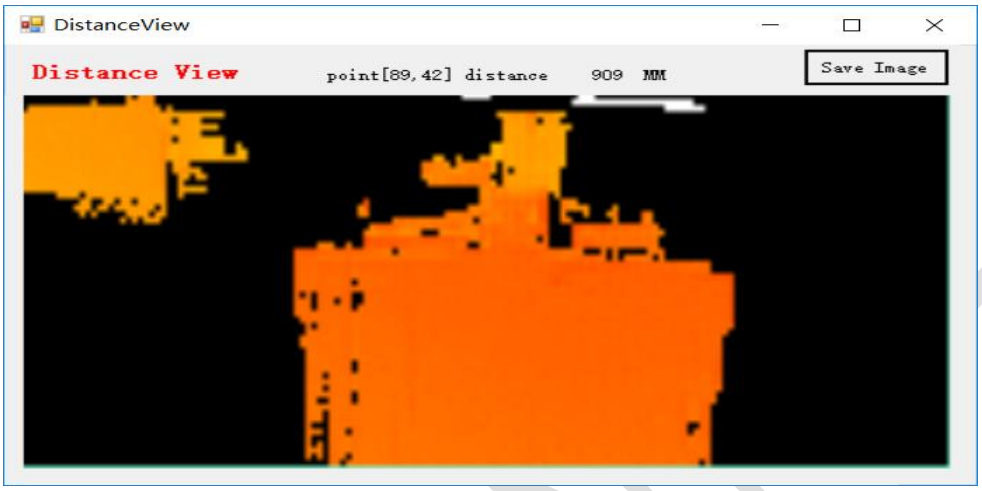
Depth Data View (3D): 3D point cloud display



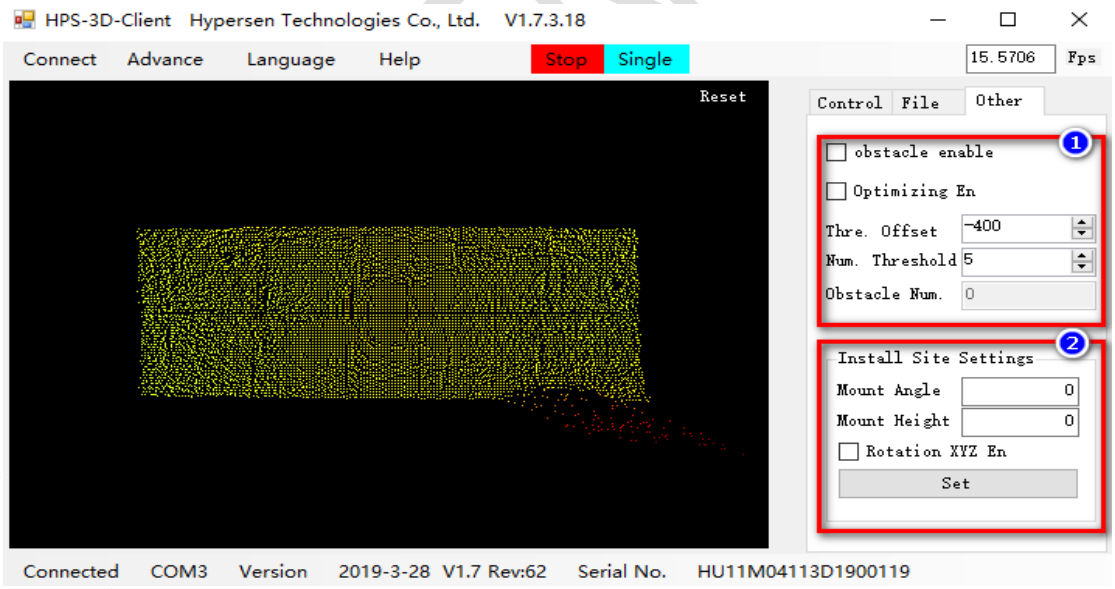
(2) Image mode: In the grayscale mode, the distance cannot be measured, only the signal amplitude is retained; the depth mode is the ranging mode

