



KAYA Chameleon App Camera simulator application User Guide

May 2014

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2.1 Safety Precautions

With your KAYA Chameleon board in hand, please take a minute to read carefully the precautions listed below in order to prevent unnecessary injuries to you or other personnel or cause damage to property.

- **Before using the product, read these safety precautions carefully to assure correct use.**
- **These precautions contain serious safety instructions that must be observed.**
- **After reading through this manual, be sure to act upon it to prevent misuse of product.**



Caution

In the event of a failure, disconnect the power supply.
If the product is used as is, a fire or electric shock may occur. Disconnect the power supply immediately and contact our sales personnel for repair.
If an unpleasant smell or smoking occurs, disconnect the power supply.
If the product is used as is, a fire or electric shock may occur. Disconnect the power supply immediately. After verifying that no smoking is observed, contact our sales personnel for repair.
Do not disassemble, repair or modify the product.
Otherwise, a fire or electric shock may occur due to a short circuit or heat generation. For inspection, modification or repair, contact our sales personnel.
Do not touch a cooling fan.
As a cooling fan rotates in high speed, do not put your hand close to it. Otherwise, it may cause injury to persons. Never touch a rotating cooling fan.
Do not place the product on unstable locations.
Otherwise, it may drop or fall, resulting in injury to persons or failure.
If the product is dropped or damaged, do not use it as is.
Otherwise, a fire or electric shock may occur.
Do not touch the product with a metallic object.
Otherwise, a fire or electric shock may occur.
Do not place the product in dusty or humid locations or where water may splash.
Otherwise, a fire or electric shock may occur.
Do not get the product wet or touch it with a wet hand.
Otherwise, the product may break down or it may cause a fire, smoking or electric shock.
Do not touch a connector on the product (gold-plated portion).
Otherwise, the surface of a connector may be contaminated with sweat or skin oil, resulting in contact failure of a connector or it may cause a malfunction, fire or electric shock due to static electricity.

Do not use or place the product in the following locations.

- Humid and dusty locations
- Airless locations such as closet or bookshelf
- Locations which receive oily smoke or steam
- Locations close to heating equipment
- Closed inside of a car where the temperature becomes high
- Static electricity replete locations
- Locations close to water or chemicals

Otherwise, a fire, electric shock, accident or deformation may occur due to a short circuit or heat generation.

Do not place heavy things on the product.

Otherwise, the product may be damaged.

2.2 Disclaimer

This product should be used for CoaXPress video simulation. It also can be used for digital input/output (GPIO) simulation purposes. KAYA Instruments assumes no responsibility for any damages resulting from the use of this product for purposes other than those stated.

Even if the product is used properly, KAYA Instruments assumes no responsibility for any damages caused by the following:

- Earthquake, thunder, natural disaster or fire resulting from the use beyond our responsibility, acts caused by a third party or other accidents, the customer's willful or accidental misuse or use under other abnormal conditions.
- Secondary impact arising from use of this product or its unusable state (business interruption or others).
- Use of this product against the instructions given in this manual or malfunctions due to connection to other devices.

KAYA Instruments assumes no responsibility or liability for:

- Erasure or corruption of data arising from use of this product.
- Any consequences or other abnormalities arising from use of this product, or damage of this product not due to our responsibility or failure due to modification.

Repair of this product is carried out by replacing it on a chargeable basis, not repairing the faulty devices. However, non-chargeable replacement is offered for initial failure if such notification is received within two weeks after delivery of the product.

2.3 Overview

The **Chameleon** is the industry's first **Camera Simulator** supporting CoaXPress standard. This simulator is capable of generating video streams and test patterns of up to 4 CoaXPress links in single, dual and quad modes. Each link supports standard CoaXPress bitrates up to 6.25 Gbps. This product is ideally suited for development of industrial, defense and aerospace Machine Vision Systems and applications. The Chameleon can easily transmit generic test patterns, customer's specific pre-processed data or custom video streams on the CoaXPress links. It also provides GPIO for machine control signals, such as triggers, shaft encoders, exposure control and general I/O, which can be simulated together with the video streams. The simulator enables transmitting the video streams from onboard memory as well as run time uploading the streams from computer memory.

The principle of the simulator operation can be seen in Figure1 .

