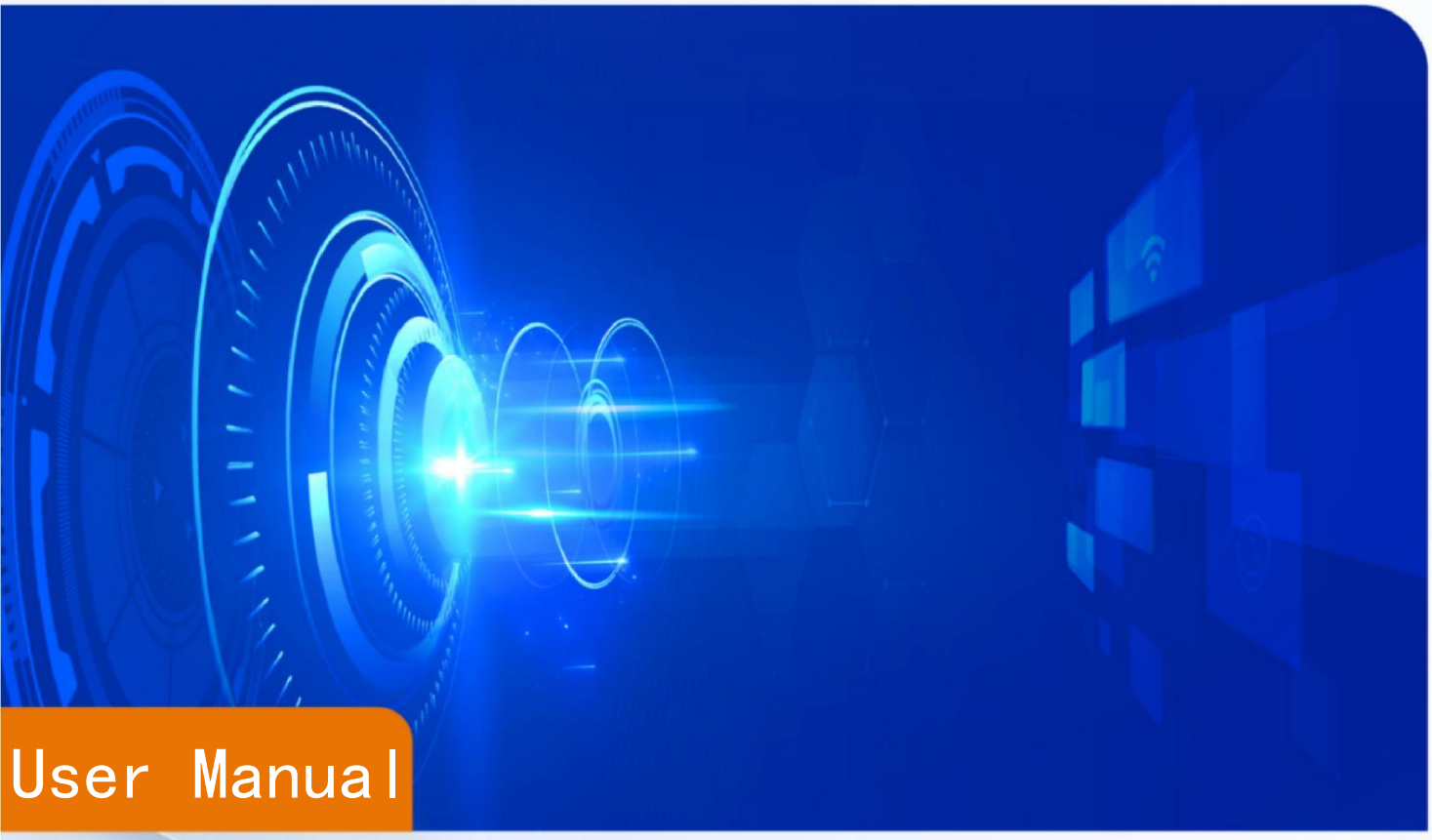
Hefei I-TEK
OptoElectronics Co., Ltd.



User Manual

IKapCViewer Software

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V3.2.1

Foreword

Copyright Statement

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- If users need the latest documents, please contact market@i-tek.cn obtain. For authorized users, Hefei I-TEK Optoelectronics Co., LTD. will provide the latest documentation of the corresponding product free of charge.

About Manual

- This manual is applicable to the IKapCViewer software developed by Hefei I-TEK Optoelectronics Co., LTD.. Before using the product, please read this manual carefully and keep it properly for use.
- By reading this manual, users can understand the functions and configuration methods of the product, and complete the basic use of the product.

Using Object

- This manual is applicable to technicians or engineers in the machine vision related industry who use this product.

Symbol Convention

The symbols appearing in the manual are described in the following table.

Symbol	Description
TIPS	Provide supplements and explanations to the main text.
STEP	Provide an introduction to the configuration method.
NOTE	Remind users of important operations or prevent potential harm and danger.
WARN	Indicates potential risks that, if not avoided, may result in serious consequences.

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Revision History

Revision	Date	Description
1.0	2018/08/16	● Initial version
1.1	2018/08/29	● Add LUT, read and write bad pixels and flat field correction data
1.2	2018/10/10	● Add contour curve prompt information and histogram grid curve
1.3	2018/10/16	● Add FPGA and MCU firmware update programs
2.0	2019/01/31	● Add parameter configuration and image acquisition for CoaXpress camera
2.1	2019/03/22	● Add CameraLink and USB 3.0 image acquisition
2.1.1	2019/03/29	● Add software prompt information
2.2.8	2020/06/15	● Add support for MacOS system
2.2.9	2020/08/14	● Add support for Linux systems
2.2.10	2021/08/05	● Modify document format
2.3	2022/04/01	● Modify document format ● Update the legend and related explanations
2.3.1	2022/04/25	● Update company logo ● Update the legend of Chapter 3
2.3.2	2022/06/06	● Update installation interface
2.3.3	2023/02/11	● Update company address
3.0.0	2024/04/23	● Update graphical interface related content
3.0.2	2024/06/21	● Update graphical interface related content ● Add multi camera image capture and related functions
3.1.0	2025/01/02	● Add descriptions related to new software features
3.2.0	2025/03/07	● Update software interface layout ● Add descriptions related to new features ● Add Linux system software installation method
3.2.1	2025/04/21	● Add specific descriptions of some parameters

Content

Foreword **2**
Revision History **4**
Content **5**
1 Software Overview **7**
2 Software Installation **8**
3 Main Interface **14**
4 Menu Bar **15**
4.1 File 15
4.2 Camera 15
4.3 View 16
4.4 Tool 17
4.4.1 Preference 18
4.4.2 Image Processing 27
4.4.3 Signal Detection 28
4.4.4 Firmware Upgrade 29
4.4.5 Preprocessing 30
4.4.6 File IO 33
4.4.7 Toolsets&Other Tools 34
4.5 Help 34
5 Toolbar **36**
5.1 Number of Views 37
5.2 Horizontal/Vertical Waveform Diagram 38
5.3 Image Analysis 39
5.4 Pixel View 40
5.5 ROI Analysis 41
5.6 Pixel Measurement 42
5.7 Acquisition Status 43
5.8 Watermark Information 43
6 Device List **45**
7 Attribute Tree **46**
8 Feature Information Area **49**
9 Image Display Area **50**
9.1 View Toolbar 50
9.1.1 Export Image 50
9.1.2 Open Image 51
9.1.3 Save Image 52
9.1.4 Save Image Sequence 52
9.2 Mouse Wheel 53
9.3 Right Click on the Display Area 54
9.3.1 Image Bit Count 55
9.3.2 Pixel Jump 56
10 Information Output Box **57**

11 Status Bar 58
12 FAQ 59

1 Software Overview

IKapCViewer is a camera/frame grabber application and management software developed by Hefei I-TEK Optoelectronics Co., LTD. Through IKapCViewer, users can configure device parameters, connect devices and perform operations such as detection, opening, modification, and parameter configuration. They can also obtain images and process them in real-time, thereby adjusting device parameters and analyzing performance.

IKapCViewer applies a series of advanced image processing techniques to achieve rich image display and analysis functions at lower CPU loads. Users can not only achieve basic controls such as zooming in and out of images in real-time, but also directly view the specific data information of each pixel, and synchronously observe the horizontal and vertical waveform diagrams of the image as well as real-time statistical results of various information, which is conducive to various machine vision testing and analysis.

The operating environment requirements for IKapCViewer are as follows:

- **Operating System:**
  - **Windows:** Windows 7/10/11, 32/64bit
  - **Linux:** 3.2.0-29-generic and above versions
  - **Mac:** Mac OS 10.9 and above versions
- **Memory:** Not less than 4GB

2 Software Installation

❖ The installation steps of IKapCViewer software on Windows system are as follows:

➢ Run the IKapLibrary.exe program, and the installation start interface is shown in the following figure.

Fig.1 Installation Start Interface

➢ Click on “Custom”, and the interface shown in the figure below will appear. Users can choose their own language, installation directory, and driver. Then click on “Next”.

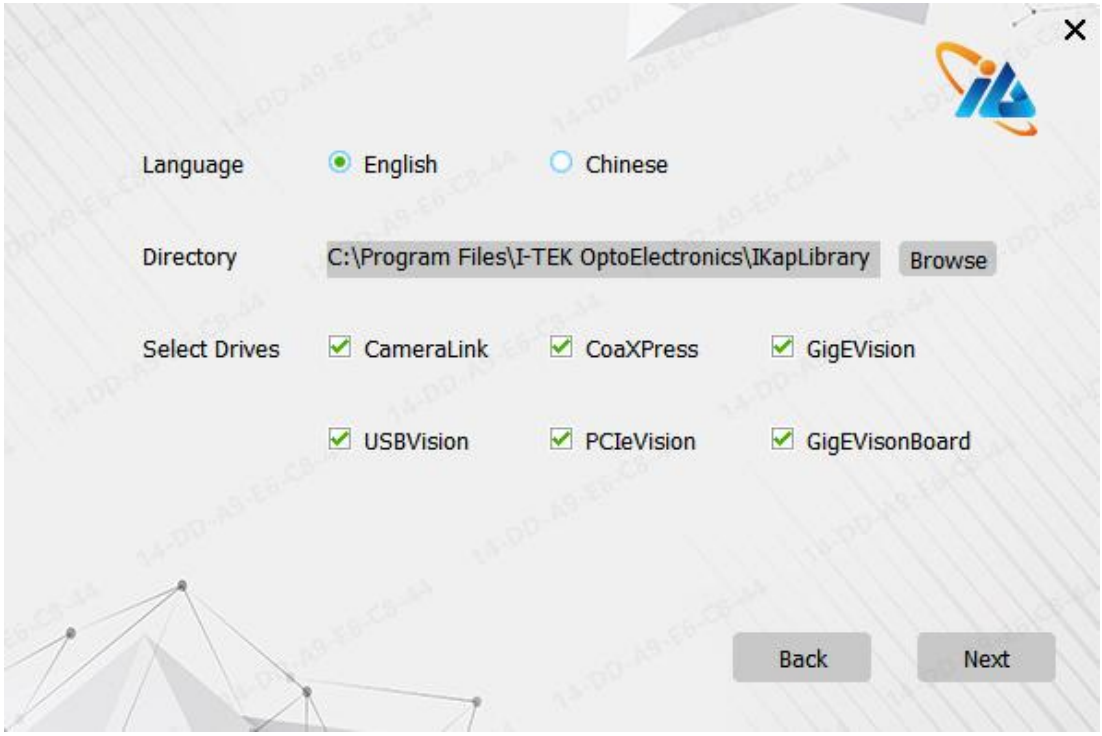

Fig.2 User Defined Interface

- During the installation process, a pre driver installation interface as shown in the following figure will appear.

Fig.3 Interface before Driver Installation

- During the installation process, the interface shown in the following figure appears. Please

click “Always install this driver software”.

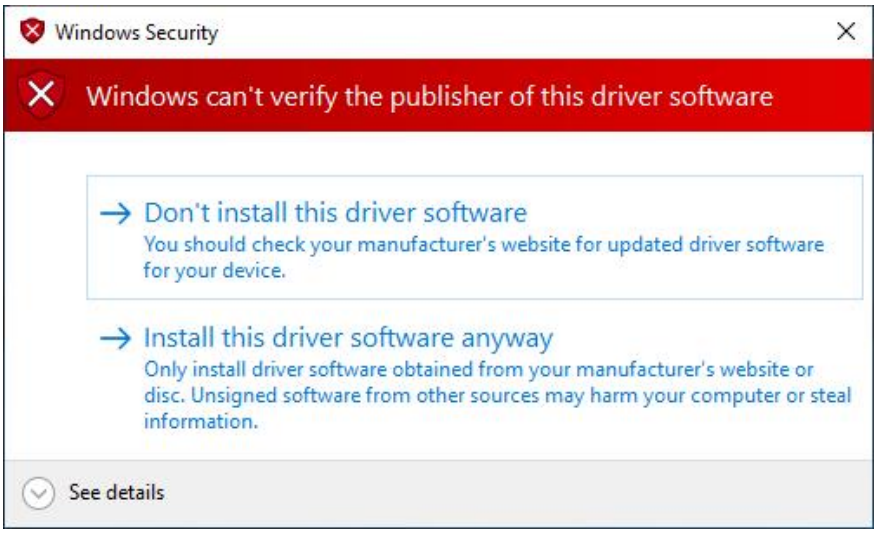

Fig.4 Driver Verification Interface

- At the end of the installation process, the interface shown in the following figure will appear. Please click the “Installation Complete” button. If the “Restart Computer” option is selected, the computer will complete the installation after restarting the computer.

Fig.5 Software Installation End Interface

❖ Installation steps of IKapCViewer software on Linux system are as follows:

- Extract the IKapInstall installation package.

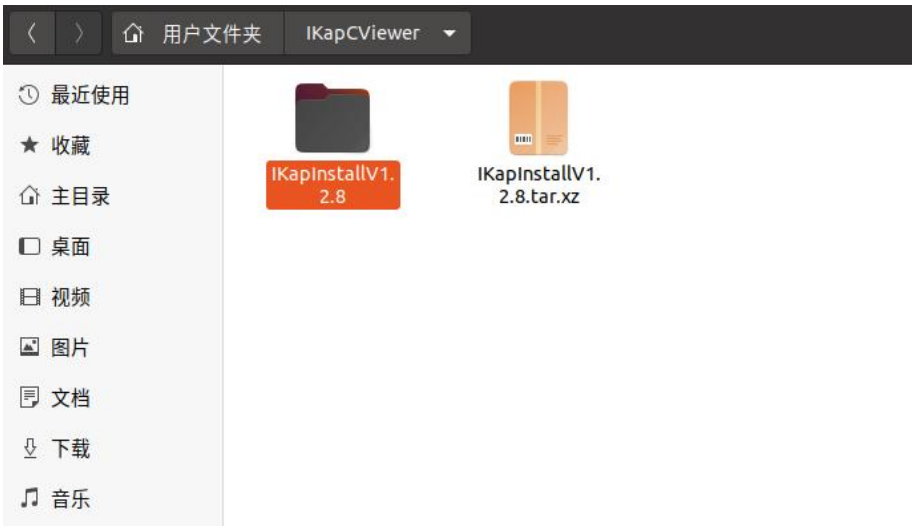

Fig.6 Extract Installation Package

- Switch the terminal to the folder where the installation package has been unpacked, enter sudo ./install.sh on the command line, and enter the user password.

