contents

1. Camera connection

1.1 Camera power supply

	The smallest	recommend	maximum	Remarks
DC supply voltage	9V	12V	12V	Network port camera
POE DC power supply	48V	48V	57V	Network port camera

It is recommended to use the original power supply. If you need to change to another power supply, please ensure that the above conditions are met and the rated power of the power supply is not less than 2W;

1.2 Camera LED light

LED indicator		Camera status
SUA camera 	Flashing every 500ms	Waiting for connection
	300ms on, 700ms off	The bandwidth used is USB2.0 bandwidth
	300ms off, 700ms on	The bandwidth used is USB3.0 bandwidth
	Flashes quickly	Sensor is taking pictures
	Always on	Sensor does not take pictures (such as trigger mode)
GIGE camera 	Yellow light-flashing uniformly and slowly (cycle 2 seconds, on for 1 second, off for 1 second)	Waiting to connect to the network (if the network cable is not connected)
	Yellow light-uneven slow flashing (cycle 1.1 seconds, on for 1 second, off for 0.1 second)	Camera initialization is complete, enter the standby state
	Yellow light-fast flashing (cycle 100ms, on for 50ms, off for 50ms)	Sensor is taking pictures
	Yellow light-always on	Sensor does not take pictures (such as trigger mode)
	Yellow light-always off	The camera is not powered or the camera hardware is faulty
	Green light-always on (1000M), always off (100M)	
Smart		The smartphone has 4 indicator lights power、

camera 	cam、trig、user Power is the power source, it will be on when it is powered on, and cam is the work of the camera. As long as you turn on the camera to collect once and turn on and off once, it will not change without collecting. Trig means to trigger once to turn on and off once, user is user-defined, and it will turn off if it is not operated

Note: Some network port cameras only have a yellow light indicator

1.3 Camera Accessories

Product name	规格
camera	Subject to the purchased model
power supply	Refer to camera power supply instructions
Lens	Subject to the purchased model

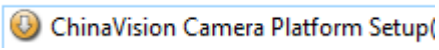
1.4 Connection instructions

Power circuit is different from IO circuit, IO power supply refers to the use of IO interface function

2. Driver Installation

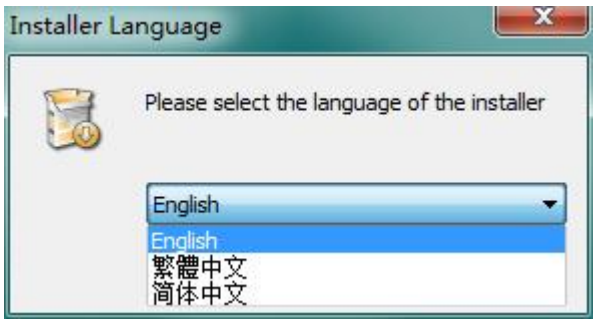
2.1 Driver package installation

The driver package can be updated on the official website

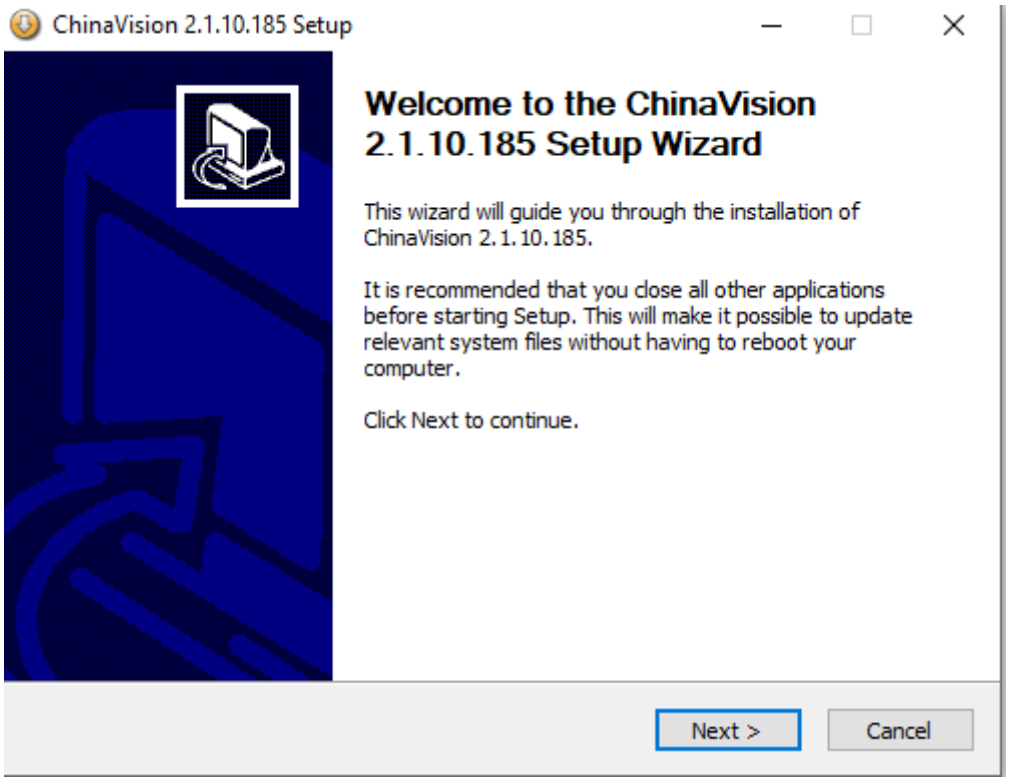


After the driver package is downloaded, double-click the driver package to enter the installation

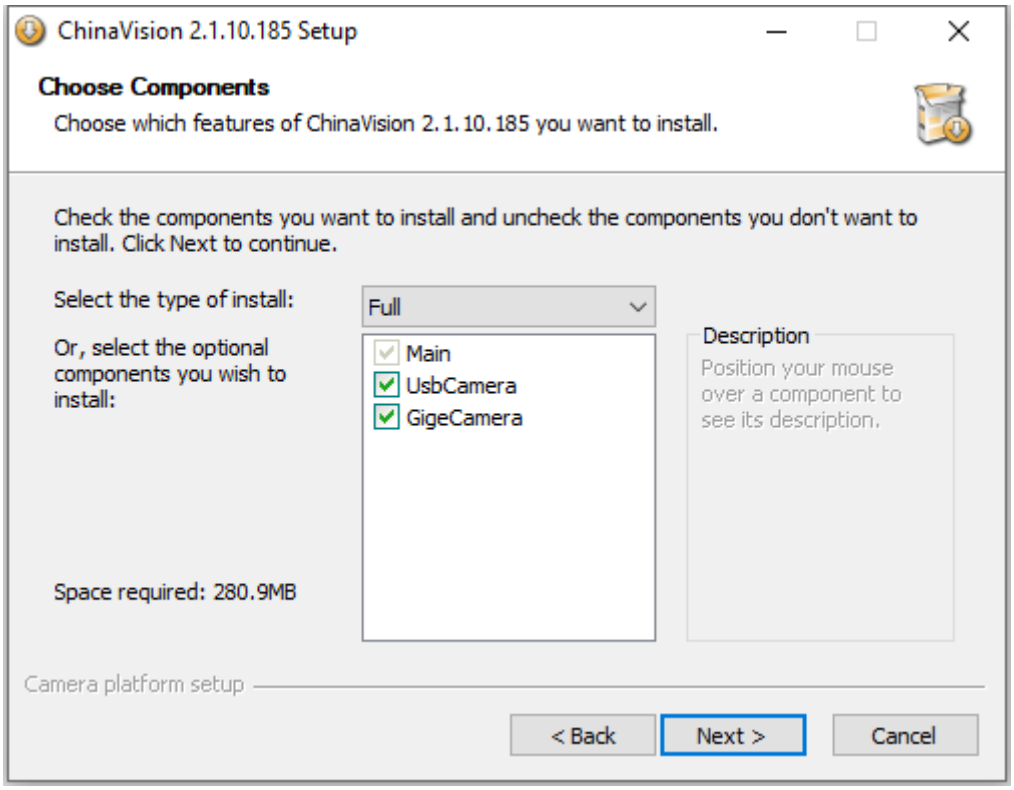
Choose SDK language;



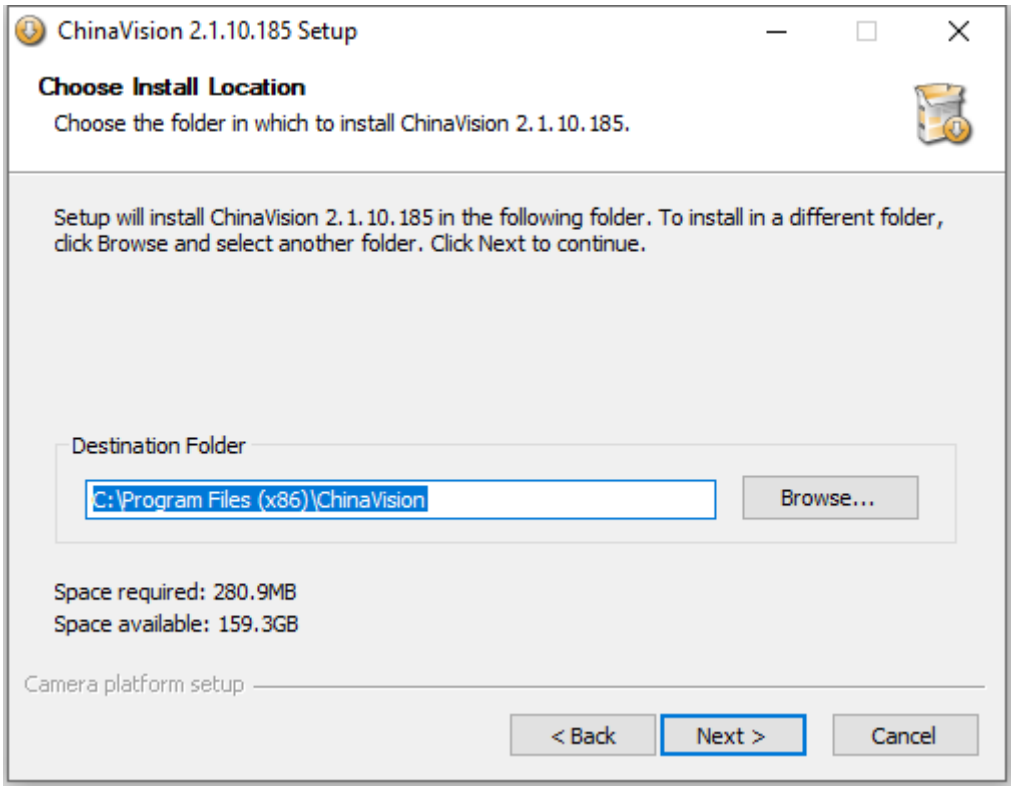
After confirming the language, select "OK" to enter the installation interface;



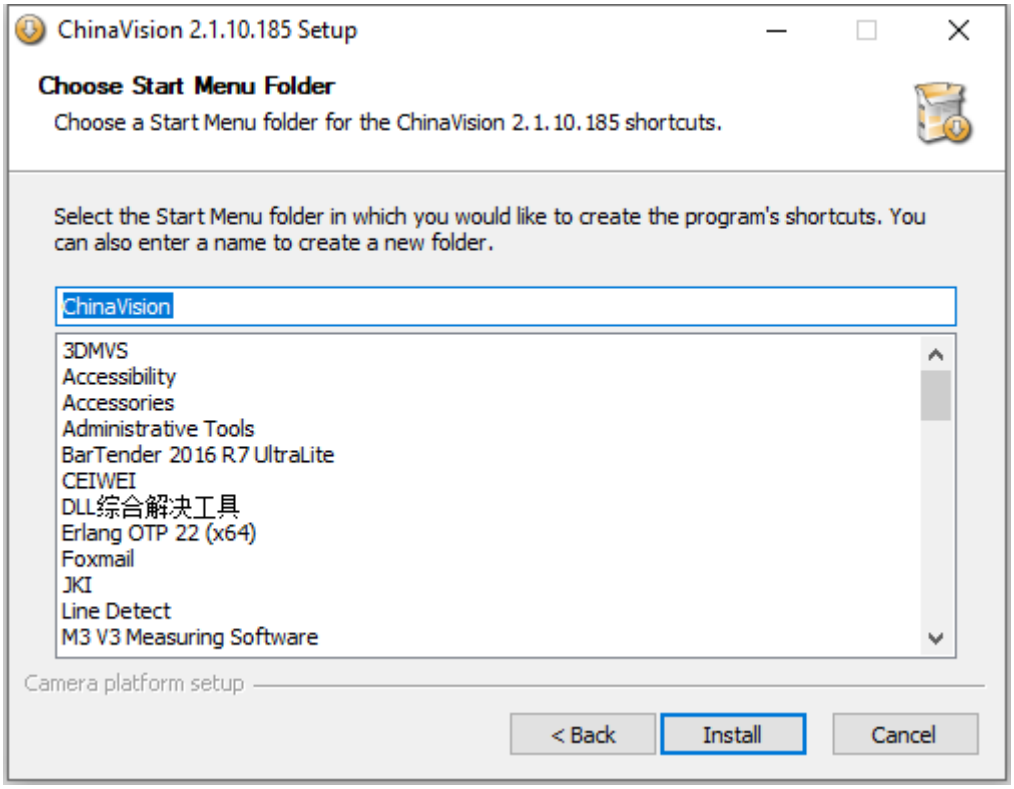
"Next" enter the driver selection interface, tick the device driver to be installed;



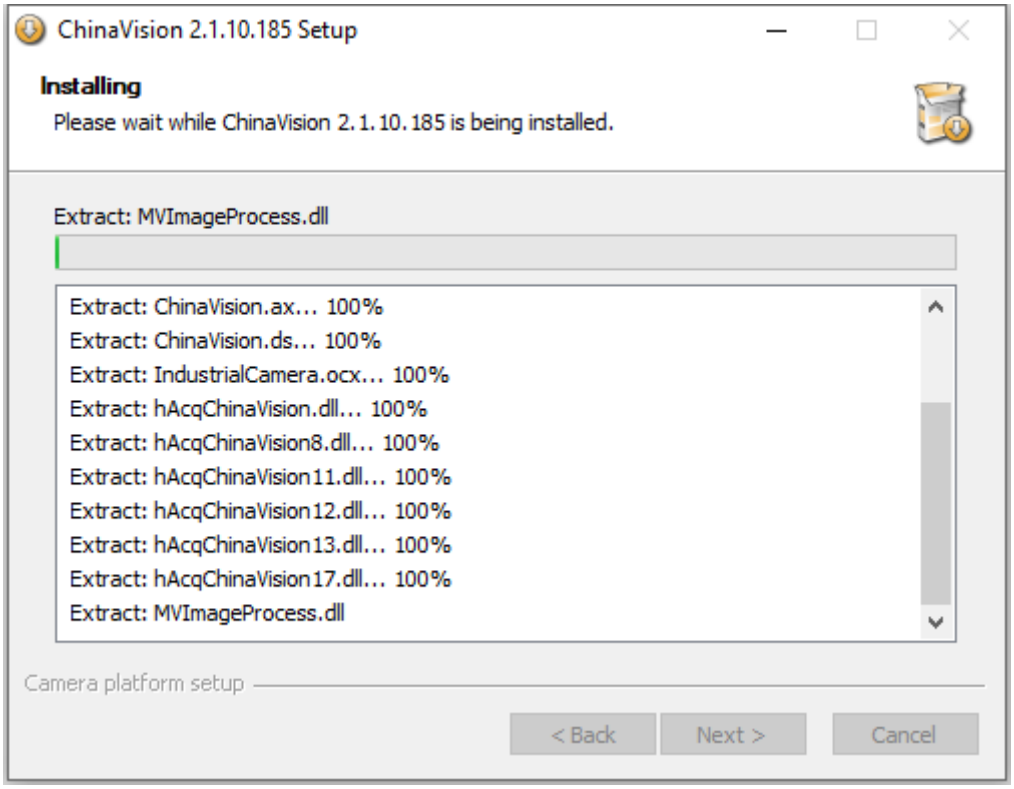
"Next" Enter the driver installation directory selection