(3) File Tab: To record and save the data to a file for analysis, also includes data playback function

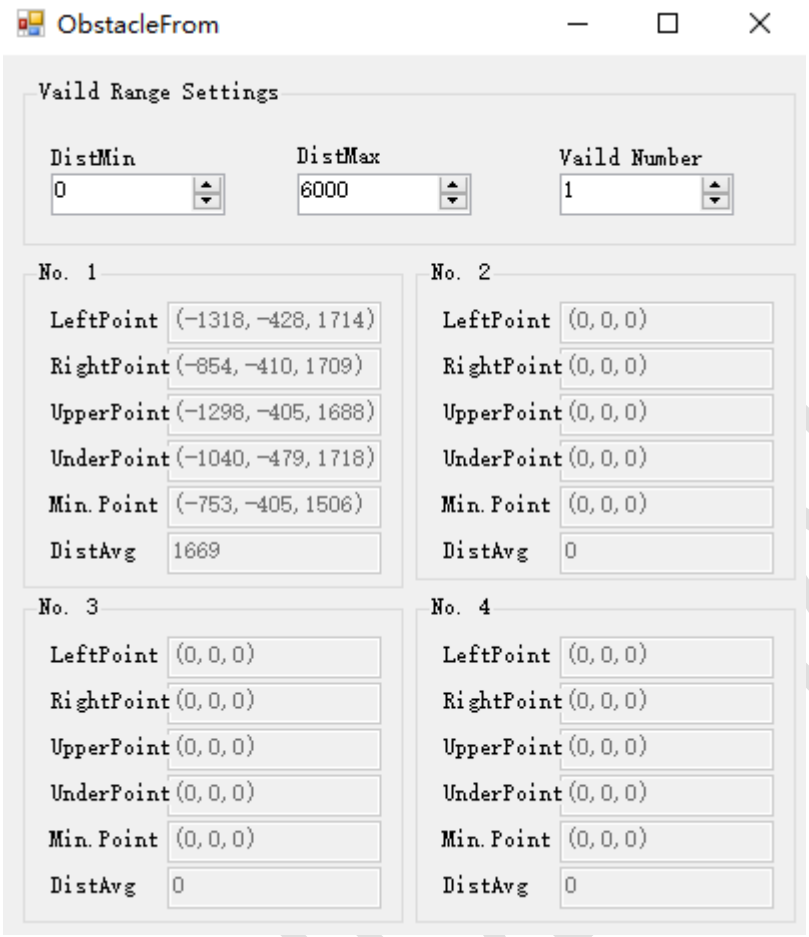
(4) Other: Mainly includes obstacle extraction parameter setting and data display.
Obstacle extraction examples as below:



Obstacle extraction parameters as below:



- Obstacle enable: To extract obstacles.
- Optimizing En: Optimize discrete pixel points of obstacles.
- Install Site Settings: By setting the installation angle and height of the camera, the sensor measurement distance value can be converted into the horizontal distance value of the measured object to the sensor; enabling the point cloud coordinate rotation translation can convert the camera world coordinate system with a certain installation angle into a world coordinate system for data analysis and processing.



The extracted obstacle information is filtered by the minimum and maximum distance values, and the coordinate information of the obstacle feature pixel points is displayed according to the effective number, to facilitate the analysis of obstacles from near and far.

(5) Advance Setting Tab:

Save to User Profile: Save the current configuration to default configuration.

Clear User Profile: Clear current configuration, rest to default configuration.

Restore factory profile: Reset to factory setting.