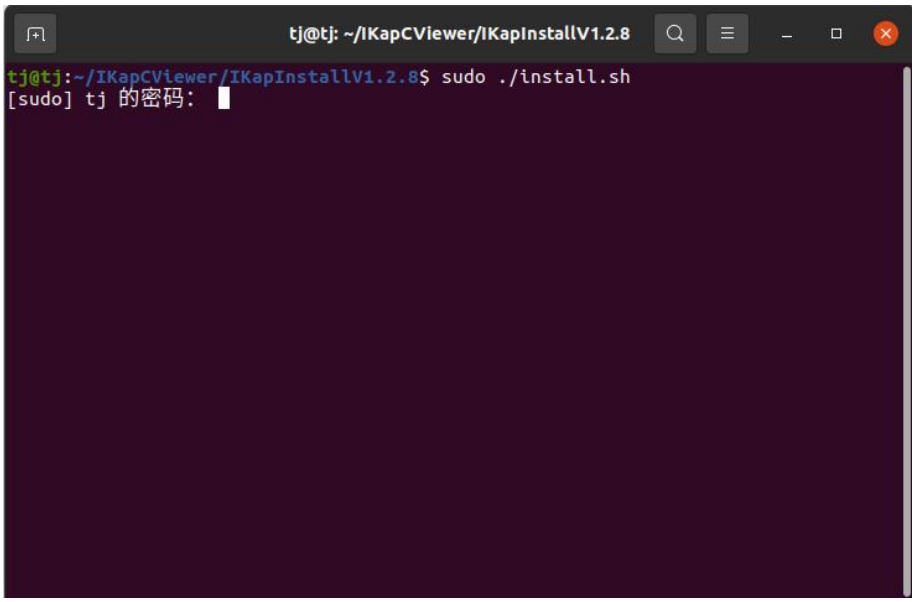

Fig.7 Enter Installation Command

- Wait for the installation of drivers and library files to complete.

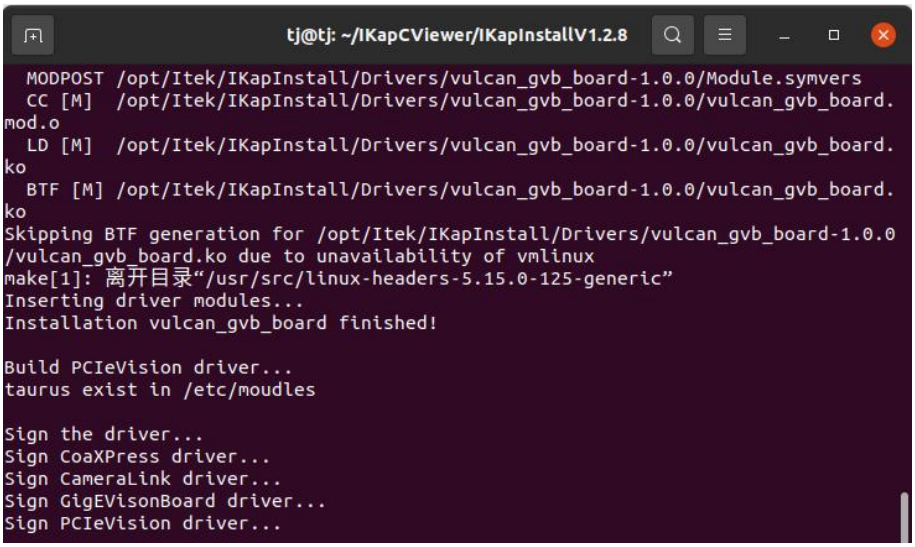

Fig.8 Waiting for Installation Process

- After the installation of drivers and library files is completed, follow the instructions in the readme.md folder, restart the import of MOK public key, and complete the installation of IKapCViewer software.

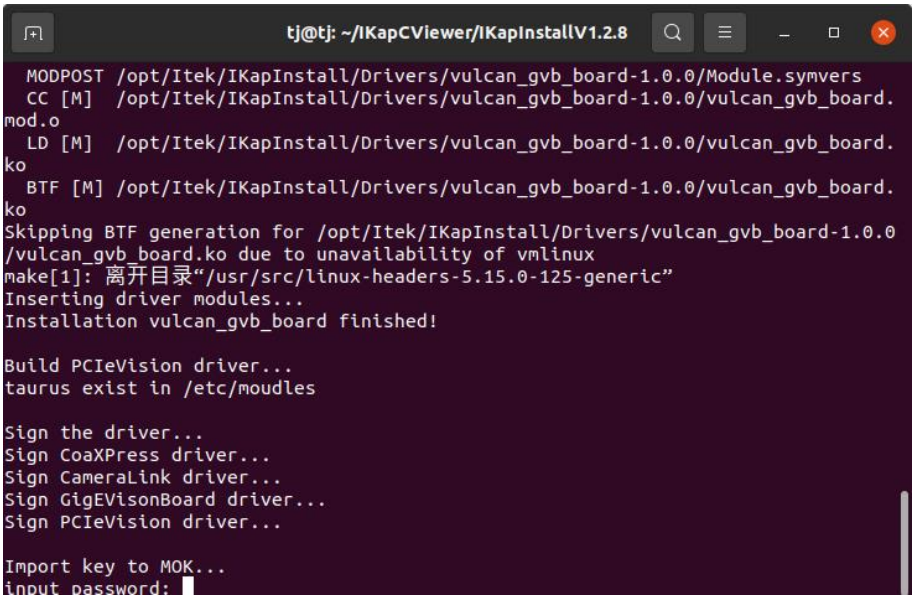

Fig.9 Driver and Library File Installation Completion Interface

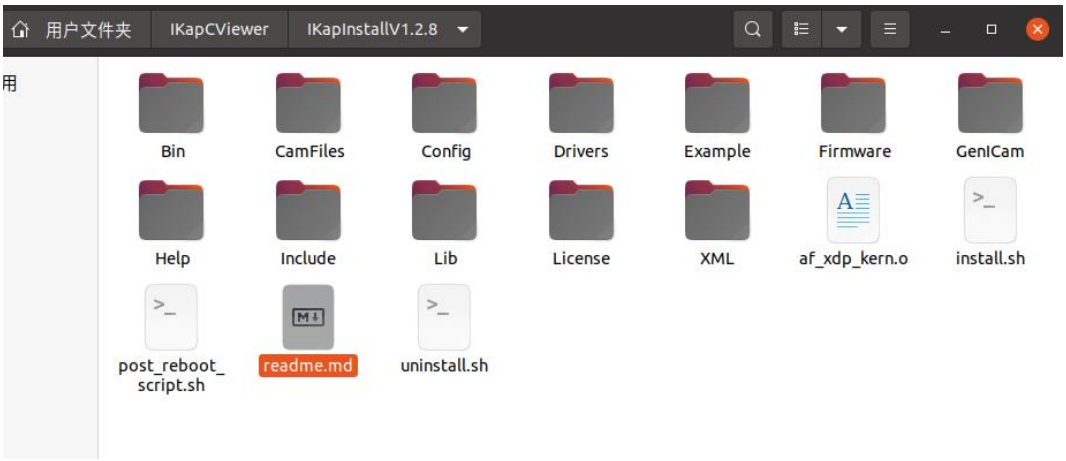

Fig.10 readme.md File Location

3 Main Interface

After IKapCViewer is launched, the main interface and functional areas are shown below.

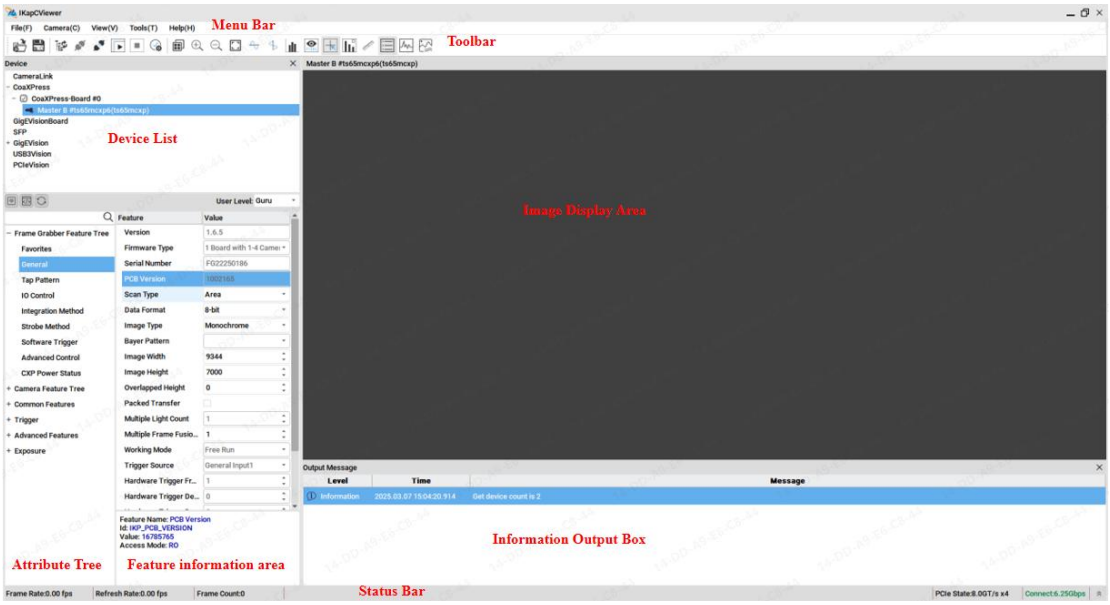

Fig.11 IKapCViewer Software Main Interface

Table1 IKapCViewer Main Interface Functional Area

Function Area	Explanation
Menu Bar	Including 5 menu items: File, Camera, View, Tools, and Help.
Toolbar	Provide some commonly used function buttons for users to operate quickly.
Device List	List all cameras and frame grabber devices connected to the current computer.
Attribute Tree	Display and configure the features of the current device.
Feature Information Area	Display detailed information about the currently selected feature.
Image Display Area	Real time display of grabbed images.
Information Output Box	Display software prompt content, including information, warnings, and errors.
Status Bar	Display the acquisition status information.

4 Menu Bar

4.1 File

"File" menu is mainly used for device configuration file management, as shown below.

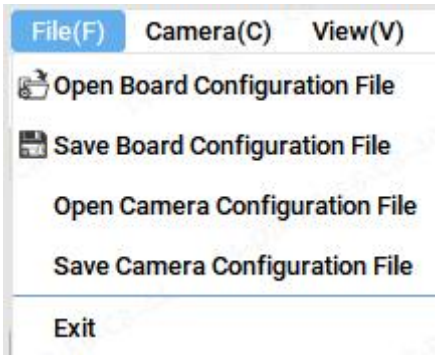

Fig.12 "File" Menu

Table2 "File" Menu Function

Function	Description
Open Frame Grabber Configuration File	Load *.vlcf configuration into the current frame grabber.
Save Frame Grabber Configuration File	Save the current frame grabber configuration to *.vlcf, which will generate or update *.vlcf in the specified directory.
Open Camera Configuration File	Load *.ccf configuration into the current camera.
Save Camera Configuration File	Save the current camera configuration to *.ccf, which will generate or update *.ccf in the specified directory.
Exit	Close and exit IKapCViewer, clear the buffer, and release all software and hardware resources.

4.2 Camera

"Camera" menu is mainly used for device connection/disconnection and image acquisition control, as shown below.

Fig.13 "Camera" Menu

Table3 “Camera” Menu Function

Function	Description
Detection	Retrieve all devices connected to the current computer and display them in the device list.
Connection	Open the currently selected individual device.
Batch Connection	Open all devices under the currently selected interface.
Disconnection	Close the currently selected individual device.
Batch Disconnection	Close all devices under the currently selected interface.
Batch Start	All open devices simultaneously and continuously grab images.
Batch Stop	All open devices simultaneously stop grabbing images.
Check	Check if the camera parameters match the fame grabber parameters.

NOTE

- Due to the limitation of human eye resolution, the image acquisition speed of IKapCViewer will be higher than the update speed of the image display area. Excessively fast image display update speed will greatly consume computer CPU and is unnecessary. The image update speed that can be recognized by the human eye is 20~30fps, so the maximum display update speed of IKapCViewer is 30fps.

4.3 View

“View” menu is mainly used for managing image display auxiliary functions, as shown below.

Fig.14 “View” Menu

Table4 “View” Menu Function

Function	Description
Mark	Control the opening and closing of the cross shaped marking line in the image display area. Marking lines can accurately obtain the coordinate information of the current pixel in the image.
Zoom	Adjust the size of the image display area, including zooming in, zooming out, and adapting.

Window	Control the opening and closing of various dockable windows, including device features, output information, horizontal waveform diagrams, and vertical waveform diagrams.
Display	Control the opening and closing of various functional sub windows, including pixel view, image analysis, ROI analysis, measurement, status, and watermarking.

❖ The functions under the “View” menu have shortcut buttons set in the IKapCViewer toolbar area for users to quickly use. The “Toolbar” section in the following text will provide detailed instructions on the specific use of each function.

4.4 Tool

“Tool” menu is mainly used for software preference configuration and management of other additional tools, as shown below.

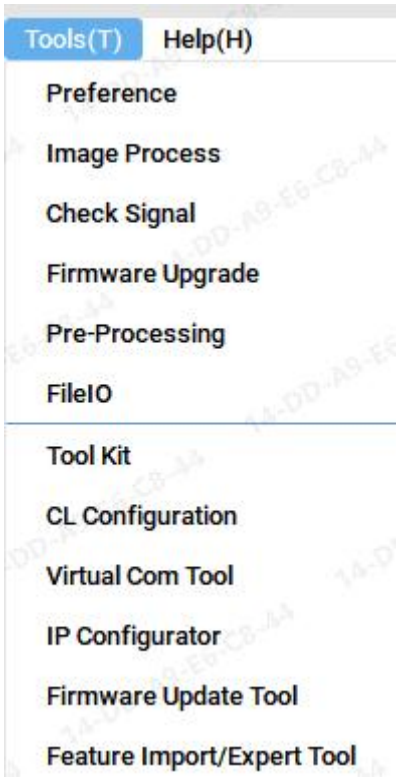

Fig.15 “Tool” Menu

Table5 “Tool” Menu Function

Function	Description
Preference	Used for configuring IKapCViewer preferences.
Image Processing	Used for configuring image processing parameters in the display area,

	the image processing parameters for different sub windows in the display area can be independently set.
Signal Detection	Used for frame grabber trigger signal detection.
Firmware Upgrade	Used for online firmware upgrade of cameras, including FPGA, MCU, and XML firmware.
Pretreatment	Used for image data processing, including bad pixel correction and flat field correction. Only cameras that support the corresponding function can use the corresponding function.
File IO	Used for camera file reading and writing, only cameras that support file reading and writing can use this feature.
Toolsets&Other Tools	Summary of C/C# sample code and additional tools in the IKapCViewer installation package.

4.4.1 Preference

IKapCViewer preference configuration is divided into five items: regular, advanced, frame grabber, camera, and shortcut keys. The configurable content in each item is shown below.

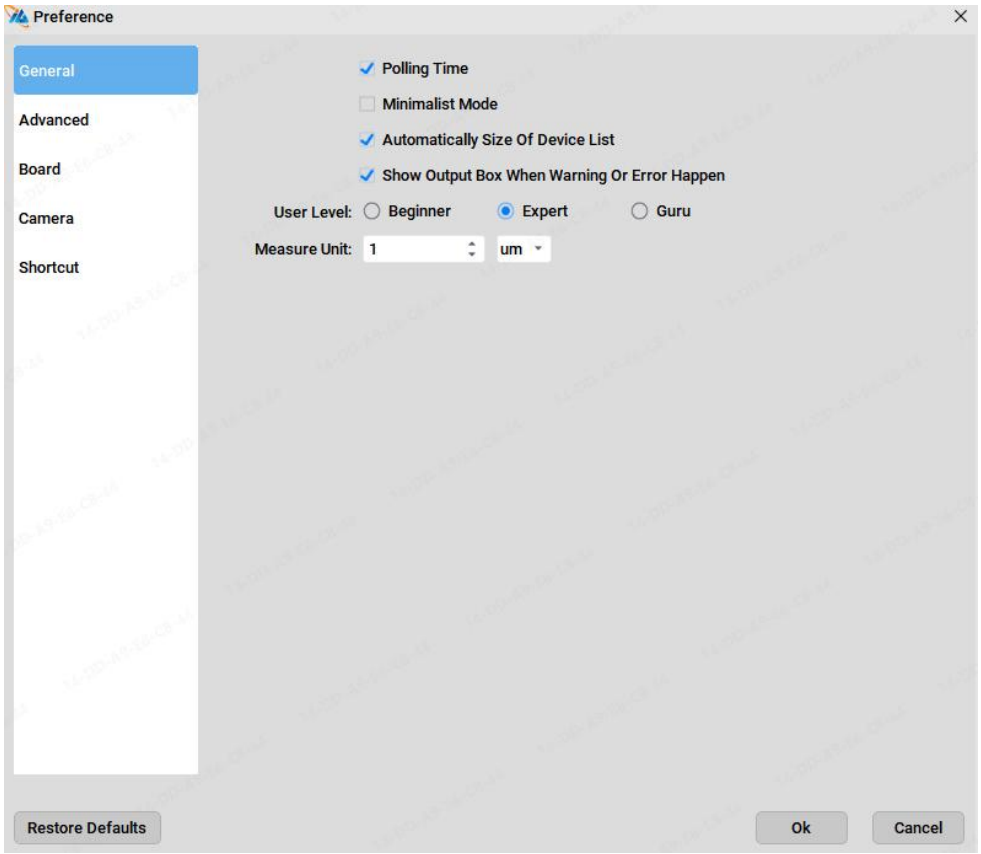

Fig.16 Preference: Regular

Table6 Preference: Regular Function Description

Function	Description
Sequence Time	Checking indicates sequence device parameters. When this item is

	enabled, real-time features such as device temperature and counter will refresh the values in real time.
Minimalist Mode	When this option is checked, the attribute tree features and information output boxes will no longer automatically refresh.
Automatically adjust Size of Device List	When this option is checked, when the mouse moves to the device list, the software automatically elongates the device list area to ensure sufficient space to display all currently connected devices.
Display Output Box when Warning or Error Occurs	When this option is checked, if the information output box is closed and a warning or error level prompt is generated, IKapCViewer will automatically open the information output box. Otherwise, the output box will remain closed.
Usage Level	Display level of the attribute tree includes beginners, experts, and masters. Novice level displays features with Beginner visibility in camera XML, expert level displays features with Beginner and Expert visibility in camera XML, and master level displays all camera features.
Measurement Unit	Set the length of one pixel.