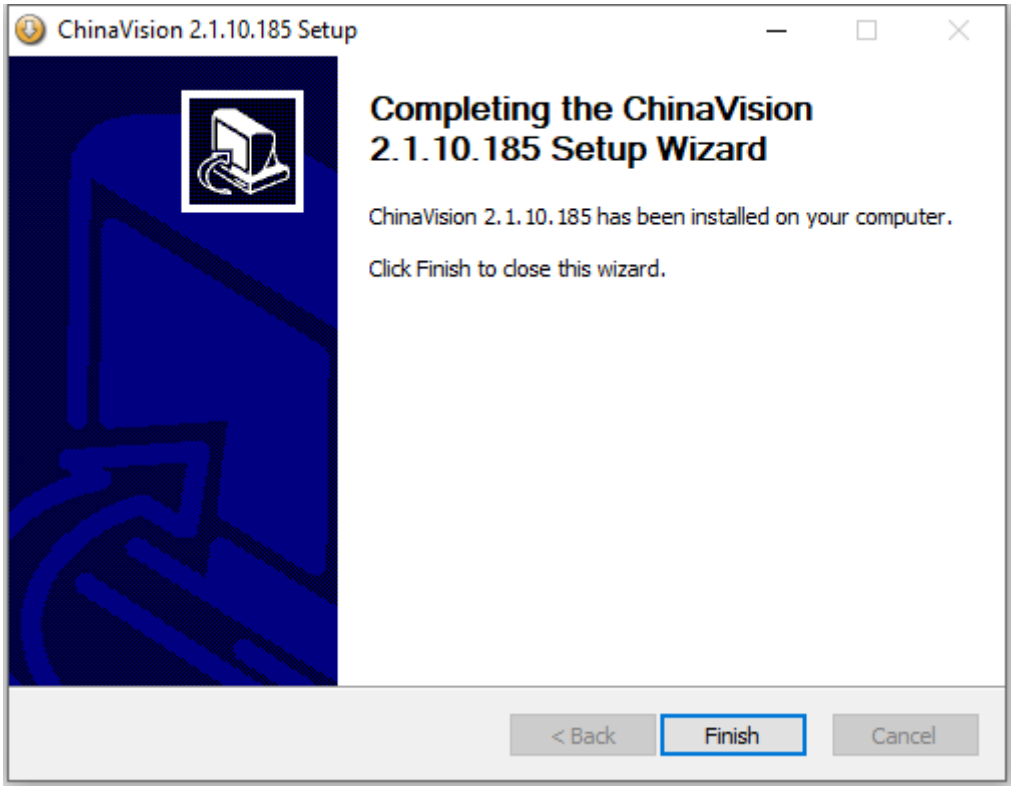
"Next" Enter the creation shortcut interface



"Install" enter the installation, if there is a problem that the signature cannot be verified during the installation process, and the signature verification of individual system drivers fails, choose to always install this driver;



Installation complete interface

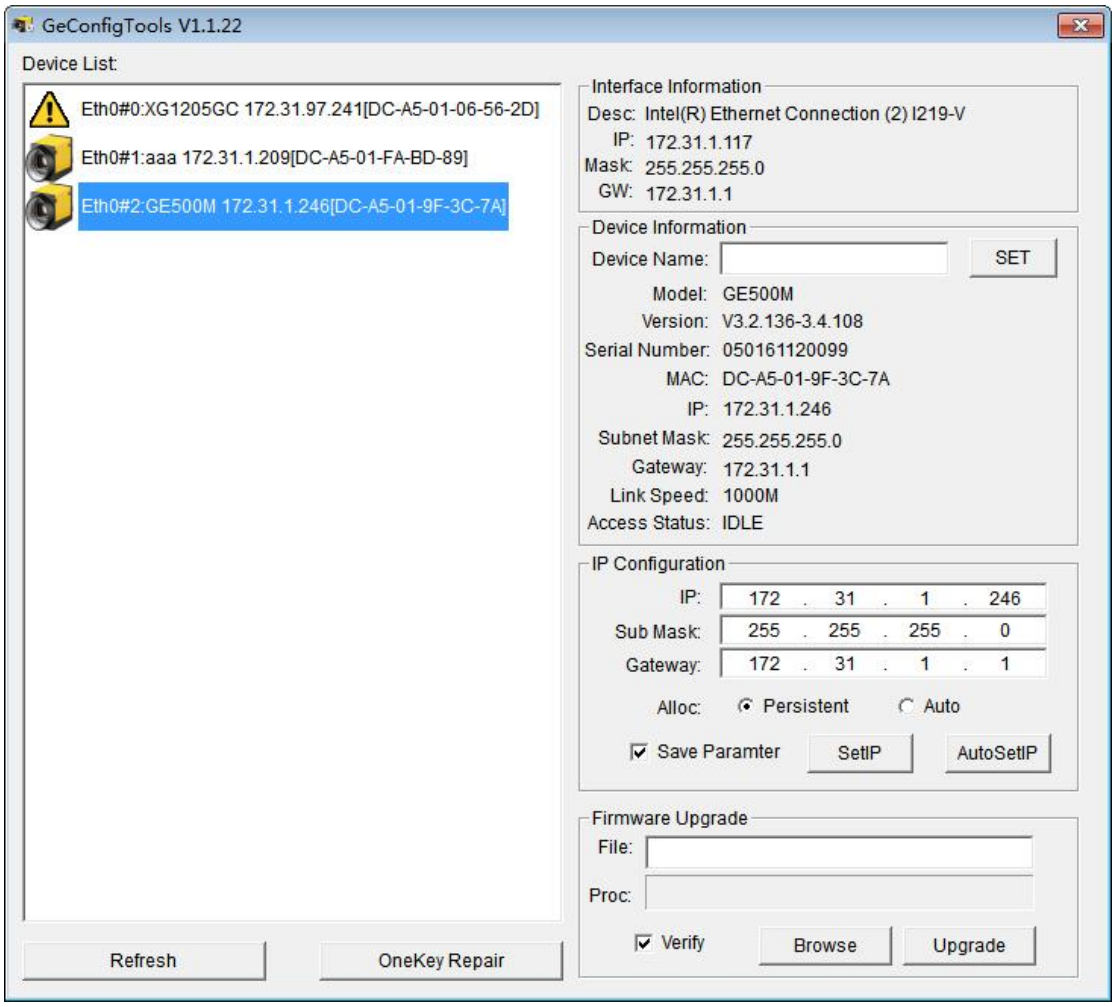


2.2 USB device

After the driver is installed, the USB device can be queried for the corresponding camera device in the device manager. If the device is not found in the device manager list, please check the camera connection.

2.3 GIGE equipment

After the driver is installed, there is an IP configuration tool in the driver installation directory, and GIGE devices can enumerate the corresponding devices in the IP configuration tool.



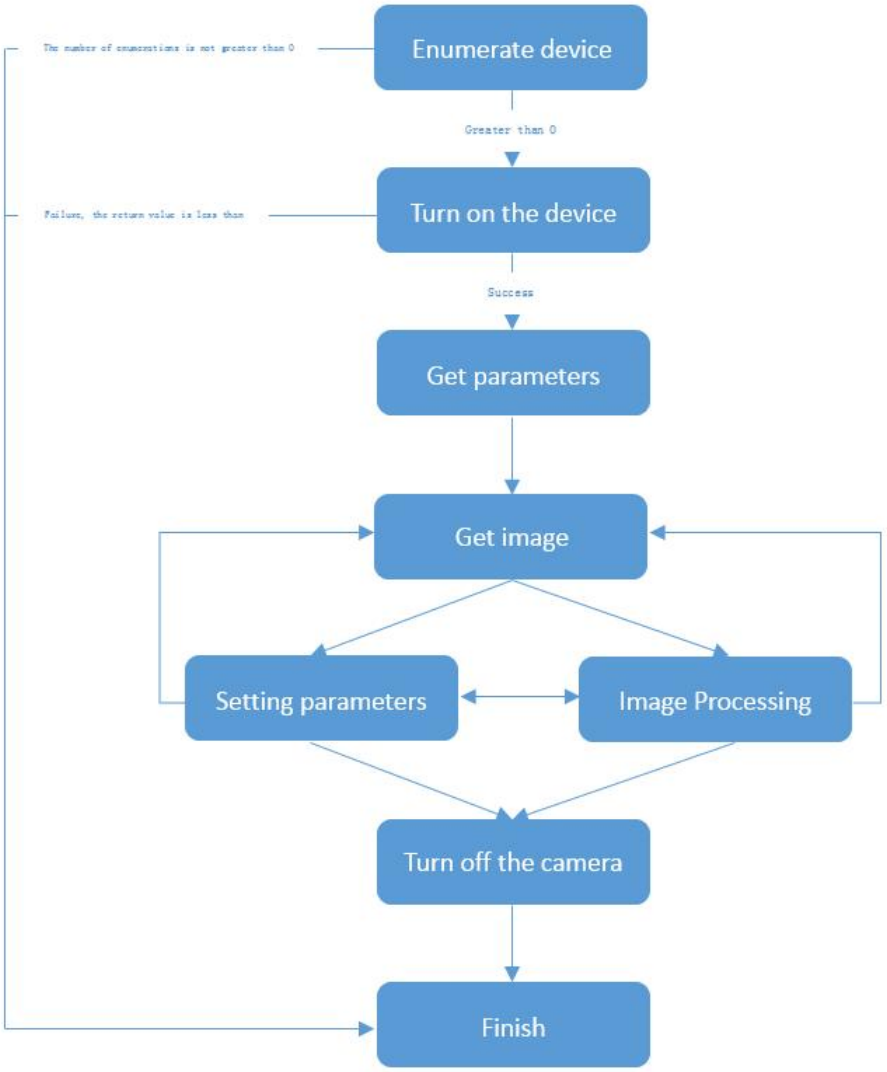
2.4 Installation Notes

If there is any abnormality such as file occupation during the driver installation, check whether the corresponding camera device or software is opened, close or restart the computer and install the driver.

For the network card bandwidth, refer to the "Gigabit Network Camera User Guide.pdf" under the driver installation directory/Document directory and configure it to a suitable bandwidth.

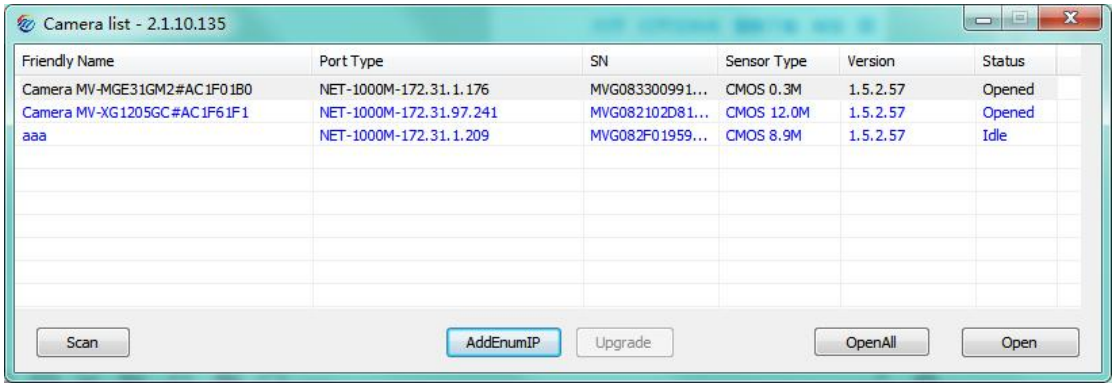
3. Camera use

3.1 Camera on and off



Desktop presentation program interface

Demo program 1.0: double-click the device to open the selected camera device



Demo Program 2.0: Double-click the device with the mouse or select the device and then click the connection symbol to open the device

3.2 Image format data (bayer) & pixel format data (RGB)

Raw data is as follows

Model\Image Format	8bit	12bit
Black and white	CAMERA_MEDIA_TYPE_MONO8	CAMERA_MEDIA_TYPE_MONO12_PACKED
color	CAMERA_MEDIA_TYPE_BAYGR8	CAMERA_MEDIA_TYPE_BAYGR12_PACKED

By default, industrial cameras generally transmit 8bit raw format data. For black and white cameras, it is grayscale image data. For color cameras, it is image data in Bayer format. The user can change the raw data bit output by the camera through the CameraSetMediaType function. depth. The bit depth we currently support is 8 or 12 bits optional. CameraSetMediaType is to select the type of bit depth supported by the camera.

The Mono format is exclusively for black and white cameras. It only expresses a grayscale image, and the value of a pixel is the grayscale of this pixel.

The three types of BAYER pixels of a color camera have their arrangement format (as shown in the figure below). If the arrangement format is not selected, abnormal colors caused by color channel confusion will occur.

When the Image Sensor outputs data line by line, the pixel sequence is GRGRGR.../BGBGBG...;

8bit data

MONO8

Y0								Y1								Y2							
0	1	2	3	4	5	6	7	0	1	2	3	4	5	6	7	0	1	2	3	4	5	6	7

BAYGR8

G0								R0								G2							
0	1	2	3	4	5	6	7	0	1	2	3	4	5	6	7	0	1	2	3	4	5	6	7
B0								G1								B1							
0	1	2	3	4	5	6	7	0	1	2	3	4	5	6	7	0	1	2	3	4	5	6	7

12bit data

MONO12

Y0								Y0				Y1				Y1							
4	5	6	7	8	9	10	11	0	1	2	3	0	1	2	3	4	5	6	7	8	9	10	11

BAYGR12

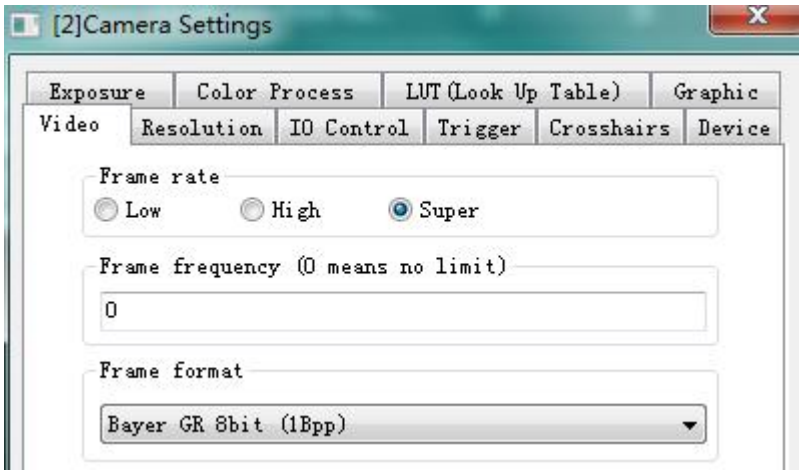
G0								G0				R0				R0							
4	5	6	7	8	9	10	11	0	1	2	3	0	1	2	3	4	5	6	7	8	9	10	11
B0								B0				G1				G1							
4	5	6	7	8	9	10	11	0	1	2	3	0	1	2	3	4	5	6	7	8	9	10	11

The pixel format is the image pixel format (RGB sequence format) obtained by restoring the raw data through the algorithm (SDK uses the CameraImageProcess function), not just the original RAW pixel format output by the camera.

Most models of industrial cameras can output 12bit or even 16bit original RAW images. For color cameras, if a color component uses 8bit, the low-level details of the image will be lost. Therefore, we provide the RBG48bit color image format to satisfy users. Dynamic, high-precision visual analysis. The three color channels of red, green, and blue are represented by 16 bits for each channel, and a pixel requires 6 bytes. When the camera supports 12-bit original RAW format, it can use 48-bit color image format. When RAW data in 12-bit format is converted into a 48-bit color image, the lower 4 bits of each channel will be filled with 0.

After the camera is initialized, the pixel format is set by calling CameraSetIspOutFormat

The Raw data format setting interface is as follows:



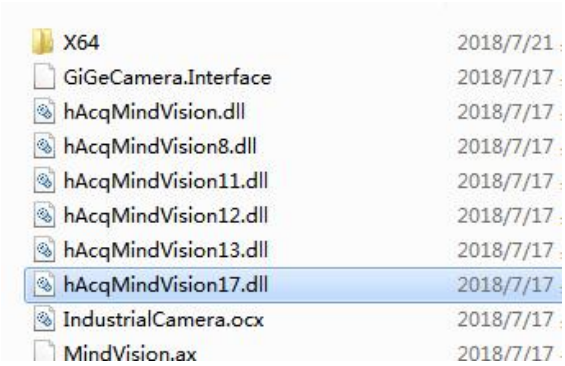
Note: Not all models support 12 raw data output modes. If CameraSetMediaType returns a non-zero value, it means that the setting has failed.

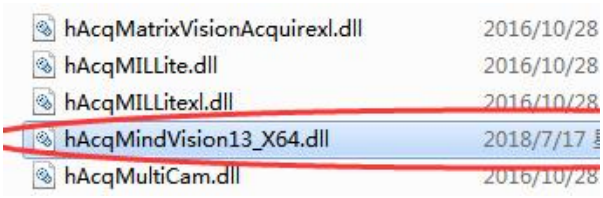
3.3 Use of visual tools

3.3.1 halcon use

Our camera interface is optimized specifically for Halcon and can support Halcon well. In the system where Halcon has been installed, run our camera software installation package HOURS Platform Setup (x.x.x.x).exe installation program, the installation program will automatically detect the installation path of Halcon and set it accordingly. Currently, our camera development kit supports the 32-bit and 64-bit versions of Halcon8, Halcon9, Halcon10, Halcon11, Halcon12, Halcon13, and Halcon17.

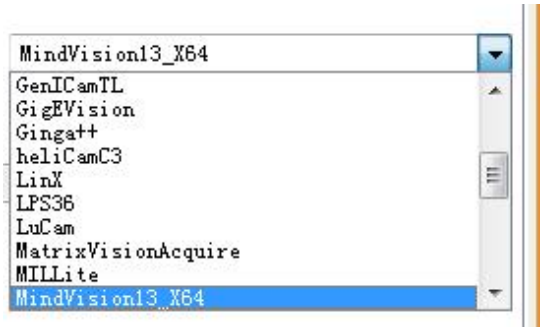
Copy the corresponding version hAcqHOURS(x).dll file in the SDK directory to the corresponding running program directory of halcon





1） After starting Halcon, click on the "Assistant" menu and select "Open New Image Acquisition", as shown in the figure.