Save to Client Profile: Save current configuration to a file (Used for multiple devices with the same configuration)

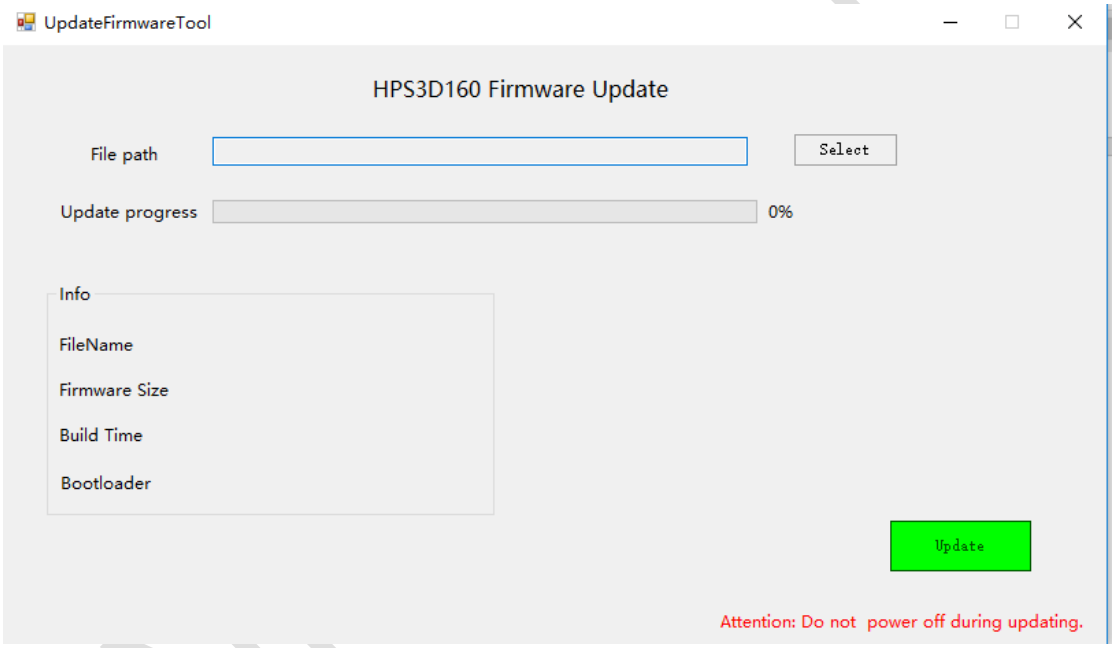
Load Client Profile: After the loading is successful, it will prompt whether to save to the user configuration. Select Yes to indicate that the setting is the default configuration of the sensor. Otherwise, it means that the single test takes effect and the last configuration will be restored after the power is cut off.

Save Transport Type: Save the current communication configuration as the default communication configuration and set it effective permanently

Edge Detection Enable (Edge noise filter): Edge noise filtering function obviously enabling filtering and improving effect on the edge pixels of the target object, but cannot be completely filtered out.

(6) Firmware update:

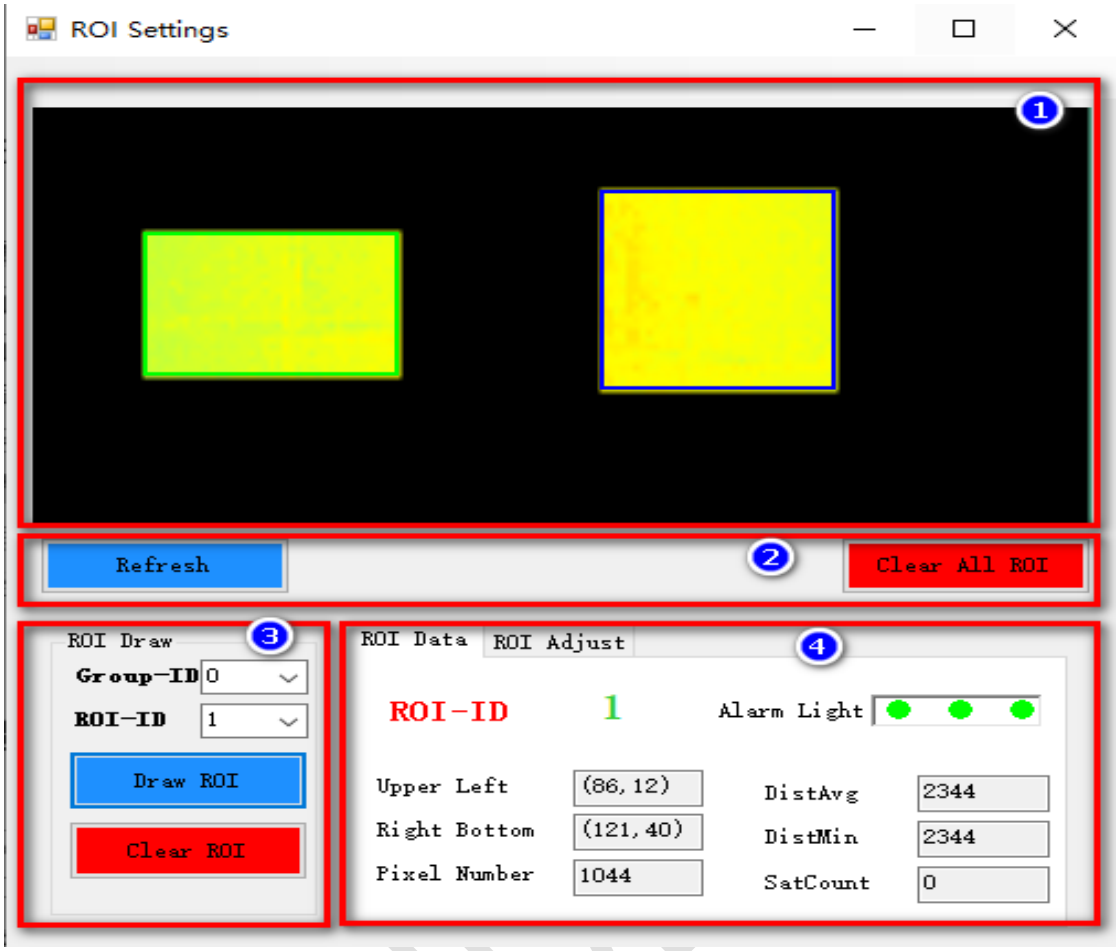
In the Help tab, select Firmware Update will pop up the following interface, select the corresponding firmware upgrade package, click on the firmware update, you can upgrade online; after the upgrade is successful and determined, the interface will automatically exit



4.2 ROI Settings

The client software supports user define multiple groups of regions of interest (ROI). Each group supports multiple custom ROI. By combining multiple ROIs to meet the requirements in our actual application scenarios.

Click Advance, ROI Settings to enter the ROI setting.



4.2.1 ROI setting main interface function and introduction

(1) Distance image display interface: color image display and rectangular ROI drawing and setting sections;
(2) ROI drawing: At present, the client software supports drawing up to 16 non-repetitive ROI. For detailed drawing steps, please refer to Section 4.2.2.
(3) ROI data display box: This area is used to display simple data in the current ROI. By moving the mouse to the ROI drawn, the current ID and its simple data package contents are displayed in the area; The alarm indicator corresponds to the three-stage threshold alarm output status bit (bit0 bit1 bit2)
(4) ROI Adjust: Manual tiny adjustment for ROI area is supported, including pan and zoom.