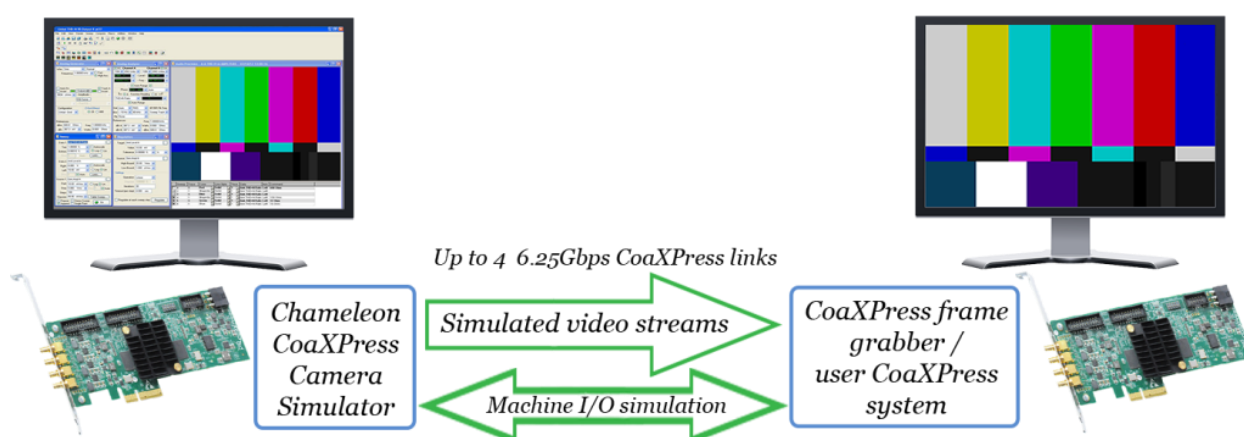


Figure 1 : Chameleon system structure

KAYA Chameleon App is a high-level windows application that provides interactive and highly configurable camera simulation interface for the Chameleon camera simulators.

It allows:

- Interfacing to various CoaXPress frame grabbers
- Simulation of different CoaXPress cameras
- Simulation of different resolutions, frame rates and image formats
- Configuration of simulation parameters

2.4 Requirements

To run the Chameleon App a PC with following is required

- Intel x64 processor or compatible.
- At least 2 GB of system memory. (The duration of simulation depends on system memory).
- Windows 7 64 bit OS
- A hard drive with 100 MB of free space
- One of KAYA Instruments' camera simulator boards installed

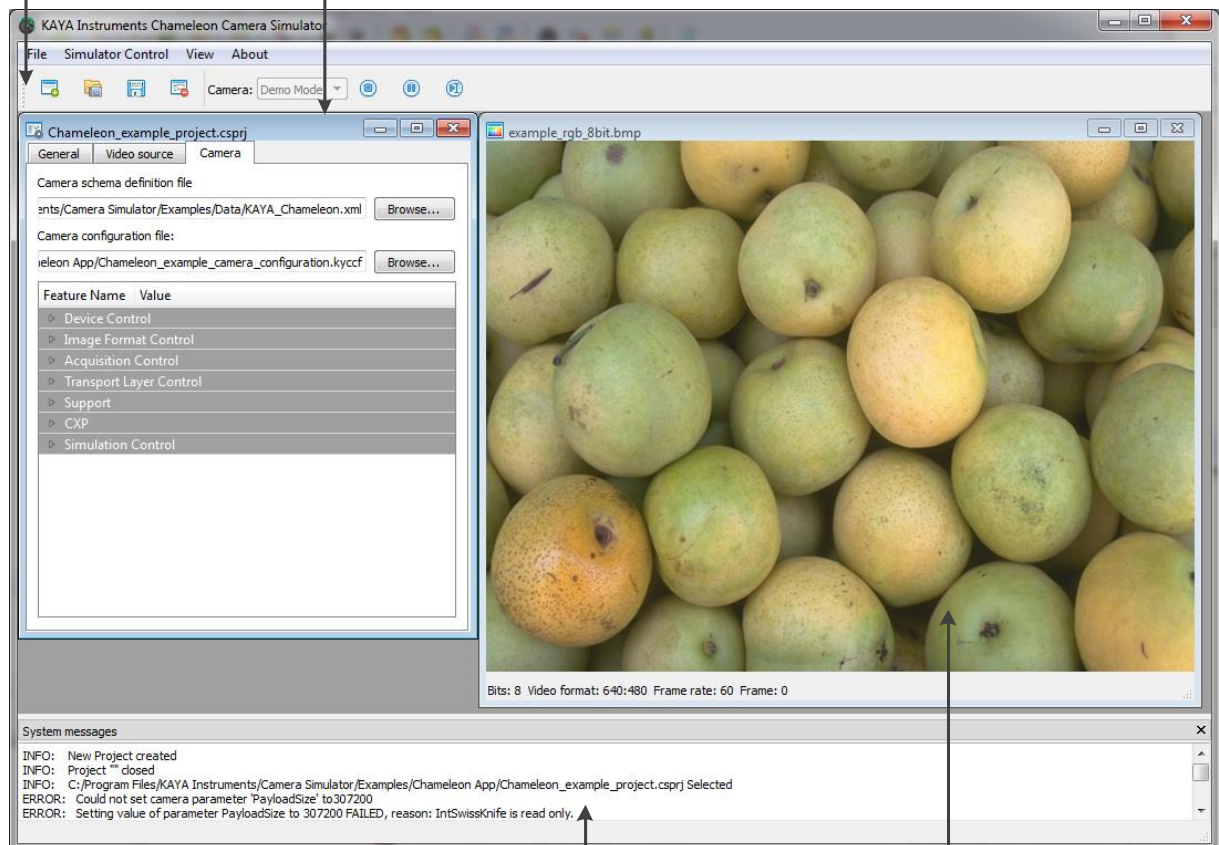
2.5 Installation

Chameleon App is included with KAYA simulator software package installation.

Please refer to the Installation manual for the installation information.

The Chameleon App main window with all of its components is shown in Figure 2.

