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QtCAM

See3CAM_12CUNIR - Linux User Manual

Revision 1.3
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Contents

1 Revision History

Rev No	Date	Major Changes	Edited By
1.3	04 Nov 2015	Added QtCAM installation procedure from Ubuntu Launchpad - Ubuntu 12.04	Business Development Team
1.2	19 Oct 2015	Minor edits and Review	Business Development Team
1.1	15 Oct 2015	Added QtCAM installation procedure from Ubuntu Launchpad - Ubuntu 14.04	QT Application Team
1.0	01 Oct 2015	Initial Version	QT Application Team

2 Introduction

The See3CAM_12CUNIR is a 1.2Mega pixel, monochrome, UVC Compliant, USB3.0 Super Speed camera from e-con Systems, a leading embedded Product Design Services Company which specializes in advanced camera solutions.

The See3CAM is a new family of USB3.0 Super Speed camera products launched by e-con and See3CAM_12CUNIR is a member of this family.

The See3CAM_12CUNIR has 1/3" CMOS Digital Image sensor namely AR0130 from Aptina. This sensor has superior low light performance in all supported resolutions and it also has excellent Near IR performance with electronic rolling shutter readout.

This See3CAM_12CUNIR is a UVC-compliant USB3.0 Super Speed Camera that is also backward compatible with USB2.0 host ports and does not require any special camera drivers. The See3CAM_12CUNIR is supported with S-mount lens holder for enabling the users to choose the lens as per their requirements.

The See3CAM_12CUNIR is UVC-compliant camera and it does not require any additional drivers to be installed on the PC. The native UVC drivers of Windows and Linux Operating Systems shall be compatible with this camera.

e-con also provides a sample application (QtCAM) that demonstrates some of the features of this camera. However, this camera can be utilized by any V4L2 application such as Skype etc.

3 Scope

e-con provides a sample V4L2 application, called **QtCAM,** along with the See3CAM_12CUNIR camera. QtCAM is V4L2 video viewer and capture software for the Linux UVC driver, but is also customized to demonstrate some of the features of See3CAM_12CUNIR.

This document describes about the usage of the QtCAM application on Ubuntu [>=12.04 (LTS)] 32- and 64-bit Linux operating systems. This document also describes about the special features of QtCAM camera application when it is used with See3CAM_12CUNIR.

4 Product Description

Currently See3CAM_12CUNIR supports **Y16** monochrome format and in this format 3 resolutions are supported in USB3.0 and USB2.0.

USB mode	**Resolution**	**Frame rates [Y16 format]**
USB 3.0	1280x720 1280x960 640x480	60 45 45

USB 2.0	1280x720 1280x960 640x480	12 9 30

The See3CAM_12CUNIR has two major camera controls:

- Brightness
- Exposure (Manual and Auto)

There are two operating modes for See3CAM_12CUNIR:

- Master mode.
- Trigger mode

5 QtCAM Application Description

The QtCAM application is a simple interface for capturing and viewing video from the devices supported by the Linux UVC driver. This tool also supports extension unit control of e-con's See3CAM USB 3.0 webcam products. The features provided in the application are as follows:

1. Enumerating and listing all USB video devices connected.
2. Changing resolution and color space/compression for video stream (if different resolutions are supported by the device)
3. Currently configured values of preview which is being shown.
4. User can capture still images and set the path where still images will be saved.
5. Configure UVC Extension Control (if supported by device)
6. Displaying the current frame rate per second.

All the above listed properties can be configured by attractive and easy to use Graphical User Interface. The application is tested in Ubuntu [>=12.04 (LTS)] 32-bit and 64-bit Linux Distributions.

e-con provides QtCAM application for the following Linux Distributions:

1. Ubuntu 12.04 (LTS) 32- and 64-bit
2. Ubuntu 14.04 (LTS) 32- and 64-bit

6 Pre-Requisites

This section describes the high level instructions to install the See3CAM_12CUNIR on a PC.

6.1 Installation of the See3CAM_12CUNIR and Drivers

Follow the below steps to initialize the device with the host computer.

1. Connect one end of the USB3.0 cable to the USB3.0 connector provided at the back of the See3CAM_12CUNIR, and connect other end to the USB 3.0 host controller on the computer.

2. Once connected, the LED light on the device will glow indicating that See3CAM_12CUNIR

is powered up and ready to use.

As See3CAM_12CUNIR is a generic USB video class device, Linux will automatically detect all the drivers and it will be installed.

6.2 Installing and Launching QtCAM application

6.2.1 Ubuntu Launchpad – Online

To install in **Ubuntu 14.04** from Ubuntu Launchpad, we have to run following commands in terminal.

$ sudo apt-add-repository ppa:qtcam/trusty
$ sudo apt-get update
$ sudo apt-get install qtcam

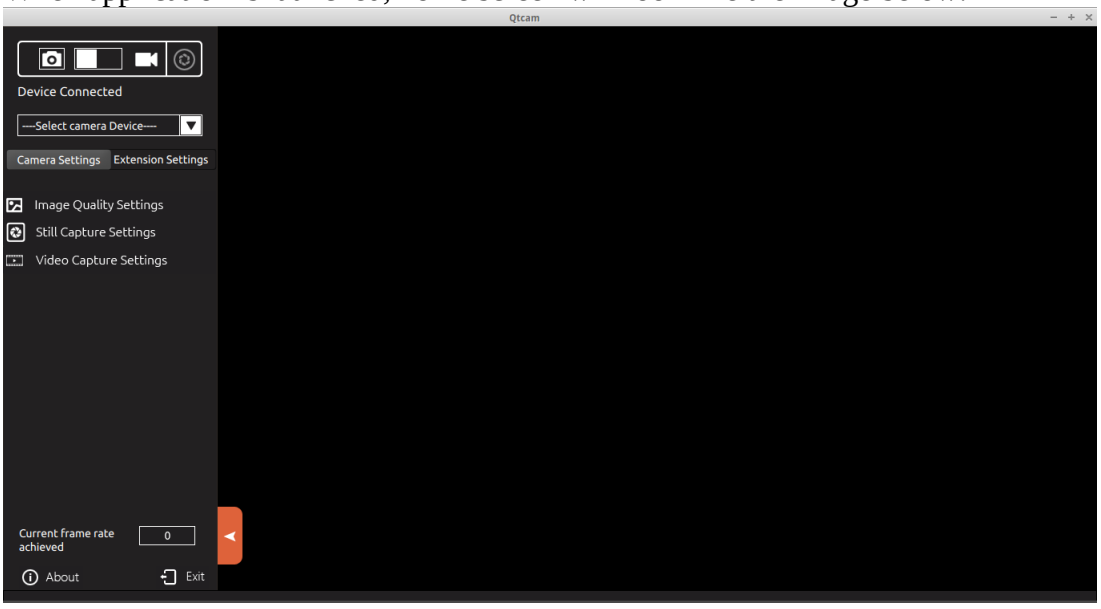
To launch QtCAM application, we have to run following command from the terminal.
$ sudo qtcam

To install in **Ubuntu 12.04** from Ubuntu Launchpad, we have to run following commands in terminal

$ sudo apt-add-repository ppa:qtcam/precise
$ sudo apt-get update
$ sudo apt-get install qtcam

To launch QtCAM application, we have to run following command from the terminal.
$ sudo qtcam

When application is launched, home screen will look like the image below:



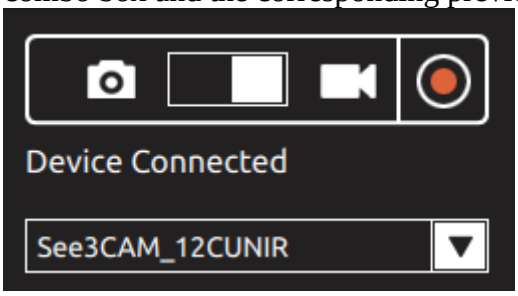
7 Application Features

The features that are supported in the current version of QtCAM are briefly described below:

1. Enumeration and Selection of camera device
2. Still capture
3. Video recording
4. Camera Settings
   a) Image Quality Settings
   b) Still Capture Settings
   c) Video Capture Settings
5. Extension settings

7.1 Enumeration and Selection of camera device

Application will emulate only the USB e-con devices connected to the system. The device name is displayed in the device connected combo box. User can select any one of the camera from the combo box and the corresponding preview is displayed in the right hand side of the side bar.

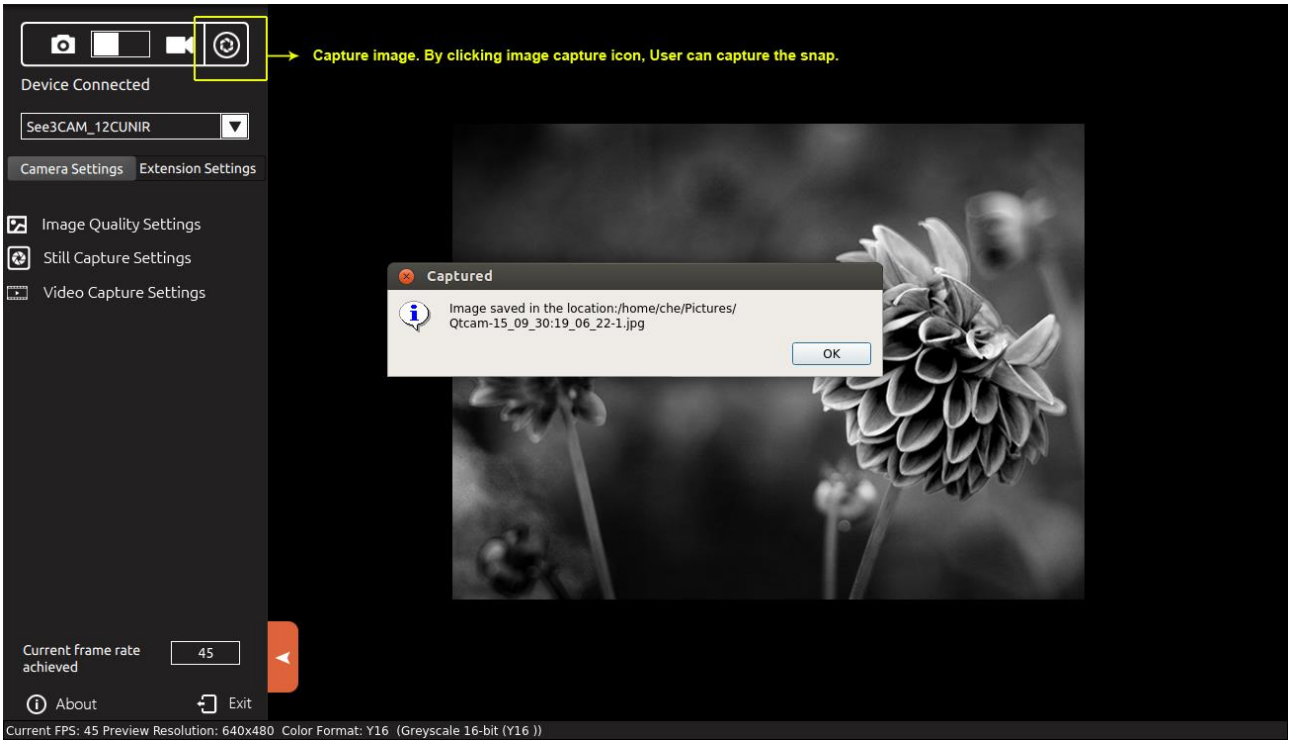


Note: Preview will not be displayed for the device if the camera is busy. i.e., camera is opened by another application like Skype etc. Also, if there are two instances of QtCAM application and both have the same camera selected then there will be no preview displayed in the second instance of the QtCAM application.

7.2 Still capture

Application by default will begin in still capture mode, if the application is in video mode click the camera icon to switch back to still capture mode, the user can capture the still image by clicking capture image icon available side bar or by clicking the preview.