2） Click "Image Acquisition Interface (I)", and find HOURS in the drop-down list. as the picture shows.



3） Click the "Connect" tab and a window will appear. In the window, we can see our MV-U300 camera. If multiple HOURS cameras are connected at the same time, please select the camera you want to access in the device list.

Detailed operation reference, "HOURS Industrial Camera Development Manual.pdf"

3.3.2 LabView use

In Labview, you can use NI MAX tools and the routines we provide based on DLL calls for development.。

1） Connect the camera first, and then run NI MAX. You can find our camera under NI-IMAQdx Devices under "Devices and Interfaces", as shown in Figure 1. After double-clicking, you can get the camera preview screen as shown in Figure 2 (you need to click the Grab button on the second side of the figure to preview).

2） In Figure 2, the resolution can be switched

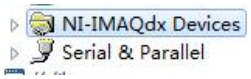


figure 1

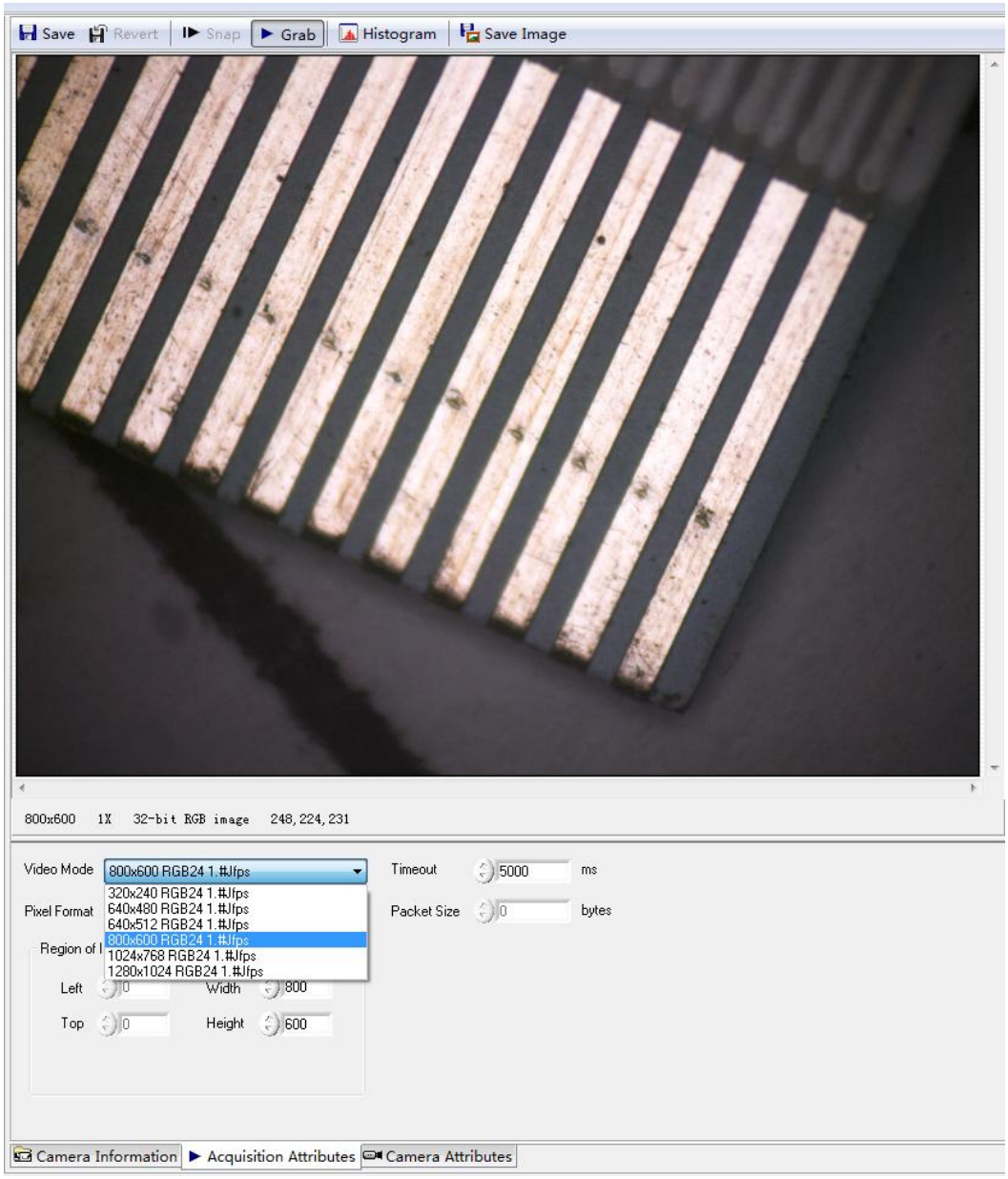


figure 2

After clicking on the Camera Attributers tab in Figure 2, you can set other camera parameters. As shown in Figure 3. Under this interface, due to the limitation of the agreement, only some parameters of the camera are allowed to be set, and the settings of other parameters can be saved through our demo software after adjustment (the camera parameters can be saved as a file, no matter which one you use This parameter file can be effectively loaded automatically when developed in various ways), and then opened with NI MAX, it is also effective.

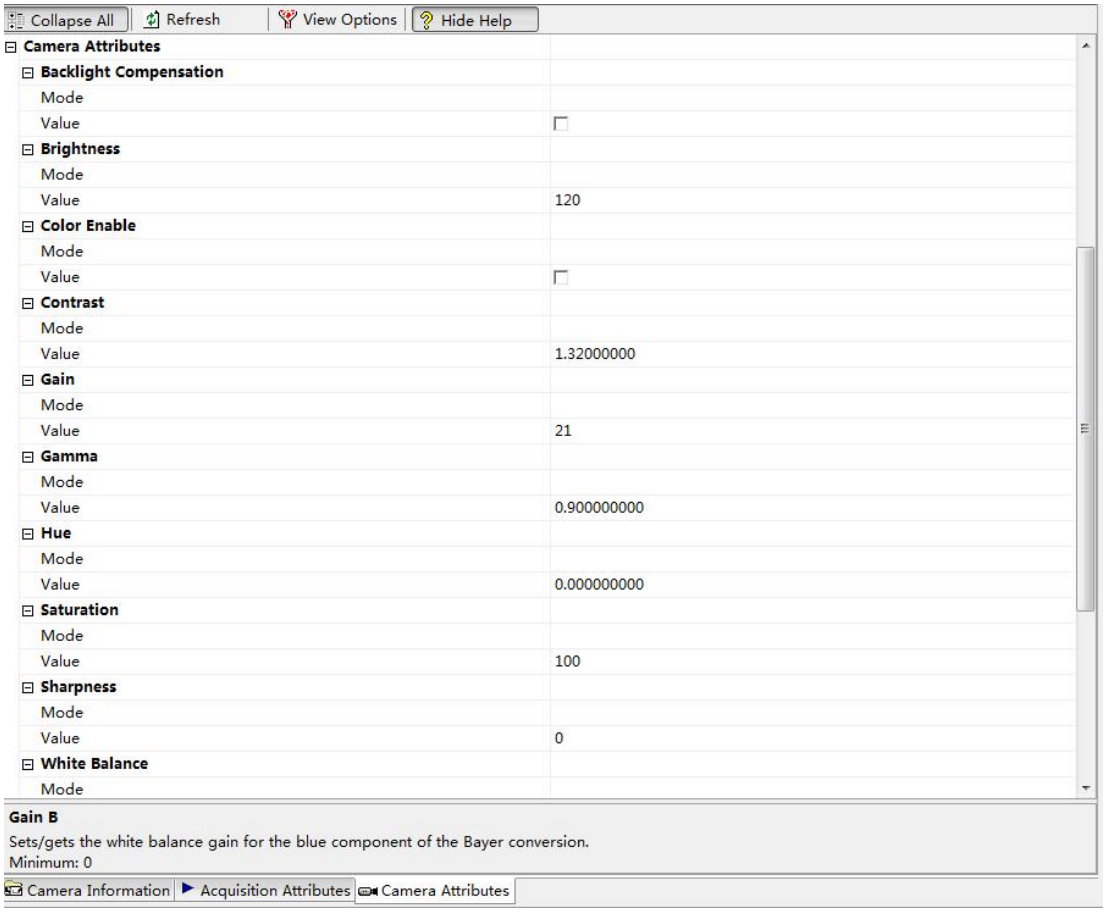
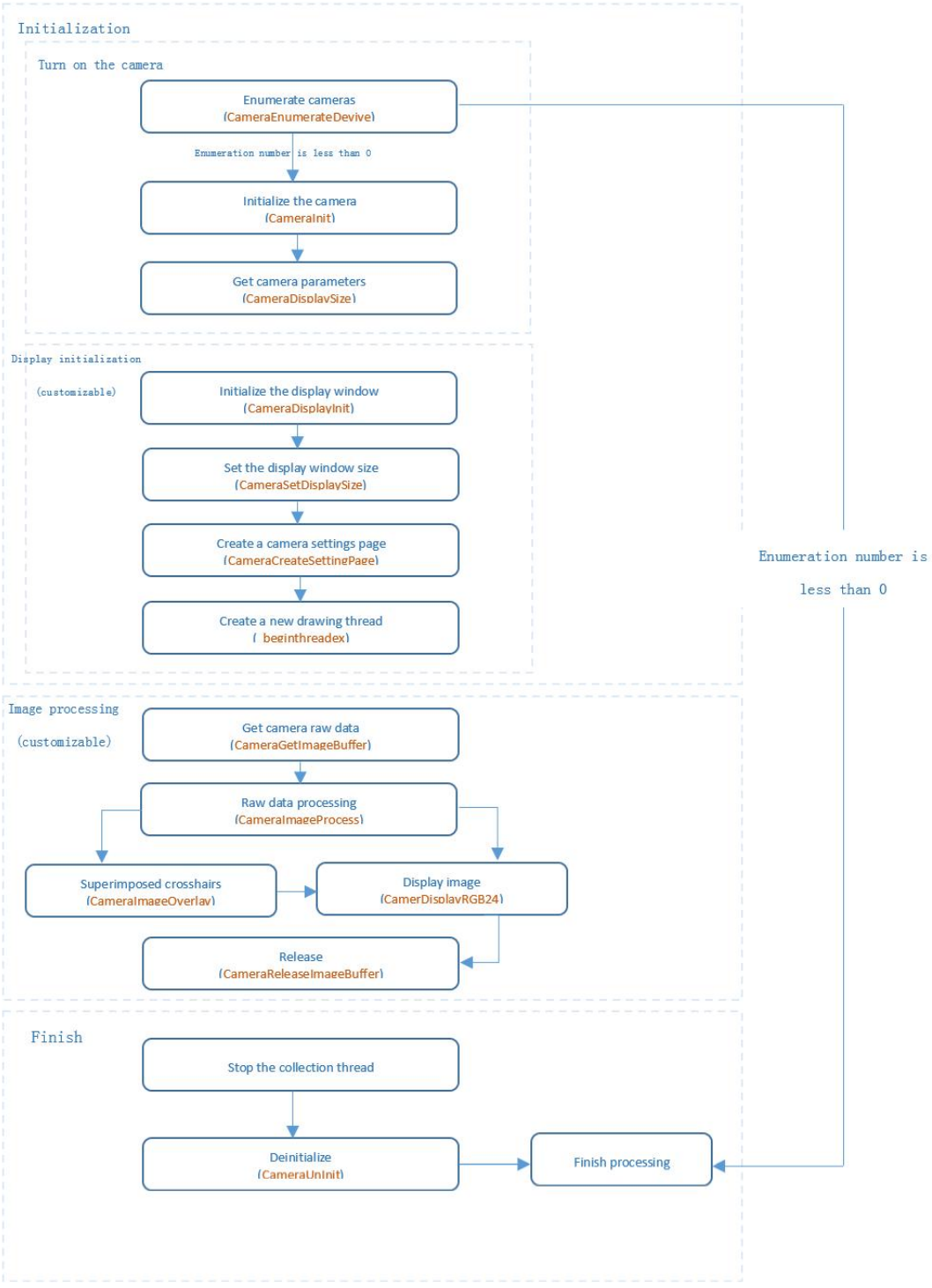


figure 3

3.4 Secondary development and use

The use process of the secondary development interface is shown in the figure:



3.4.1 C#

The C# routine is located in the Demo\C# folder of the installation directory. When developing in this language, copy the file MVSDK.cs in the demo to the project directory and add it, corresponding to the MVSDK interface.

Note: The C# interface is similar to the C++ interface parameter usage, please refer to the CameraApi.h file interface description for the parameter usage

3.4.2 C++ builder

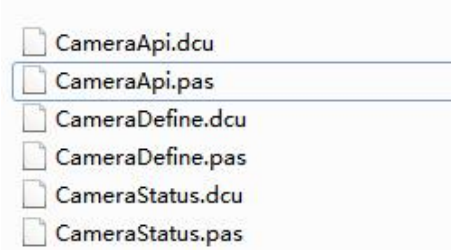
The C++ builder method example is located in the Demo\C++ builder folder of the installation directory. When using it, just copy the MVCAMSDK.LIB in the demo to the corresponding project and use it

Note: If the desktop demo program opens the camera without exception, and the project opens with an exception such as -6, use MVCAMSDK.dll in the SDK directory to update the MVCAMSDK.LIB file.

Update operation: implib1 is used to convert dll files into lib files that CB can call. implib1.exe -a c:/KeyDLib.lib c:/KeyDLib.dll, where c:/KeyDLib.lib is the file to be generated, and the other is the existing file. The parameter a does not care about it.After the conversion is completed, click [project] -> [Add to project] -> [lib file] -> [Import] to import the newly converted lib file into the project.

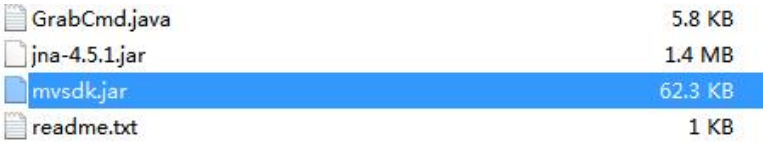
3.4.3 Delphi6

The example of Delphi6 mode is located in the Demo\Delphi6 folder of the installation directory. When using it, copy CameraApi.pas and other pas files in the Units directory and add them to the project.



3.4.4 java

The Java routines are located in the Demo\java folder of the installation directory. When using, copy mvsdk.jar in the demo to the project and add it to the project.



3.4.5 LabView

The LabView routines are located in the Demo\Labview\useDLL folder of the

installation directory, and the corresponding library function interface is added during development.

3.4.6 QT

The QT method is located in the Demo\QT folder of the installation directory (QT directory is QT4 version demo, QT5 is QT5 version demo), you need to link the corresponding MVCAMSDK.lib during development, including CameraApi.h and other header files.

Note: QT development is similar to C++. Demo is written and developed using vs. Qt creator development only needs to create a new project and modify the link library and header file corresponding to the pro file.

3.4.7 VB6

VB6 routines are located in the Demo\VB6 folder of the installation directory. During development, you only need to copy and add files such as the Module directory CameraApi.bas to the project

3.4.8 VC++

The VC++ routines are located in the Demo\VC++ folder of the installation directory. You only need to copy the MVCAMSDK.lib and corresponding CameraApi.h in the demo to the project and add them during development.

VC++ is the most comprehensive relative routine:

Advanced routine： Covers most of the SDK interface functions.

Basic routine： Basic collection display.

FirstStep routine： Collector grabber collection routines.

MultiCamera routine： Open multiple cameras for development and use at the same time.

MultiExposure routine： One camera and two exposure channels preview, wide dynamic effect.

TriggerAndStrobe routine： Trigger and flash signal control.

UserDataTest example： Read and write custom data in the camera and modify the secondary SN.

SnapshotOnPreview routine: Small resolution high-speed preview, large

resolution photos, take pictures and take photos using different threads.

ROI routine： How to customize the camera image size and set the ROI resolution.

GPIO routines: Only valid for models with GPIO, GPIO setting test.

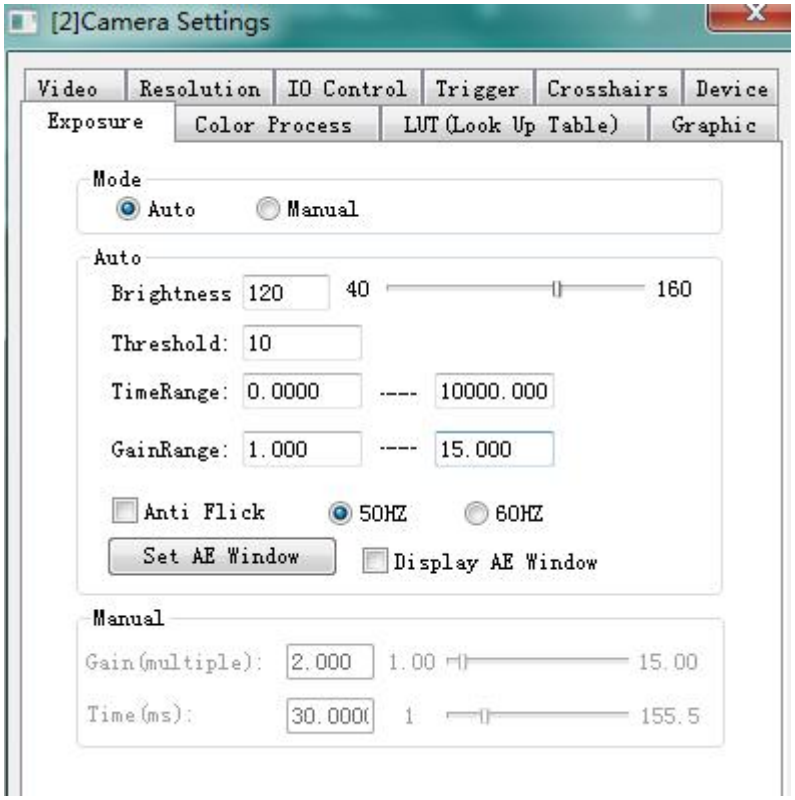
SaveImage routine: Picture storage The newly created thread stores pictures, and the storage speed does not affect the display.