4.2.2 ROI setting steps

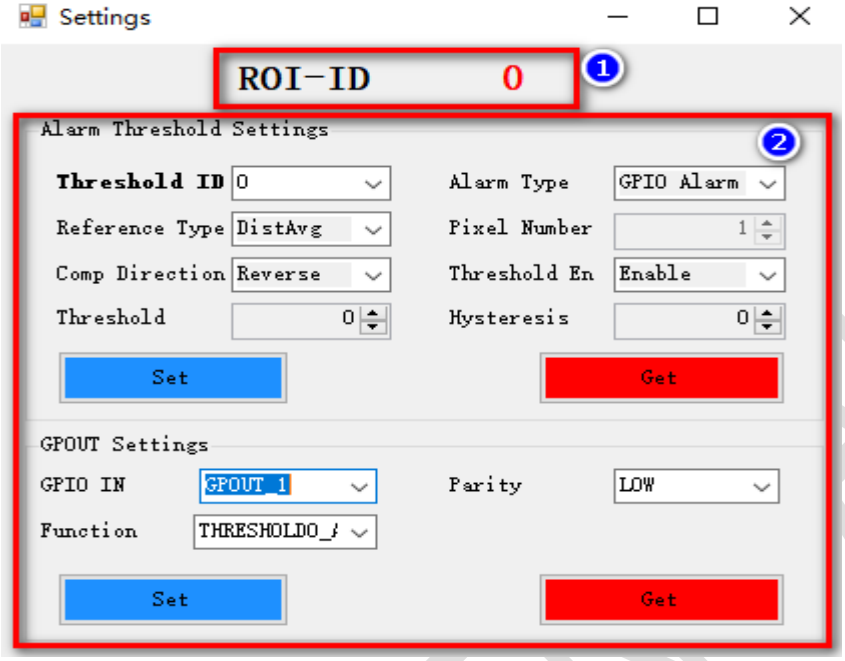
In the first step. Choose group ID (Group-ID)(0~15) in ROI main interface 2 area.

In the second step, the ROI ID number is selected in the area where the main interface 2 is set in the ROI;

In the third step, click the button to draw the ROI, and then use the mouse to drag the mouse from the upper left to the lower right in the area to draw the rectangle of ROI. If you need to draw

again after each drawing, you need to click the button to draw ROI.

In the fourth step, click the mouse in the ROI to be displayed, and set the alarm parameters for the area. The setting interface is as follows:



1) Display the currently set ROI ID number

2) Alarm threshold setting: At present, the client software supports three segments of threshold setting threshold ID range is 0~2;

The setting steps are as follows:

Step 1: Select a threshold ID, and set three threshold parameters by ID switching.

Step 2: Select a threshold reference type, the reference type represents a data type of the threshold, and the set threshold is compared with the reference type to output;

Step 3: Select the comparison direction, you can select two types: forward comparison and reverse comparison. The forward direction indicates that the reference value is larger than the threshold output alarm signal, and the reverse direction indicates that the reference value is smaller than the threshold value to output the alarm signal.

Step 4: Set a threshold, which is set according to the selected reference type;

Step 5: Set the alarm type, select GPIO to output an alarm or turn off the alarm;

Step 6: Set the threshold enable to individually switch a certain threshold;

Step 7: Set the hysteresis range, which is to solve the problem that the frequent alarm output occurs when the reference type value jumps back and forth around the threshold. Therefore, the setting of the value should not be too large, otherwise the alarm trigger delay will be caused;