The image will be saved in the directory path, selected in the image location available under the Still Capture Settings menu. The file name for captured image file is "QtCAM-YY_MM_dd:hh_mm_ss", plus the image extension format selected. If the extension format is "jpg", the filename will be "QtCAM-YY_MM_dd:hh_mm_ss.jpg"



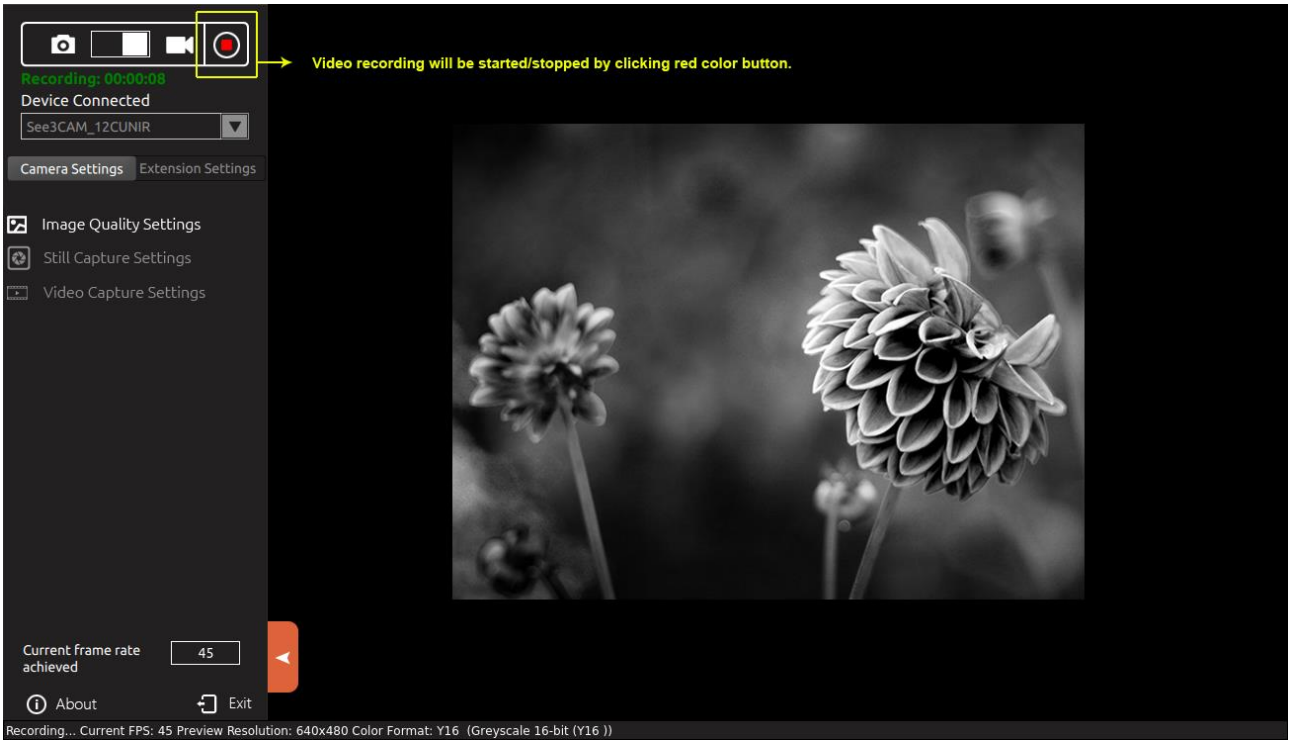
7.3 Video recording

To record a video, user has to switch the application from capture mode to video mode by clicking the video icon. Then the user can record a video by selecting record icon available in the sidebar.

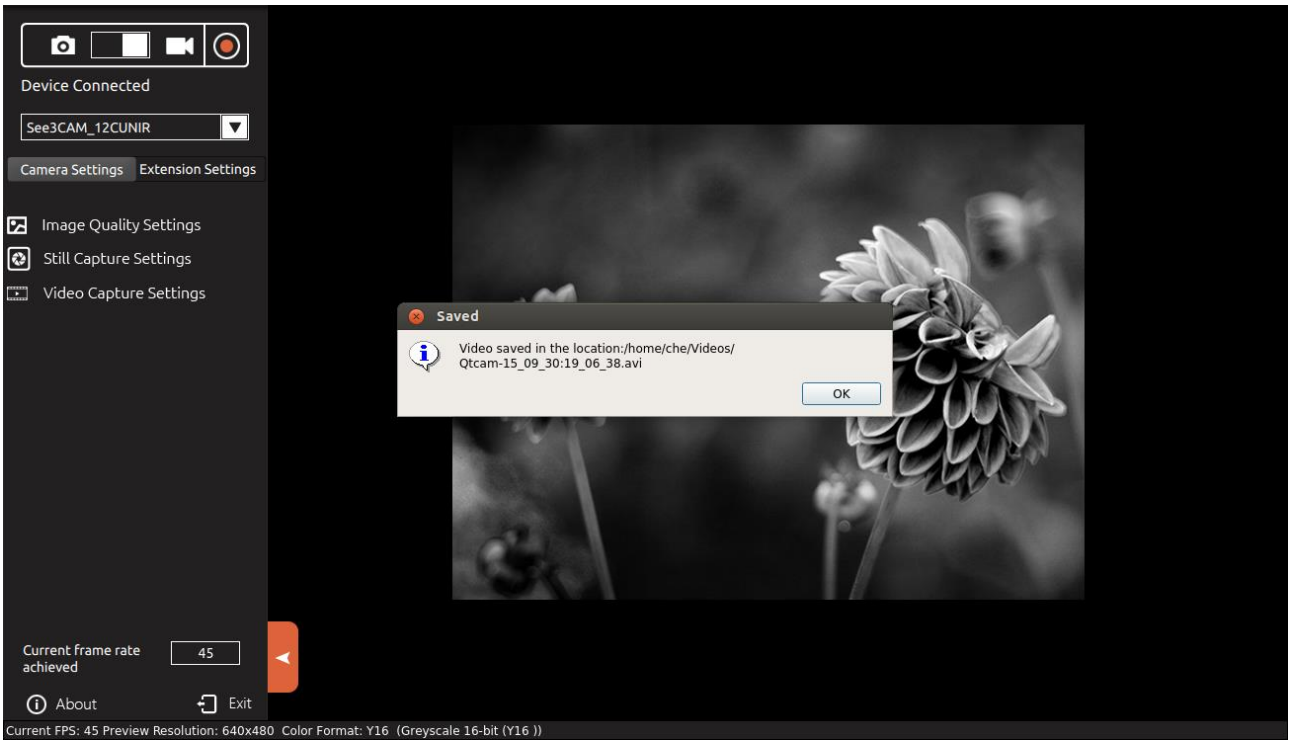
The video will be saved in the directory path, selected in the video location path. The default name for recorded video file is "QtCAM-YY_MM_dd:hh_mm_ss", plus the video record extension format. If the extension format is "avi", the filename will be "QtCAM-YY_MM_dd:hh_mm_ss.avi".

Once the user clicks the video record icon, video recording will begin, to stop recording click the stop icon which is available in the side bar. During video recording, user cannot change the preview resolution and camera device.

For more details like video record format, video encoder format in video recording please refer the section 7.4.3 Video Capture Settings



Once user clicks video stop icon while recording, recording will be stopped and video file will be saved in the path specified in “Video Location” in Video Capture Settings.



7.4 Camera Settings

7.4.1 Image Quality Settings

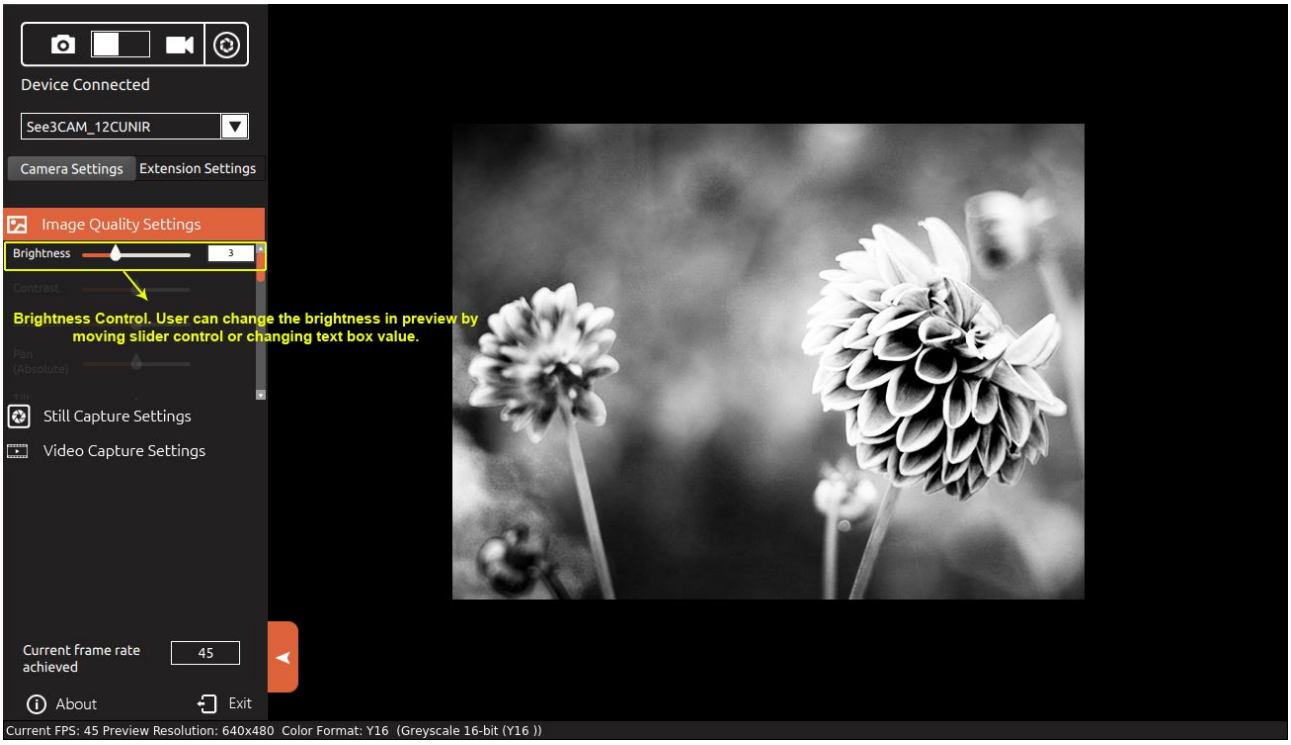
On selecting Image Quality Settings, a control menu will display camera control settings. The user can adjust the video preview settings in the Menu tab. Only sliders whose labels are not greyed out could be configured.

The user can move the slider and configure the preview settings according to their needs. The value being set will be displayed in the text box based on the position of the slider marker. As soon as the slider is moved to configure the values the preview's property will change at that instance.

Controls	*Slider Minimum Value*	*Slider Maximum Value*	*Slider Default Value*	*Manual Control*	*Auto Control*
Brightness	1	8	1	YES	NO
Exposure	5	35000	625	YES	YES

7.4.1.1 Brightness Control

The Brightness values can be changed from a minimum value of 1 to 8 by moving the slider, and the exact changes will be reflected immediately in the preview. This brightness control increases the brightness of See3CAM_ 12CUNIR. The Default value is 1.

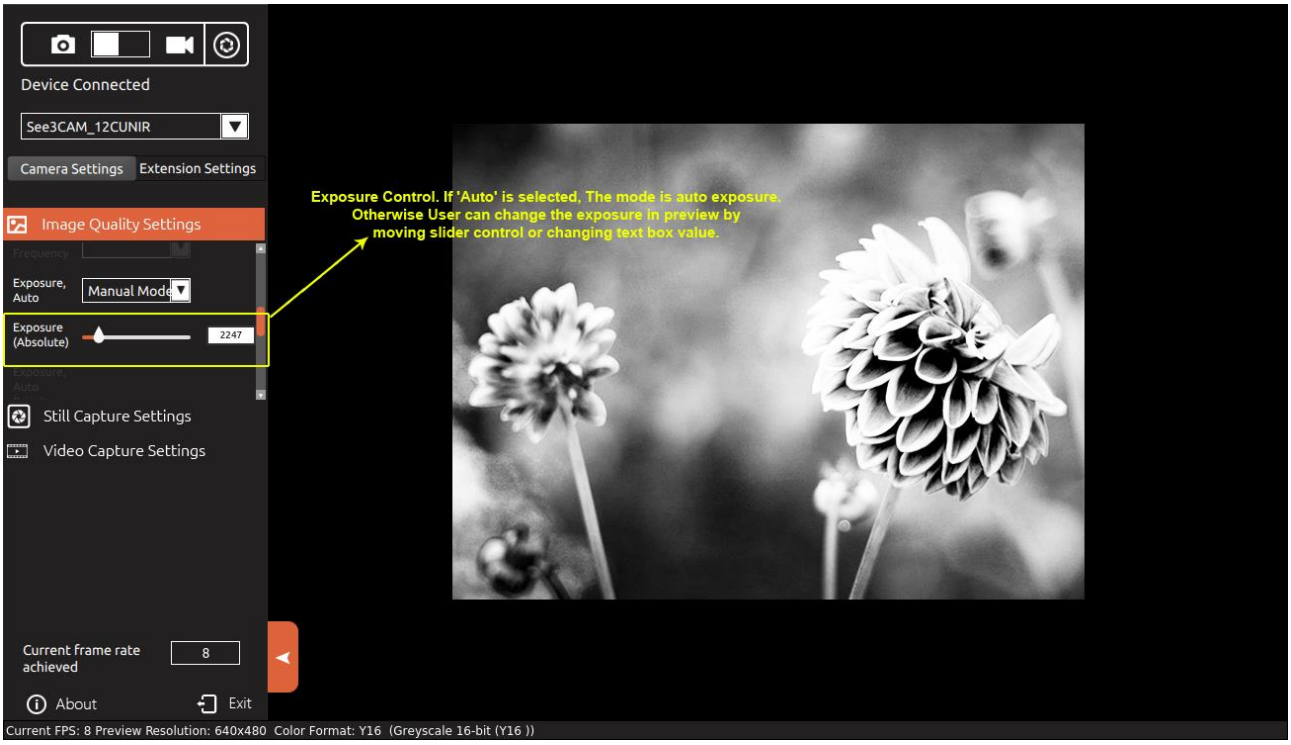


7.4.1.2 Exposure Control

The See3CAM_12CUNIR supports both auto and manual exposure control which can be controlled using the Exposure (Absolute) slider of the Image Quality Settings of the QtCAM application. To use the manual exposure slide the user must first select the Manual Mode from the Exposure, Auto drop down list box.

The exposure value could be manually changed by moving the slider, and the See3CAM_12CUNIR supports exposure values ranging from 5 to 35000 in the slider. The default value is 625. The exposure values are configured inside the CMOS image sensor based on the sensor configuration and clock configuration details.