4. Camera function

4.1 amera function

4.1.1 Exposure control

The exposure control page is shown in the figure:



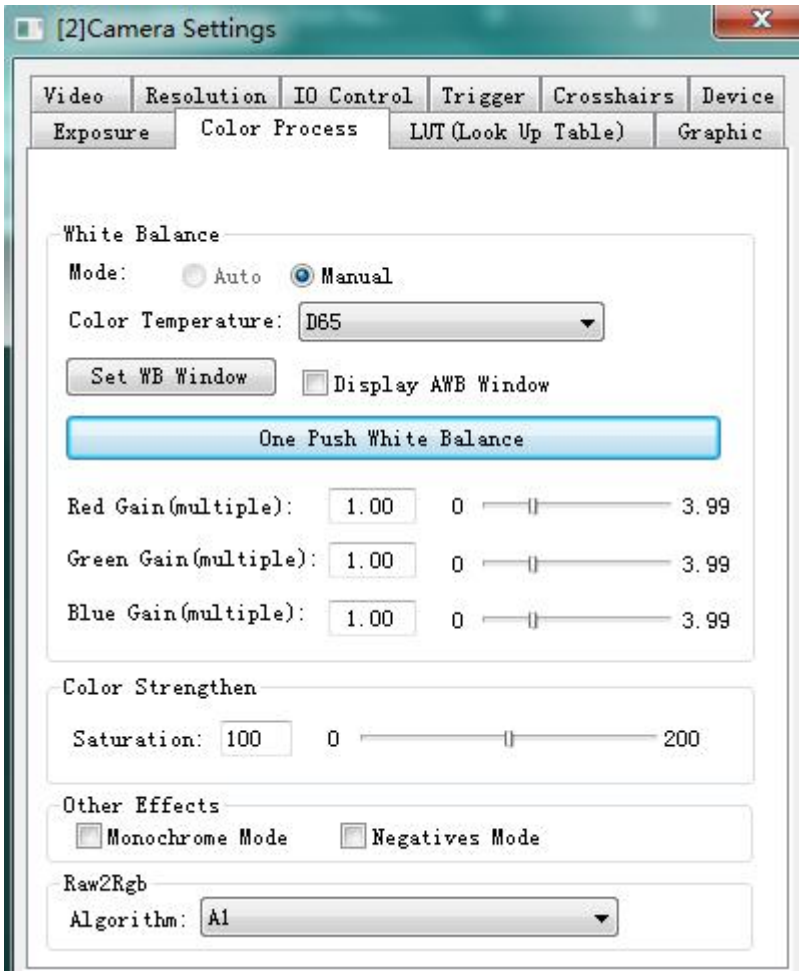
In automatic exposure mode, the analog gain value and exposure time are automatically adjusted with the brightness of the shooting environment, so that the range (reference window setting value range, by default the reference range is the entire image), the average brightness of the final image is the threshold value of the target brightness value Within the range, that is, abs (target brightness-image brightness) <threshold, stop adjusting.

The anti-stroboscopic function can effectively reduce the influence of AC light on the image brightness, and DC light source is recommended.

In manual exposure mode, the analog gain value and exposure mode are fixed values. The camera capture frame rate is more stable than the automatic mode. When shooting moving objects, a short exposure is usually required, because a long exposure will blur the image. This mode requires Illuminated by an external light source.

4.1.2 Color adjustment

The exposure control page is shown in the figure:



The color adjustment function is only available for color cameras.

Under different color temperature and light source environments, the measured object may have a color cast phenomenon. For example, under a yellow light source, the image may be yellowish after the camera is imaged. In this case, white balance correction is required. Its function is to restore the original white area in the image (but the color has been cast due to the influence of the color temperature of the light source) into pure white under the lighting of various color temperatures, that is, R = G = B. The so-called regional white balance means that when doing white balance operations, you can specify a certain image area as the reference analysis object. By default, the reference range of white balance is the entire image.

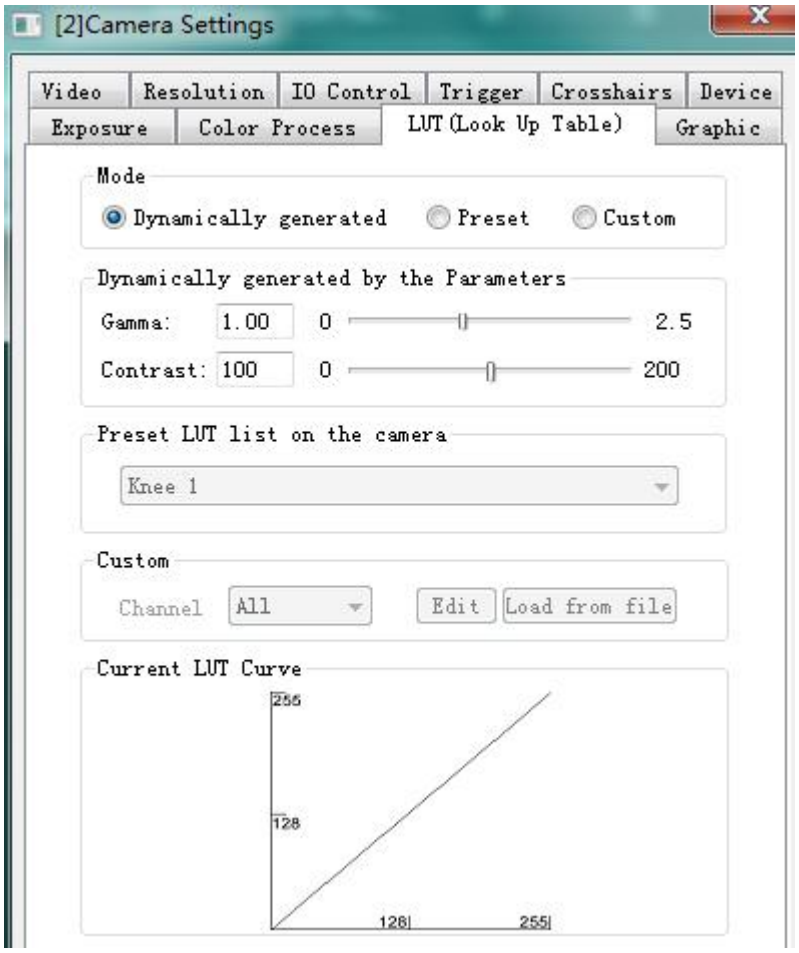
Manually adjust the color gain of the red, green and blue channels. After the manual white balance operation is completed, the white area is restored to the real white that the computer thinks, that is, the R, G, and B components of the white area are completely equal, but this does not mean that the current color will make people look comfortable. According to the survey, Europeans prefer warm-toned images

(yellowish), while Asians prefer cool-toned images (blueish). At this time, you can manually modify the R, G, and B three-channel gains to improve the image color .

Saturation adjustment. Different people have different preferences for rich colors, which can be improved by adjusting the saturation. If you like bright colors, increase the saturation setting; if you like light colors, decrease the saturation setting.

4.1.3 Lookup table transformation

The lookup table transformation page is shown in the figure

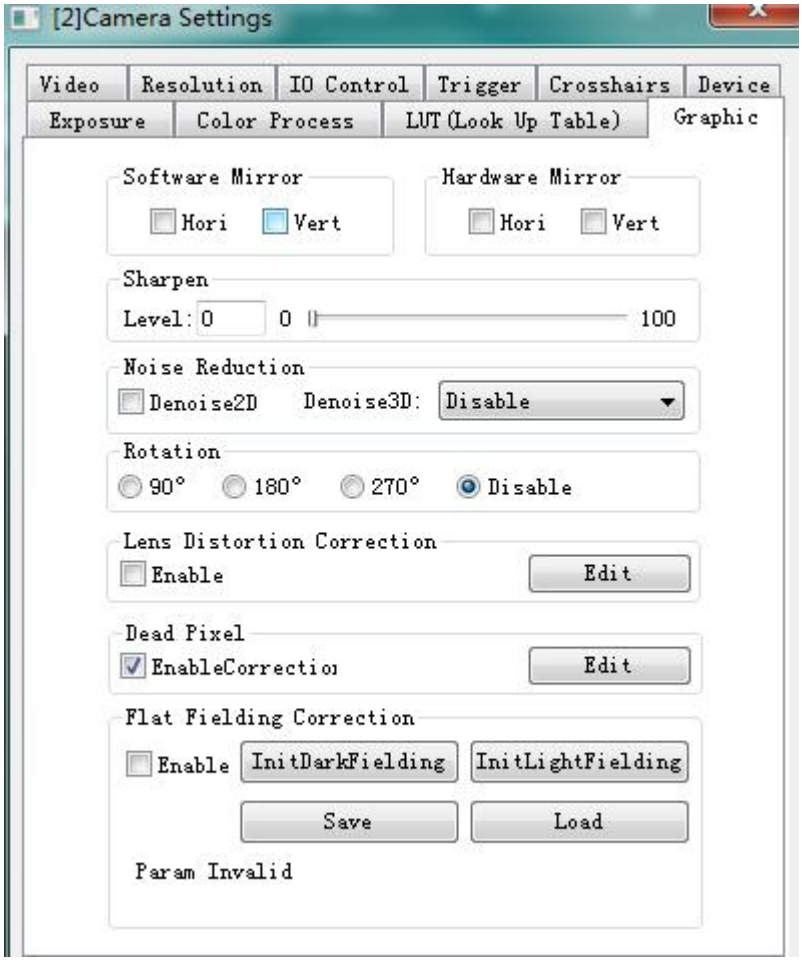


The SDK supports three look-up table conversion methods, namely, generating LUT tables by adjusting parameters, using camera preset LUT tables, and custom LUT tables.

In the dynamic mode, adjust the image brightness by manually adjusting the gamma and contrast values. The smaller the gamma value, the pixels with the smaller brightness values will be increased, making the overall brightness positive, and the greater the contrast, the darker the image will be The white area is whiter, making the image look very clear black and white, and can effectively capture the outline in some visual processing.

4.1.4 Graphics transformation

The graphics transformation page is shown in the figure



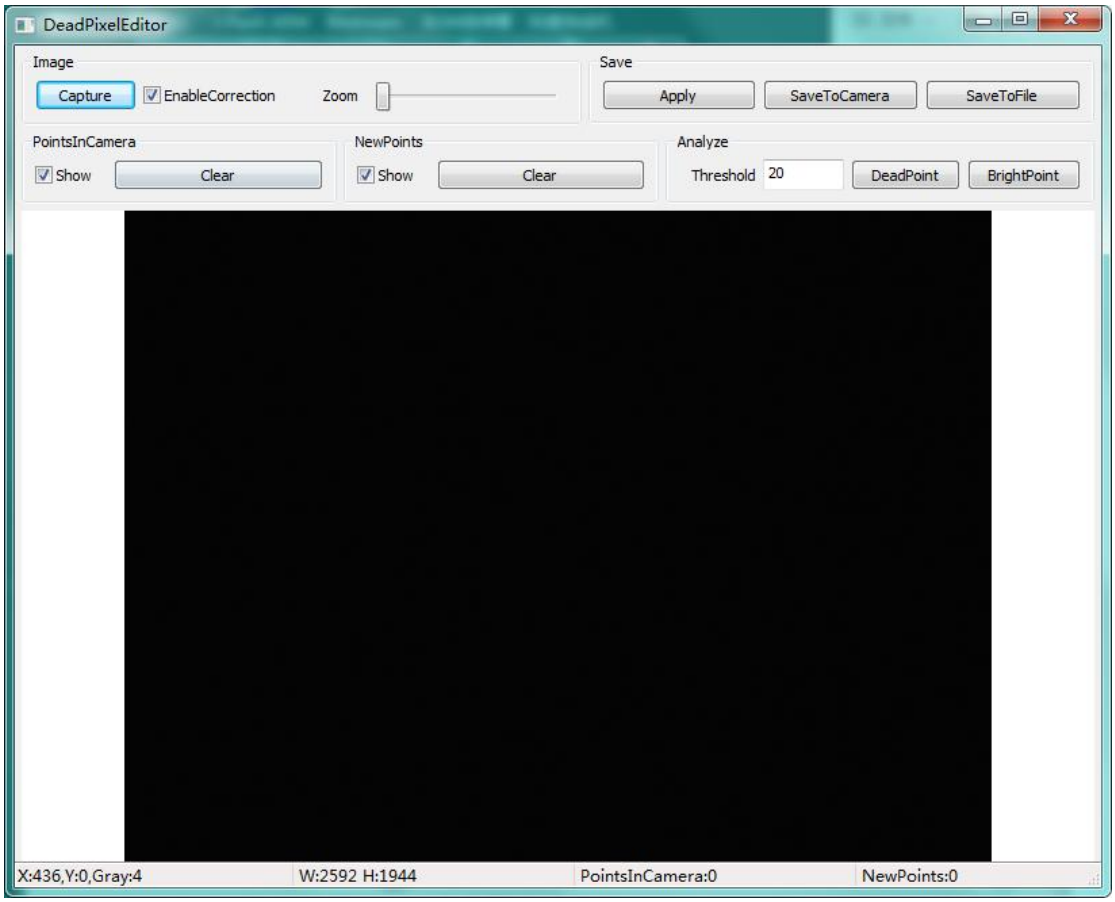
On the graphics transformation page, you can set the up, down, left, and right mirror images, and set the sharpening level of the image. The higher the sharpness, the better the image clarity, but the greater the noise. The default sharpening level is 0.

The 2D noise reduction function can reduce the random noise of the image and make the image smoother. When using the 2D noise reduction function, the image sharpness will also be reduced.

The 3D noise reduction function is a multi-frame average noise reduction, which can greatly reduce the random noise of the image and achieve excellent image quality without reducing the sharpness. The 3D noise reduction function is only suitable for shooting static objects, and moving objects will produce abnormal smear. 3D noise reduction is recommended to be used in continuous image output mode. In trigger mode, set no image output in the first few frames (for example, the number of noise reduction frames is set to 6, no data is output in the first 5 frames, and data

is output at the 6th frame, and the 6th frame is 1 ~5 frames of noise reduction processing, the 7th frame is processed with 2~6 frames of noise reduction).

Color point correction is used to repair the camera color point. The color point coordinates can be saved in the camera (up to 64K) or in a file. The color point can be restored by loading the color point file. The color point editing interface is as follows:

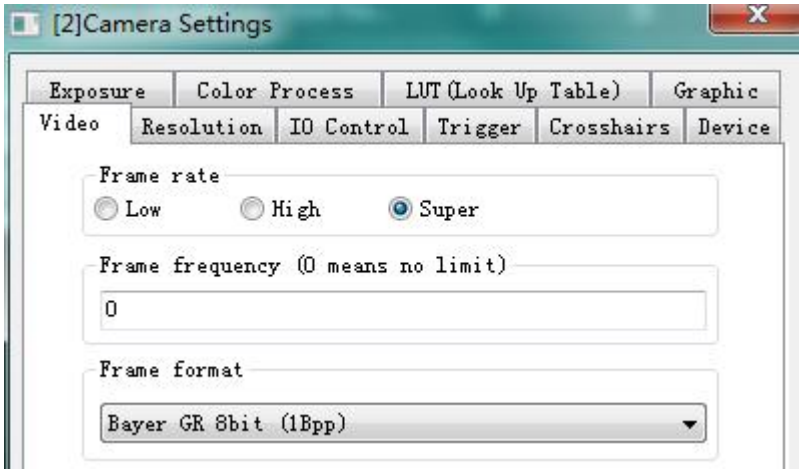


The flat field correction function is used to correct the uneven gray value of uniform target imaging caused by uneven illumination, inconsistent response of lens center and lens edge, inconsistent response of each pixel of the imaging device, and fixed image background noise.

Note: Too much exposure will cause more color dots, so the exposure should not exceed 200ms when using.