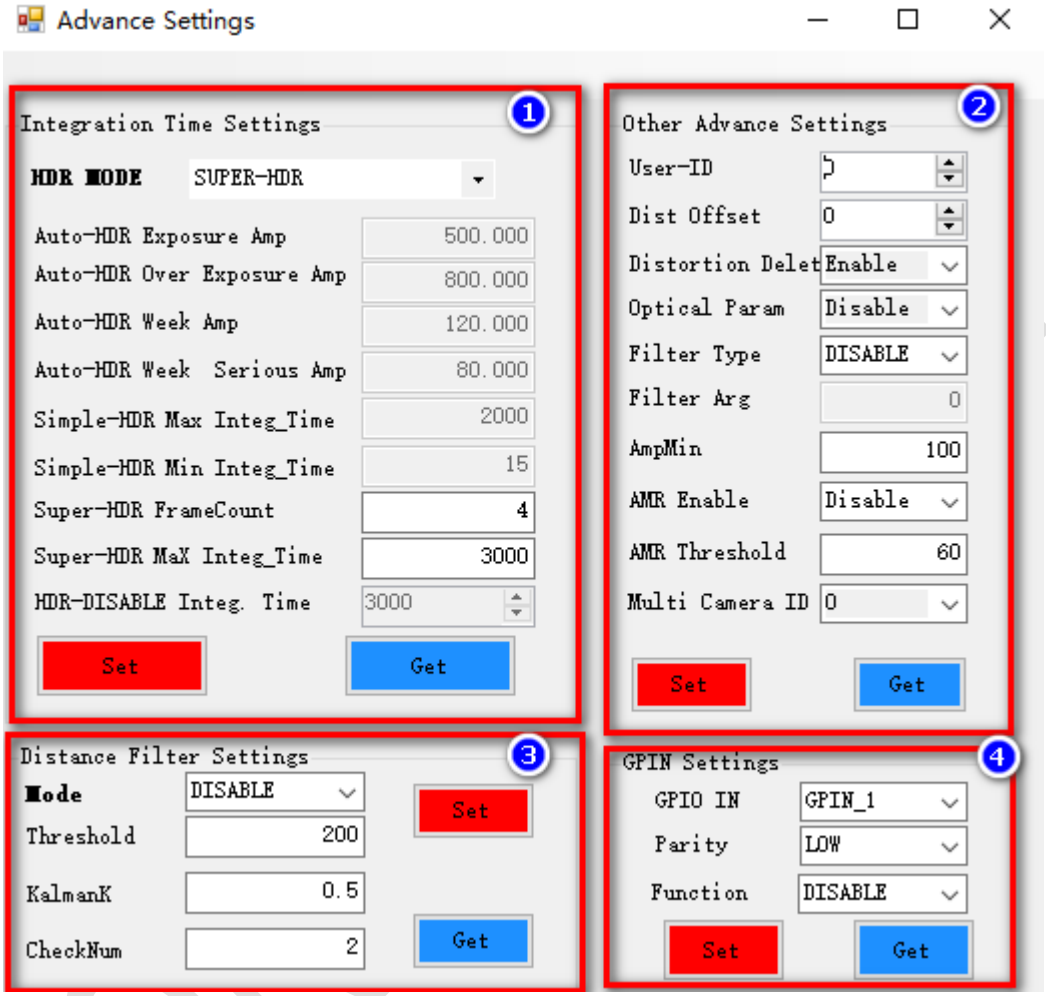
Step 8: GPIO output configuration, select the alarm function, and set a certain threshold alarm separately;

Step 9: Click the Settings button to save the settings. If you need to power on the next time, you need to save to the user configuration.

The fourth step is to view the data information in the current ROI and move the mouse to the ROI to be viewed.

4.3 Advanced parameters setting function introduction

Click the Advanced Features tab of the main interface and select Advanced Parameter Settings to display the advanced parameter settings window, as follows:



(1) Integration time mode setting: set the corresponding parameters according to the selected mode;

The HDR-DISABLE mode is measured by manually setting the integration time;

The AUTO-HDR mode automatically adjusts the integration time based on the amplitude of the signal in the current measurement environment. This mode is more suitable for use in close proximity (negative background);

The SUPER-HDR mode is measured by combining multiple frames into one frame. This mode is suitable for the situation where the background of the measured object is more concerned; for example, the number of frames is 4, and the maximum integration time is 40000us, then the integration time of the four frames 4000, 40,000/4, 40,000/4/4, 40,000/4/4/4;

The SIMPLE-HDR mode combines data frames acquired under two different integration times to synthesize one frame of data for output; the two sets of integration time can be adjusted according to the actual application scenario;

Integration time mode			
Mode	Applications	Integration time description	Frame rate
HDR-DISABLE	Static and fixed environment	Manual setting	The longer the integration time, the lower the frame rate
AUTO-HDR	Obstacle avoidance, sensitive to close proximity environment	Auto adjust	High
SUPER-HDR	Most objects in the environment, black objects are also identifiable	Calculate the remaining frames based on the set maximum integration time	Low
SIMPLE-HDR	Measuring environment within a specified distance	Adjust two sets of integration time according to the measurement distance range	Medium, stable

SUPER-HDR is suggested.