To obtain a good low light performance it is essential to change the exposure according to the change in lighting conditions. To support this feature the See3CAM_12CUNIR has an auto exposure feature, by which the exposure of the camera will be changed according to the lighting conditions giving the best low light performance. To select this auto exposure control the user has to select the Auto Mode from the Exposure, Auto drop down list box.

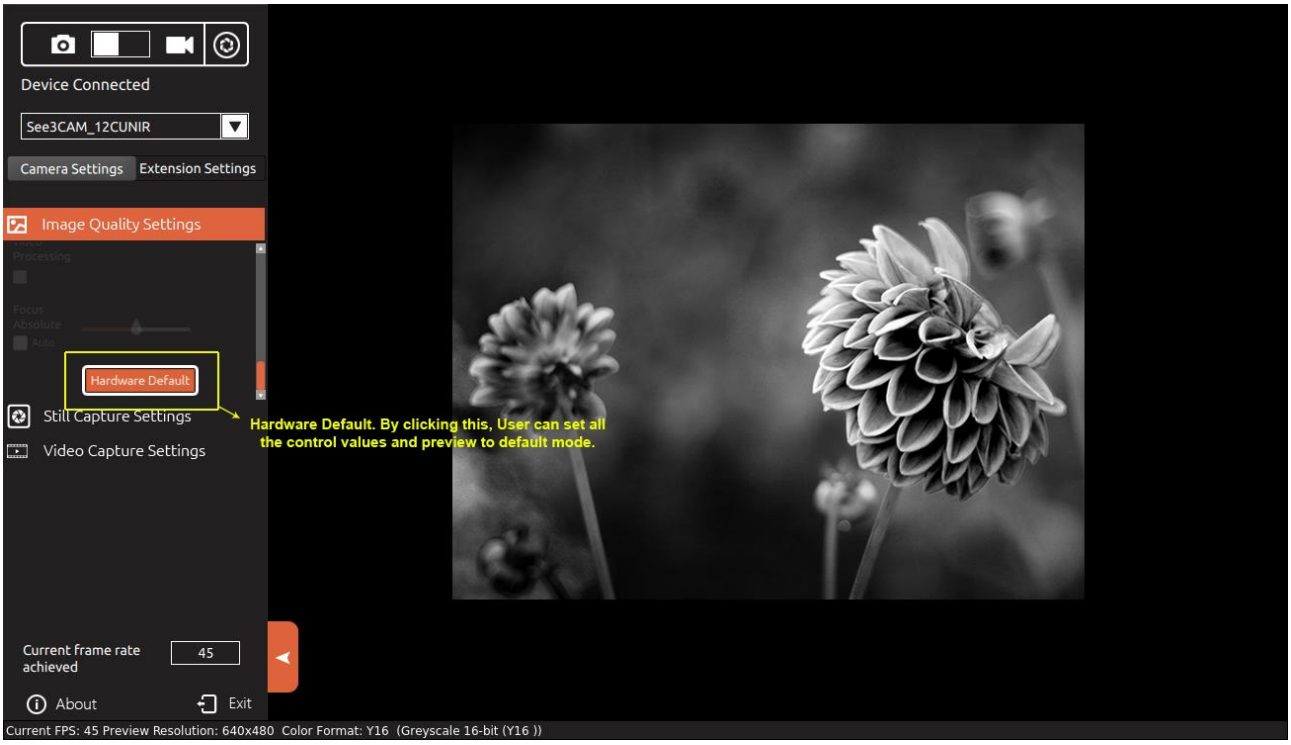


Note: Controls are global across all resolutions and all modes, and hence changing the control values will reflect the changes in both the modes and resolutions.

The slider values are computed according to the USB Video Class standards, and hence the exposure time that is applied is given in the following table. Also when the user is in a specific range of exposure value, the same value will persist in the exposure setting of the See3CAM_12CUNIR. To switch to a new value the user must increase the value to the next range by moving the slider. This is done to ensure compliance with the USB Video Class standard.

7.4.1.3 Hardware Default

This button is helpful to reset the Image Quality Settings menu values to the hardware default state. Once the user clicks the hardware default button, all the control values and preview is set to the default mode.

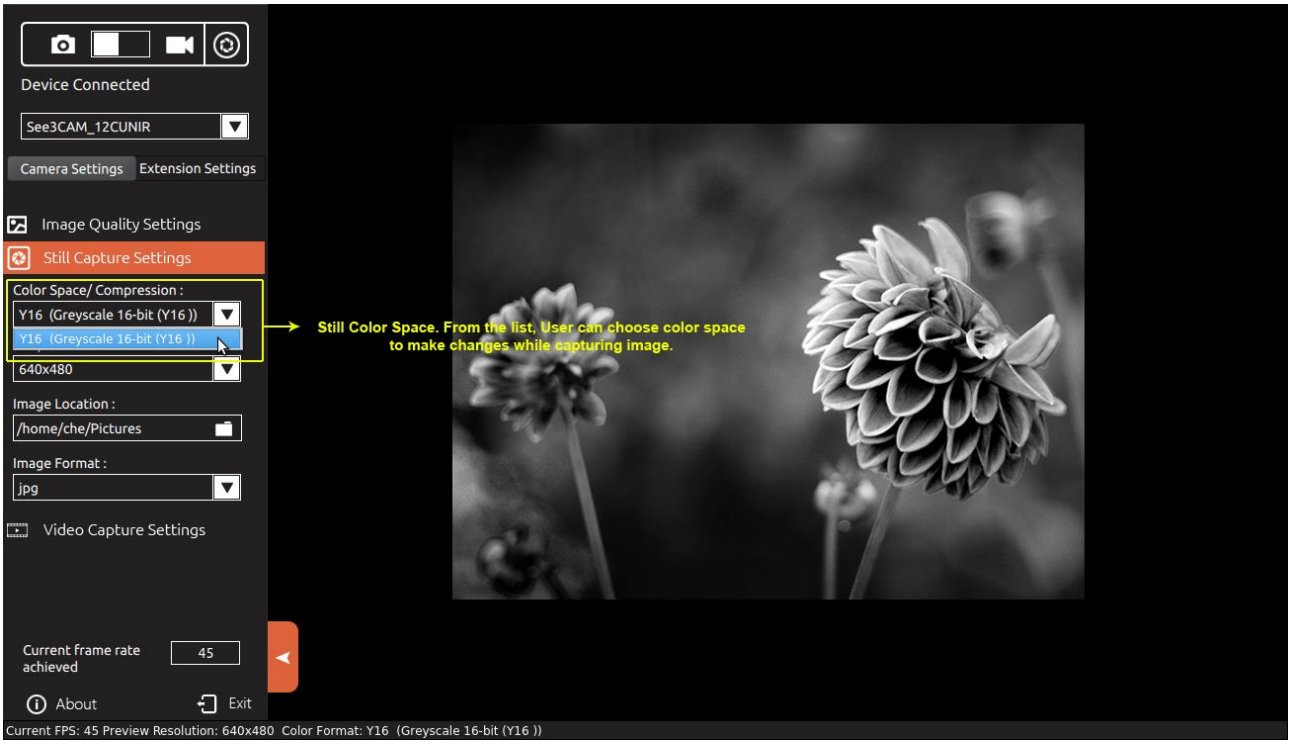


7.4.2 Still Capture Settings

On selecting still capture settings, the user can select the still color space, image output size, capture image location path and image save format type.

7.4.2.1 Color space/compression

Only Y16 color space is available.

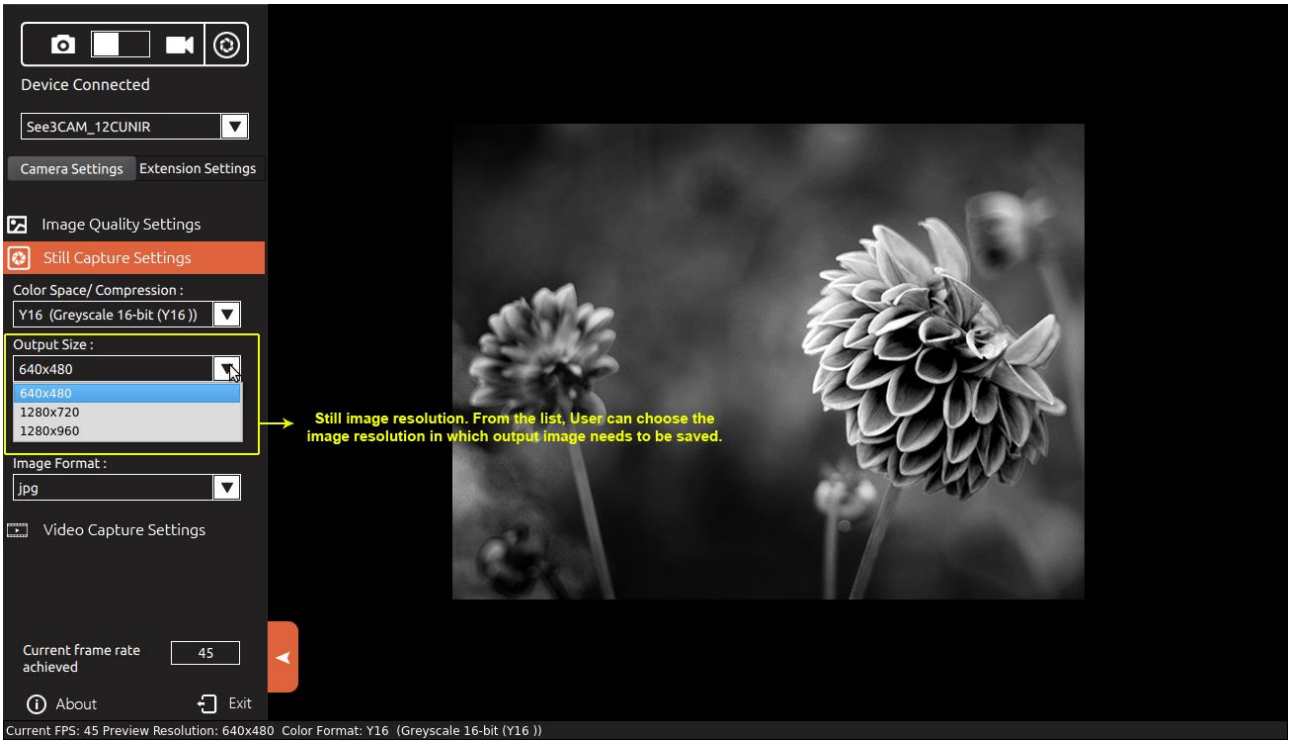


7.4.2.2 Output size

Three output resolution sizes are available when the device is connected in USB 3.0, they are as follows:

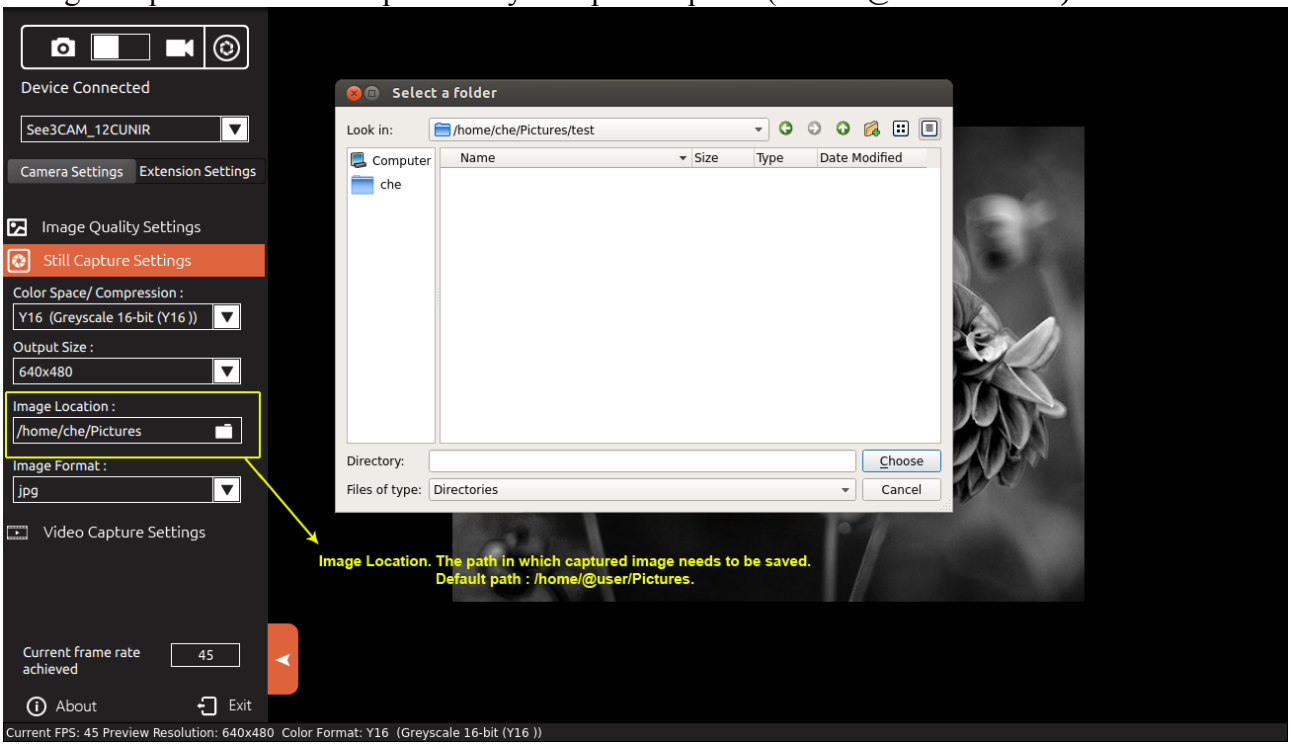
1. 1280x960
2. 1280x720
3. 640x480

By default (while camera is selected), the preview output size will be selected, but the user can change this at any point of time.