Toolbar Menu Project navigator



System messages window Simulated picture window

Figure 2: Chameleon App main window

The main items of Chameleon App are:

3.1 Toolbar Menu

The Toolbar Menu includes project operation buttons, hardware selection and simulation control buttons. The Toolbar Menu is shown in Figure 3 and includes the following components:

1. New project button to create a new project from scratch
2. Open project button to open existing project or example
3. Save project button to save the opened project and all of its configurations
4. Close project button.
5. Camera selection list enables to select available hardware board simulator, or running in simulation mode with no hardware connection.
6. Stop button to stop a running simulation.
7. Start/Pause button to start or pause a simulation
8. Trigger button, to trigger a frame/line transmission when working in triggered mode

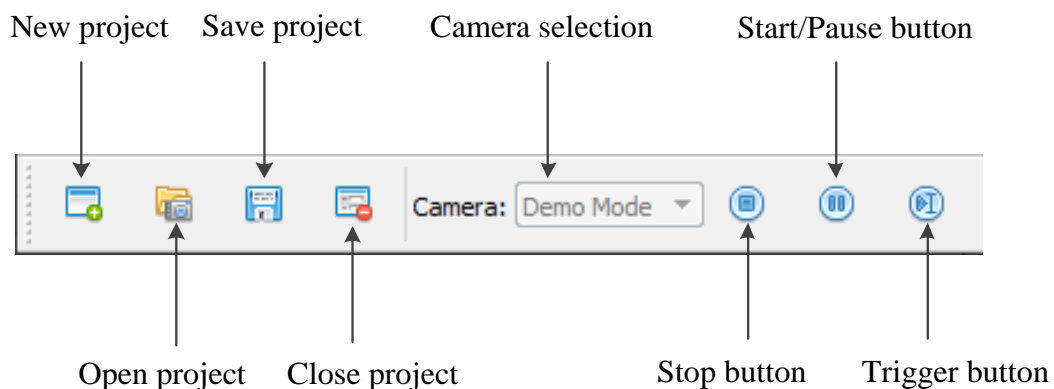


Figure 3 : Toolbar Menu

3.2 Project navigator

The project navigator allows configuring the camera and selecting a video source. It includes several tabs:

1. A General tab, used to specify the project name and description as shown in Figure 4.
2. A Video source tab is used to specify a video source for the current project as shown in Figure 5.
3. A Camera tab enables configuring the camera GenCam parameters listed in the chosen XML file. It also enables specifying a camera configuration file that will store the values for all the GenCam parameters (file extension .kyccf). The camera tab is shown Figure 6.