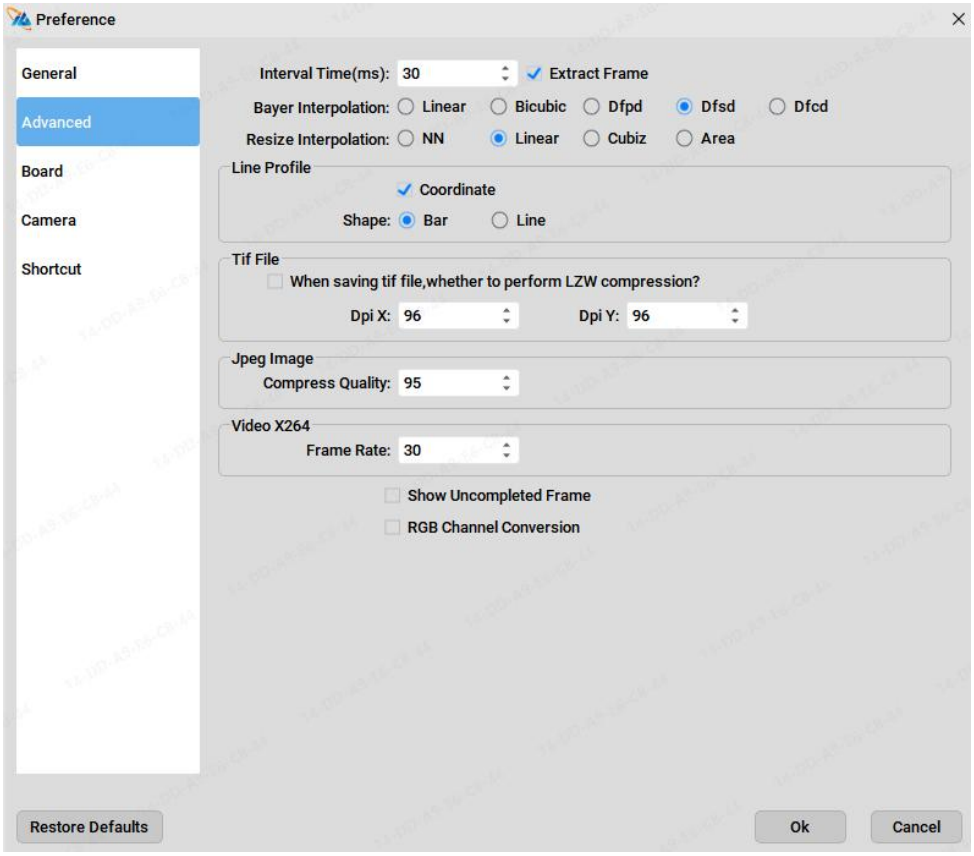

Fig.17 Preference: Advanced

Table7 Preference: Advanced Function Description

Function	Description
Interval Time (ms)	Frame extraction can reduce the refresh rate of the image display area and

	decrease CPU usage. Interval time represents how often the image is refreshed, and the longer the interval time, the slower the image refresh rate. When camera's acquisition rate is high and the CPU cannot process it in a timely manner, it is recommended to enable frame extraction.
Bayer Interpolation	Interpolation method selection for Bayer images, please refer to the following text for specific instructions.
Zoom Interpolation	Selection of image scaling interpolation methods, please refer to the following text for specific instructions.
Contour Line	Coordinates: Set whether the waveform graph displays coordinates.
	Shape: Set the waveform display style.
Tif File	Whether to perform LZW compression when saving tif files: Check this option to perform LZW compression when saving tif files.
	Dpi X: Horizontal LZW compression coefficient, which is the number of pixels per inch length in the horizontal direction.
	Dpi Y: Vertical LZW compression coefficient, which is the number of pixels per inch length in the vertical direction.
Jpeg Image	Compression quality: Set the quality of the saved Jpeg image, the higher the value, the better the quality.
Transcribe	Frame rate: Set the video frame rate.
Display Incomplete Frames	Check this option to display incomplete images in the image display area.
RGB Image Channel Conversion	Checking this option can convert the pixel values of R and B channels. When using a third-party color camera with our frame grabber, this option needs to be checked.

❖ Bayer interpolation method currently supports Linear, Bicubic, Dfsd/Dfcd and Dfpd. The interpolation effect gradually improves from left to right, and the processing speed gradually slows down. Users can choose according to their actual needs. Among them, Dfcd is an optimized version of Dfsd, which has better interpolation effect and faster speed in most scenarios compared to Dfsd. The actual effect of each interpolation method is shown in the following figure:

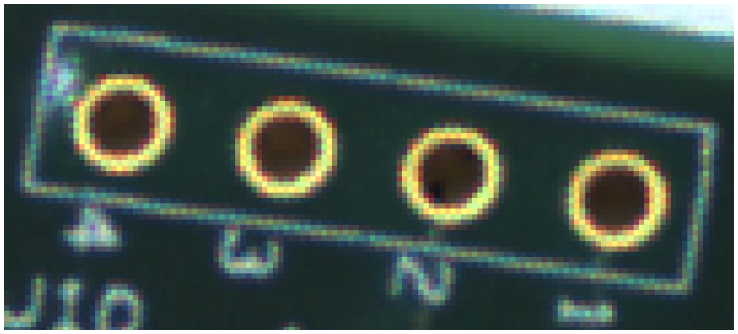

Fig.18 Linear Interpolation Method

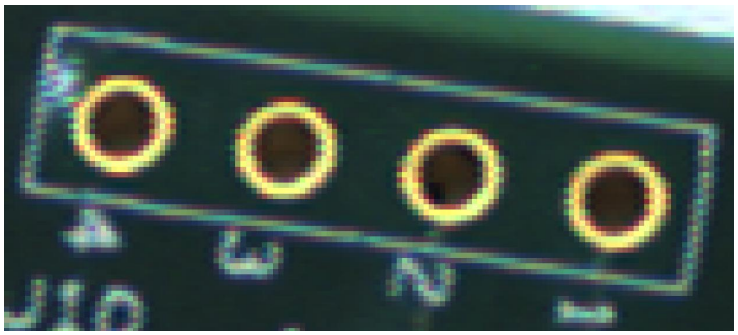

Fig.19 Bicubic Interpolation Method

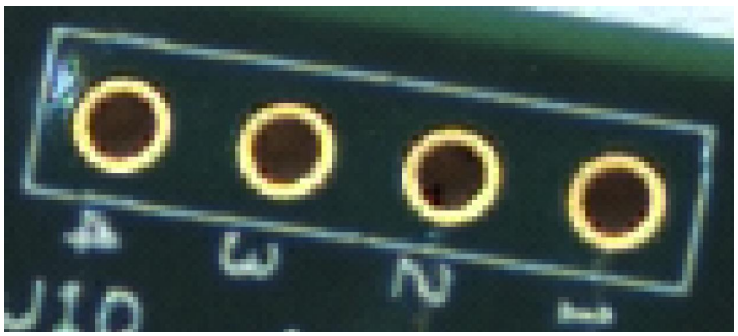

Fig.20 Dfsd Interpolation Method

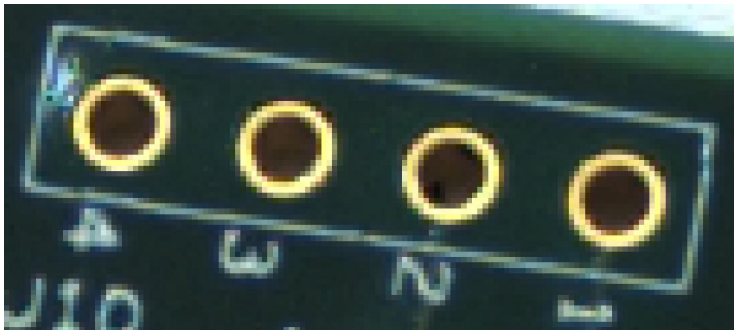

Fig.21 Dfcd Interpolation Method

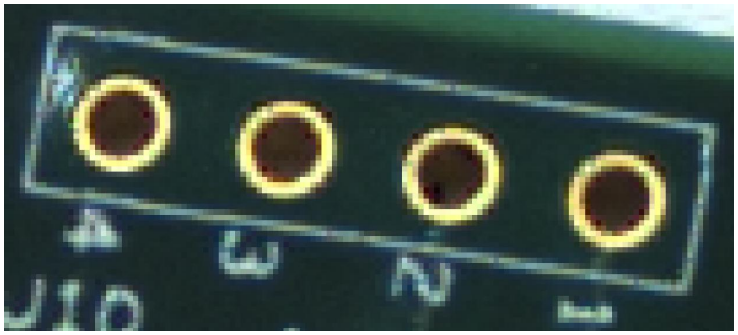

Fig.22 Dfpd Interpolation Method

- Scaling interpolation method currently supports NN, Linear, Cubiz, and Area. The order of interpolation effect is Area ≥ Cubiz > Linear > NN, and the order of processing speed is NN > Linear ≥ Area > Cubiz. Users can choose according to their actual needs. The actual effect of each

interpolation method is shown in the following figure:

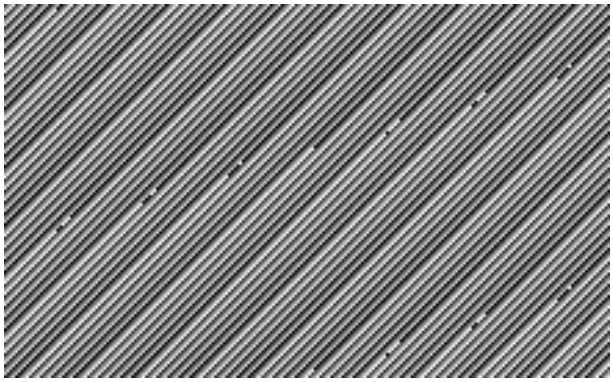

Fig.23 NN Interpolation Method

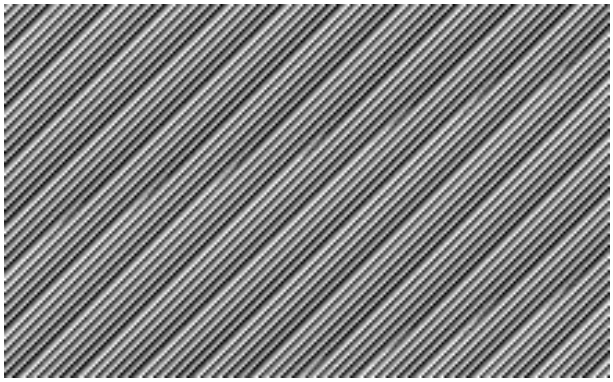

Fig.24 Linear Interpolation Method

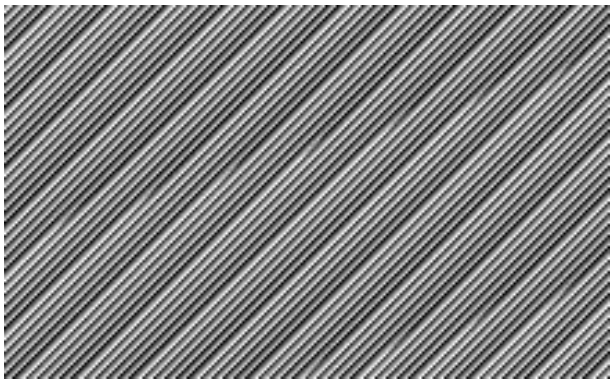

Fig.25 Cubiz Interpolation Method

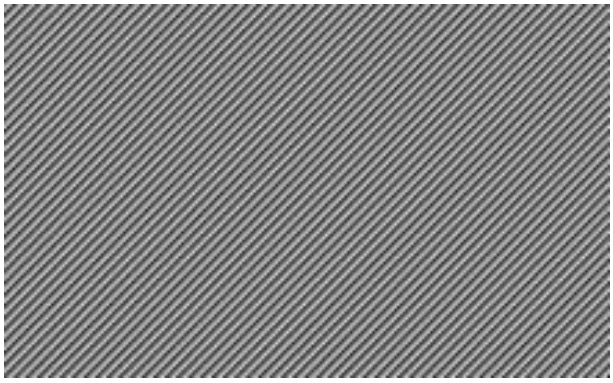

Fig.26 Area Interpolation Method

❖ The effects of bar and line contour lines are shown in the following figure.

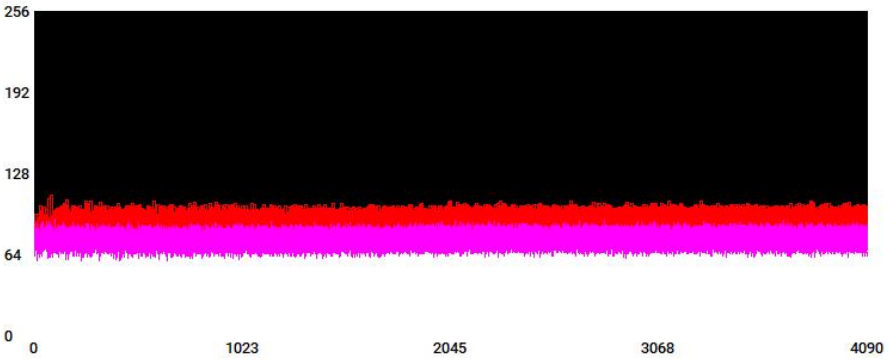

Fig.27 Bar Shaped Contour Line

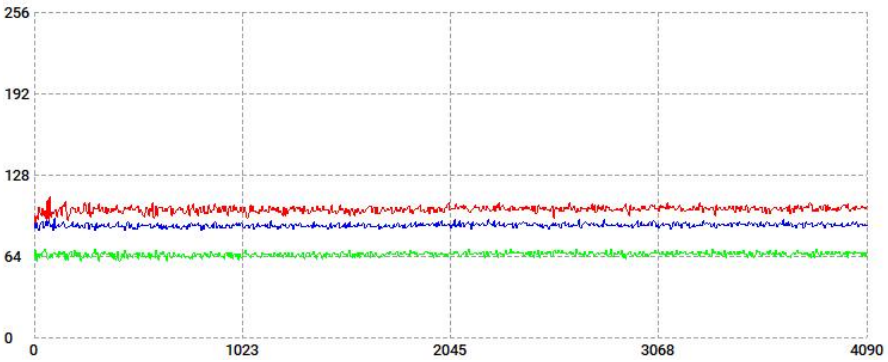

Fig.28 Linear Contour Line

NOTE

❖ If either the width or height of the Bayer image is less than 16, the Linear interpolation method is called by default.