7.4.2.3 Image Location

The image location can be changed by clicking the folder icon or the text box. A file dialog will open for the user to select the new location. User has to click the open button in the file dialog to change the path. The default path is "System picture path" (/home/@user/Pictures).

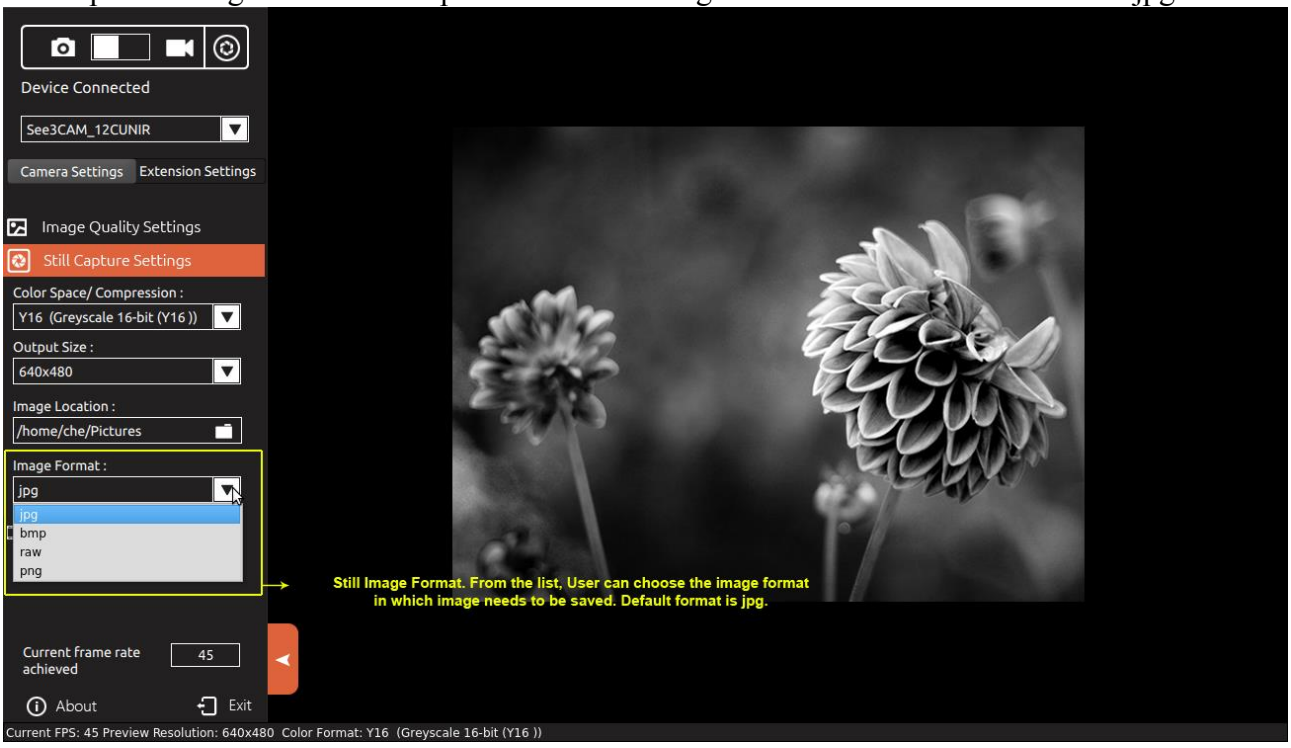


7.4.2.4 Image format

Four image formats are available in this version as follows:

1. jpg
2. bmp
3. raw
4. png

The captured images are saved as per the selected image format. The default format is "jpg".

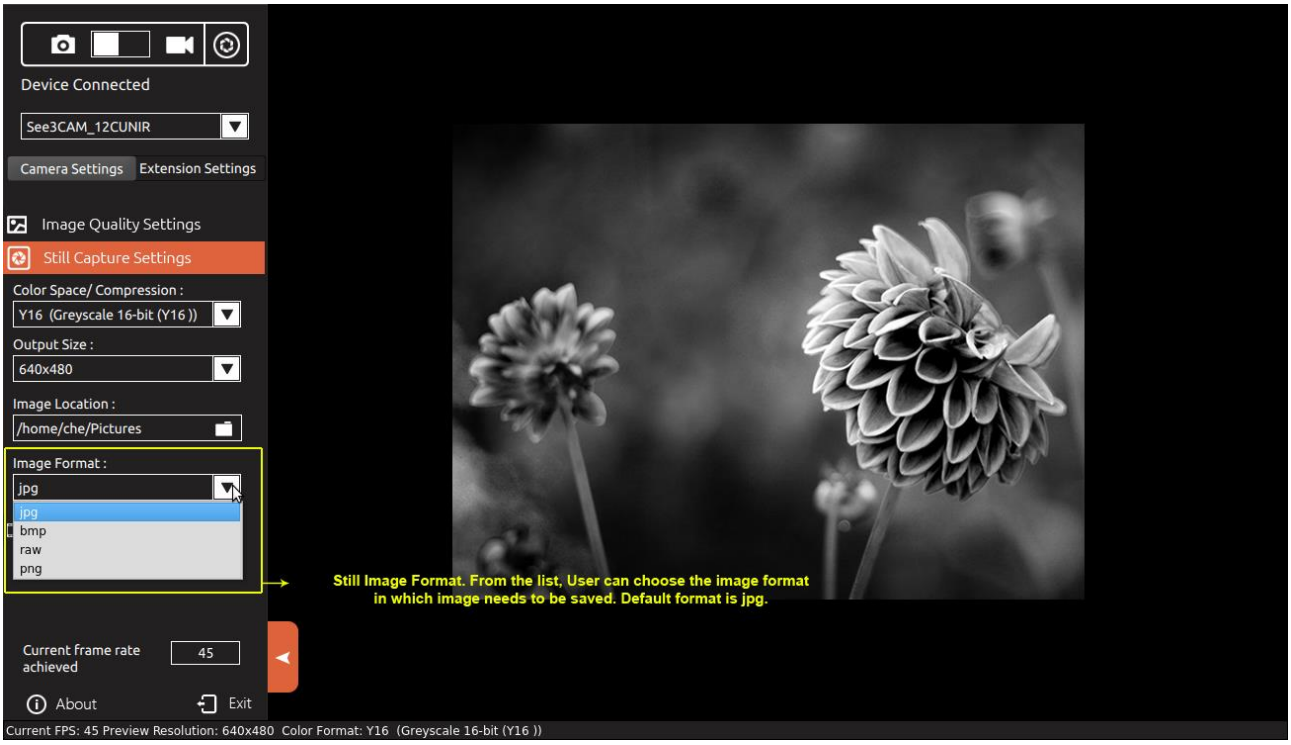


7.4.3 Video Capture Settings

On selecting the video capture settings, the user can select their frame rate, video color space, preview resolution, video encoder format, video container (Extension) and the video location.

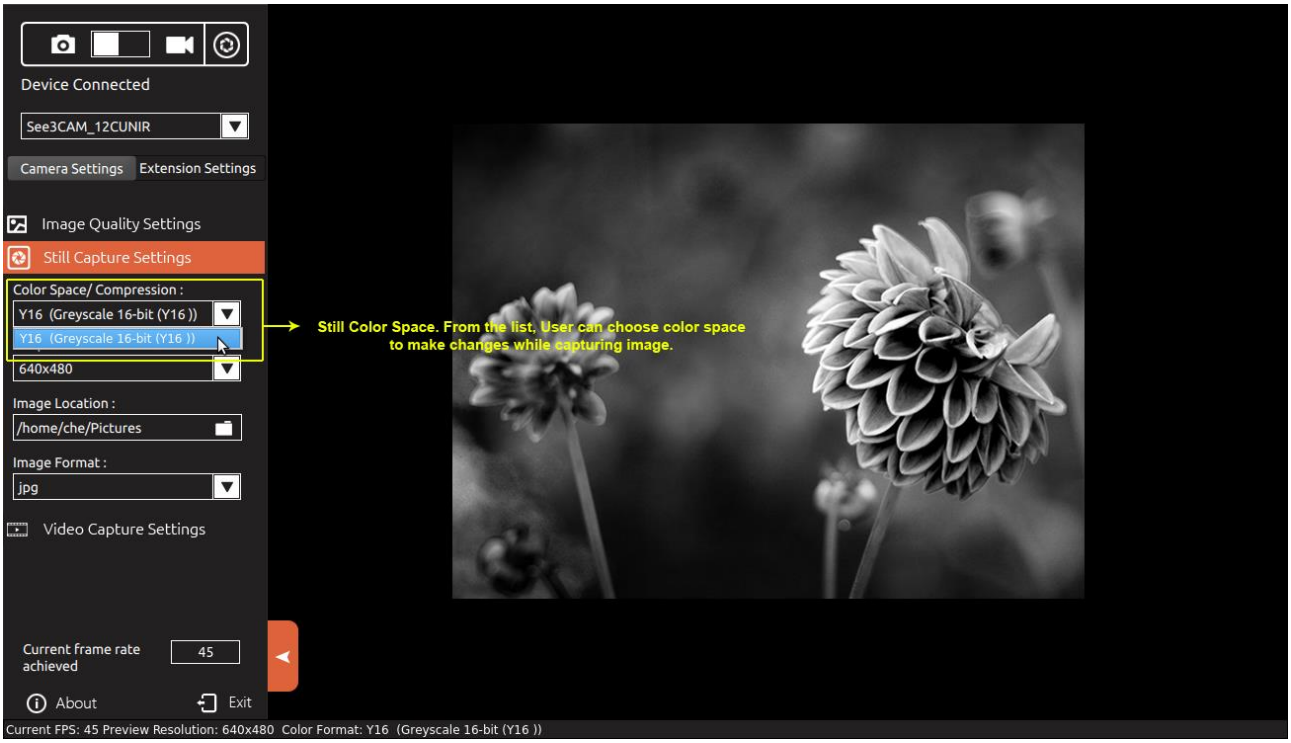
7.4.3.1 Frame Rate

Frame rate displayed is the maximum expected fps for the current resolution (output size).



7.4.3.2 Color space/compression

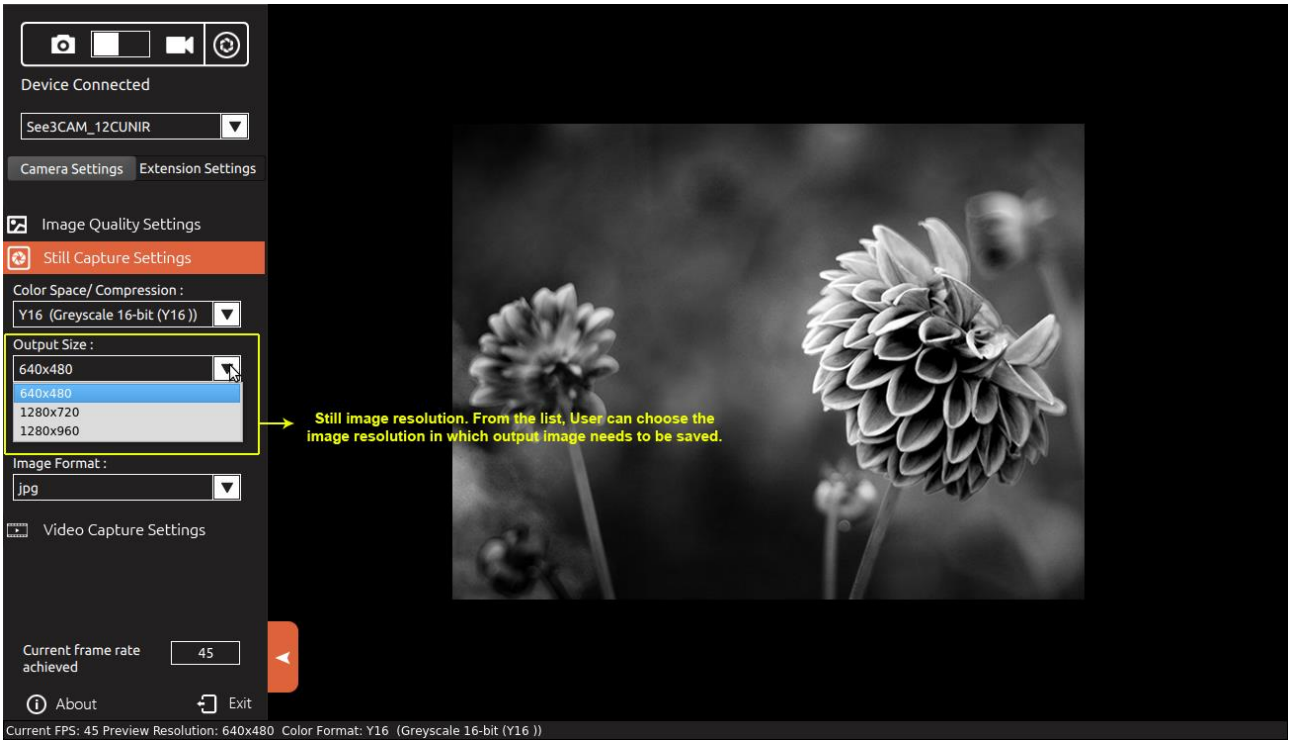
One Y16 color space is available.