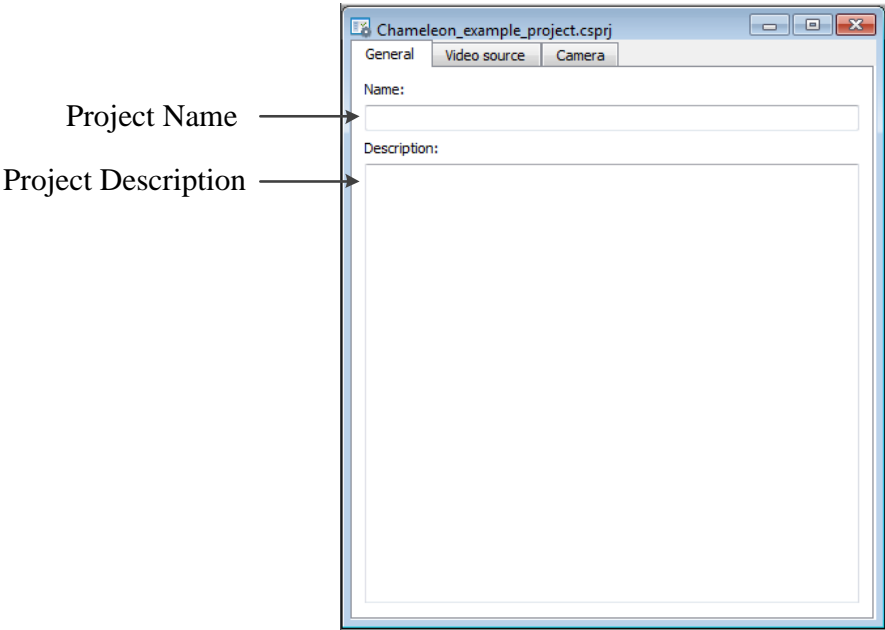


Figure 4 : General project navigator tab

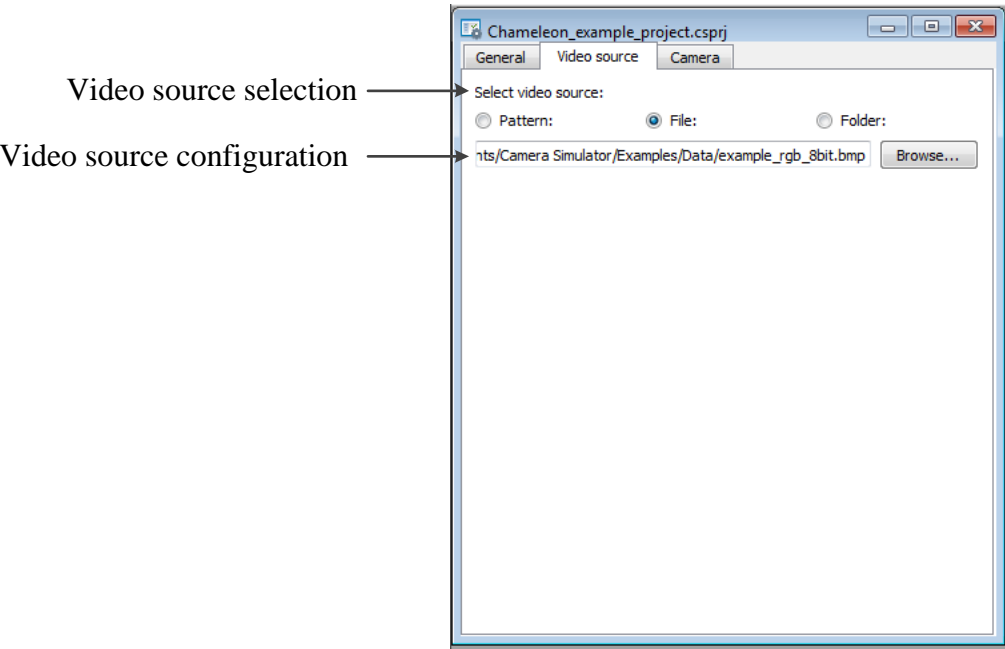


Figure 5 : Video source project navigator tab

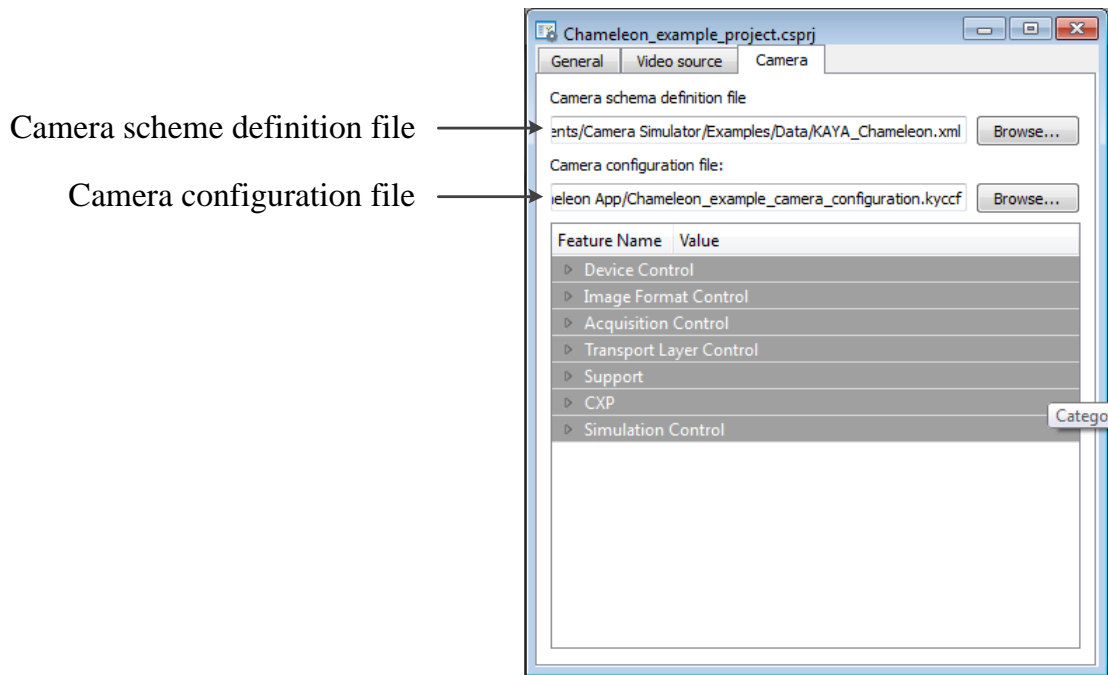


Figure 6 : Camera project navigator tab

3.3 System messages window

The system messages window displays general, runtime informational and error messages regarding the state of simulation and changes to various components. If not needed the message window can be hidden/shown via View tab of the Chameleon App menu bar. The system messages window is shown in Figure 7.

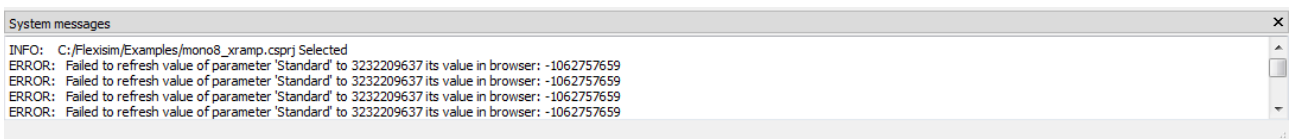


Figure 7 : System messages window

3.4 Simulated picture window

The simulated picture window, displays the current frame that is being simulated. Information on frame rate and image format can be found at the bottom of the picture window. The picture window can be seen in Figure 8.