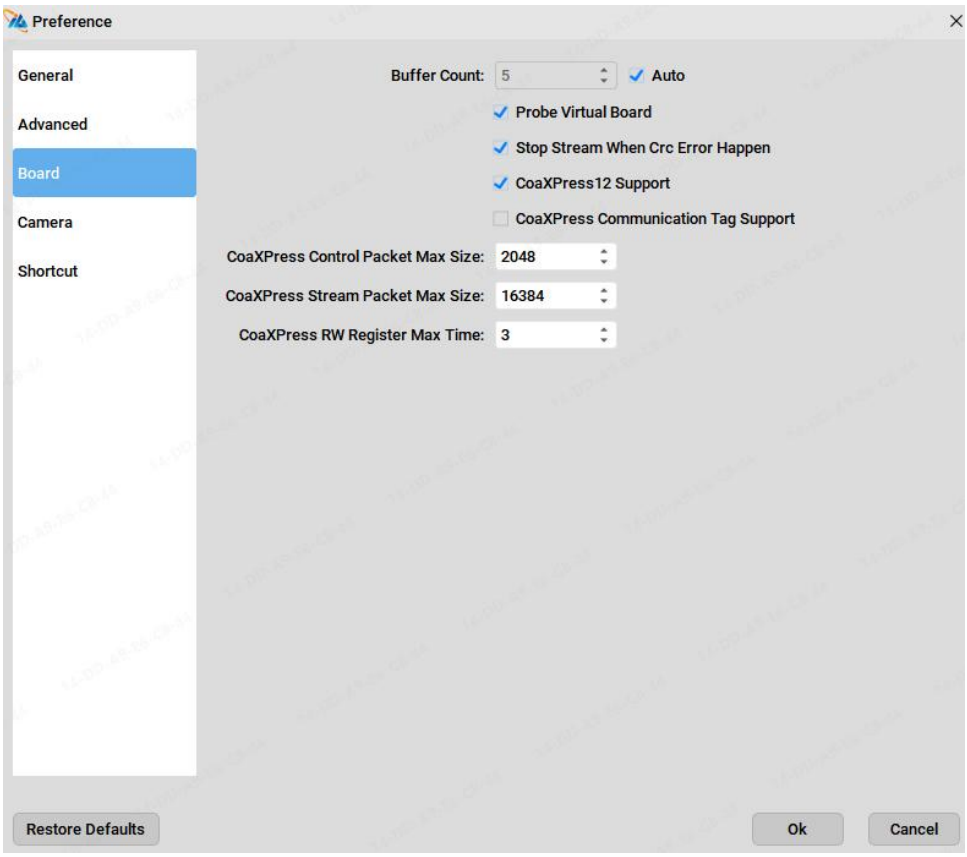

Fig.29 Preference: Frame Grabber

Table8 Preference: Frame Grabber Function Description

Function	Description
Number of Buffer	Set the number of buffer zones for the frame grabber, and check “Auto” to indicate automatic allocation by the software. Too few buffers can lead to frame loss during data acquisition, while too many buffers can result in insufficient memory allocation. It is recommended to check “Auto” to use the software’s automatic allocation of buffer numbers.
Detect Virtual Frame Grabber	Check this option to display virtual frame grabber devices in the device list for understanding the characteristics of the frame grabber.
Stop Data Flow when CRC Error Occurs	Check the box to stop data acquisition when a CRC error is detected during the CXP device image acquisition process.
Support CoaXPress12	Checking this option indicates support for sending data on the low-speed link of CXP12. When using CXP10/CXP12 interface cameras and Vulcan-CXP12 series frame grabbers, this option needs to be checked.
CoaXpress Command Tag Support	Check to indicate the use of CXP 2.1 protocol for reading and writing CXP registers.
Maximum Size of CoaXpress Sontrol Package	Set the maximum size of the CoaXpress control package.
CoaXpress Streaming	Set the maximum size of CoaXpress streaming packages.

Package Maximum Size	
CoaXpress Read Write Maximum Number of Registers	Set the maximum number of reads and writes to the CoaXpress register.

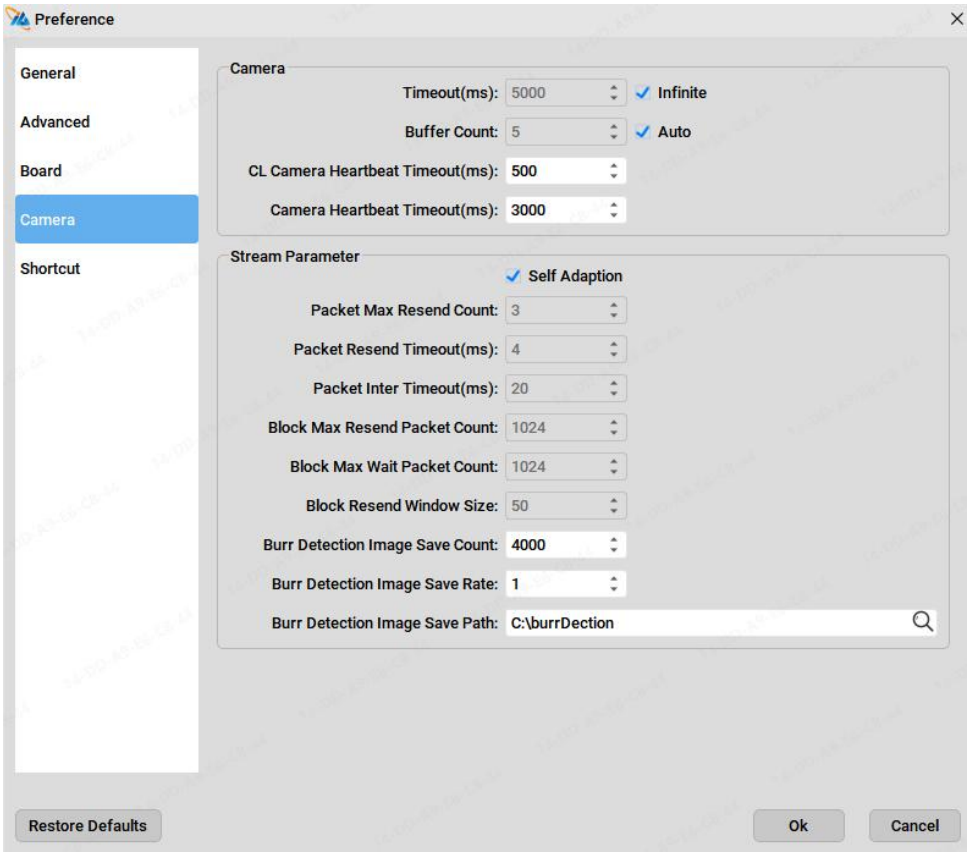

Fig.30 Preference: Camera

Table9 Preference: Camera Function Description

Function	Description
Camera	Timeout (ms): Set the timeout period for the data stream. Checking “infinite” means waiting for data indefinitely.
	Number of buffer zones: Set the number of buffer zones for the data stream. Checking “Auto” indicates that the software will automatically allocate them. Too few buffers can lead to frame loss during data acquisition, while too many buffers can result in insufficient memory allocation. It is recommended to check “Auto” to use the software’s automatic allocation of buffer numbers.
	CL camera heartbeat packet timeout time (ms): Set the CL camera heartbeat packet timeout time.
	Camera heartbeat packet timeout time (ms): Set the timeout time for the network port camera heartbeat packet.
Data Flow	Adaptive: Checking indicates using default data stream parameters.

Parameters	Maximum number of packet retransmissions: If the network camera does not respond in a timely manner to the retransmission command packet sent by the PC, this parameter can be set for retransmission, and the set value is the maximum number of retransmissions supported. Suggest setting the range to 3~10. Setting it too small may result in ineffective retransmission, while setting it too large may lead to meaningless retransmission attempts. If there is occasional small packet loss and successful retransmission is not possible, you can try increasing this parameter appropriately.
	Packet retransmission timeout (ms): For lost packets, if the PC sends a retransmission command and receives a retransmission packet from the camera within the timeout period, it is considered a successful retransmission. If it exceeds this time, it is considered a retransmission failure. Suggest setting the range to 4~100ms. Setting it too small may result in ineffective retransmission, while setting it too large may lead to meaningless waiting. If the CPU usage of the operating system occasionally reaches 100%, with a small amount of packet loss and unsuccessful retransmission, you can try increasing this parameter appropriately.
	Packet timeout time (ms): The timeout time for data reception between adjacent packets in the same frame of image. Generally, due to network transmission delay jitter or PC operating system performance jitter, the interval time between two packets received by the PC will jitter. If it exceeds this set value, it is considered to have a packet timeout. It is recommended to set the range of 4~100ms. If a packet timeout occurs, it is necessary to check the network and computer load situation.
	Maximum number of retransmission packets per frame: The cumulative maximum number of retransmission packets allowed per frame of an image. If the cumulative number of retransmission packets in a frame of actual image acquisition exceeds this value, the image will be directly discarded to avoid a large number of retransmission requests interfering with normal image acquisition in the future. The recommended value for this value varies depending on the average network bandwidth usage. The proportion of this value to the number of image packets per frame should not exceed the average network idle bandwidth ratio. It is recommended to set it uniformly to 1024.
	Maximum number of waiting packets per frame: Abandoned, no practical use.
	Single frame retransmission window size: A retransmission window designed to address packet reordering and retransmission efficiency issues caused by switches. It is recommended that users do not make any modifications and maintain the default value of 50.
	Number of saved burr detection images: Set the number of saved burr detection images.
	Burr detection image saving ratio: Set the burr detection image saving ratio.
	Path for saving burr detection images: Set the path for saving burr detection images.

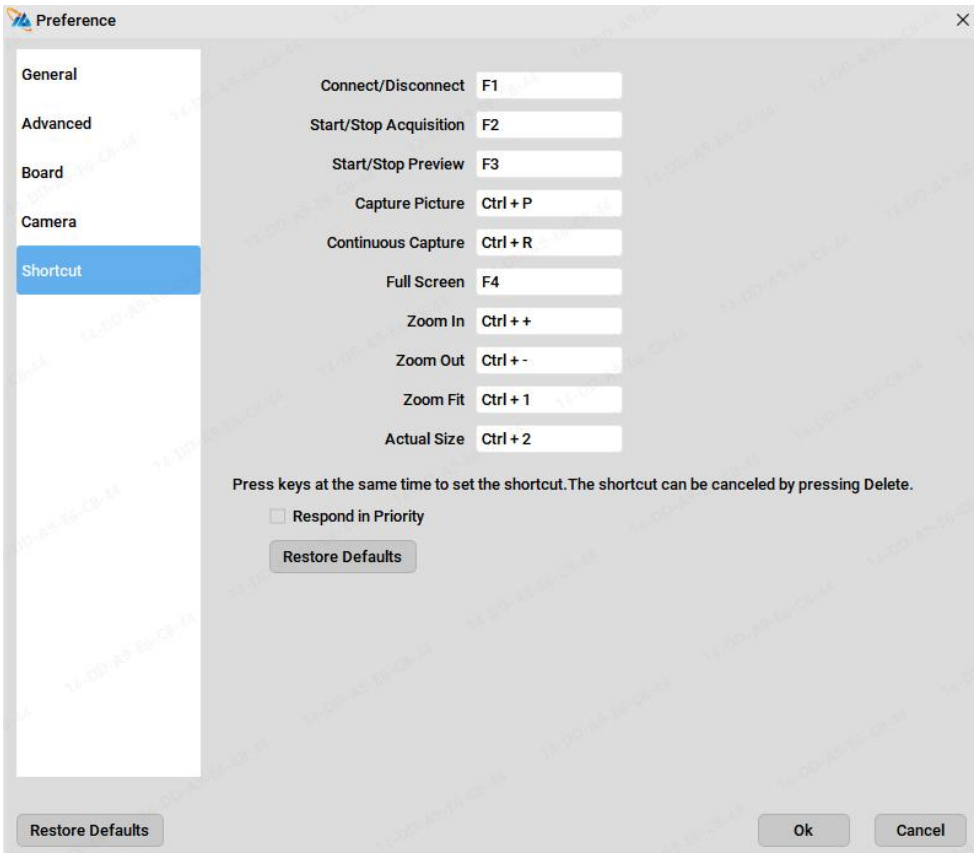

Fig.31 Preference: Shortcut Keys

Table10 Preference: Shortcut Keys Function Description

Function	Description
Shortcut Key List	Display shortcut keys corresponding to various operations.
Priority Response	When this option is checked, if there is a conflict between the IKapCViewer shortcut key and other application shortcut keys, the corresponding function of the IKapCViewer shortcut key will be used first.
Restore Default Values	Shortcut keys restore default settings.

4.4.2 Image Processing

Image processing includes calculation of noise standard deviation, sharpening and denoising settings, and independent configuration of image processing parameters for each device.

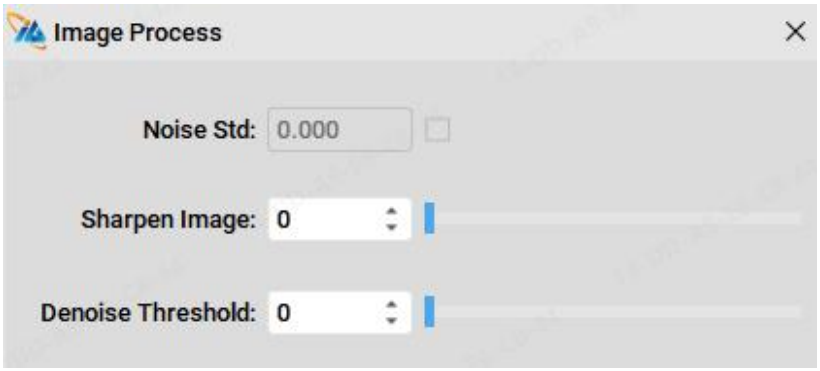

Fig.32 Image Processing

TIPS

- Noise standard deviation: used to estimate the degree of image noise, the larger the value, the stronger the noise.
- Sharpening images: used to enhance the edges and other details of an image, making it clearer and more visible, highlighting edge information. The larger the parameter value, the more pronounced the sharpening effect, but it may introduce additional noise.
- Noise reduction threshold: Reduce or eliminate random noise in an image through smoothing operations while retaining as much effective information as possible, making the image smoother and improving image quality. The larger the parameter value, the more obvious the noise reduction effect, but it will make the image edges increasingly blurry.

NOTE

- When the image size is too small, the noise standard deviation is not calculated and the value is always displayed as 0.

4.4.3 Signal Detection

Signal detection is used to grab statistics on the number of trigger signals received by the frame grabber, as shown in the following figure.

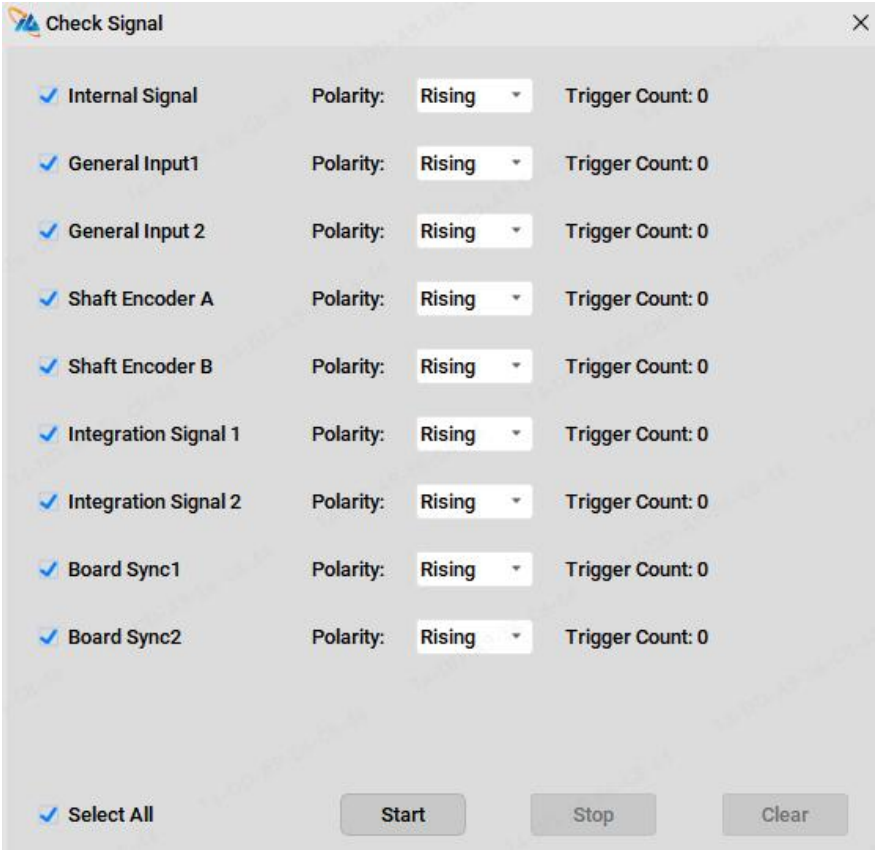

Fig.33 Signal Detection

- Check the trigger signal type that needs to be detected and select the signal polarity.
- The start and stop buttons are used to control the signal detection, and the reset button is used to trigger the reset of the number.
- Obtain the number of signals received by the frame grabber by triggering the number of signals.