7.4.3.3 Output size

Three output resolution sizes are available in both USB 3.0 and USB 2.0 as follows:

1. 1280x960
2. 1280x720
3. 640x480

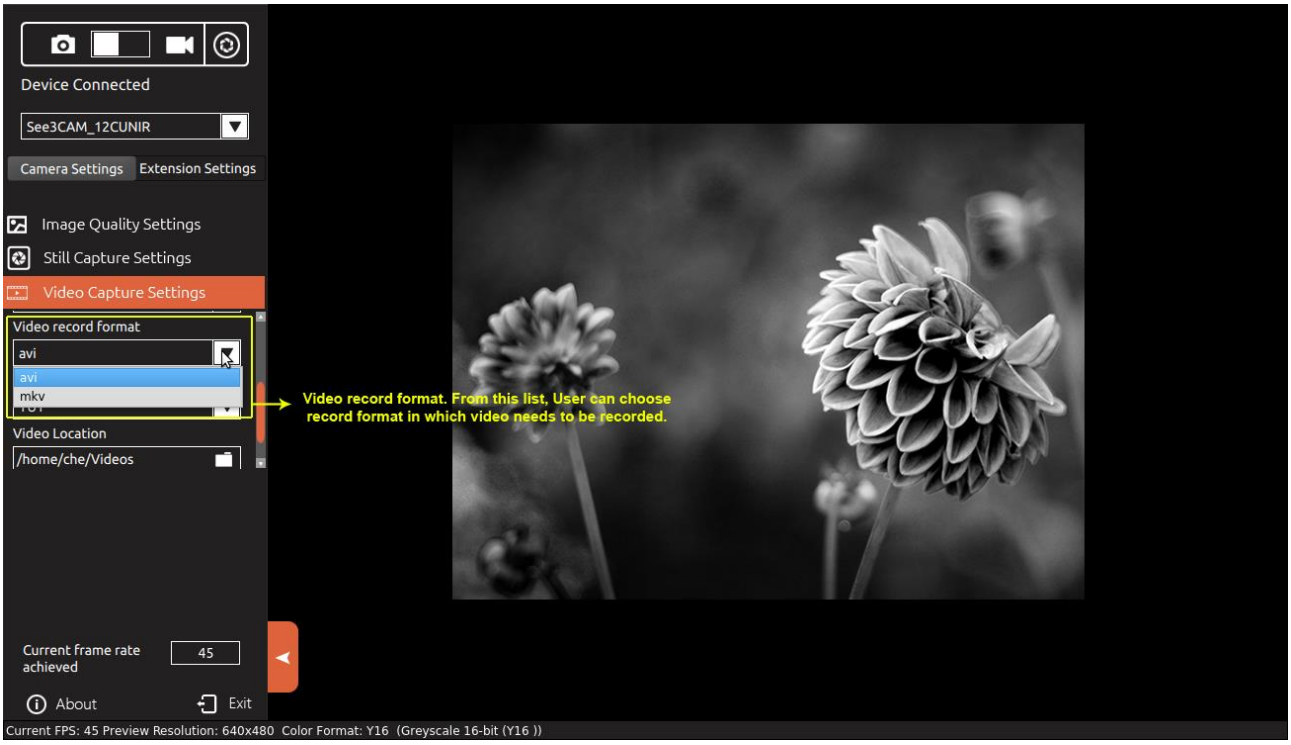


By default (while camera is selected), the preview output size will be selected, but the user can change this at any point of time. The preview will be updated as per the selected output size, once the user selects from list.

7.4.3.4 Video record format

Two video formats are available in this version:

1. mkv
2. avi

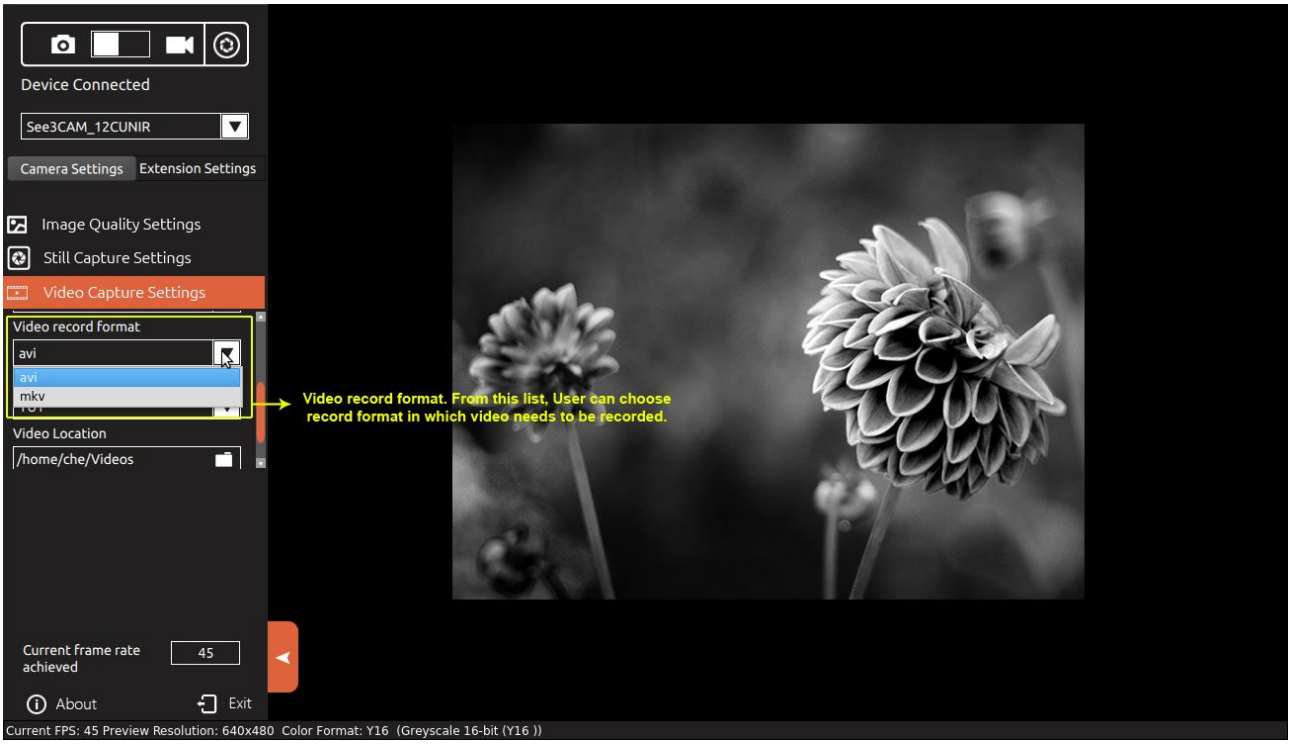


7.4.3.5 Video Encoder Format

There are four video encoder formats available in this version:

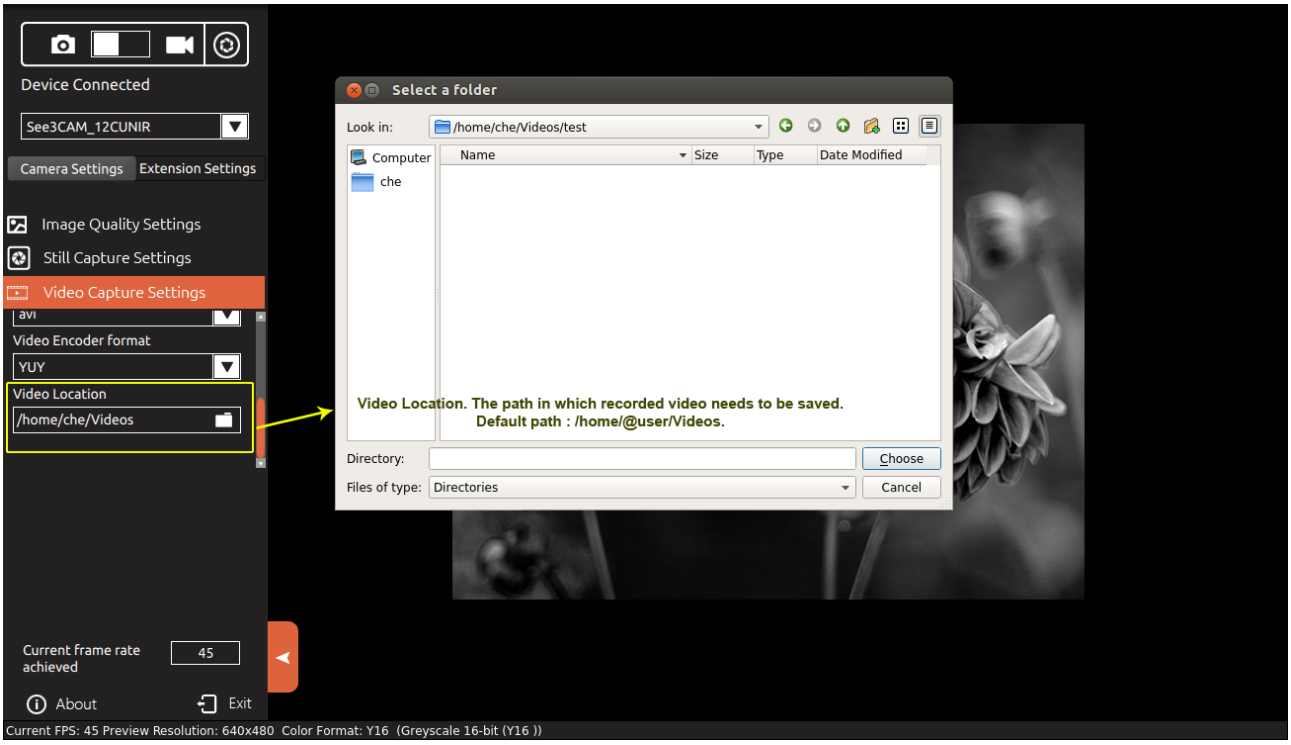
- YUY (Raw)
- MJPEG
- H264
- VP8

The video will be recorded in any one of the selected encoder format.



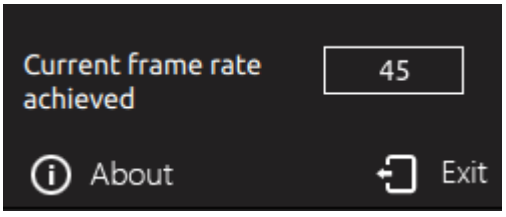
7.4.3.6 Video Location

The video location can be changed by clicking the folder icon or the text box. A file dialog will open for the user to select the new location. User has to click the open button in the file dialog to change the path. The default path is “System video path” (/home/@user/Videos).



7.5 Display Current frame rate achieved

Current frame rate achieved per second: - Frame rate will be affected by various environmental parameters. It is displayed all the time [Just above "About" option].



7.6 Extension Settings

On selecting the Extension settings tab, the extension control will appear, if the device supports extension unit. The See3CAM_12CUNIR camera has some additional controls and features and these are not quite common controls and hence they are not included in the standard UVC controls, but Listed as Extension controls.

The Extension settings are used to select these extended controls of See3CAM_12CUNIR. It can be used to switch between Master and Trigger mode of operation.

To select the Master mode, click on the MASTER MODE button. Similarly to select the Trigger mode, click on the TRIGGER MODE button. For more information on operating conditions of Master and Trigger modes, please refer to the sections below.

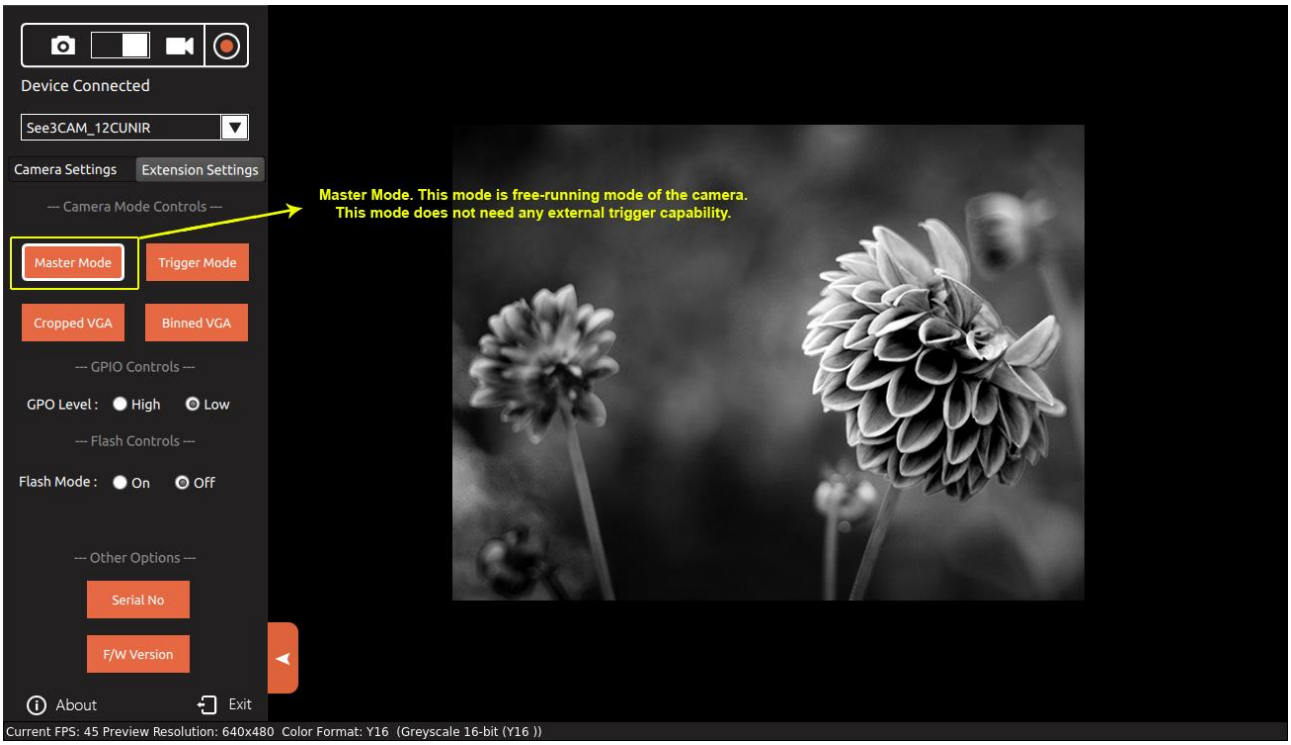
Note: The preview will be stopped when See3CAM_12CUNIR goes into trigger mode and it will resume when it comes back to Master mode.