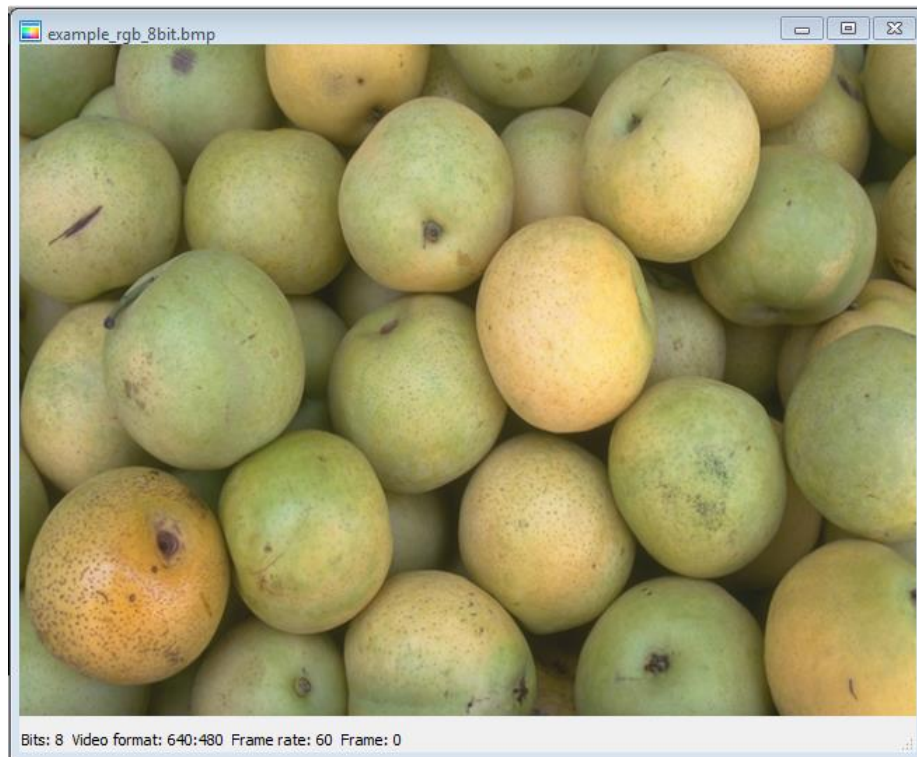


Figure 8 : Picture window

4.1 Using Chameleon App

This section describes the basic simulation setup. The basic step for the simulator configuration includes:

1. Selecting a simulator board
2. Opening/creating a project
3. Adjusting the camera parameters
4. Selecting the video source
5. Starting the simulation

4.2 Selecting a simulator board

A Chameleon App requires selecting a KAYA simulator target board before using any simulation features. Different boards may include different feature sets. The target board is selected from the scroll bar and is only available when there is no active project mounted. If a different target board to be selected, the active project should be closed first.

To select a target board:

- Click the ▼ button of the camera selection scroll bar located on the Toolbar Menu.
- When the list of available target boards will open, select the required board/simulation mode from the list.

Note: When no Chameleon board is installed the application will start in Demo mode

The simulator selection example is shown in Figure 9.

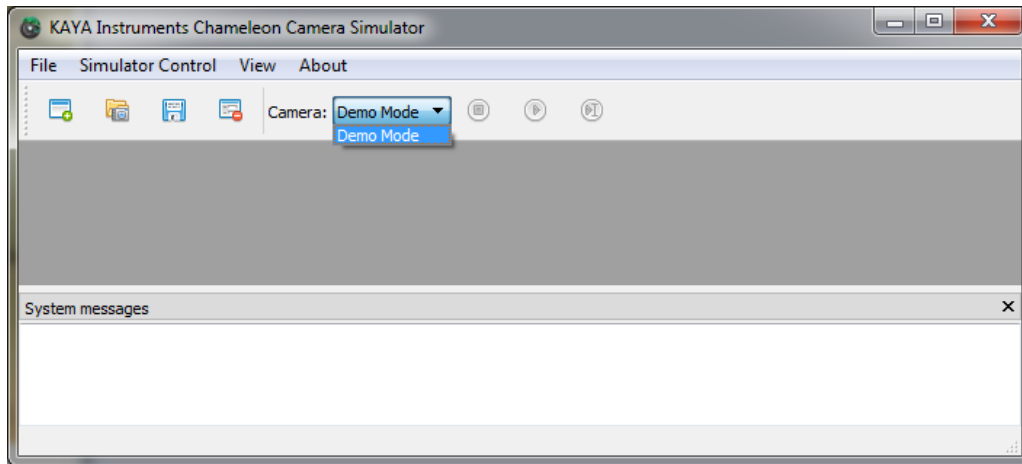



Figure 9: Selecting the camera

4.3 Open a project file

After a target board is selected, a simulation project can be opened.


To open a project file:

- Click on the  Toolbar Menu button, or select “Open Project” from “File” menu.
- Select the desired project file (file extension .csprj).

KAYA Instruments provides a pre-defined example project files. The example project files are located in *Examples\Chameleon App* under the installation directory.

NOTE: A frame grabber won't be able to detect a simulator, unless a project is opened and an XML file is already mounted.

4.4 Creating new project file

To create a new project file use the  toolbar button, or click “New Project” in the “File” menu. Please follow the instructions described in Creating a new project from scratch section 6 on creating a custom configuration.

4.5 Adjusting the camera parameters

The camera configuration contains many parameters. Some of the parameters are standard CoaXPress defines, some are camera dependent and some effect the image type and geometry. Before starting the simulation, the image parameters have to be configured to match the simulated camera requirements. The parameters can be configured under the “Camera” tap in the project dialog as can be seen in Figure 10.