4.1.5 Video parameters

The video parameter page is shown in the figure



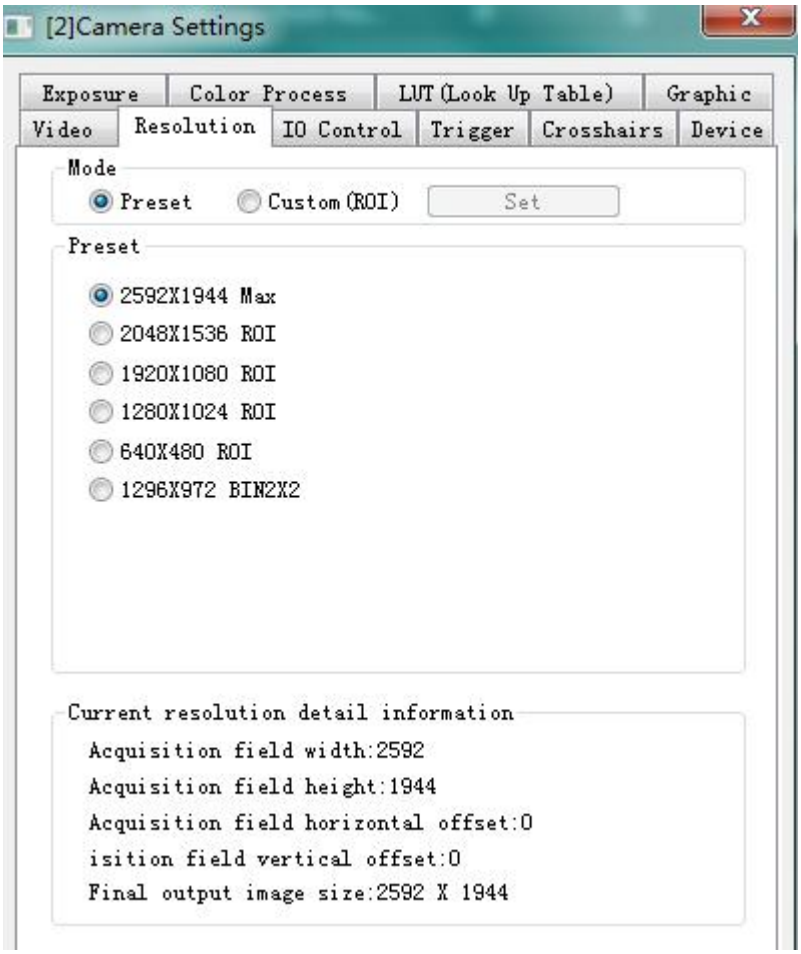
The video parameter page can set the speed gear. We divide it into high-speed, medium-speed, and low-speed modes. For different models of cameras, the corresponding specific frame rates in high, medium and low speed modes are different. For cameras with insufficient bandwidth and no BUFF, you can set a low frame rate to reduce frame loss.

Camera output format can set the camera output raw data format.

Note: The output format of the camera is different for different models, the output format is subject to the specific camera model.

4.1.6 Resolution

The resolution page is shown in the figure:



This page is used to set the camera resolution. ROI (Region Of Interest) only outputs the image of the region of interest, and does not output other irrelevant regions. Since the ROI area is smaller than the original image, it can reduce the computer's CPU load and increase the frame rate.

The camera usually has a minimum resolution requirement under the ROI, and the width requirement of the camera ROI is an integer multiple of 16; the height requirement is an integer multiple of 16. If the width and height of the set ROI are not multiples of the above integer, the software will automatically round up (discard decimals).

Data transmission under ROI will be reduced.

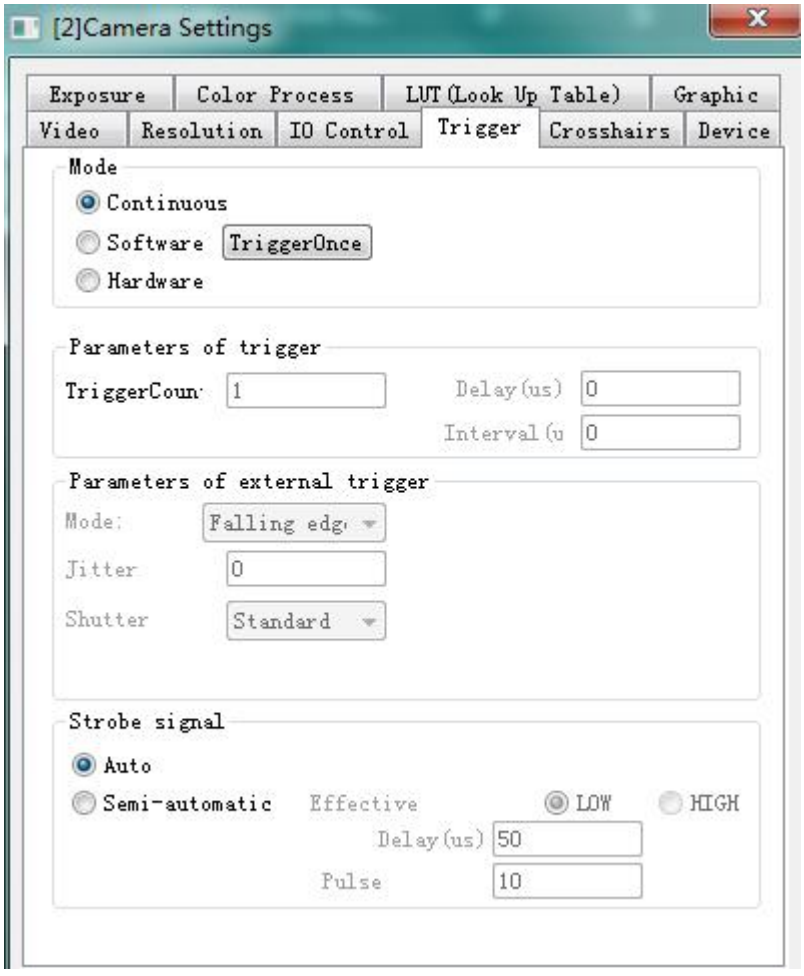
In BIN average mode, the values of adjacent 4 pixels are added together and then averaged. The number of pixels is reduced to 1/4 of the full resolution (BIN2),

but the camera's viewing angle will not change.

Note: Under normal circumstances, setting the ROI and BIN zoom can increase the frame rate by reducing the data, and some cameras have insufficient frame rate for capturing pictures, which has no obvious effect. The resolution settings are all set using CameraSetImageResolution, and the camera supports multiple ROI use. For details, please refer to the Demo/VC++/ROI example in the driver installation directory.

4.1.7 Camera output mode

The camera output mode page is shown in the figure:



In continuous output mode, the camera is in overlapping exposure mode. Overlapping exposure means that the current frame's exposure and the previous frame's readout process overlap, that is, while the previous frame is read out, the next frame has already started exposure. In this mode, if the exposure time is less than the transmission time of 1 frame, the time of one frame is equal to the

transmission time, and the frame rate remains unchanged.

In the trigger mode, the camera is exposed to non-overlap. That is, the exposure time period and the transmission time period do not overlap. In this mode, the camera frame rate will change with the adjustment of the exposure time.

In the trigger mode, you can set the number of output frames for one trigger, that is, a trigger signal causes the camera to continuously output multiple pictures, and the acquisition of multiple pictures is similar to the continuous mode.

The maximum frame rate calculation in trigger mode: 1s / (exposure time + transmission time).

In the hard trigger mode, you can set the rising edge trigger, falling edge trigger, high level trigger and low level trigger. If you are using mechanical switches, it is recommended to use level trigger mode and set the debounce time to filter out mechanical switch volume jumps. If the interfering signal that changes time is an electronic switch, there is no limit.

Debounce time, that is, eliminate jitter time.

Trigger delay, start when the trigger signal is received, and start exposure after the delay ends

The flash signal supports two modes of automatic and semi-automatic.

Flash signal automatic mode, automatically generate signal waveform when the camera is exposed.

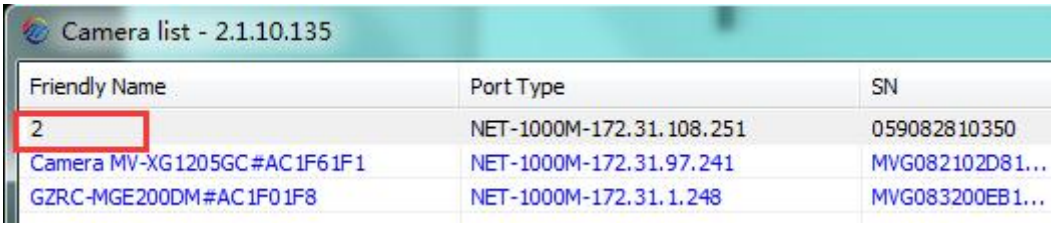
The flash signal semi-automatic mode, after receiving the trigger signal, after a delay of x (us), output y (us) time pulse.

4.1.8 Device Information

The device information page is shown in the figure:

The device information page provides firmware version information, SDK driver version (device platform), and camera serial number (cannot be changed).

The nickname of the device can be modified on the device page (empty to use the default nickname), the nickname is permanently effective after modification, and it is fixed in the camera. After changing the computer or USB slot, the nickname will not change. The device name after modifying the nickname is as follows:



4.1.9 Parameter save

The parameter save page is shown in the figure:

Four sets of parameters are provided in the SDK for secondary development or direct use by users to save or load camera parameters. In our software platform, the camera parameters are saved on the disk as a binary file, the save path is /Camera/Configs under the software installation directory, and the extension is a .Config file.

There are three ways to access camera parameters: by model, by nickname, and by serial number. The default is to load by model. If the parameters need not affect each other, you can use the serial number loading method.

Parameter restoration will perform a reset operation by default. If you want to use your own parameters when restoring the default parameters, use the following method:

Using our demo software, after setting the camera parameters, save it as a separate file, the file name is model name + "-Default.Config", take MV-UB130M (1.3 million black and white frame memory camera) as an example, and save it Save the parameters as a file "MV-UB130M-Default.Config", you can also directly rename the existing Config file to "MV-UB130M-Default.Config", and then put this file in the installation directory /Camera/Configs Under contents. In this way, the end user will restore the parameters in the "MV-UB130M-Default.Config" file when performing preset parameter restoration.

4.2 IO function

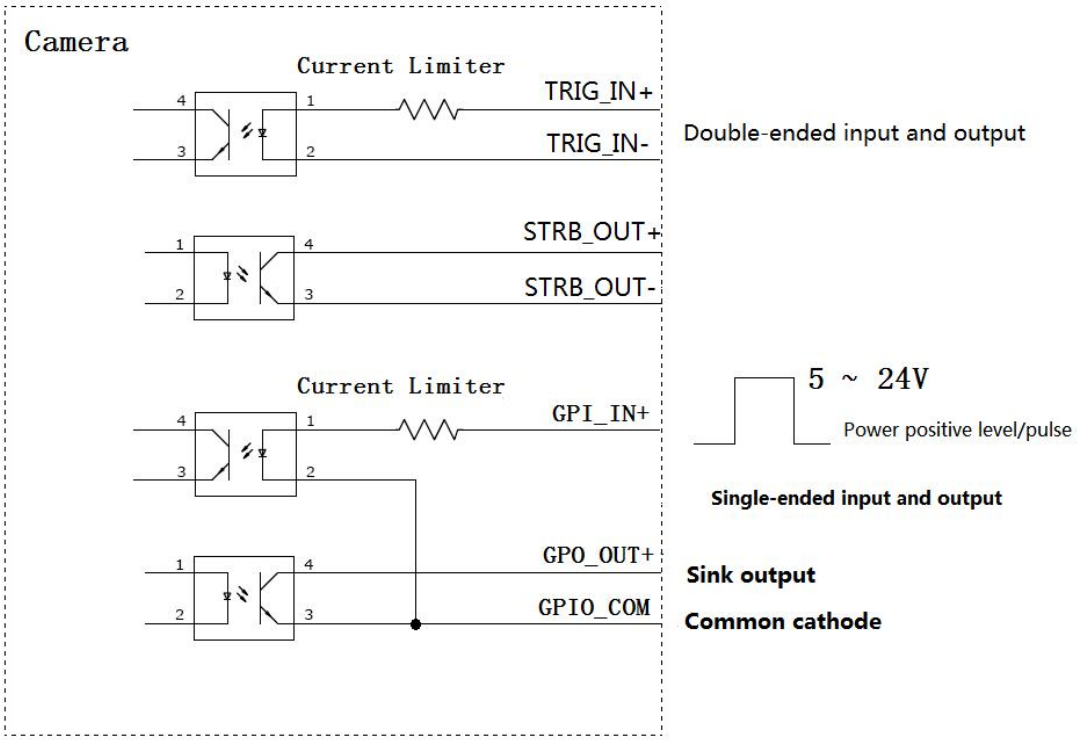
4.2.1 IO Power supply

project	Access power limit
Trigger input TRIG	Voltage 5~24 V
Flash STRB	The maximum current is less than 50 mA
Normal input IO	Voltage 5~24 V

Normal output IO	The maximum current is less than 50 mA

4.2.2 Trigger & IO schematic

The schematic diagram is as follows:

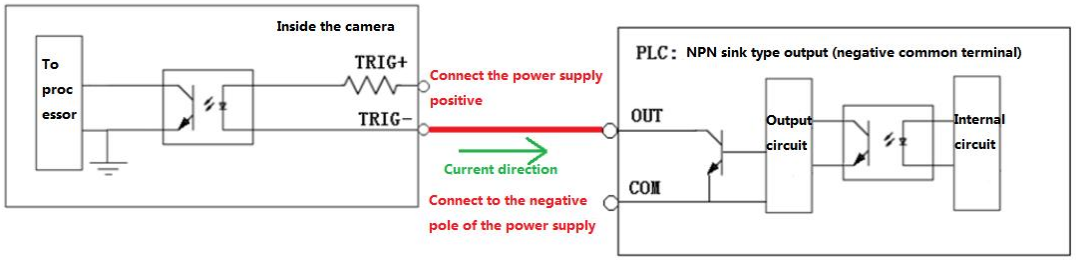


Note: Double-ended input can be connected to NPN and PNP switches, double-ended output can drive common anode and common cathode loads; while single-ended input can only be connected to PNP type switches, single-ended output can only drive common anodes For load, the common end of single-ended type can only be connected to the negative pole of the power supply.

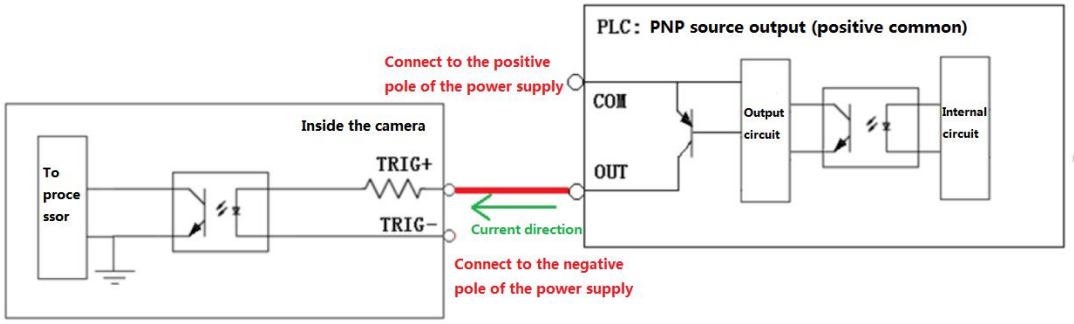
4.2.3 Wiring reference diagram

Note: The power supply is an external power supply. The voltage between the positive and negative poles of the power supply is 5~24V. The red identification line is the wire; please refer to the appendix for the color of the line corresponding to the camera network name.