7.6.1 Master Mode

The Master Mode of operation can be considered as a free-running mode of the camera. The camera is configured for a preview resolution and still resolution. The application is started and the Master mode is chosen and the application starts streaming the video. This is a simple mode of operation for the camera without any external trigger capability.

In master mode of See3CAM_12CUNIR in Linux, there are two methods of still image capture. They are:

1. Software Still Capture
2. Hardware Still Capture



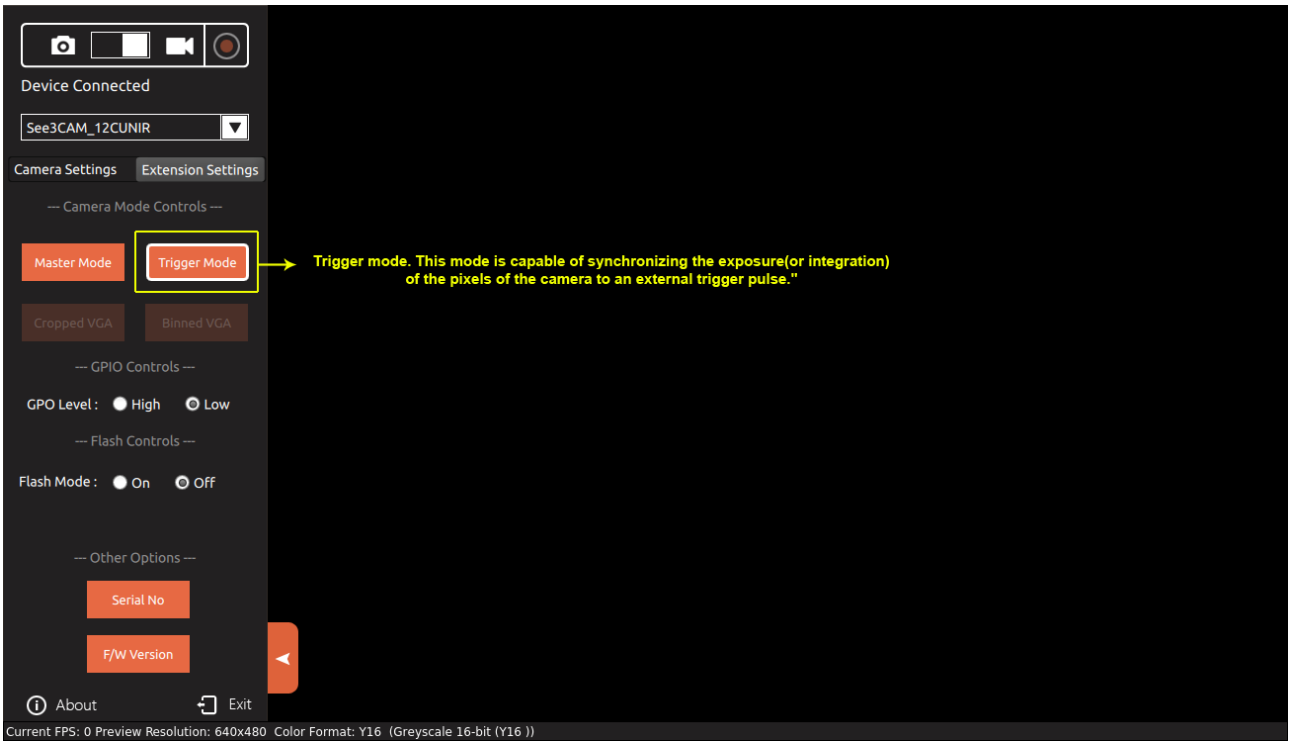
e-con systems has found an intelligent method to facilitate still image capture by using the sample application QtCAM. In Master Mode still image can be taken by using any of the methods, and also in both the resolutions using any exposure or brightness value.

If the user wants to take an image in the preview resolution the user should first select the path of image storage and then click on capture image icon or give a trigger input through the DIN connector to get the image in the same resolution. If the user wants to take an image in the other resolution, the user must change the still capture settings and then take the picture.

In both the cases, the Auto exposure value is set in the still image capture. However, when the camera is in Manual exposure mode for the video preview, the same manual exposure value is used during the still image capture as well. Both Software and Hardware still capture methods are supported in the Master mode of See3CAM_12CUNIR.

7.6.2 Trigger mode

In Trigger mode, See3CAM_12CUNIR camera is capable of synchronizing the exposure (or integration) of the pixels of the camera to an external trigger pulse that can be given through the DIN connector of the camera.



Since this is a global shutter camera, all the pixels start and stop integrating at the same time, avoiding rolling skew during the capture of fast moving scenes. In addition to this, the start of integration of pixels can be synchronized to an external event in Trigger mode.

In Trigger mode of See3CAM_12CUNIR, the preview will not be available and the camera will be kept in standby waiting for a trigger pulse to start the integration of pixels and provide a global shutter image. The user can switch to trigger mode by clicking on the Trigger Mode button in the extension settings tab of the QtCAM application.

The user can configure the camera settings such as exposure, still image resolution, still image storage location etc., in Master mode and then enter the Trigger mode. In the Trigger mode, the camera settings will be retained, but preview will not be available.

The camera shall be waiting for an external event on the DIN connector and the camera will start exposing on the trigger signal. The external trigger pulse on the DIN connector must be of certain duration in order for the camera to recognize this event.

In Trigger mode, only external Trigger event is supported and no mouse event (software) software still image capture is possible.

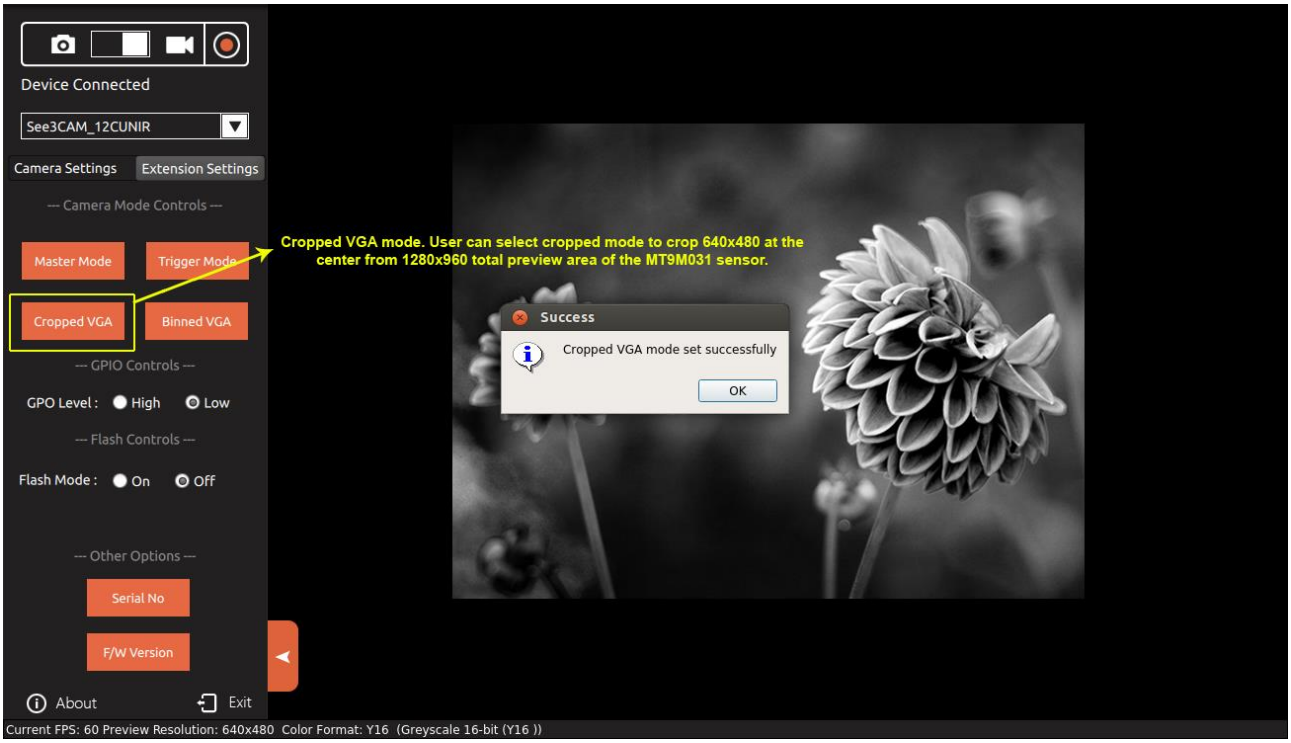
7.6.3 VGA Mode

The See3CAM_12CUNIR supports two types of VGA resolution modes:

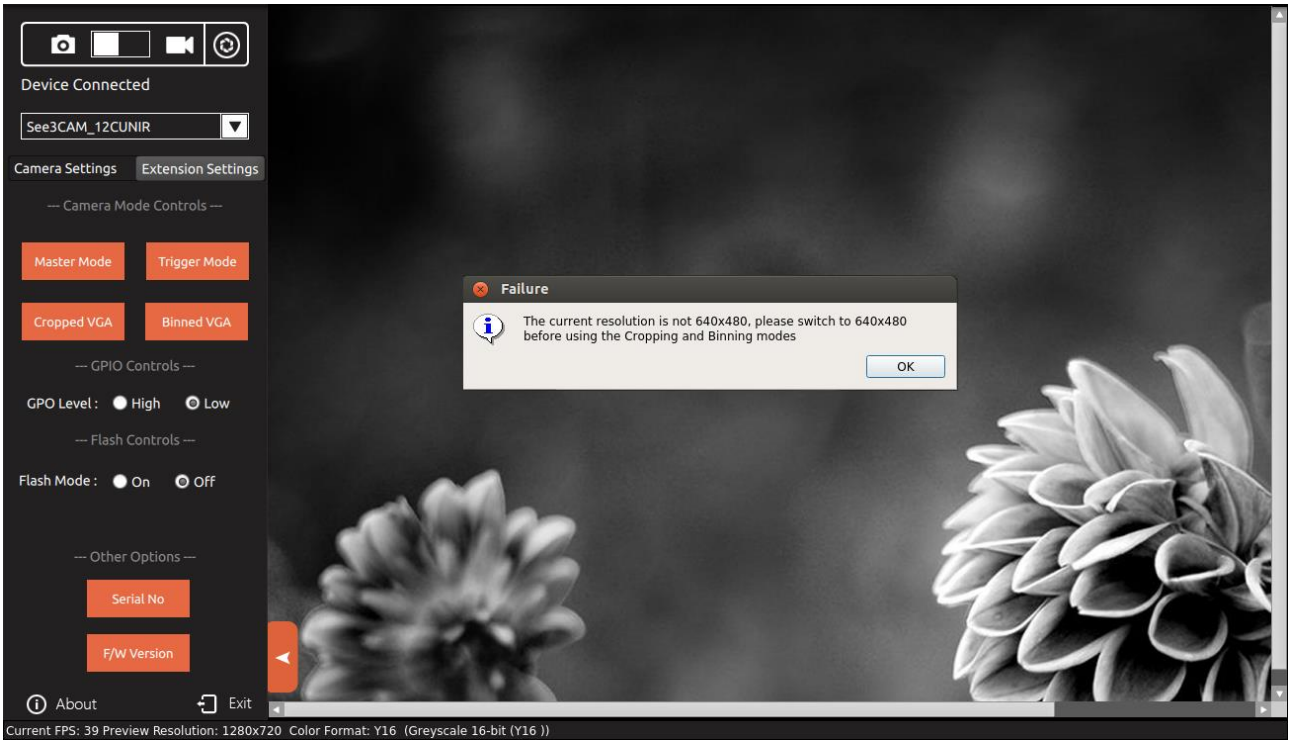
1. Cropped VGA mode
2. Binned VGA mode

7.6.3.1 Cropped VGA Mode

The Cropped VGA mode is selected by cropping the 640x480 at the centre from the 1280x960 total preview area of the MT9M031 sensor. Because of this See3CAM_11CUG is able to stream at 60 fps in this resolution. This mode can be used by clicking on the Cropped VGA button in the extension settings tab.