4.4.4 Firmware Upgrade

Firmware upgrade is used for online camera upgrade, supporting FPGA, MCU, and XML firmware, as shown in the following figure. The FPGA firmware file format is *.rbzx, the MCU firmware file format is *.binx, and the XML firmware file format is *.xml.

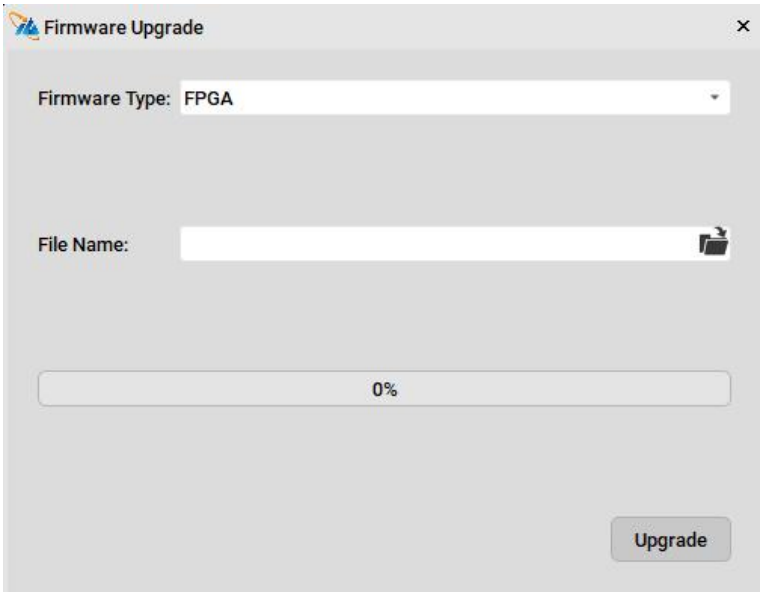

Fig.34 Firmware Upgrade

STEP

- Select FPGA, MCU, or XML type in the firmware category.
- Click on the folder icon at the file name and select the camera firmware file. Note that the file format should match the firmware type.
- Click the upgrade button to upgrade the camera firmware online until the software prompts that the upgrade is complete.

NOTE

- It is recommended to perform MCU firmware upgrade first, followed by FPGA firmware upgrade.
- After the MCU firmware upgrade is completed, the camera can restart without power, while after the FPGA firmware upgrade is completed, the camera needs to be powered off and restarted.

4.4.5 Preprocessing

Preprocessing includes bad pixel correction and flat field correction coefficients, and each function is used as follows.

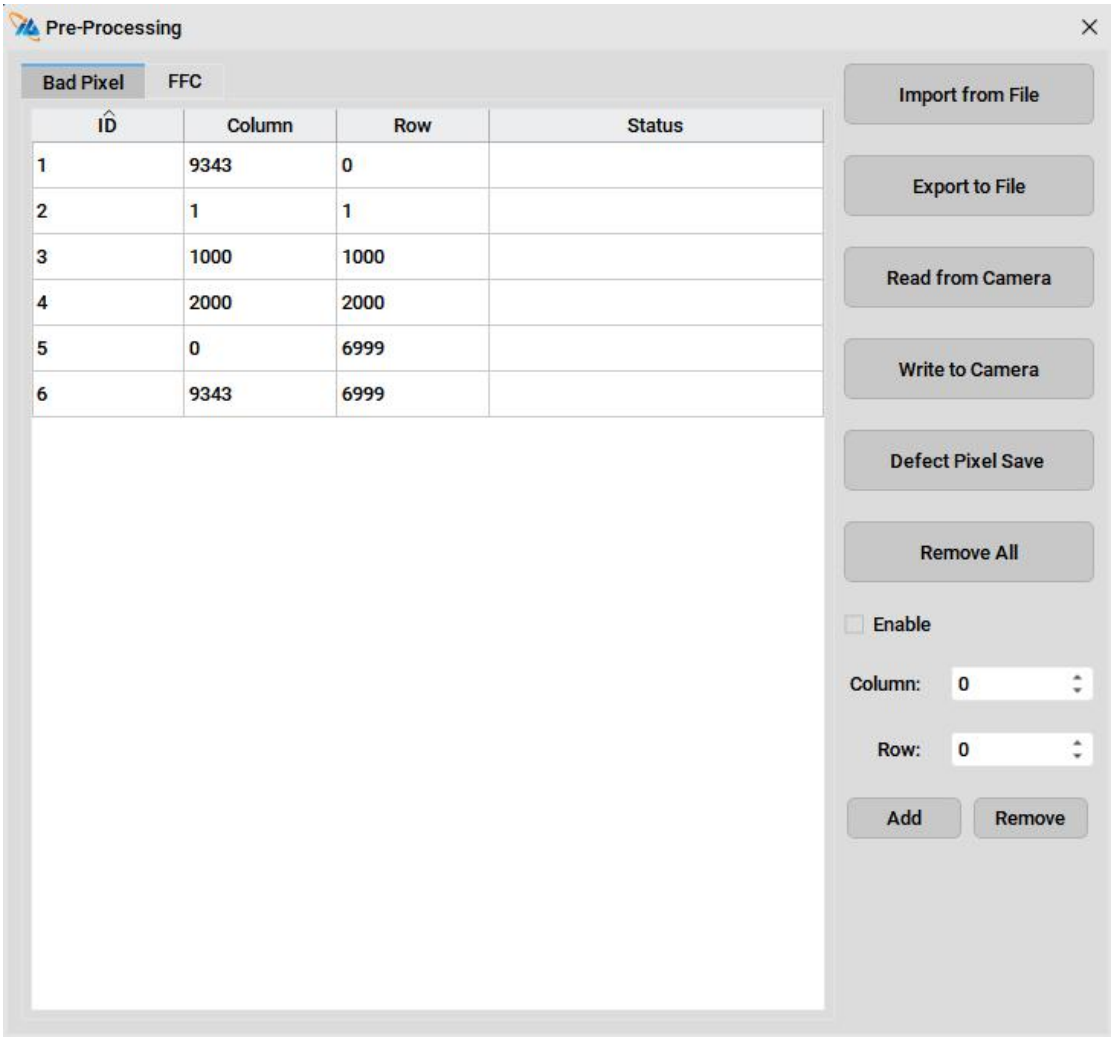

Fig.35 Bad Point Correction

TIPS

- Import from file: Import bad pixel data from a *. csv file.
- Export to file: Export bad pixel data to a *. csv file.
- Read from camera: Read bad pixel data from the camera.
- Write to camera: Write bad pixel data to the camera.
- Enable: Whether to use the bad pixel correction function.
- Column: Manually enter the number of bad pixel columns.
- Line: Manually enter the number of bad pixel rows.
- Add: Add current bad pixel data.
- Remove: Remove the current bad pixel data.

STEP

- Set the coordinates of bad pixels by importing from a file or manually adding them.

- Click the add button to write the bad pixel data to the camera.
- Save bad pixel data to a *.csv file by clicking the export to file button, which can be optionally performed.
- Select the corresponding bad pixel from the bad pixel list and click the remove button to remove the corresponding bad pixel data.
- Check the option to use the camera's bad pixel correction function.

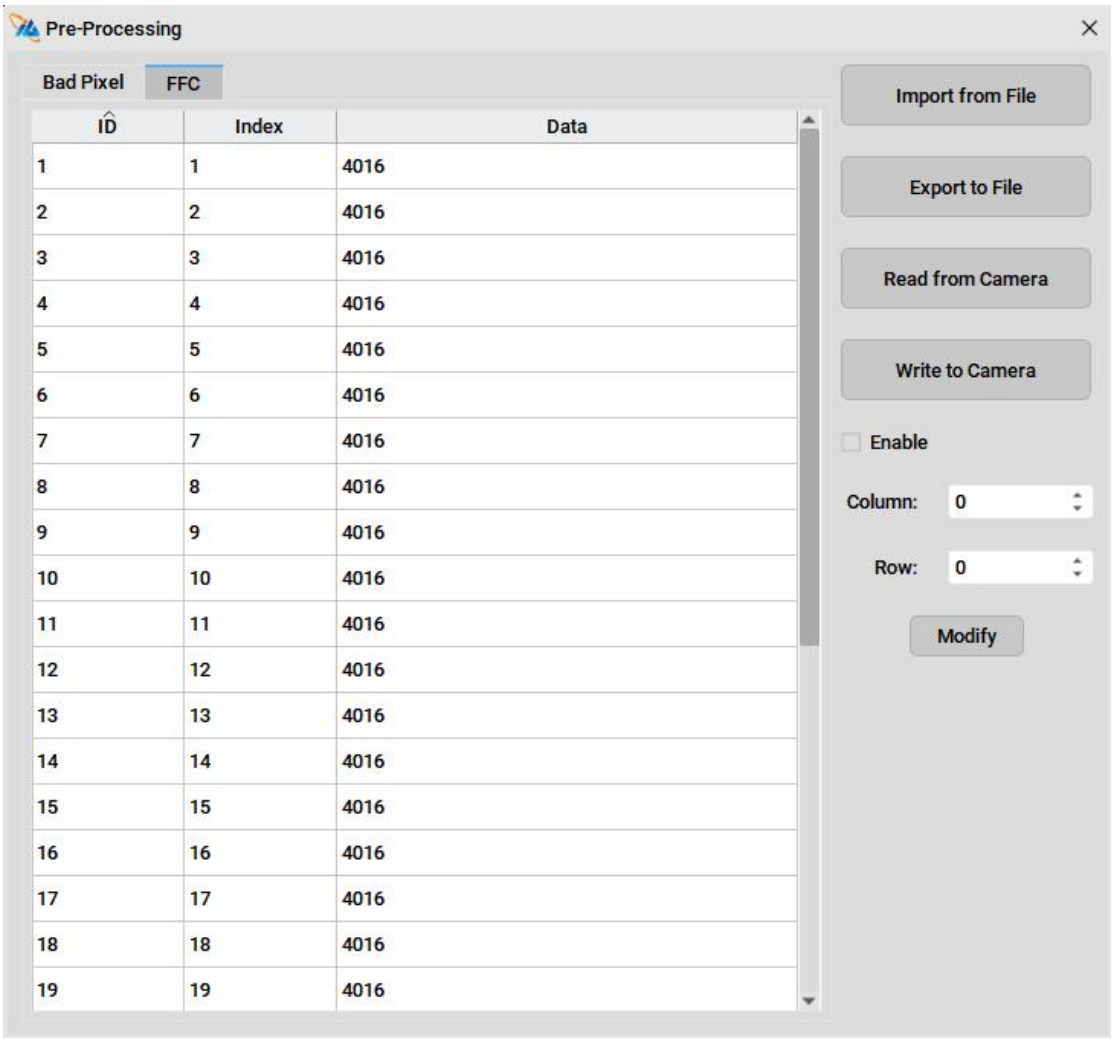

Fig.36 Flat Field Correction Coefficient

TIPS

- Import from file: Import flat field correction data from a *.csv file.
- Export to file: Export flat field correction data to a *.csv file.
- Read from camera: Read flat field correction data from the camera.
- Write to camera: Write flat field correction data to the camera.
- Enable: Whether to use the flat field correction function.
- Column: Index of flat field correction data.
- Line: Index the corresponding flat field correction coefficient.

- Modification: Modify the flat field correction coefficient of the current index.

STEP

- Obtain flat field correction data by importing from a file or reading from camera.
- Select the corresponding data from the flat field correction data list and modify the flat field correction coefficient.
- Export the modified flat field correction data to a file or write it to the camera.
- Check the option to use the camera's flat field correction function.

NOTE

- Setting the flat field correction coefficient one by one is a huge workload, so this function is mainly used for viewing and modifying the flat field correction coefficient. The execution of camera flat field correction can be done through the attribute tree flat field correction control.

4.4.6 File IO

Some cameras support file read and write functions, which can export and write files through file IO, as shown in the following figure.

Fig.37 File IO

STEP

- Write external files to the camera by right clicking on the pop-up window and reading files from the PC. Note that the file size cannot exceed the remaining space size.
- Select the desired camera file, right-click on the pop-up window and select 'Write File to PC' to export the camera file to PC.

❖ Select the desired camera file and delete the corresponding file by right clicking on the pop-up window and selecting “Delete File”.

4.4.7 Toolsets&Other Tools

Toolkit summarizes the C/C # sample code and all additional tools of IKapCViewer, making it easy for users to find and quickly use. The details are shown below.

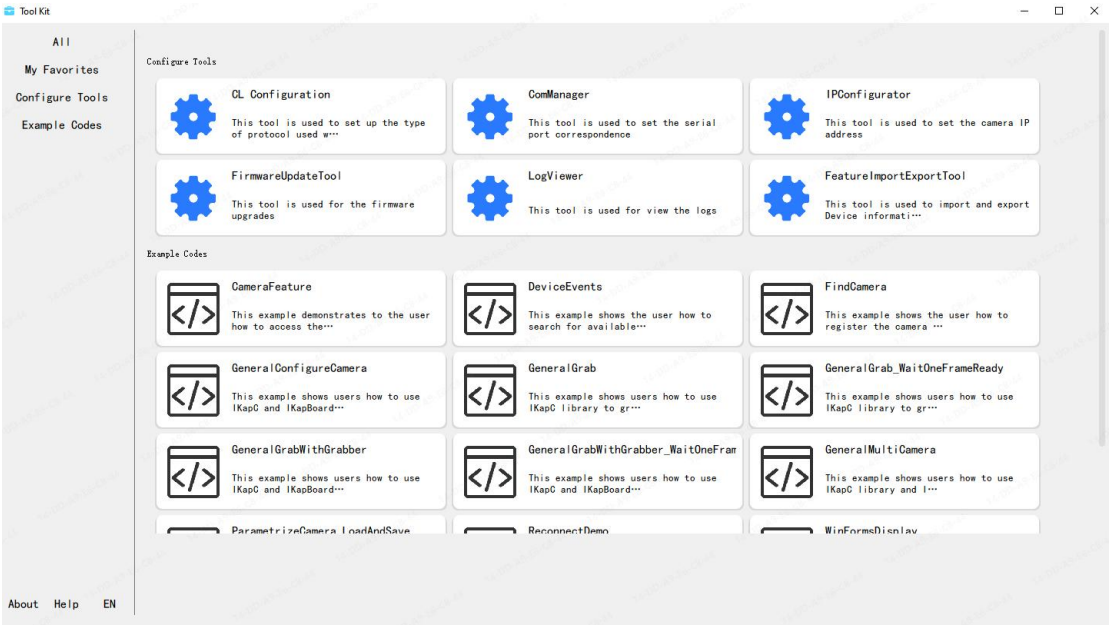

Fig.38 Toolsets

TIPS

❖ For specific usage of toolsets and corresponding tools, please refer to the “Tool Kit User Manual”.

4.5 Help

“Help” menu is mainly used for language, software version information, and user manual management, as shown below.

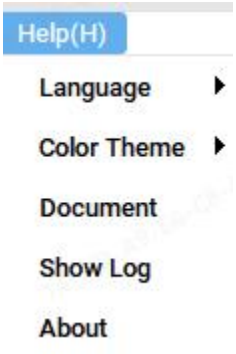

Fig.39 “Help” Menu

Table11 “Help” Menu Function

Function	Description
Language	Set the software display language, which can be selected as Chinese or English.
Color Theme	Set the software color theme, you can choose a white theme or a black theme.
File	Open the installation package user manual folder.
Display Logs	Open the software work log folder.
About	Display software version information.

5 Toolbar

IKapCViewer toolbar provides some commonly used function buttons for users to quickly operate, as shown in the following figure.