(2) Other advanced parameter settings: User-defined ID: used to set the frame ID, the default is 0; distance offset, multi-machine interference and optical parameter enable settings; Smoothing filter setting: smoothing and filtering the image;

(3) GPIO input setting: set input GPIO input function, realize command transmission by level triggering;

Caution: GPIO input connection: purple-white ground, blue and white to 24V power supply; default configuration GPIO polarity is low, when this pin is high, GPIO function is executed; if GPIO polarity is high, GPIO function is CAPTURE_START default When the power is turned on, the client will not be able to configure the parameters again and cannot connect. You need to connect the GPIO to the 24V power supply to stop the sensor, and then connect to the client again to configure.

(4) Distance filter

Mode selection: Turn the distance filter function on or off;

Noise threshold: This threshold should be set higher than the expected distance noise, otherwise each noise peak will clear the counter or cause unnecessary filter reset;

Scale factor K: filter gain value for filtering sensitivity control;

Threshold check frame number: The effective threshold value that must be reached to check the number of frames for filter reset. The default value is 2, the larger the value, the slower the corresponding speed and the longer the delay;

5. FAQ

5.1 The interface layout of the software is confusing

Solution:

This problem is caused by the resolution mismatch, the software supports resolution adaptation, please maximize the software window;

5.2 Cannot measure black object?

Solution:

This problem is caused by the low reflectivity of the black object. By increasing the integration time can fix this problem (the larger the integration time, the stronger the received optical signal value). If there is not restriction for the frame rate, set the integration time mode to SUPER-HDR to measure black object. For the mode, please refer to section 4.3 for detailed settings.

5.3 The noise on the measurement result is high?

Solution:

The measurement noise is related to the measurement environment. The larger the received optical signal value is, the lower the noise is. The farther the measurement distance is, the larger the noise is. The software integrates various filtering algorithms to alleviate the influence of the noise on the measurement result, including smoothing filter, Gaussian filtering, Kalman distance filtering, edge filtering, etc., When enabling the filtering, the frame rate will be reduced. The most common used filtering is Kalman filtering, for detailed parameters please refer to Section 4.3; for the edge noise between the object and the background, this problem is due to the pixel angle resolution and optical impact, the client software adds an edge filtering algorithm to properly mitigate this problem, enabling or enabling edge filtering in the advanced features of the main interface.

5.4 Confused about the ROI parameters setting?

Solution:

The ROI area setting contains many parameters. For a brief description, refer to Section 4.2; an example will be described here;

1) How is the threshold ID used?

At present, the sensor is divided into single IO and 3IO versions, which are applied to the AGV obstacle avoidance. The threshold ID is used to divide the multi-segment obstacle avoidance area, such as threshold ID0: threshold detection value is 300mm, threshold ID1: threshold detection value is 600mm, threshold ID2 : The threshold detection value is 900mm; the three-stage obstacle avoidance range is configured and the corresponding IO output is configured correspondingly, and the corresponding action indication is made through the IO output signal to avoid obstacles;

For example, when the threshold ID2 is in the alarm state, the deceleration action is performed; when the threshold ID1 is in the alarm state, the deceleration action is performed; when the threshold ID0 is in the alarm state, the stop action is performed;

2) What scenario does the threshold reference type “number of pixels” adapt to?