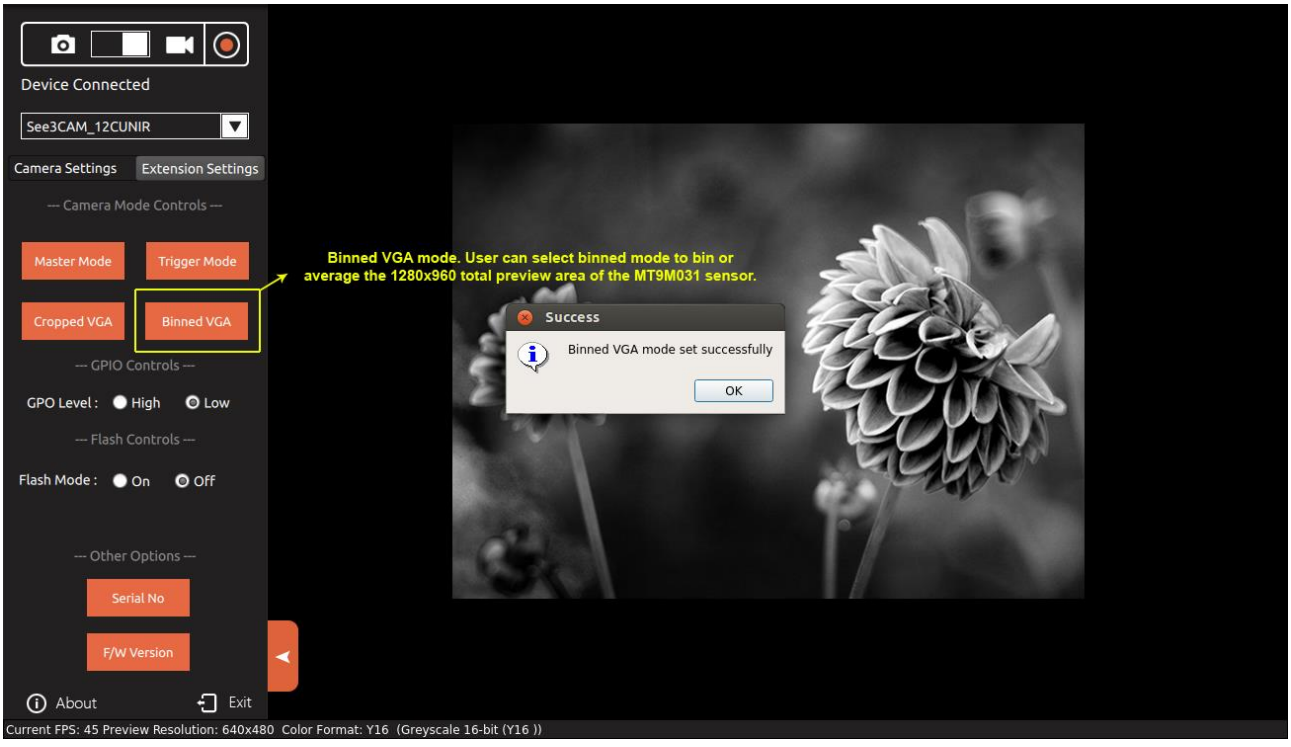


If the Cropped VGA button is clicked when the resolution selected in the Video capture settings is not 640x480, we get an error dialog box telling the user to change the resolution to VGA and then try again.

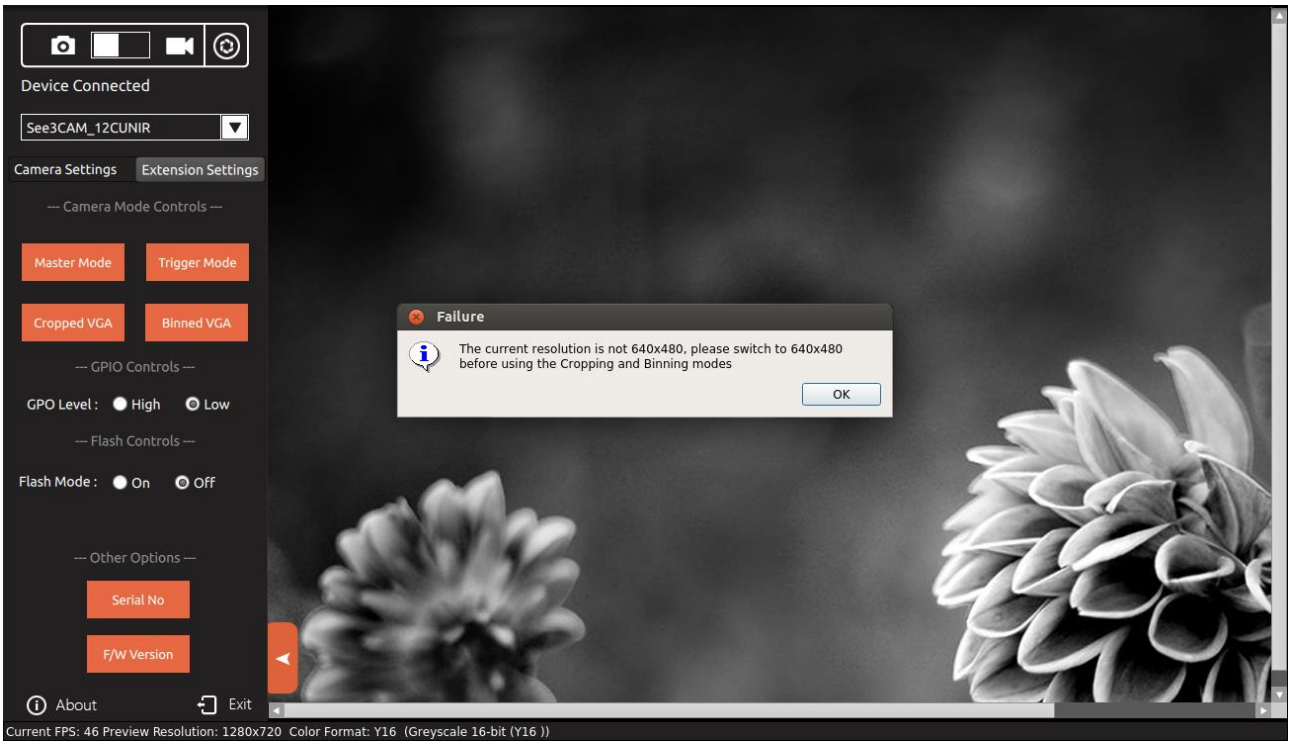


7.6.3.2 Binned VGA Mode

The Binned VGA mode is selected by binning or averaging the 1280x960 total preview area of the MT9M031 sensor. In binned VGA mode the See3CAM_11CUG is able to stream at 30 fps. This mode can be used by clicking on the Binned VGA button in the extension settings tab.



If the Binned VGA button is clicked when the resolution selected in the Video capture settings is not 640x480, we get an error dialog box telling the user to change the resolution to VGA and then try again.

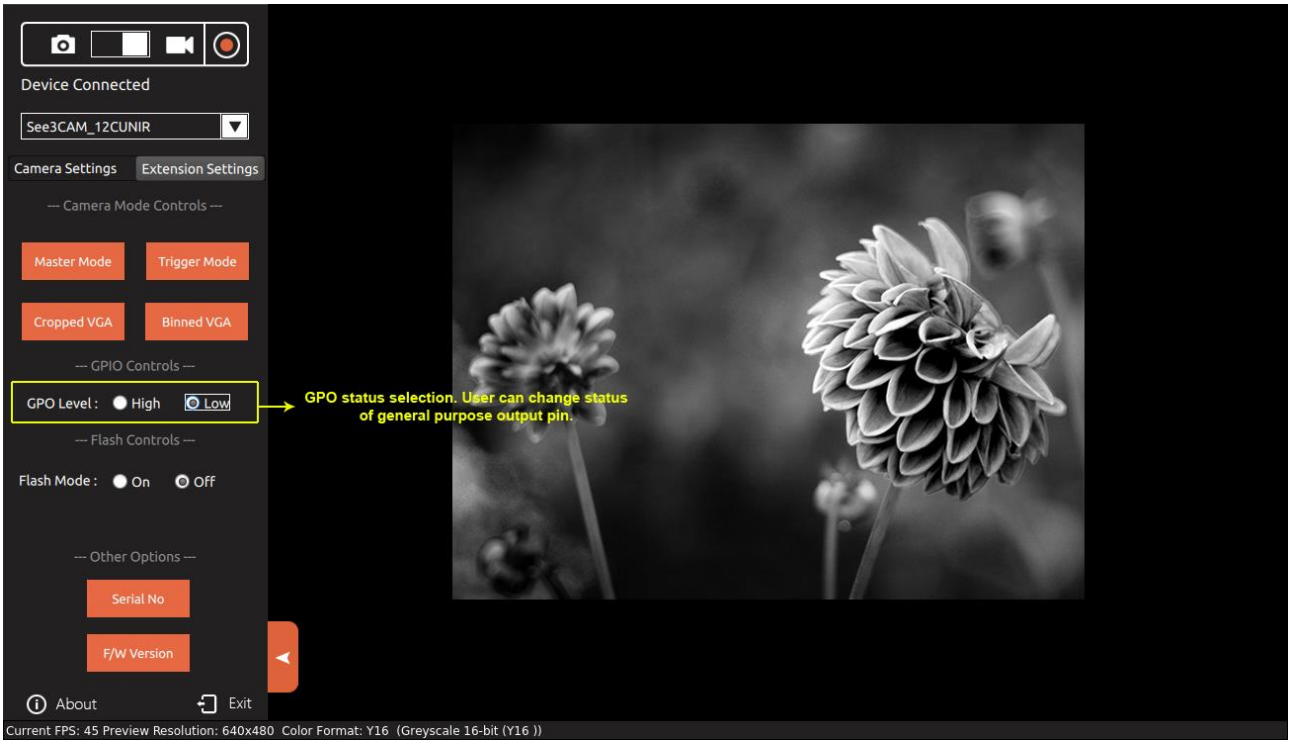


7.6.4 GPO Control

There is one general purpose output pin in See3CAM_12CUNIR camera.

7.6.4.1 General Purpose Output pin

The GPO pin's current status is reflected in the high/low radio button when the application is opened. The status of the output pin can be changed by clicking either one of the 'high' or 'low' radio buttons.

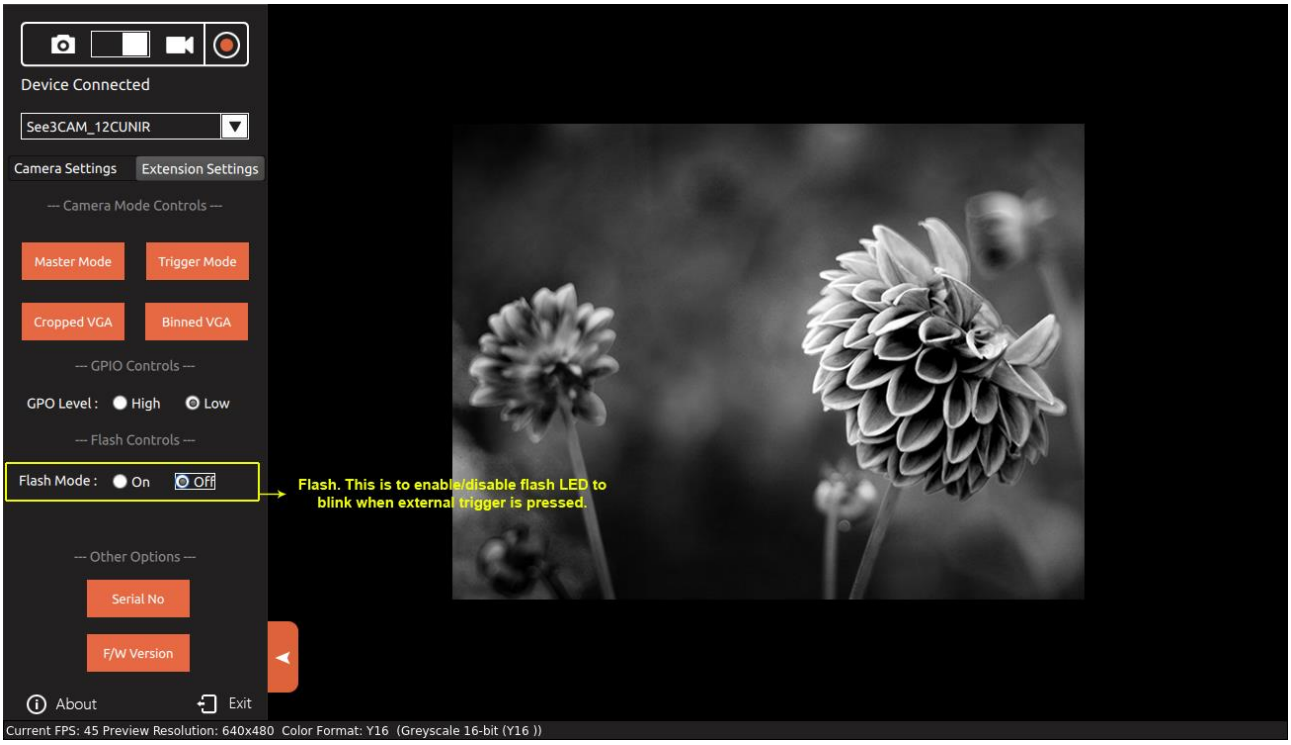


7.6.5 Flash Control

The Flash controls supported by See3CAM_12CUNIR camera is:

1. Flash mode (on and off)

By default Flash mode is off in See3CAM_12CUNIR camera. If Flash mode is set to on, the flash LED blinks when external trigger is pressed and image is saved in the selected path.