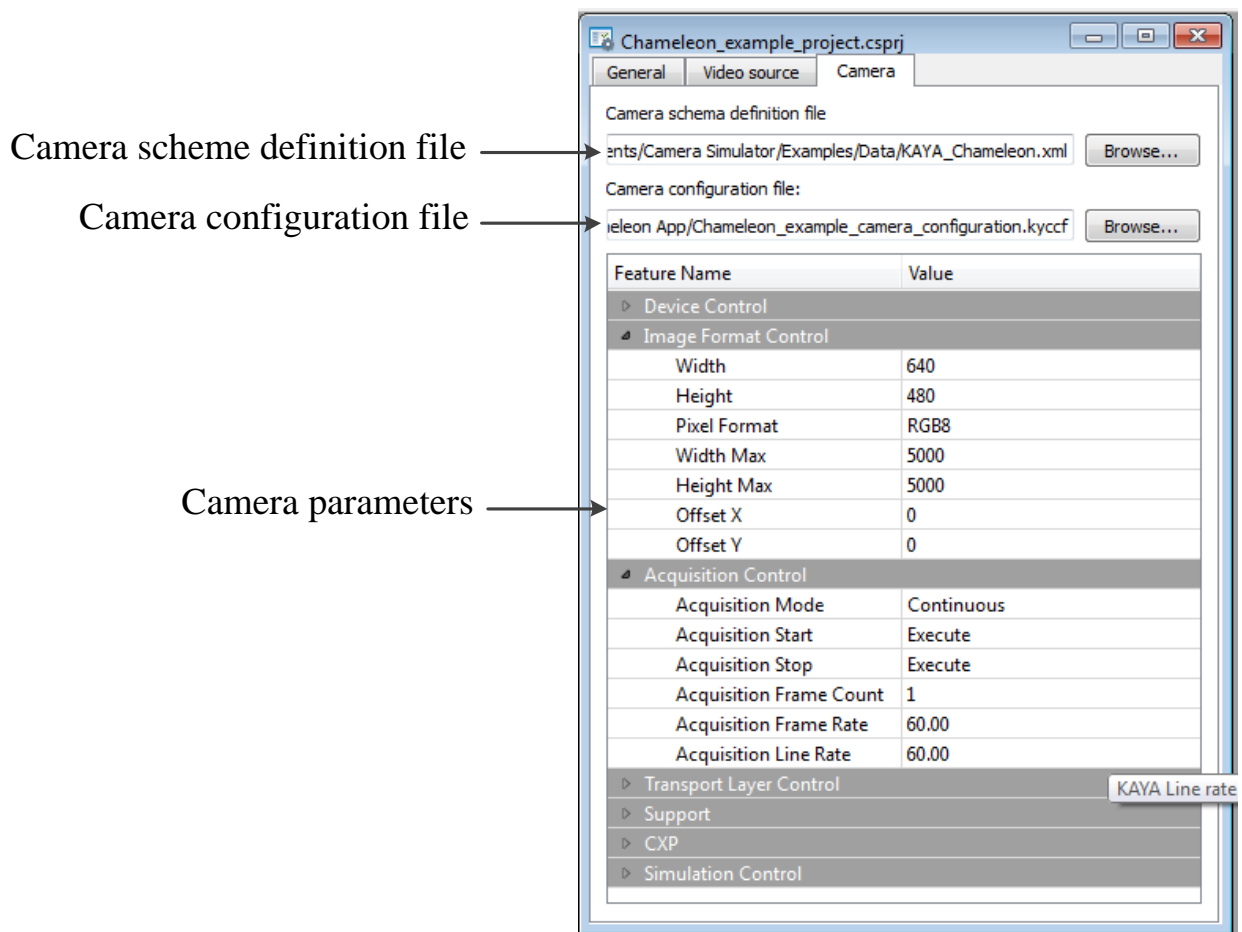


Figure 10: Adjusting camera parameters

There are several properties that directly affect the simulation. These parameters must be configured prior to starting the simulation. The mandatory parameters are described in Table 1.

Category	Property	Description
Image Format Control	Width	This property defines the frame width in pixels
Image Format Control	Height	This property defines the frame height in pixels
Image Format Control	Offset X	This property defines the horizontal offset of the frame within ROI in pixels
Image Format Control	Offset Y	This property defines the vertical offset of the frame within ROI in pixels
Image Format Control	Pixel Format	This property defines the pixel format of the image as specified in section 9.4.1.1 of the CoaXPress 1.1 standard.
Acquisition Control	Acquisition Mode	This property defines acquisition mode of the camera, it can be “Continues”, “SingleFrame” or “MultiFrame”. In case of “Continues” mode the simulation will continue running until a stop command is issued. In “SingleFrame” mode a single frame will be sent. In “MultiFrame” mode the number of frames defined in “Acquisition Frame Count” field will be sent. .
Acquisition Control	Acquisition Frame Rate	Defines the frame rate for frame scan cameras. The units are frames per second.
Acquisition Control	Acquisition Line Rate	Defines the line rate for line scan cameras. The units are lines per second.
Acquisition Control	Acquisition Frame Count	Defines the number of frames to be simulated. Used only if “MultiFrame” value is chosen in the “AcquisitionMode” enumeration field
Simulation Control	Simulation Format	The format of the simulated camera. This can be Either “Line Scan” or “Frame Scan”
Simulation Control	Trigger Mode	“Free Running” for internal timing and “Triggered” for external triggered timing. In case of “Free Running” mode, frames/lines are send according to “Acquisition Frame Rate”/“Acquisition Line Rate property“. In case of “Triggered” mode a new line/frame is send upon hardware/software trigger.
Simulation Control	Simulation Trigger Source	Selects a source for the trigger. The sources are described in Table 3.