Fig.40 Toolbar

Table12 Toolbar Icons and Functions

Icon	Description
	Open the frame grabber configuration file.
	Save the frame grabber configuration file.
	Detect all devices connected to the current computer.
	Open the currently selected individual device.
	Open all devices under the currently selected interface.
	Close the currently selected individual device.
	Close all devices under the currently selected interface.
	Batch start image acquisition, which means all currently open devices start image acquisition.
	Batch stop image acquisition, which means all currently open devices stop image acquisition.
	Parameter rationality verification.
	Number of views.
	Enlarge and display the image.
	Image reduction display.
	Image adaptive window display.
	Horizontal waveform diagram.
	Vertical waveform diagram.

	Image analysis.
	Pixel view.
	Mark line.
	ROI analysis.
	Pixel measurement.
	Output information.
	Acquisition status.
	Watermark information, only applicable to cameras with watermark function.

5.1 Number of Views

The number of views is used to select the number of sub windows in the image display area, and currently supports creating up to 9 sub windows. The number of views must be greater than the number of devices that have already been opened, otherwise the software will prompt a pop-up window, as shown in the following figure. If the currently created view is full but other devices still need to be opened, IKapCViewer will automatically match the number of views to the appropriate value.

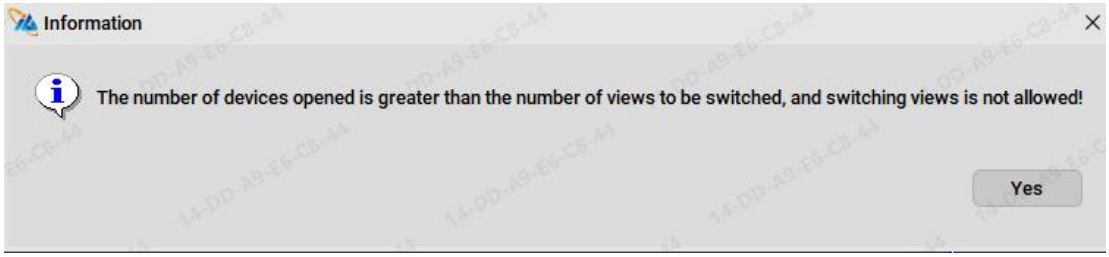

Fig.41 Number of Views is less than the Number of Opened Devices

Users can define the number and arrangement of sub windows in the image display area as needed, as shown in the following figure.

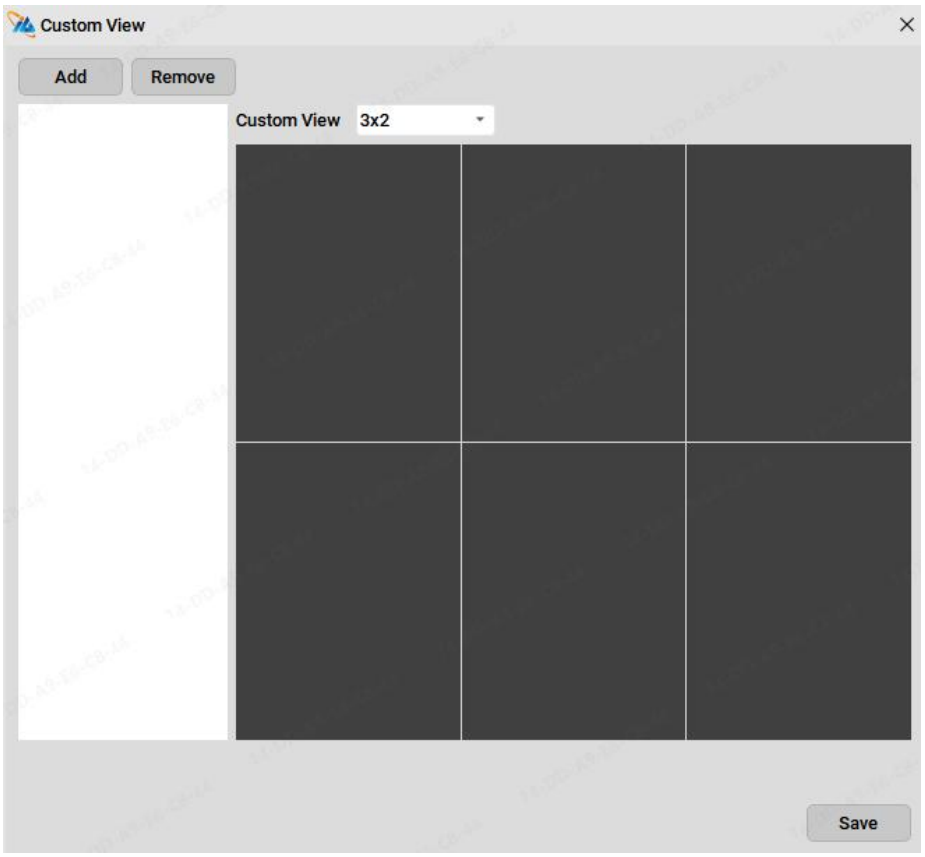

Fig.42 Customize Sub Window Interface

5.2 Horizontal/Vertical Waveform Diagram

The vertical axis of the horizontal waveform represents the size of the pixel's grayscale value (from bottom to top corresponding to the grayscale value from small to large), each grid represents one fourth of the maximum grayscale value of the pixel, and the horizontal axis represents the pixel number (from left to right corresponding to the line pixel number from small to large). If it is a color image, the grayscale values of the R, G, and B components in the image will be represented by red, blue, and green, respectively.

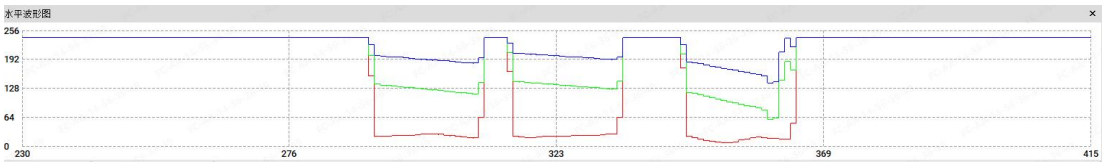

Fig.43 Horizontal Waveform Diagram

The horizontal axis of the vertical waveform represents the size of the pixel grayscale value (from right to left, corresponding to the grayscale value from small to large), each grid represents a quarter of the maximum pixel grayscale value, and the vertical axis represents the pixel number (from top to bottom, corresponding to the row number from small to large). If it is a color image, the grayscale values of the R, G, and B components in the image will be represented by red, blue, and green, respectively.

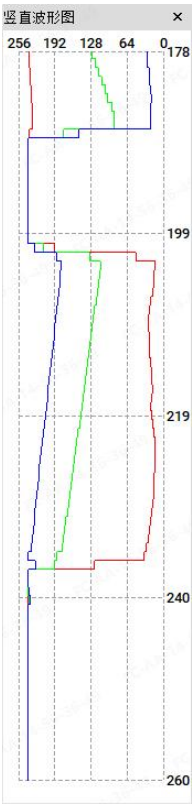

Fig.44 Vertical Waveform Diagram

TIPS

❖ Horizontal/vertical waveform diagrams of each sub window in the image display area are displayed independently.

5.3 Image Analysis

Image analysis function will display an image histogram window, which is used to view the corresponding grayscale values of each channel and the statistical histogram of the overall grayscale value of the image. The horizontal axis of the histogram represents the grayscale values of each component, and the vertical axis represents the number of pixels corresponding to each grayscale value.

The lower part of the histogram lists the statistical information of the currently specified row, column, and entire image data. Users can manually select the channels, line coordinates, and column coordinates for data statistics in the editing box, or select them through marker lines in the image display area.

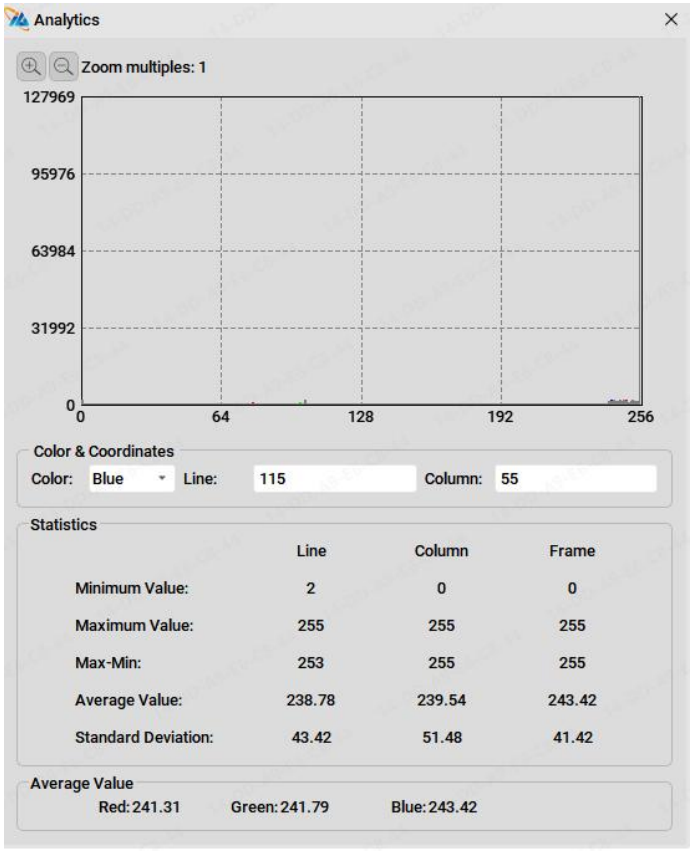

Fig.45 Image Analysis

5.4 Pixel View

Pixel view is used to display the grayscale value information of the entire image, and can be displayed in decimal or hexadecimal format.

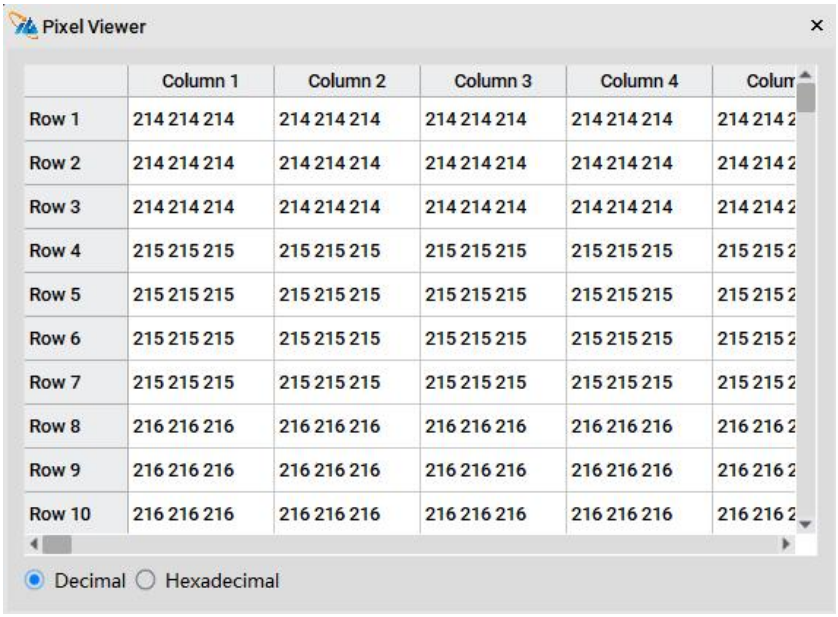

Fig.46 Pixel View

5.5 ROI Analysis

When users use ROI analysis, they can select any image area in the image display area for data analysis. The starting point of ROI is the position clicked with the left mouse button. Dragging the mouse can change the size of ROI. The interface input box can adjust the position and size of the selected area, and obtain the starting point, ending point, pixel area, and actual area of ROI through the interface.

In the ROI analysis window, you can view the grayscale values of each channel corresponding to the ROI area and the statistical histogram of the overall grayscale values. The horizontal axis of the histogram represents the grayscale values of each channel, and the vertical axis represents the number of pixels corresponding to each grayscale value. Users can also choose to separately count the histogram information of odd pixels, idol pixels, and all pixels in the ROI area.

The lower part of the histogram lists the statistical information of the specified lines, columns, and overall in the current ROI area. Users can manually select the channels, row coordinates, and column coordinates for data statistics in the editing box, or select them through marker lines in the image display area.

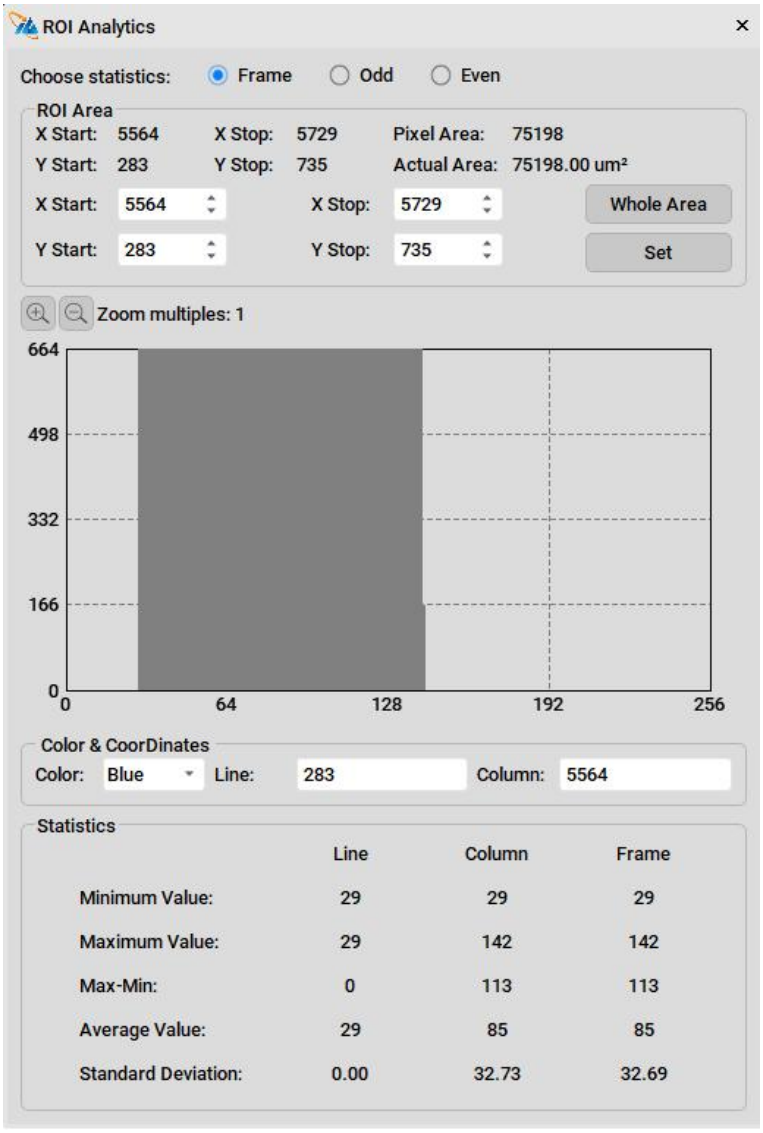

Fig.47 ROI Analysis

5.6 Pixel Measurement

Pixel measurement can measure the horizontal distance, vertical distance, and Cartesian distance of any two pixels in an image. The starting point of the measurement is the click position of the left mouse button, and the endpoint of the measurement dynamically changes with the movement of the user's mouse.

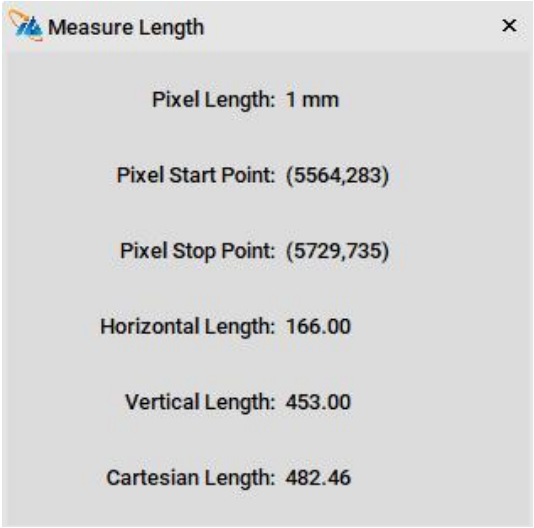

Fig.48 Pixel Measurement

TIPS

- Pixel length: The actual physical length corresponding to each unit pixel length can be set in the menu bar - Tools - Preferences - General section for its size and unit.
- Pixel starting point: The starting coordinate of the measured line segment.
- Pixel endpoint: Measure the endpoint coordinates of a line segment.
- Horizontal length: Measures the horizontal distance of a line segment.
- Vertical length: Measures the vertical distance of a line segment.
- Cartesian length: Measures the Cartesian distance of a line segment.