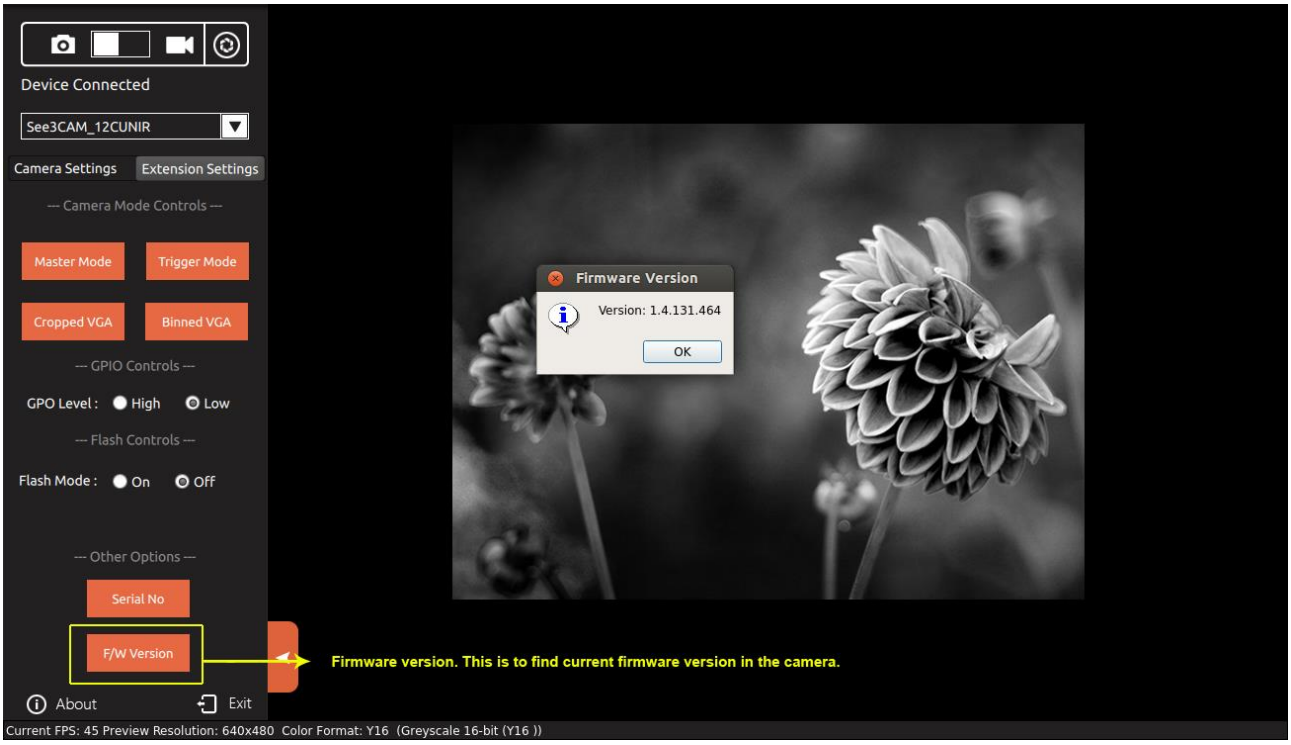


If Flash mode is set to on, the flash LED blinks when external trigger is pressed and image is saved in the selected path.

7.6.6 Other Options

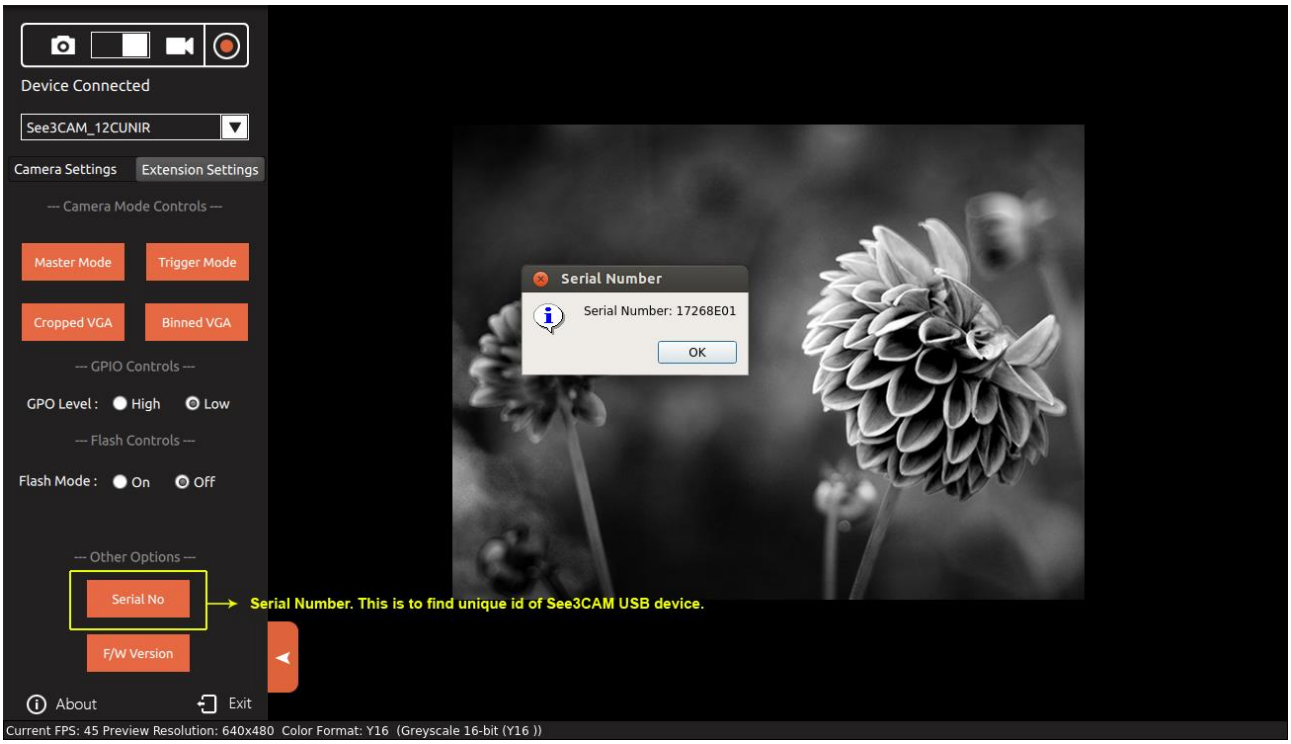
7.6.6.1 Firmware Version

The Firmware Version button can be used to see the current firmware version running on the camera.



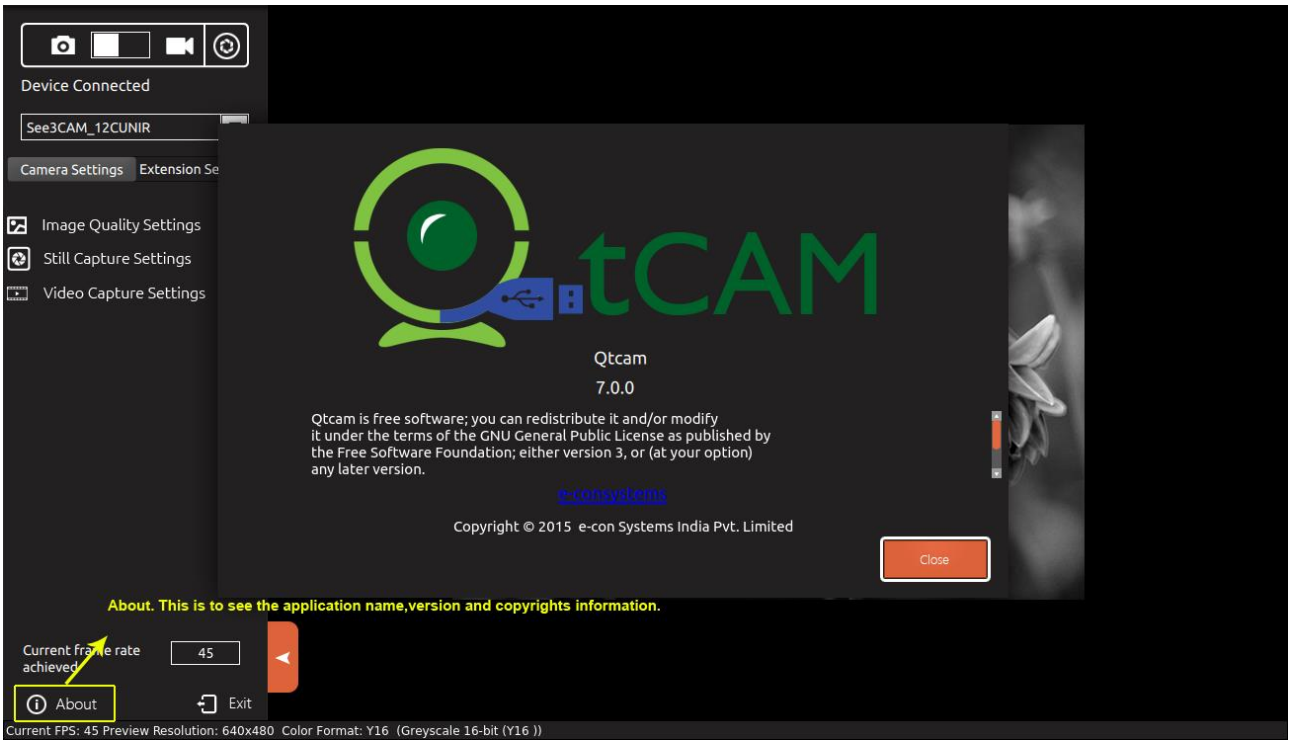
7.6.6.2 Serial Number

The Serial Number button can be used to view the Unique ID of the See3CAM USB camera device.



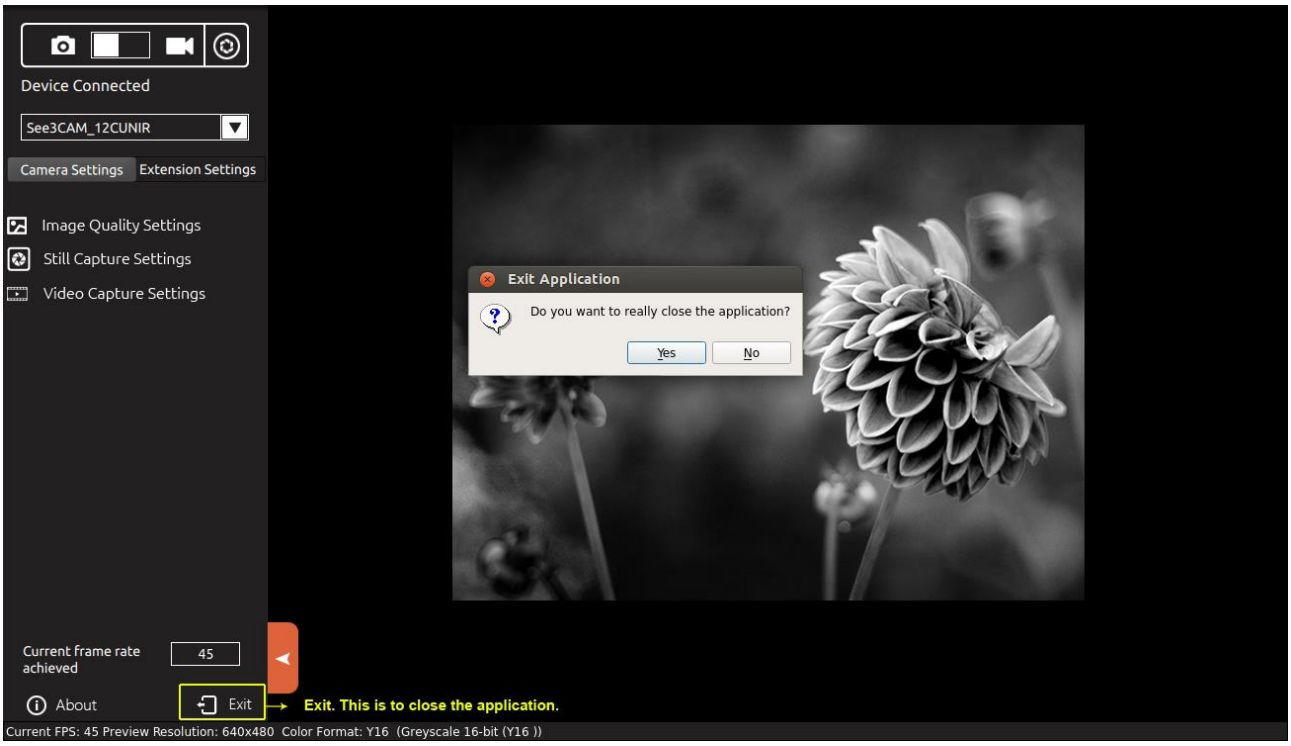
8 About

To know about the application name, version and copyrights click the about button available in the side bar.



9 Exit

Click the exit button available in the side bar to close the application.



10 Known issues and Limitation

1. This QtCAM application is in Ubuntu 14.04(64-bit & 32-bit) and Ubuntu 12.04(64-bit & 32-bit) Linux Distribution only.

2. When auto exposure mode is selected, the top and bottom line of the preview is corrupted.

3. In this version, Audio recording is not supported during video recording. We have planned to give support for the same in the near future.

11 Conclusion

This document provides detailed explanation on various features and options available in QtCAM application.

12 Appendix -1

12.1 Keyboard Shortcuts

1. Press Key “I” to capture the image from keyboard.
2. Use the Left arrow key and Right arrow key to open and close the side bar respectively.
3. Use the TAB key to navigate between the menus from keyboard.