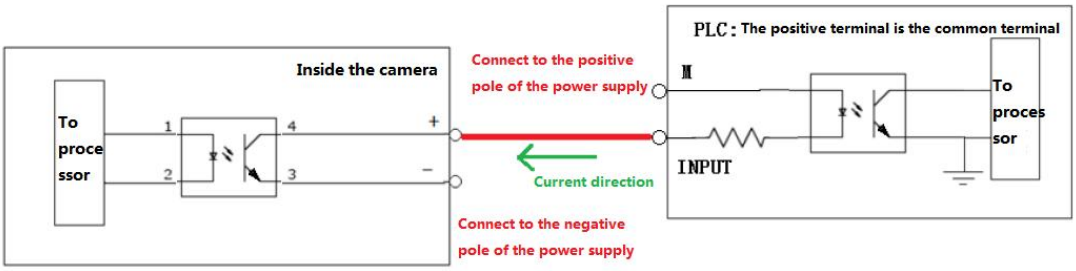
（1）The camera input is connected to the NPN PLC output



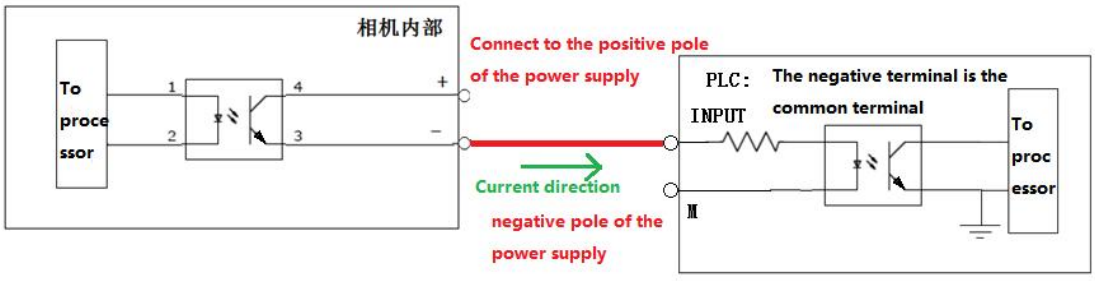
（2）The camera input is connected to the PNP PLC output



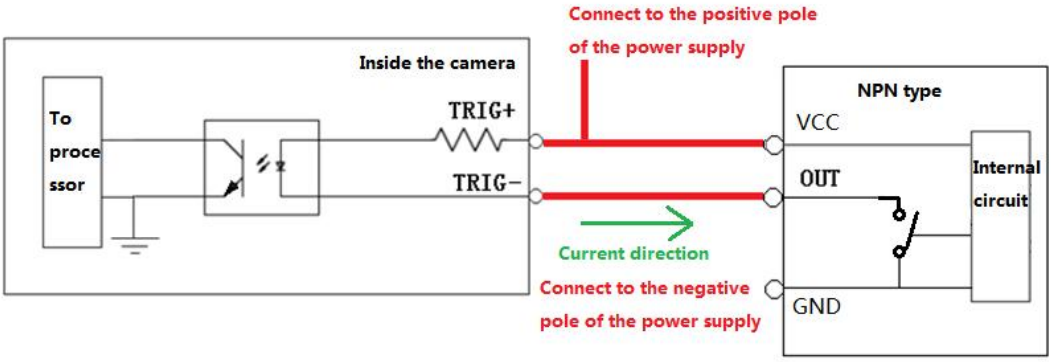
（3）The camera output terminal is connected to the common anode PLC input terminal



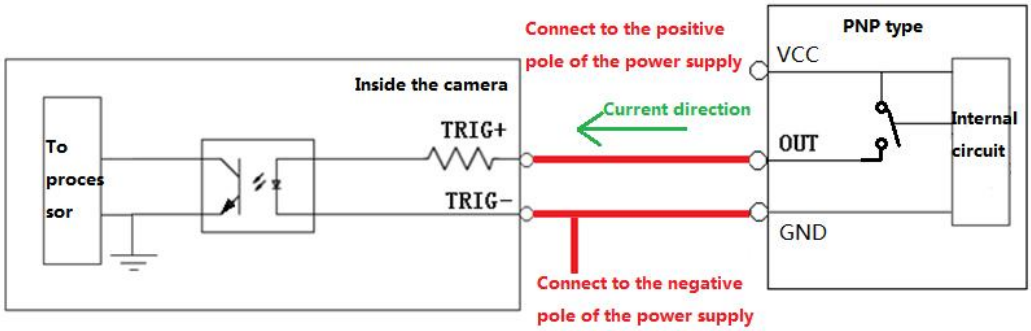
（4）The camera output is connected to the common cathode PLC input



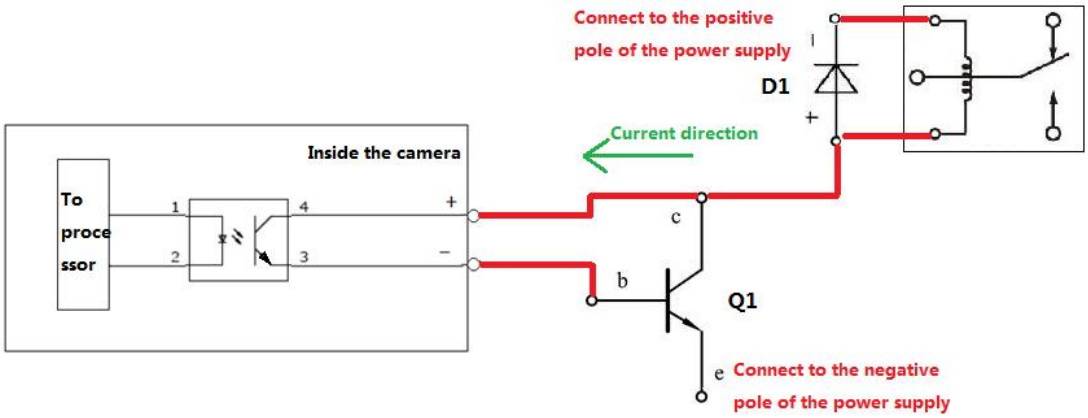
（5）The camera input is connected to the NPN photoelectric switch



（6）The camera input is connected to the PNP photoelectric switch



（7）The camera output terminal is connected to the relay (Q1 and D1 are external, reference model: Q1(C8050)D1(1N4148))

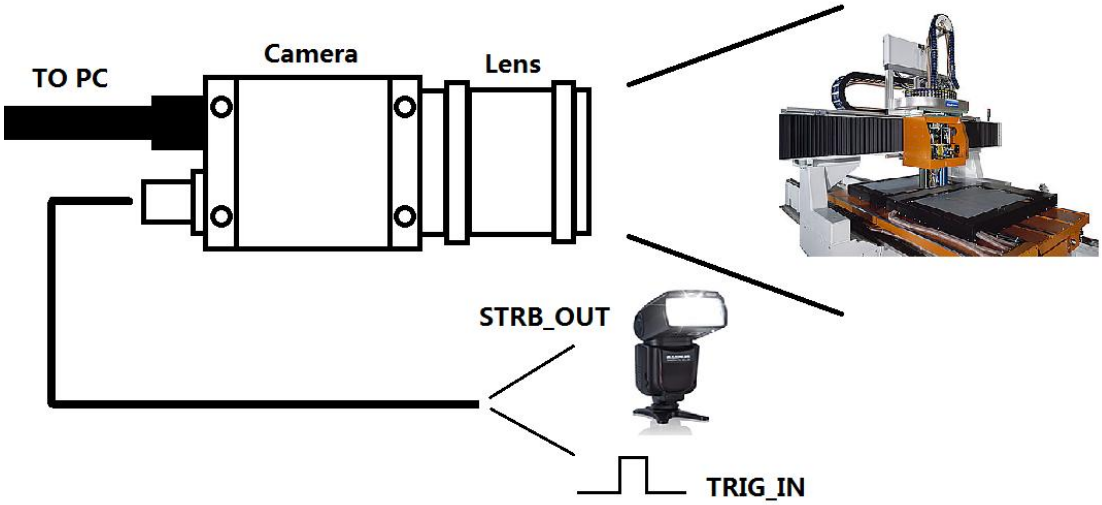


4.2.4 Trigger function

The trigger signal is an input signal, and the corresponding index is 0 input IO port;

There is an aviation head connector on the camera, which is used to connect an external switch and flash. A typical external trigger application is shown in the figure

below:



The external trigger input terminals are labeled TRIG+ and TRIG- (for the corresponding line color, please find the line sequence definition table in the appendix). The camera uses optical coupling isolation, which can identify rising edge, falling edge, double edge, high level, and low level. Several kinds of signals, these kinds of signal generation methods are as follows:

A rising edge: when the voltage across TRIG+ and TRIG- changes from 0V to 5~24V, it changes once;

A falling edge: when the voltage across TRIG+ and TRIG- changes from 5~24V to 0V, it changes once;

One double edge: one rising edge plus one falling edge;

High level: The voltage across TRIG+ and TRIG- keeps continuously 5~24V;

Low level: the voltage across TRIG+ and TRIG- keeps continuously 0V;

To trigger the test program, double-click the TriggerAndStrobe.exe file in the VC++\TriggerAndStrobe directory:

4.2.4.1 Trigger mode

Edge trigger mode. You can select the upper edge or the lower edge as the trigger condition on the interface. When a valid trigger signal is received on the trigger terminal, the camera starts to collect a frame of image and transmit it to the host. Each valid edge corresponds to a trigger, and only one frame of image is output. Before the last frame of image acquisition is finished, the repeated trigger signal will be ignored. For example, if the camera's exposure time is set to 10 milliseconds and the effective trigger signal is set to rising edge trigger, then within 10 milliseconds, even if there are multiple rising edge signals, only one frame of image will be

triggered.

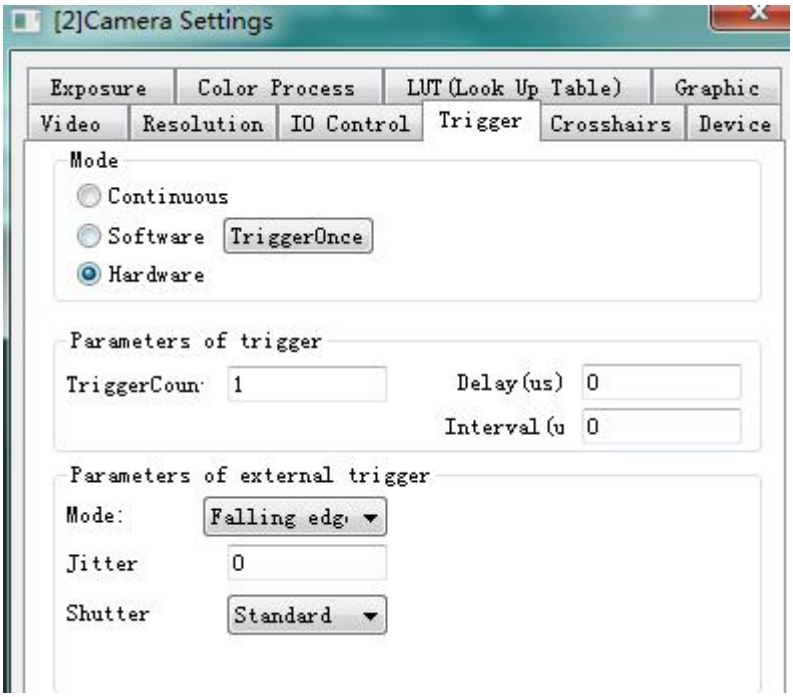
Level trigger mode. You can select high level or low level as the trigger condition on the interface. When a trigger signal is at a valid level, the camera starts to collect a frame of image and transmits it to the host. After the frame is collected, if the signal is still at a valid level, the camera starts to collect the next frame of image and transmit it to the host until it is triggered The signal becomes an invalid level.

Note: If the rising edge is given too fast, it will be ignored. The rising edge and high and low levels should also be maintained at least 20us, and it is recommended to exceed 500us.

4.2.4.2 Trigger delay

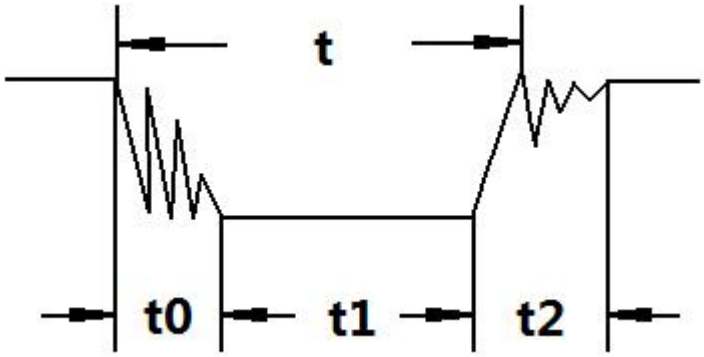
Trigger delay means that when the external trigger signal is generated, the camera does not start exposure immediately, but starts exposure after a certain delay. When the delay is set to 0, it means no delay.

Demo program interface:



4.2.4.3 Eliminate trigger signal jitter

When a mechanical switch is connected to the external trigger terminal TRIG_IN, due to the jitter of the contact, it may cause false triggering. There is a hardware filter circuit in the camera, and the debounce time can be set to filter out jitter, such as t0 and t2 jitter in the following figure:



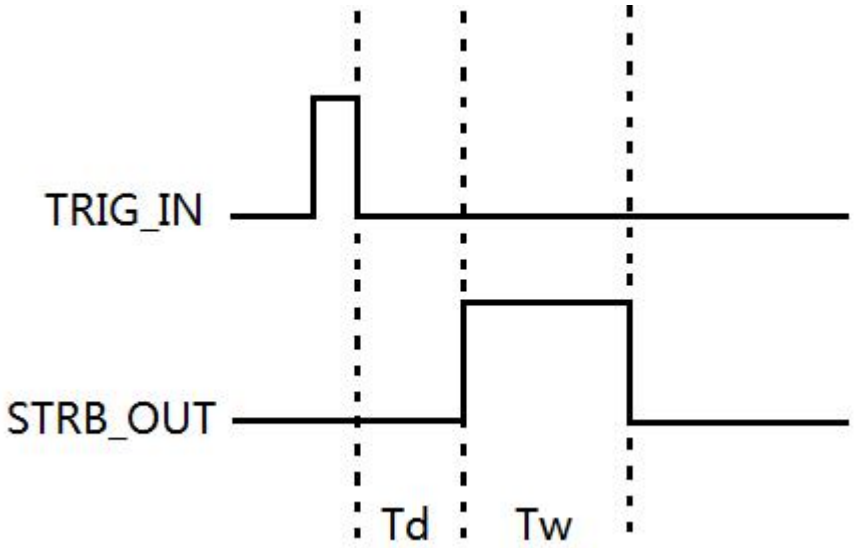
When the electronic switch is connected, it is not necessary to eliminate jitter, and the jitter elimination time can be set to 0.

4.2.5 flash

The flash signal is the output signal, and the corresponding index is 0 to output the IO port;

In auto mode, the flash is synchronized with the exposure. When the sensor starts to expose, the flash turns on, and when the sensor ends the exposure, the flash turns off. This mode is used by default.

In semi-automatic mode, the timing of the flash is completely controlled by software programming. It needs to set the delay and width. When an external signal is generated, the flash signal starts to output for one cycle. The timing is as follows (assuming that the trigger and flash output are both high and effective):



Td is the delay, and Tw is the pulse width.

Flash test program, double click TriggerAndStrobe.exe file in VC++\TriggerAndStrobe directory:

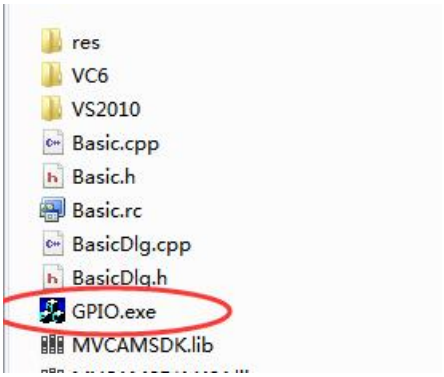
4.2.6 IO interface

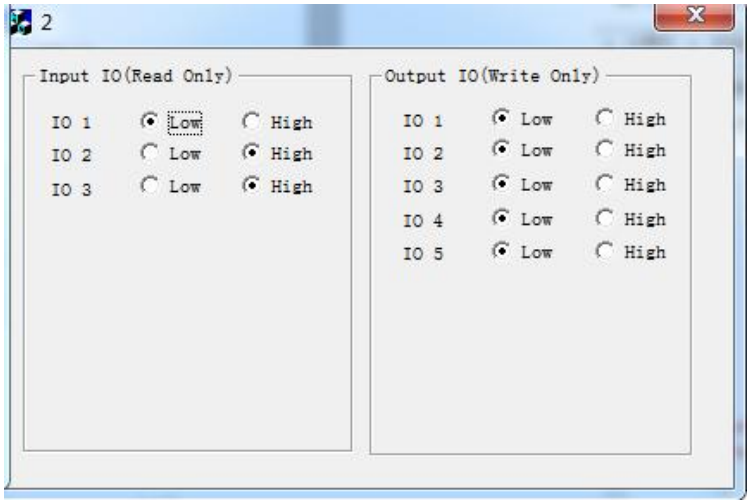
Ordinary output port. The output state has high level/low level (high level means on, low level means off), which is controlled by software, flexible but not high in speed, not suitable for applications that require very precise delay and high speed.

Ordinary input port. The software calls the API once, and the hardware captures the state of the interface once. The discontinuous read mode does not support interrupt response. Suitable for medium and low speed acquisition input.

The positive and negative poles of the input or output interface cannot be reversed, otherwise it will not work normally.

Ordinary IO test program, double-click the GPIO.exe file in the VC++\GPIO directory to open the GPIO test program. The corresponding IO number is the IO index (the demo index shows the maximum number of IO supported by the camera, and the test uses the corresponding IO port to switch the signal state)：





5. Integrated release of camera installation files

When you integrate our camera and need to package and release the camera SDK files, you can follow the following methods:

1， The files that need to be packaged are in our camera program installation directory, there are the following folders:

The ./SDK directory contains all the SDK files.

The ./Drivers directory contains the camera's kernel driver files.

The ./Demo directory contains the development DEMO of the camera, you can publish it as needed, or not publish the Demo program at all.

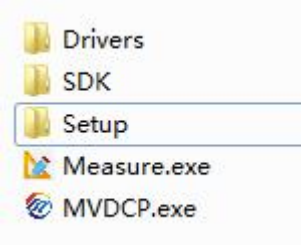
./Camera/Configs directory, the corresponding camera configuration file. This directory saves the configuration parameters of the camera on your current computer, you can package them together and release them, and the parameter file will be automatically loaded. If the camera configuration file is not released, the camera will use the default parameters the first time it is used, and a file will be generated in the Camera/Configs directory.

Please put the above files and the exe program you developed in the same directory.

2， How to publish. You can choose the following 3 ways to publish.