5.7 Acquisition Status

Acquisition status is used to monitor the real-time acquisition status of all currently open devices, as shown in the following figure.

Fig.49 Acquisition Status

5.8 Watermark Information

The watermark information is used to display the watermark of cameras with chunk function, and the chunk function needs to be enabled on the camera side to obtain it. Users can select the type of watermark information to be displayed in the upper left corner of the interface.

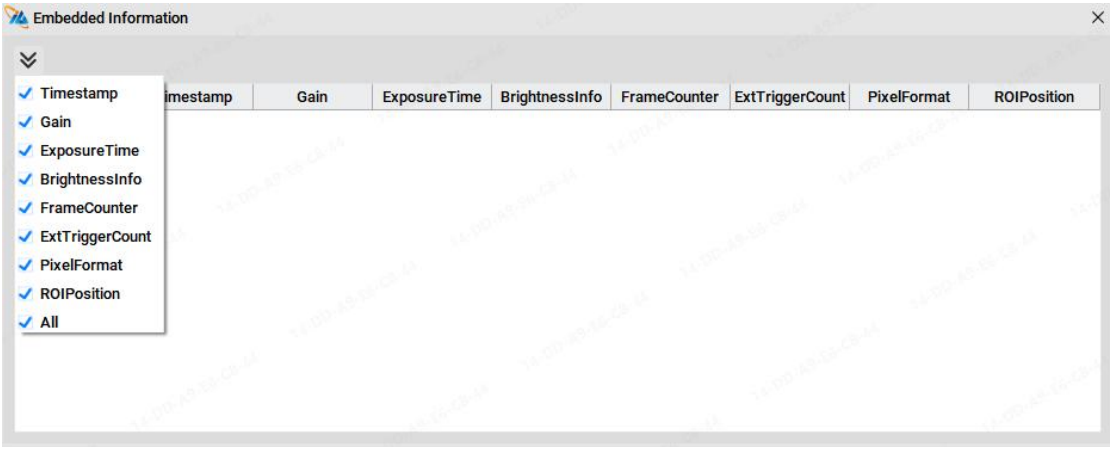

Fig.50 Watermark Information

6 Device List

Device list lists all cameras and frame grabbers currently connected to the computer by interface type. Users can open the selected device by double clicking or using the corresponding icon in the toolbar.

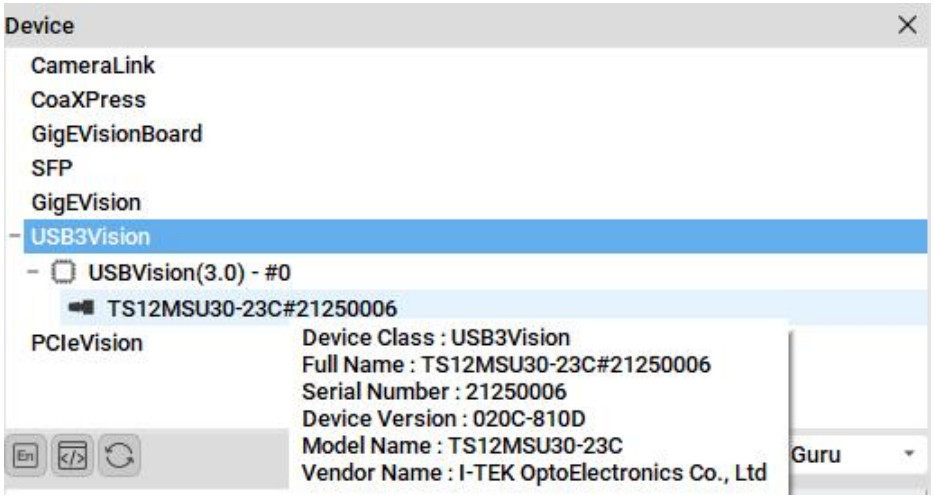

Fig.51 Device List

When the mouse pointer is hovering over the device, it will display the basic information of the current device.

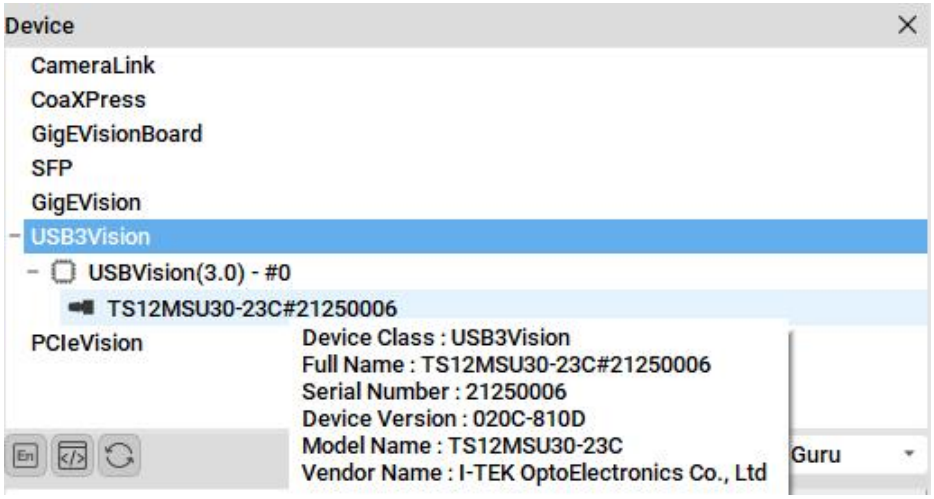

Fig.52 Basic Equipment Information

TIPS

- When the connected device is a GigE Vision camera, IKapCViewer will automatically analyze whether the camera IP address conflicts. If there are conflicts, they will be displayed in red font. When opening the GigE Vision camera, IKapCViewer will automatically modify the IP address.

7 Attribute Tree

Attribute tree is used to display and configure the characteristics of the frame grabber and camera, and is divided into frame grabber attribute tree, camera attribute tree, common attributes, trigger, advanced attributes, and exposure.

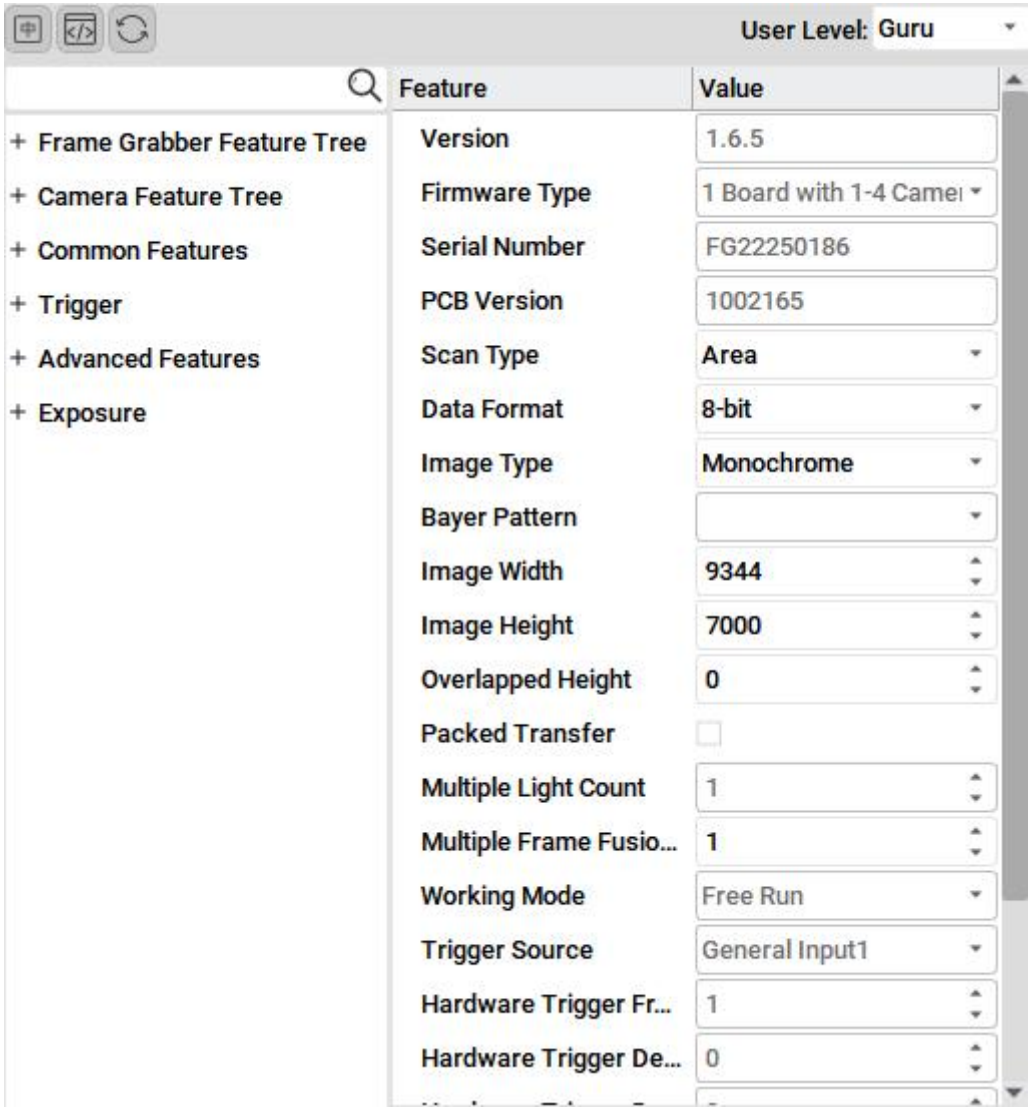

Fig.53 Attribute Tree

Table13 Attribute Tree Branch

Branch	Description
Frame Grabber Attribute Tree	Display all feature information of the frame grabber device, select the feature and right-click on “Add to Favorites” to summarize the selected features in the favorites list. Right click on “Remove” after selecting a feature from your favorites to remove it from your favorites.
Camera Attribute Tree	Display all feature information of the camera device, select the feature and right-click on “Add to Favorites” to summarize the selected features in the favorites list. Right click on “Remove” after selecting a feature from your favorites to remove it from your favorites.

Common Attributes	List the features that may be frequently configured.
Trigger	List the relevant features triggered by the device.
Advanced Attributes	List image processing related features.
Exposure	Used for automatic exposure control to automatically adjust the grayscale value of the image to the set value.

TIPS

- When modifying the camera features, the corresponding features on the frame grabber will be automatically updated.
- Users can select the feature display language, feature example code display, feature value refresh, and feature display level through the buttons at the top of the attribute tree.
- Users can search for features by entering the feature name through the search box at the top of the branch.

STEP

- The lookup table control interface and configuration method are as follows:

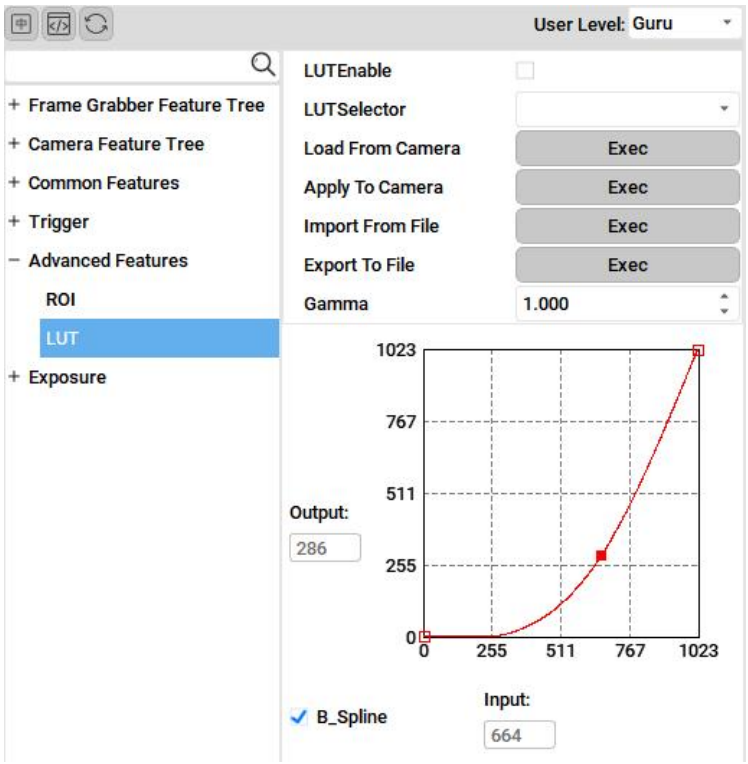

Fig.54 Advanced Attribute: LUT

- Select the desired set of lookup table parameters. If the camera only supports one lookup table parameter set, this step can be ignored.
- By importing files, setting gamma coefficients, or B-spline curves, the input-output mapping relationship of lookup tables can be established.
- Click the save to camera button to write the mapping relationship to the camera.
- You can choose to save the mapping relationship to a *.csv file by clicking the save to file button. This step is optional.
- Check the option to use the camera lookup table function.

❖ The automatic exposure control interface and configuration method are as follows:

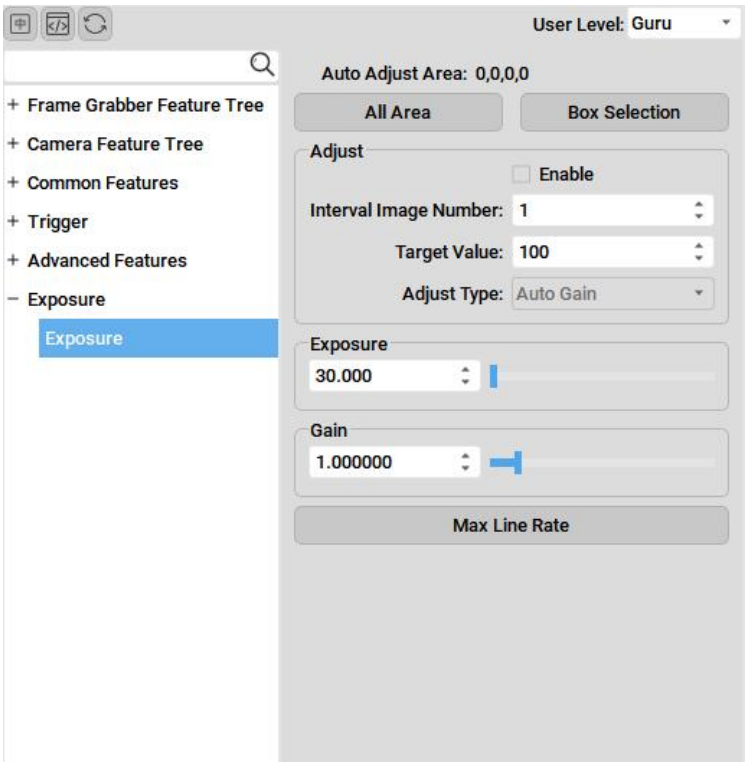

Fig.55 Attribute Tree: Exposure

- Select the grayscale adjustment area, which can be chosen as the entire area or a boxed area. The starting point of the boxed area is the position where the left mouse button is clicked, and dragging the mouse can change the size of the area.
- Set the target grayscale value.
- Check the enable button and wait for the average grayscale value of the selected area to automatically adjust to the target grayscale value. If the grayscale value of the image continues to change and is unstable, the number of interval images can be appropriately increased.
- If necessary, you can set the camera's acquisition line rate to the maximum value by clicking the maximum line rate button.

8 Feature Information Area

The feature information area is used to display the specific information of the currently selected feature, including feature name, data type, parameter range, etc.

Fig.56 Feature Information Area

9 Image Display Area

The image display area is used to display the grabbed images in real time, and users can control the image display by right clicking on the view toolbar or image display area.

9.1 View Toolbar

The image display area view toolbar is shown below.

Fig.57 View Toolbar

Table14 View Toolbar Icons and Functions

Icon	Description
	Currently selected device for single frame acquisition.
	Currently selected device is continuously grabbing data.
	Currently selected device has stopped grabbing data.
	Software triggered.
	Is the image previewed in the display area.
	Sharpness indicator, used to reflect the clarity of an image.
	Export the image to a *.csv table.
	Open the image.
	Save the image.
	Save image sequence.
	Record a video and generate *.h264 video files in the specified directory.