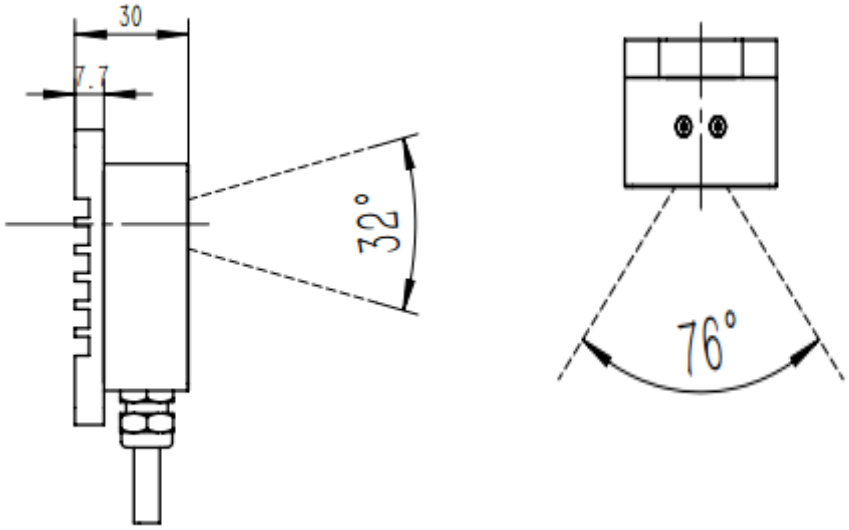
Number of pixels: This reference type is a way to replace the minimum distance reference type; since the minimum distance value is only a pixel point, it is easy to generate false positives; therefore, the minimum distance value alarm can be replaced by the number of pixel points; Smaller objects can also be ignored without alarm processing by specifying the number of pixels. For example, there are two objects in the range of 1 meter, one is a small paper group and the other is a large cardboard box. We need a small paper group to detect the situation where no alarm occurs, and the large cardboard box performs corresponding alarm processing; at this time, the threshold value needs to be set. It is 1000mm, and the number of pixels occupied by the small paper group is more than 1 meter. In this case, some small objects can be easily ignored, thereby reducing the false positive report;

3) What is the meaning of positive comparison and reverse comparison in the comparison direction?

The positive comparison is to trigger the alarm state when the measured value is greater than the set threshold, and the reverse comparison is the opposite;

Usually, the obstacle avoidance is the reverse comparison, that is to say, when the measured distance value is less than the preset distance, the alarm state is triggered; the positive comparison scene also has, for example, we need to let the trolley along the distance wall 500mm~800mm range Internal motion, in which the condition of motion within 800mm requires a positive comparison, when the trolley exceeds the 800mm range, the alarm signal indication should be output at this time;

5.5 How to calculate the projected area?



- Resolution 160*60
- The horizontal field of view is 76° and the vertical field of view is 32°
- Horizontal angular resolution: 76/160 = 0.475°
- Vertical angular resolution: 32/60 = 0.533°

Assuming that the horizontal projection length is Width, the vertical projection length is Height, and the true measurement distance is D, there are: Width = 2 * D * tan(76/2)≈1.5625 * D; Height = 2 *D * tan(32 /2)≈0.5735 * D;
Projection area S = Width * Height = 0.8961 * D * D;
Example: The projected area at D = 2 meters is 0.8961 * 2 * 2 = 3.5844 square meters;

5.6 How to edit sensor IP for Ethernet edition?

Default IP address of the device is 192.168.0.10, the port number is 12345, default subnet mask is 255.255.255.0, default gateway is 192.168.0.1. Enter device IP and port number before connecting, such as HPS3D_SetEthernetServerInfo (&handle," 192.168.0.10", 12345);
To modify the device default IP address, port number, subnet mask or gateway, you need to call the reset server interface HPS3D_ConfigEthernet(...); If you want to set it for permanent, need to set the parameter to communication configuration.
After resetting the server IP, if you need to save permanently, you need to save the communication configuration (refer to 3.26). Please remember the modified IP, otherwise you will not be able to connect again.

5.7 Mutual interference for multi device?

Multi-device collaboration is supported for software version 1.7.17 and above version, and the

firmware version 1.7.61 and above version. The configuration method performs multi-device encoding in other advanced parameter settings in advanced parameter settings.

六、Revision history

Date	Revision	Description
2018/10/25	1.0	initial version.
2018/11/06	1.1	Improve data logging and playback
2018/12/06	1.2	Add graph data type switch
2018/12/20	1.3	Add HDR mode feature description and comparison
2019/01/15	1.4	Add distance filtering and modify interface layout
2019/01/25	1.5	Add edge filtering
2019/02/18	1.6	Add obstacle extraction and optimization
2019/03/06	1.7	Compatible with Ethernet version, join server IP reset
2019/03/27	1.8	Join multi-machine assisted code setting