1.Use our platform installation package to install directly, HOURS Platform setup (version number).exe, but the installation package will contain some company information.

2.Use the tools we provide. In the Setup folder, we provide a program called "Installer.exe", which is used to install all files in the SDK and Drivers directories. Copy the SDK, Drivers, and Setup folders to the target machine, and then run "Installer.exe" in the Setup folder to automatically complete the installation, as shown in the figure below (MVDCP.exe and Measure.exe are the demo software we provide And measurement software, it is not necessary to publish, after running Installer.exe, MVDCP and Measure software can run normally):



3.Manually or write the installation program yourself to install. First copy the Drivers directory to the target machine, and then manually install the device kernel driver (when the USB camera is plugged into the computer, you will be prompted to install the driver. Just select the corresponding INF file in the Drivers directory. For Gige cameras, you need to manually run the driver under Drivers\Gige The MvDriverInstall.exe program can complete the installation of the kernel driver); then copy all the files in the SDK (if it is an X64 system, copy the SDK/X64) folder (note: it is the file under the folder, not the folder) to Any directory of the target machine (assuming it is the C:\TEST directory), and then put the executable file that you have developed for the second time in the C:\TEST directory, and you can run it directly without other installations.

Appendix

Interface return code description

```
#define CAMERA_STATUS_SUCCESS                    0     // Successful operation
#define CAMERA_STATUS_FAILED                     -1    // operation failed
#define CAMERA_STATUS_INTERNAL_ERROR             -2    // internal error
#define CAMERA_STATUS_UNKNOW                     -3    // unknown mistake
#define CAMERA_STATUS_NOT_SUPPORTED              -4    // Does not support this feature
#define CAMERA_STATUS_NOT_INITIALIZED            -5    // Initialization is not complete
#define CAMERA_STATUS_PARAMETER_INVALID          -6    // Invalid argument
#define CAMERA_STATUS_PARAMETER_OUT_OF_BOUND     -7    // Parameter out of bounds
#define CAMERA_STATUS_UNENABLED                  -8    // Not enabled
#define CAMERA_STATUS_USER_CANCEL                -9    // The user manually canceled,
for example, click cancel on the roi panel to return
#define CAMERA_STATUS_PATH_NOT_FOUND             -10   // The corresponding path was
not found in the registry
#define CAMERA_STATUS_SIZE_DISMATCH              -11   // The length of the obtained
image data does not match the defined size
```

#define CAMERA_STATUS_TIME_OUT -12 // Timeout error

#define CAMERA_STATUS_IO_ERROR -13 // Hardware IO error

#define CAMERA_STATUS_COMM_ERROR -14 // Communication error

#define CAMERA_STATUS_BUS_ERROR -15 // Bus error

#define CAMERA_STATUS_NO_DEVICE_FOUND -16 // No device found

#define CAMERA_STATUS_NO_LOGIC_DEVICE_FOUND -17 // No logical device found

#define CAMERA_STATUS_DEVICE_IS_OPENED -18 // Device is already on

#define CAMERA_STATUS_DEVICE_IS_CLOSED -19 // Device is turned off

#define CAMERA_STATUS_DEVICE_VEDIO_CLOSED -20 // If the device video is not opened, when the function related to recording is called, if the camera video is not opened, this error will be returned.

#define CAMERA_STATUS_NO_MEMORY -21 // Not enough system memory

#define CAMERA_STATUS_FILE_CREATE_FAILED -22 // Failed to create file

#define CAMERA_STATUS_FILE_INVALID -23 // Invalid file format

#define CAMERA_STATUS_WRITE_PROTECTED -24 // Write protection, not writable

#define CAMERA_STATUS_GRAB_FAILED -25 // Data collection failed

#define CAMERA_STATUS_LOST_DATA -26 // Data loss, incomplete

#define CAMERA_STATUS_EOF_ERROR -27 // End of frame not received

#define CAMERA_STATUS_BUSY -28 // Busy (the last operation is still in progress), this operation cannot be performed

#define CAMERA_STATUS_WAIT -29 // eed to wait (the conditions for the operation are not established), you can try again

#define CAMERA_STATUS_IN_PROCESS -30 // In progress, has been operated

#define CAMERA_STATUS_IIC_ERROR -31 // IIC transmission error

#define CAMERA_STATUS_SPI_ERROR -32 // SPI transmission error

#define CAMERA_STATUS_USB_CONTROL_ERROR -33 // USB control transmission error

#define CAMERA_STATUS_USB_BULK_ERROR -34 // USB BULK transmission error

#define CAMERA_STATUS_SOCKET_INIT_ERROR -35 // Failed to initialize the network transmission kit

#define CAMERA_STATUS_GIGE_FILTER_INIT_ERROR -36 // The network camera kernel filter driver failed to initialize, please check whether the driver is installed correctly, or reinstall it.

#define CAMERA_STATUS_NET_SEND_ERROR -37 // Network data sending error

#define CAMERA_STATUS_DEVICE_LOST -38 // Lost connection with web camera, detection timed out

#define CAMERA_STATUS_DATA_RECV_LESS -39 // The number of bytes received is less than requested

#define CAMERA_STATUS_FUNCTION_LOAD_FAILED -40 // Failed to load program from file

#define CAMERA_STATUS_CRITICAL_FILE_LOST -41 // The files necessary for running the program are missing

#define CAMERA_STATUS_SENSOR_ID_DISMATCH -42 // The firmware and program do not match because the wrong firmware was downloaded

#define CAMERA_STATUS_OUT_OF_RANGE -43 // The parameter is out of the valid range

#define CAMERA_STATUS_REGISTRY_ERROR -44 // Installer registration error. Please reinstall the program, or run the installation directory Setup/Installer.exe

#define CAMERA_STATUS_ACCESS_DENY -45 // No Access. When the specified camera is already occupied by other programs, and then apply for access to the camera, it will return to this state. (A camera cannot be accessed by multiple programs at the same time)

#define CAMERA_STATUS_CAMERA_NEED_RESET -46 // It means that the camera needs to be reset before it can be used normally. At this time, please power off the camera and restart it, or restart the operating system before it can be used normally

#define CAMERA_STATUS_ISP_MOUDLE_NOT_INITIALIZED -47 // ISP module is not initialized

#define CAMERA_STATUS_ISP_DATA_CRC_ERROR -48 // Data verification error

#define CAMERA_STATUS_MV_TEST_FAILED -49 // Data test failed

#define CAMERA_STATUS_INTERNAL_ERR1 -50 // Internal error 1

#define CAMERA_STATUS_U3V_NO_CONTROL_EP -51 //U3V control endpoint not found

#define CAMERA_STATUS_U3V_CONTROL_ERROR -52 // U3V control communication error

common problem

Return code exception

Return code -1

Repair: The camera is disconnected, plug the camera and computer cable, replace the connection port.

Return code -7

Fix: Return when color point editing is saved to the camera, because the number of color points is too much and the camera is insufficiently stored, save the color points to the color point file.

Return code-13

Repair: No permission, run the program with administrator permissions, or update the latest program driver package on the official website.

Return code-14

Repair: The network port camera appears. Check the IP address of the corresponding network card IPV4. It must be a valid non-zero value. If the computer does not obtain a valid IP, it is usually all 0s. After setting the IPV4 IP, use the IP configuration tool to configure the camera IP Is a valid IP. The USB camera appears, check if the connection is normal, and change the connection port.

Return code-16

Repair: 1. No permission, run the program with administrator permissions, or update the latest program driver package on the official website 2. The driver package version is too old, the official website update the latest driver package 3. The camera is connected abnormally, re-plug, check the device list to see if there is a device.

Return code-37

Repair: The general network port camera appears, refer to -14 for exception handling.

Return code-41

Repair: 1. Library file conflict, there is MVCAMSDK.dll file in the secondary development project directory, delete and run 2. Driver file is lost, reinstall the driver.

Return code 32774

Repair: Network port camera, the camera is turned on and occupied, close the software or restart the computer.

Driver installation is abnormal

1.Cannot find the camera after installing the network port camera driver

Repair: 1. Check whether the firewall is off, turn off the firewall 2. Check the device properties to see whether there are other filters, uncheck, and only keep the HOURS filter.

2.Unknown device is prompted when the USB device is inserted

Repair: Confirm that the driver installation is normal, check the hardware ID, and get the abnormality because the cable is not plugged in. After changing the mouth test, it can not be recognized. It may be a cable problem. Use other normal cameras to check the cable and check that the cable is normal. Use the same set of ports And line detection does not recognize the camera. Without firmware, the hardware ID can be identified.

3.Prompt that product registration failed during driver installation

Repair: The driver file is occupied. Close the running camera software or restart the computer before installing.

4.The network port camera can find the camera in the IP configuration tool, but the camera cannot be found in the DEMO

Repair: Confirm that the driver package version is not abnormal, check whether there is a HOURS driver in the Ethernet properties, and the IP configuration tool will repair the camera IP.

5.fter the network port camera driver is installed, other manufacturers' cameras cannot find the device in halcon

Repair: The device information package is filtered, and the network port camera driver is like this. Use the later-installed driver, first install ours, and then install another camera, ours will not be found. When using it, cancel it in the network properties Checked.

Camera use problem

1.Camera frame rate

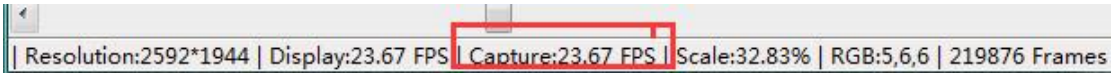
Solution: 1. The maximum supported frame rate of the camera can be found on the official website for the camera parameters of the corresponding model.

2. The camera frame rate is related to the bandwidth and the chip. The camera needs the bandwidth calculation formula: the data size of each frame of the camera (generally the resolution size, such as 3M per frame for a 3 million camera) * frame rate = required bandwidth, if a USB3.0 camera Use USB2.0 bandwidth,

network port camera does not use gigabit bandwidth, the frame rate cannot be reached. The chip directly affects the maximum frame rate of the camera capture, and some chips are high-speed chips, which can reach very fast speeds.

3. The camera bandwidth is normal, and the frame rate is related to the exposure time and resolution. The larger the exposure time, the smaller the frame rate, and the smaller the resolution, the larger the frame rate.

4. The display frame rate of the color camera is insufficient. The display frame rate is related to the performance of computer accessories such as CPU and memory. The conversion of raw data into rgb data by color cameras requires time-consuming processing, and the display cannot reach the high frame rate. There is no abnormality.



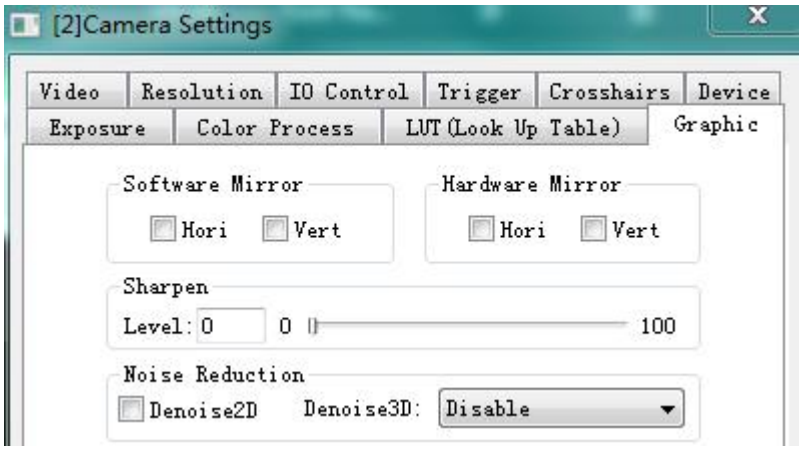
2.The image appears wavy (strobe)

Solution: The frequency of the light source is not synchronized with the camera's exposure cycle. For example, the fluorescent lamp 60HZ AC light source, 1s/60 = 16.67ms/hz, setting the exposure time around 16.67ms can reduce the impact, and other AC light sources have the same principle. It is recommended to use a direct current light source.

3.Smear

Solution: 1. Check whether the exposure is too large, the frame rate is low, and there is smear.

2.Whether 3D noise reduction is turned on, and after turning it on, there is a smear in shooting moving objects.



4.The camera sometimes drops

Solution: 1. Static electricity, the computer motherboard is used to remove

dust. The possibility of static electricity is very high. The anti-interference strength of the U-mount camera of the SUB may not be enough. Check if the USB cable or connection point is loose. Change the cable and try it. Cancel allowing the computer to shut down the device. High-power machines will affect, change the environment.

2.Move the camera when in use, change the port, and change to a flexible line

5. Filter

Solution: The default camera filter is an infrared filter, IR 650, which can be customized if required. Black and white cameras are equipped with AR glass.

6.Image reverse

Solution: 1. For some models of cameras, the sensor is inverted, and the SDK will enable left and right mirroring by default, and the mirroring function is not enabled.

2. QT directly displays image mirroring. The image data obtained by the camera is reversed. Window languages such as MFC display bmp (bmp storage mode is from bottom to top), which can be displayed normally. QT and other languages need to mirror the image.

7.QT display color is abnormal

Solution: MFC display format is BGR, QT display format is RGB. When the camera algorithm is A1, only BGR format can be output, and the switching algorithm is A3, and then set the output format to RGB format, or add an interface to manually exchange BGR data with B and R.

8.Camera ID

Solution: The camera comes with a three-level serial number. The first-level serial number is read-only and cannot be modified. It has been fixed when it leaves the factory. The secondary and tertiary serial numbers can be read and written freely. The serial number of each level is 32 bytes.

CameraReadSN, read the serial number.

CameraWriteSN, write the serial number.

For the usage of this function, please refer to the \Demo\VC++\UserDataTest example in the installation directory.

9.Timestamp

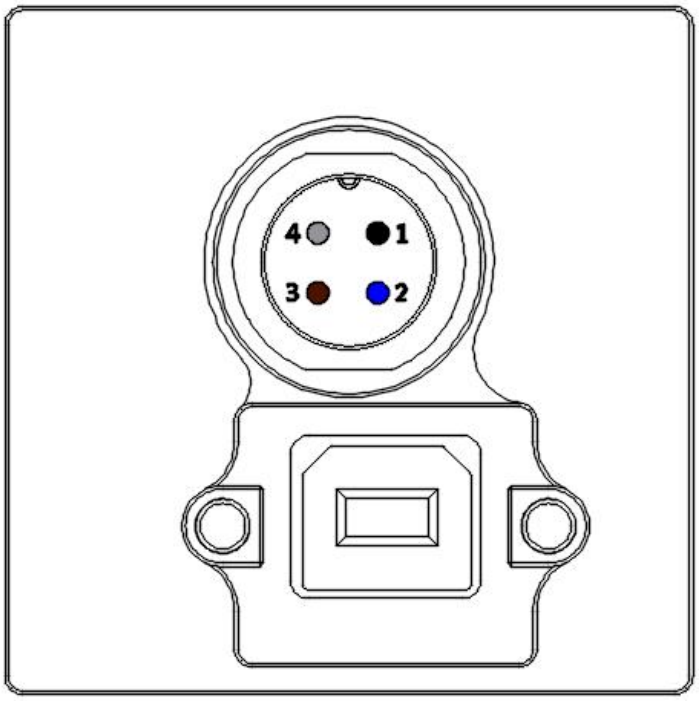
Solution: Each frame of the camera's image output will be accompanied by a time

stamp, whether it is continuous output mode or trigger mode.

The time stamp is a relative time of the camera, which starts when the camera is powered on, and the unit is 0.1ms. The time stamp of each frame of the SUA (USB3.0) camera and the network port camera is frozen at the moment when the SENSOR starts to output the first line of image data. You can use the SDK interface to reset the time stamp.