9.1.1 Export Image

For a monochrome image, the pixel numbers in the *.csv file correspond to the positions from left to right and top to bottom in ascending order. As shown in the figure below, P1 represents the grayscale value of the first pixel, P2 represents the grayscale value of the second pixel, and PN represents the grayscale value of the Nth pixel.

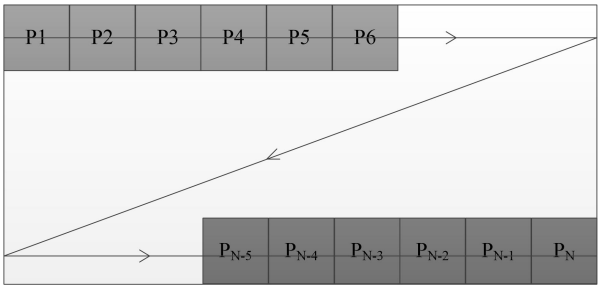

Fig.58 Monochrome Image Data Arrangement

For a color image, the pixel numbers in the *.csv file correspond to the positions from left to right and top to bottom in ascending order, with the B channel data of each pixel stored as the first value, the G channel data as the second value, and the R channel data as the third value. As shown in the figure below, B1, G1, and R1 represent the blue, green, and red channels of the first pixel, B2, G2, and R2 represent the blue, green, and red channels of the second pixel, and BN, GN, and RN represent the blue, green, and red channels of the Nth pixel.

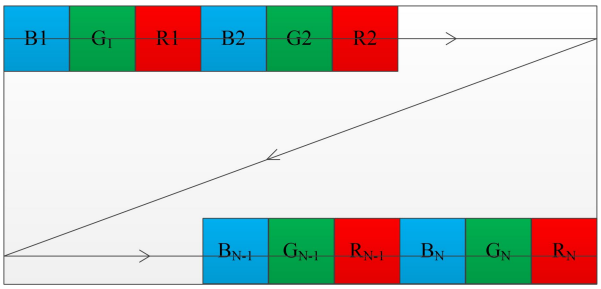

Fig.59 Color Image Data Arrangement

9.1.2 Open Image

The image formats supported by IKapCViewer include bitmap (*. bmp), JPEG image (*. jpg, *. jpeg), PNG image (*. png), TIFF image (*. tif, *. tif), raw image (*. raw), and iim image (*. iim). When the image type is in raw format, users need to fill in the corresponding image information.

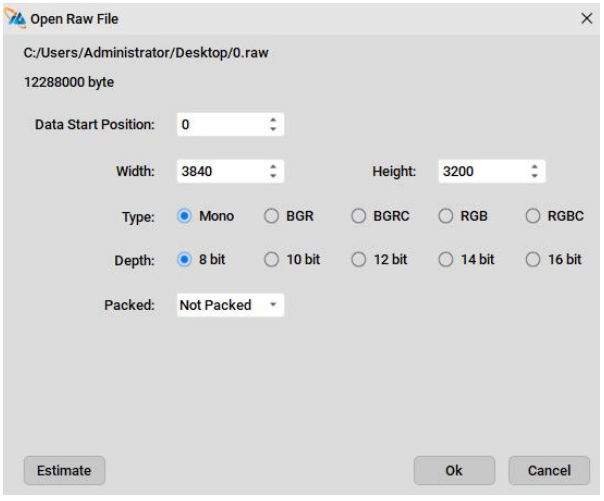

Fig.60 Raw Image Information

9.1.3 Save Image

Used to save the currently grabbed single frame image. For raw format images, IKapCViewer uses small end storage.

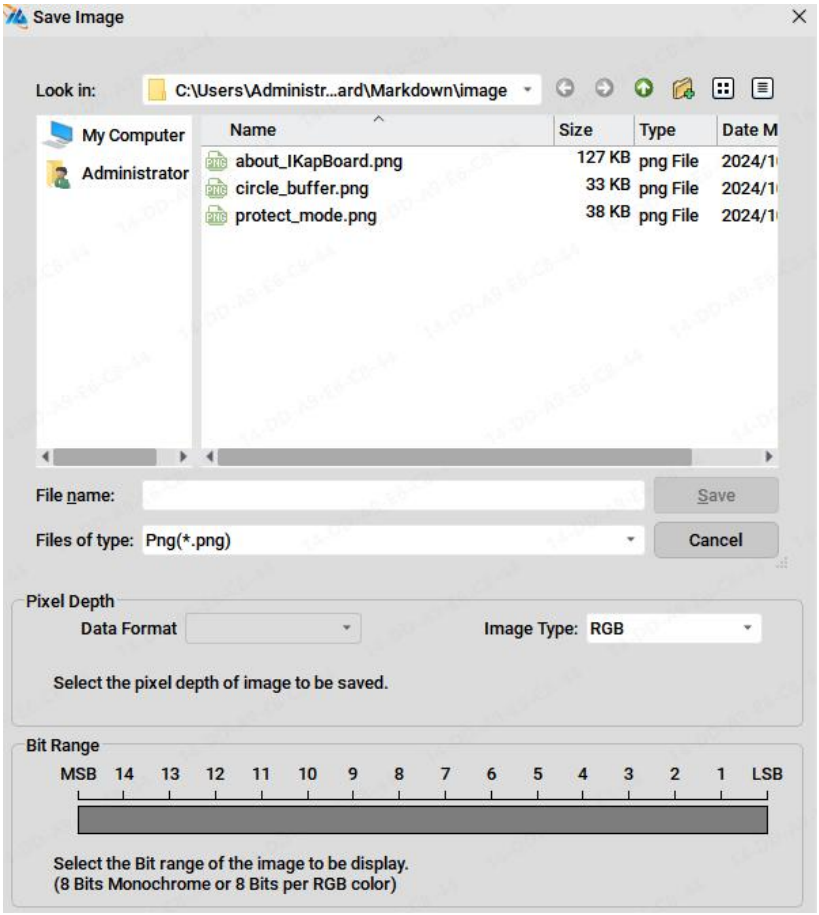

Fig.61 Save Image

TIPS

- For images with pixel depth greater than 8bit, users can choose to save all pixel information, capture any 8bit data, or stretch pixels to 16bit.
  - Save all pixel information: Select 16bit from the data mode drop-down menu, and each channel data of each pixel will be saved in two bytes.
  - Extract any 8bit data from it: Select 8bit from the data mode drop-down menu. At this time, each channel data of each pixel will be saved in one byte, and the effective data range can be selected within the bit range.
  - Pixel stretching to 16bit: Select the data mode drop-down box to stretch to 16bit. At this time, each channel data of each pixel will be saved in two bytes, and the pixel grayscale value will be proportionally enlarged, with a maximum grayscale value of 65535.

9.1.4 Save Image Sequence

Used to save multiple frames of images currently grabbed. When saving image sequences, users need

to specify the image save path, input the prefix and suffix of the file name, the starting number of the suffix, the number of image files, and the image suffix. The names of continuously saved images are named in the form of “prefix suffix number”, with the suffix number increasing from the starting number of the image to the number of images saved.

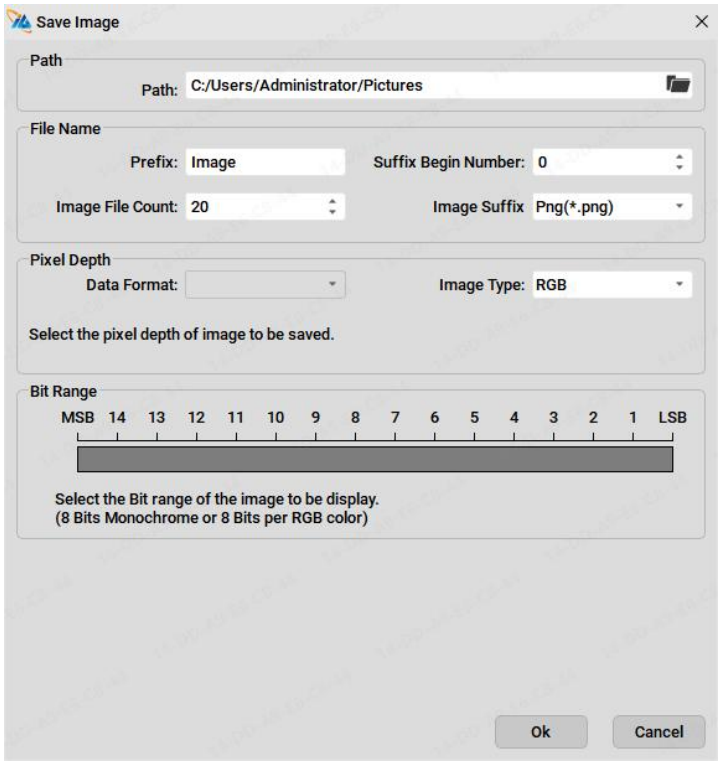

Fig.62 Save Image Sequence

TIPS

- For images with pixel depth greater than 8bit, users can choose to save all pixel information, extract any 8bit data, or stretch pixels to 16bit. For specific instructions, please refer to the “Save Image” section above.

9.2 Mouse Wheel

IKapCViewer supports using the mouse wheel to directly zoom in or out of the currently displayed image. When the mouse scrolls forward, the image shrinks. With each step of scrolling, the image shrinks proportionally by half. When the mouse scrolls back, the image is enlarged, and with each step of scrolling, the image is proportionally doubled. When enlarged to a certain scale, the image is divided into pixel squares, and each square displays the coordinate position and grayscale value of the pixel.

(961, 1405) 114	(962, 1405) 87	(963, 1405) 114	(964, 1405) 88	(965, 1405) 116	(966, 1405) 88	(967, 1405) 111
(961, 1406) 142	(962, 1406) 113	(963, 1406) 144	(964, 1406) 114	(965, 1406) 145	(966, 1406) 113	(967, 1406) 144
(961, 1407) 114	(962, 1407) 87	(963, 1407) 118	(964, 1407) 88	(965, 1407) 118	(966, 1407) 86	(967, 1407) 115
(961, 1408) 140	(962, 1408) 114	(963, 1408) 138	(964, 1408) 114	(965, 1408) 141	(966, 1408) 114	(967, 1408) 145
(961, 1409) 115	(962, 1409) 85	(963, 1409) 115	(964, 1409) 89	(965, 1409) 113	(966, 1409) 88	(967, 1409) 114

Fig.63 Pixel Information Display

9.3 Right Click on the Display Area

Right click on the image display area and a shortcut operation for viewing the image will pop up, as shown in the following figure.

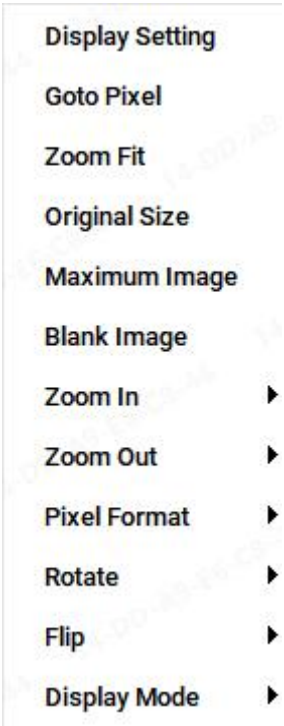

Fig.64 Right click on the Image Display Area

Table15 Right Click Function in Display Area

Function	Description
Image Bit Count	Configure the pixel format and bit range for image display.

Pixel Jump	Jump to the specified coordinate pixel.
Adaptive	Image adaptive window for proportional scaling.
Zoom	Set the image display scale, including the original size, maximum image size, and various scaling factors.
Rotate	Set the image rotation method, including no rotation, 90 ° left rotation, and 90 ° right rotation.
Flip	Set image flipping methods, including no flipping, X-axis flipping, Y-axis flipping, and XY axis flipping.
Numeric Format	Set the decimal and hexadecimal formats for displaying pixel grayscale values.
Display Channel	Set the image display mode, and the options may vary depending on the current pixel format of the image.
Black Image	Clear the image to a completely black image.

9.3.1 Image Bit Count

IKapCViewer achieves real-time display of images. For non 8bit images, IKapCVierwer can achieve high adaptability image display through automatic truncation operation, and users can also adjust the display range of effective images by configuring the lowest bit.

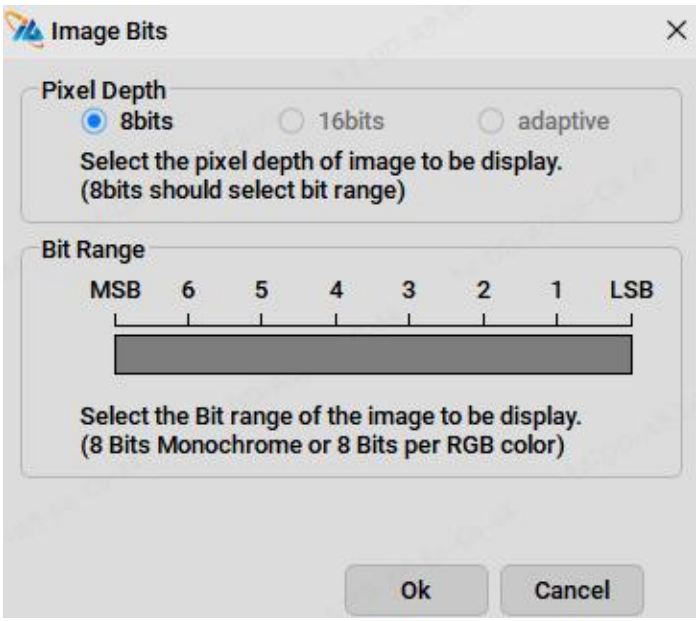

Fig.65 Image Bit Count

TIPS

- Pixel depth represents the display accuracy of an image. If the user uses 8bit image display, please select 8bit; If using 16bit image display, please select 16bit or adaptive. For non 8bit images, IKapCViewer defaults to adaptive display.
- The bit range represents the range of bit truncation. For non 8bit images, if choosing to use 8bit image display, it is necessary to specify the range of segmentation. IKapCViewer allows users to

capture any 8bit within the image accuracy range as the effective part of the image display. IKapCViewer defaults to grabbing the top 8 digits.

NOTE

❖ Bit cropping only affects the display effect of the image and does not affect the software's ability to accurately capture the image.

9.3.2 Pixel Jump

When using the pixel jump function, a coordinate setting dialog box will pop up as shown in the following figure. After entering the X and Y coordinate positions in the dialog box and clicking OK, the marking line will automatically move to the set coordinate position.

Fig.66 Pixel Jump

10 Information Output Box

Display software prompt content, including three levels: prompt, warning, and error.

Fig.67 Information Output Box

NOTE

❖ When multiple devices are used simultaneously, prompt to distinguish by device name.

11 Status Bar

IKapCViewer status bar displays acquisition related information, and users can select the content to be displayed in the lower right corner of the status bar.

Fig.68 Camera Status Information

Fig.69 Frame Grabber Status Information

Fig.70 Status Bar Information Options

12 FAQ

- **If the camera doesn't light up,**
  - Check if the camera power is connected.

- **If the device cannot be scanned,**
  - Check if the network is connected.
  - Scan multiple times to check if the scan is successful.

- **If there is an IP address conflict,**
  - Read the "Tool Kit User Manual" and find a solution.

- **If opening the device fails,**
  - Check the software prompt information and determine the reason for the failure.

- **If there is no image after the camera starts grabbing,**
  - Reopen the software, start collecting again, and observe if there are any images.
  - Detect camera trigger mode, if triggered externally, add external trigger source.

- **If the frame rate does not meet expectations,**
  - Adjust camera parameters to increase acquisition frame rate.
  - Replace with a host with better performance.
  - Replace the network card with a better performance one.
  - Contact our company's technical support.

- **If the GigE Vision camera grabs lost frames,**
  - Reduce the frame rate appropriately.
  - If multiple cameras acquisition data simultaneously, multiple network cards can be used to share the bandwidth occupied by the network.

- **If the frame grabber grabs lost frames,**
  - Reduce the frame rate appropriately.
  - DDR bandwidth is insufficient, replace with a better performing host or increase memory modules.

- **If loading the configuration file fails,**
  - The configuration file may be an old version, please replace it with the latest version of the configuration file.