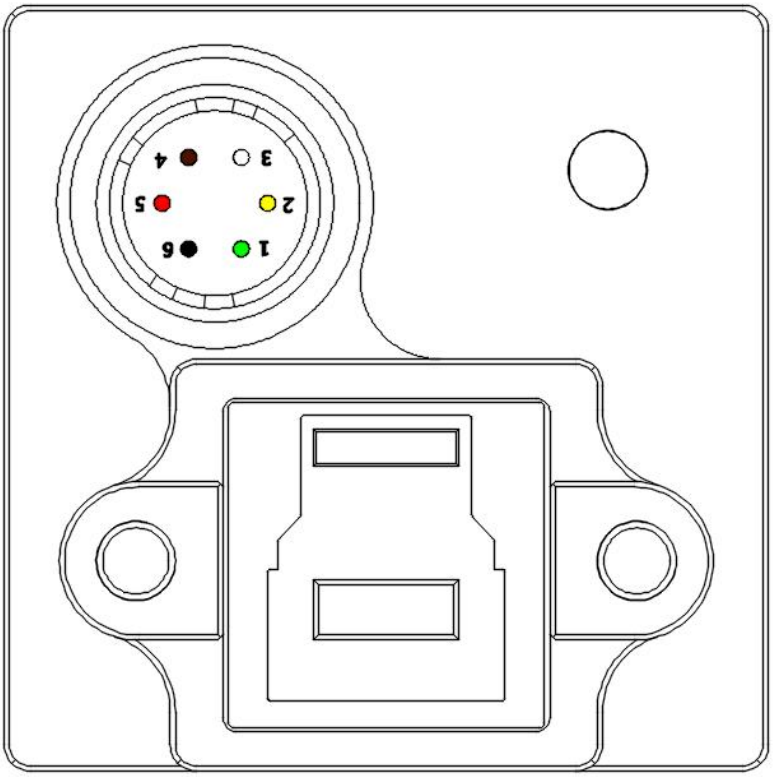
Hard trigger line sequence definition

1.Four-core aviation head line sequence definition (UB series)



Pin number	Line color	Signal name	Description
1	black	TRIG_IN-	External trigger signal input negative terminal
2	blue	TRIG_IN+	External trigger signal input positive terminal
3	Brown	STRB_OUT-	Flash output negative terminal
4	gray	STRB_OUT+	Flash output positive terminal

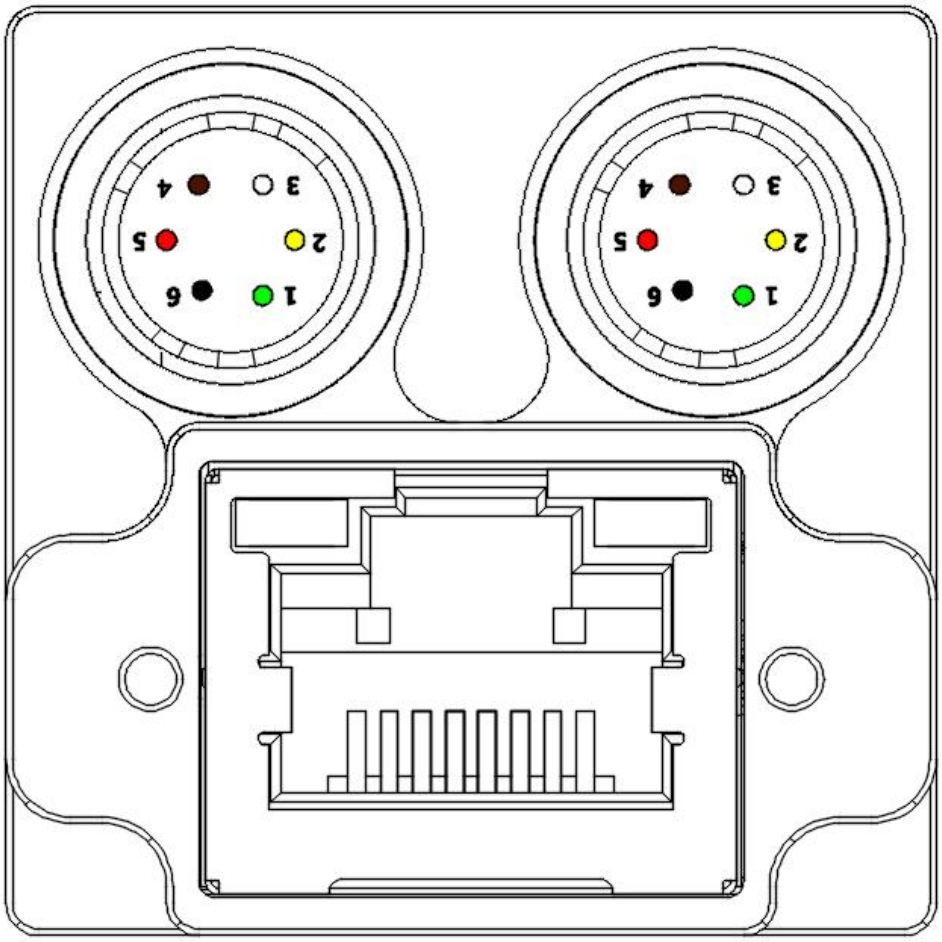
2. Six-core aviation head line sequence definition (UBS, SUA series)



Pin number	Line color	Signal name	Signal description	Remarks
1	green	GPO1+/STRB_OUT+	GPO1 positive terminal/flash output positive terminal	The default is flash output
2	yellow	GPO1-/STRB_OUT-	GPO1 negative terminal/flash output negative terminal	The default is flash output
3	White	GPI1+/TRIG_IN+	GPI1 positive terminal/trigger input positive terminal	Default is trigger input
4	Brown	GPI1-/TRIG_IN-	GPI1 negative terminal/trigger input negative terminal	Default is trigger input
5	red	GPO2+	GPO2 positive output	
6	black	GPO2-	GPO2 negative output	

3.Six-core aviation head line sequence definition (GE series)

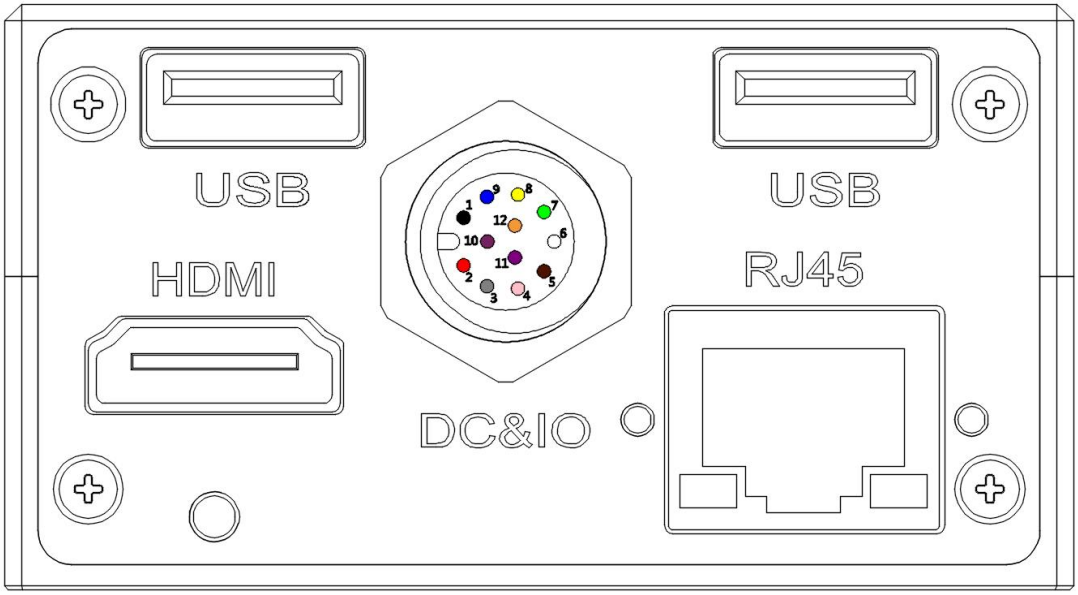
Port A Port B



port	Pin number	Line color	Signal name	Signal description	Remarks
Port A	1	green	GPO1+/STRB_OUT+	GPO1 positive terminal/flash output positive terminal	The default is flash output
	2	yellow	GPO1-/STRB_OUT-	GPO1 negative terminal/flash output negative terminal	The default is flash output
	3	White	GPI1+/TRIG_IN+	GPI1 positive terminal/trigger input positive terminal	Default is trigger input
	4	Brown	GPI1-/TRIG_IN-	GPI1 negative terminal/trigger input negative terminal	Default is trigger input
	5	red	PWR12V	Camera power input positive terminal	
	6	black	PWRGND	Camera power input negative terminal	

Port B	1	green	GPO2+	GPO2 positive output	
	2	yellow	GPO3+	GPO3 positive output	
	3	White	GPO4+	GPO4 positive output	
	4	Brown	GPI2+	GPI2 positive input	
	5	red	GPI3+	GPI3 positive input	
	6	black	GPIO_COM	GPIO public negative terminal	

4.Twelve-core aviation head line sequence definition (ITA series)

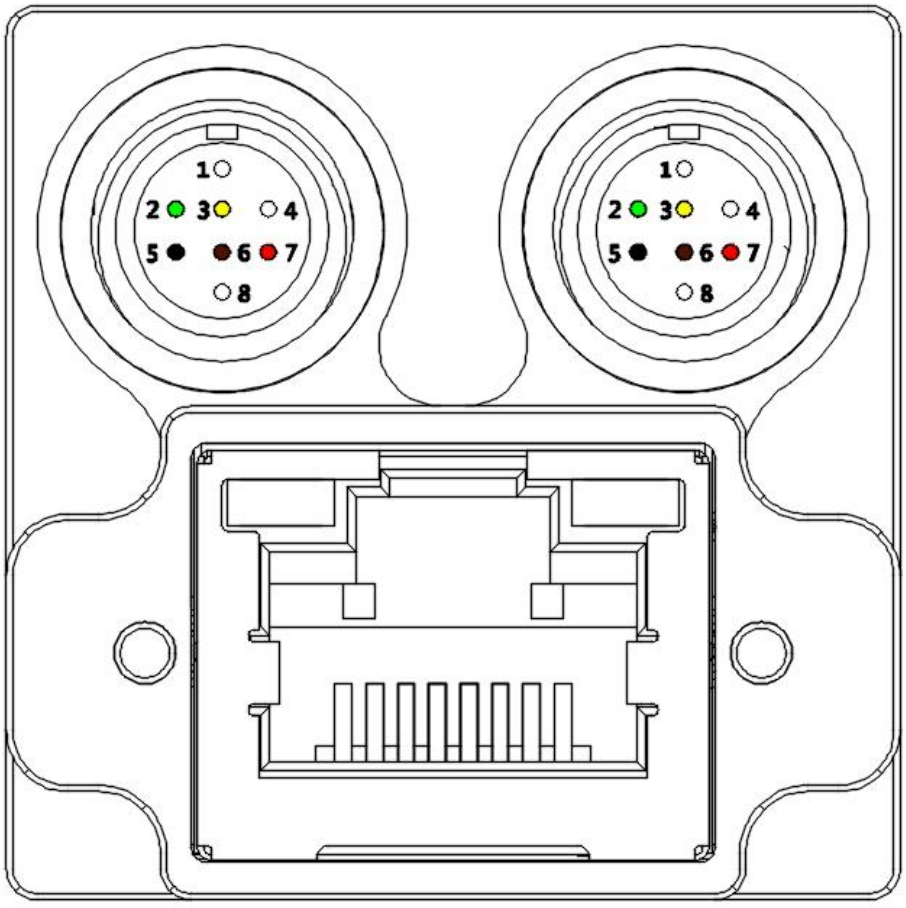


Pin number	Line color	Signal name	Description
1	black	PWRGND	Camera power input negative terminal
2	red	PWR12V	Camera power input positive terminal
3	gray	UART_TX	Serial port send
4	Pink	UART_RX	Serial port receiving
5	Brown	TRIG-	Trigger input negative terminal

6	White	TRIG+	Trigger input positive terminal
7	green	STRB+	Flash output positive terminal
8	yellow	STRB-	Flash output negative terminal
9	blue	GPIO_COM	GPIO public negative terminal/serial port ground
10	Magenta	GPO2+	GPO2 positive output
11	purple	GPO3+	GPO3 positive output
12	Orange	GPI2+	GPI2 positive input

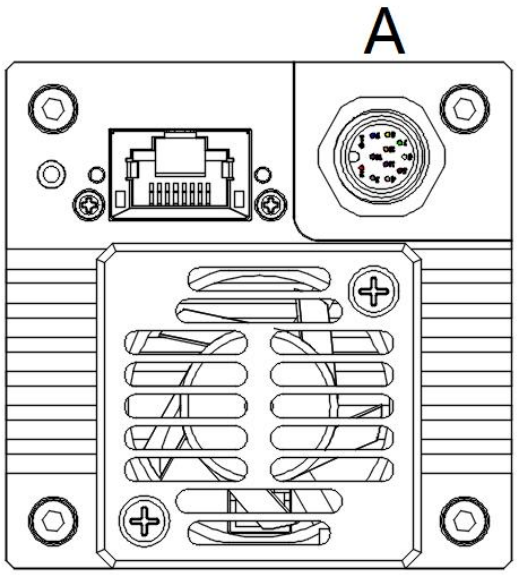
5.Eight-core thread aviation head line sequence definition

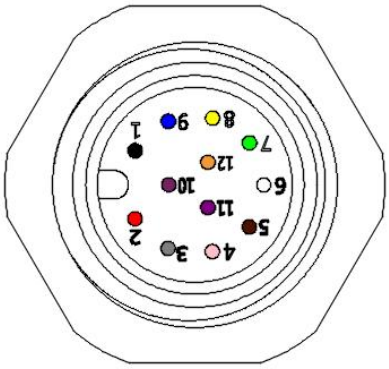
Port A Port B



port	Pin number	Line color	Signal name	Signal description	Remarks
Port A	1	White	GPI1+/TRIG_IN+	GPI1 positive terminal/trigger input positive terminal	Default is trigger input
	2	green	GPO1+/STRB_OUT+	GPO1 positive terminal/flash output positive terminal	The default is flash output
	3	yellow	GPO1-/STRB_OUT-	GPO1 negative terminal/flash output negative terminal	The default is flash output
	4	Empty feet			
	5	black	PWRGND	Camera power input negative terminal	
	6	Brown （High soft blue）	GPI1-/TRIG_IN-	GPI1 negative terminal/trigger input negative terminal	Default is trigger input
	7	red	PWR12V	Camera power input positive terminal	
	8	Empty feet			
Port B	1	White	GPO4+	GPO4 positive output	
	2	green	GPO2+	GPO2 positive output	
	3	yellow	GPO3+	GPO3 positive output	
	4	Empty feet			
	5	black	GPIO_COM	GPIO public negative terminal	
	6	Brown	GPI2+	GPI2 positive input	
	7	red	GPI3+	GPI3 positive input	
	8	Empty feet			

6.Twelve-core aviation head line sequence definition (XG series)



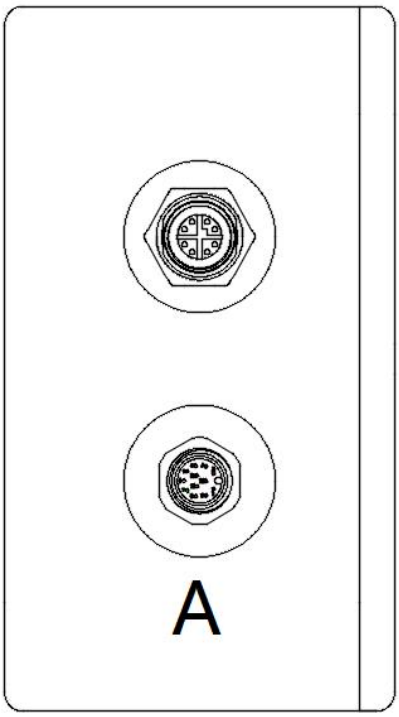


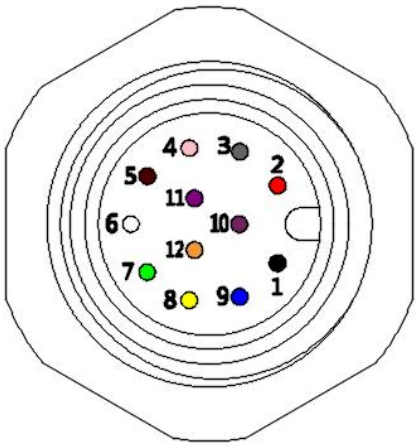
DETAIL A
SCALE 3:1

Pin number	Line color	Signal name	Signal description	Remarks
1	black	PWRGND	Camera power input negative terminal	
2	red	PWR12V	Camera power input positive terminal	
3	gray	GPI1+/ TRIG_IN+	GPI1 or trigger input optocoupler positive terminal	Default trigger
4	pink	GPI1-/ TRIG_IN-	GPI1 or trigger input optocoupler negative terminal	Default trigger
5	Brown	GPI2+	GPI2 input optocoupler positive terminal	
6	White	GPI2-	GPI2 input optocoupler negative terminal	
7	green	GPI3+/GPO3+	GPI3 input or GPO3 output optocoupler positive terminal	Default output
8	yellow	GPI3-/GPO3-	GPI3 input or GPO3 output optocoupler negative terminal	Default output
9	blue	GPO1+/STRB_OUT+	GPO1 or flash output photocoupler positive terminal	Default flash
10	Magenta	GPO1-/STRB_OUT-	GPO1 or flash output optocoupler negative terminal	Default flash

11	purple	GPO2+	GPO2 output optocoupler positive terminal	
12	Orange	GPO2-	GPO2 output optocoupler negative terminal	

7.Twelve-core aviation head line sequence definition (I3D series)





DETAIL A
SCALE 5:1

Pin number	Line color	Signal name	Description
1	black	PWRGND	Camera power input negative terminal
2	red	PWR12V	Camera power input positive terminal
3	gray	UART_TX	Serial port send
4	pink	UART_RX	Serial port receiving
5	Brown	TRIG-	Trigger input negative terminal
6	White	TRIG+	Trigger input positive terminal

7	green	STRB+	Flash output positive terminal
8	yellow	STRB-	Flash output negative terminal
9	blue	GPIO_COM	GPIO public negative terminal/serial port ground
10	Magenta	GPO2+	GPO2 positive output
11	purple	PWR12V	Camera power input positive terminal
12	Orange	PWRGND	Camera power input negative terminal

Version update record

time	Remarks
2020.12.19	User manual