Table 1: Mandatory camera properties

NOTE: The “Image Format Control” properties can be also modified from the frame grabber according to GenCam protocol. Such changes are only allowed when the simulation is stopped.

The other properties in the list do not effect the type and geometry of the image. They are either standard CoaXPress properties or a custom properties related to a specific camera.

For more information regarding the CoaXPress standard properties please refer to CoaXPress standard, GenCam standard and specific camera documentation.

4.6 Saving a project

To save a project file, use the  toolbar button or click “Save” or “Save As...” in the “File” menu.

4.7 Selecting a video source

The next step prior to starting the simulation is to select the right video source. This can be one of the following:

1. Pattern
2. An image file
3. A directory containing several files of a specific type.

To select and configure the desired video source, use the “Video source” tab in the project navigator window as described in the next sections.

4.7.1 Pattern source

A pattern source generates a static pre-defined pattern. In case of pattern, a pattern type should be specified in the “Pattern type” list. There are several patterns that can be selected as shown in Figure 11.

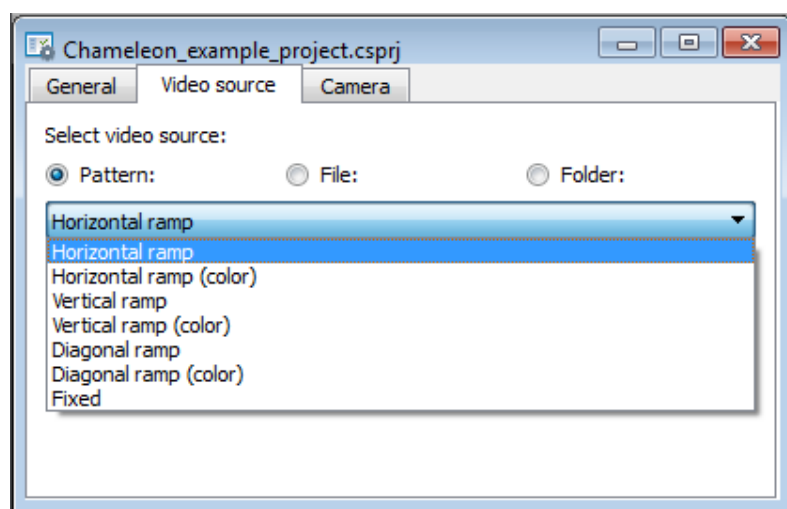


Figure 11 : Pattern video source

The different available patterns are:

1. Horizontal ramp – a gray scale horizontal gradient as shown in Figure 12.

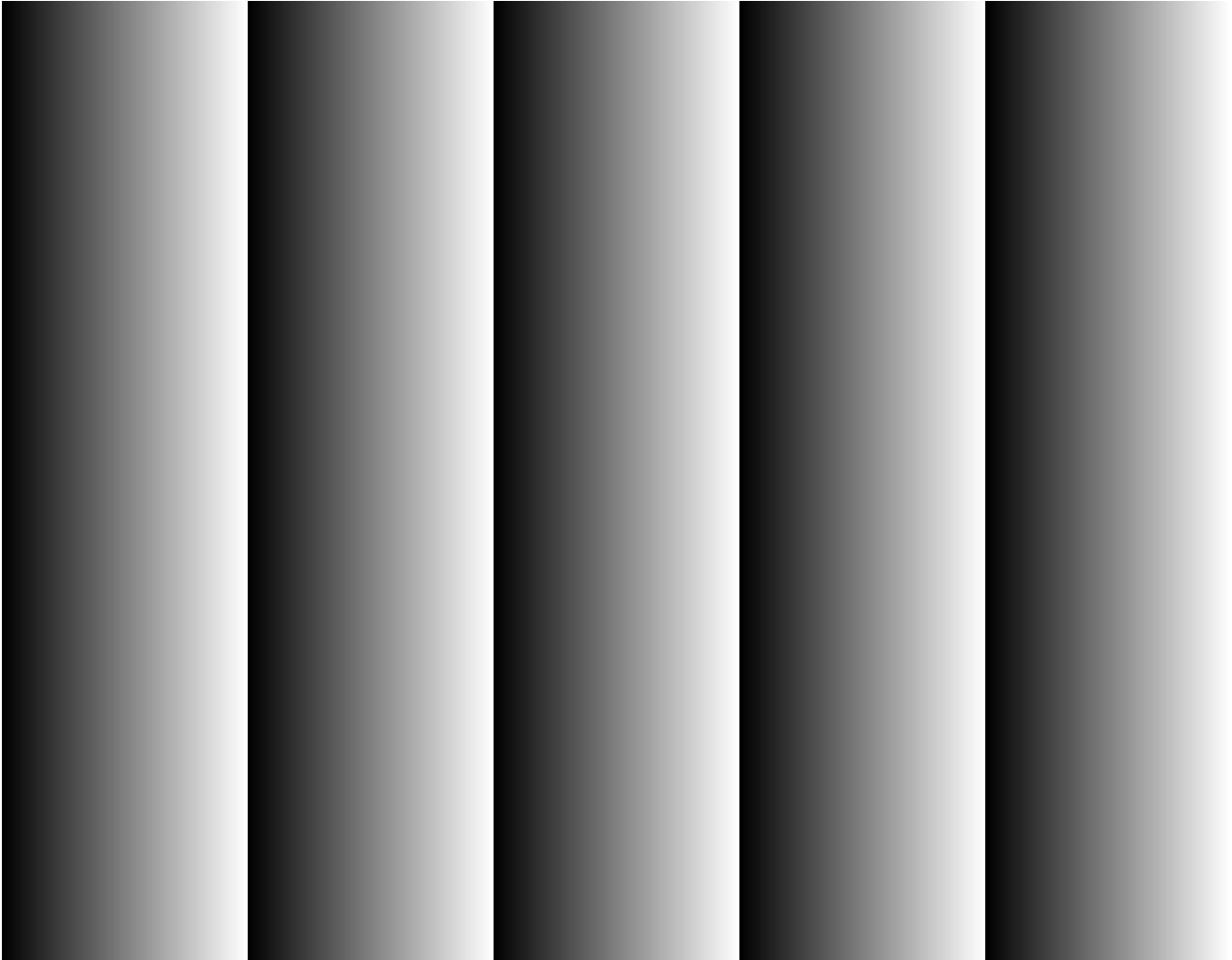


Figure 12 : Horizontal pattern

2. Horizontal color ramp – horizontal gradient of several color stripes as shown in Figure 13.

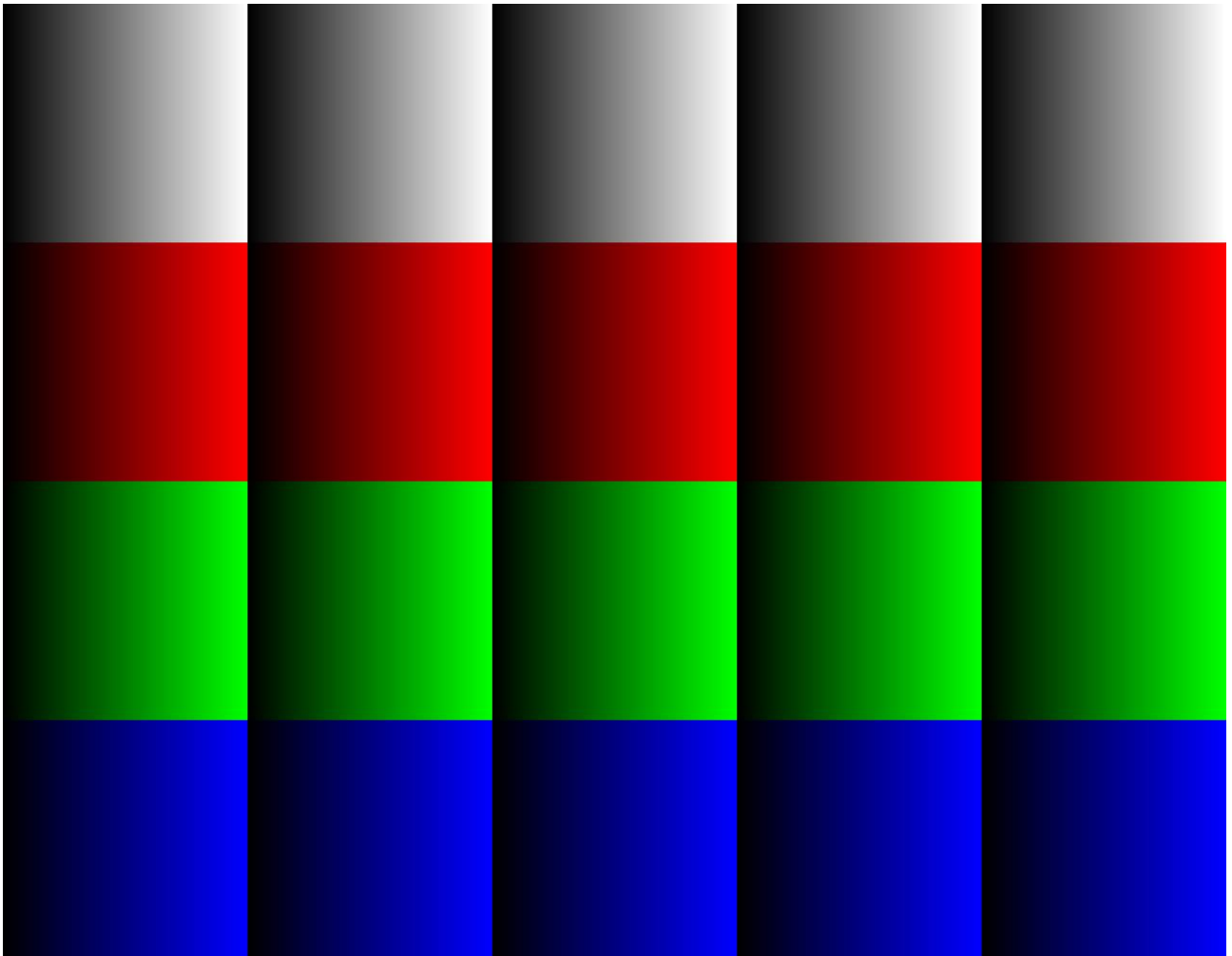


Figure 13 : Horizontal color pattern

3. Vertical ramp – a gray scale vertical gradient as shown in Figure 14.



Figure 14 : Vertical pattern

4. Vertical color ramp – vertical gradient of several color stripes as shown in Figure 15.

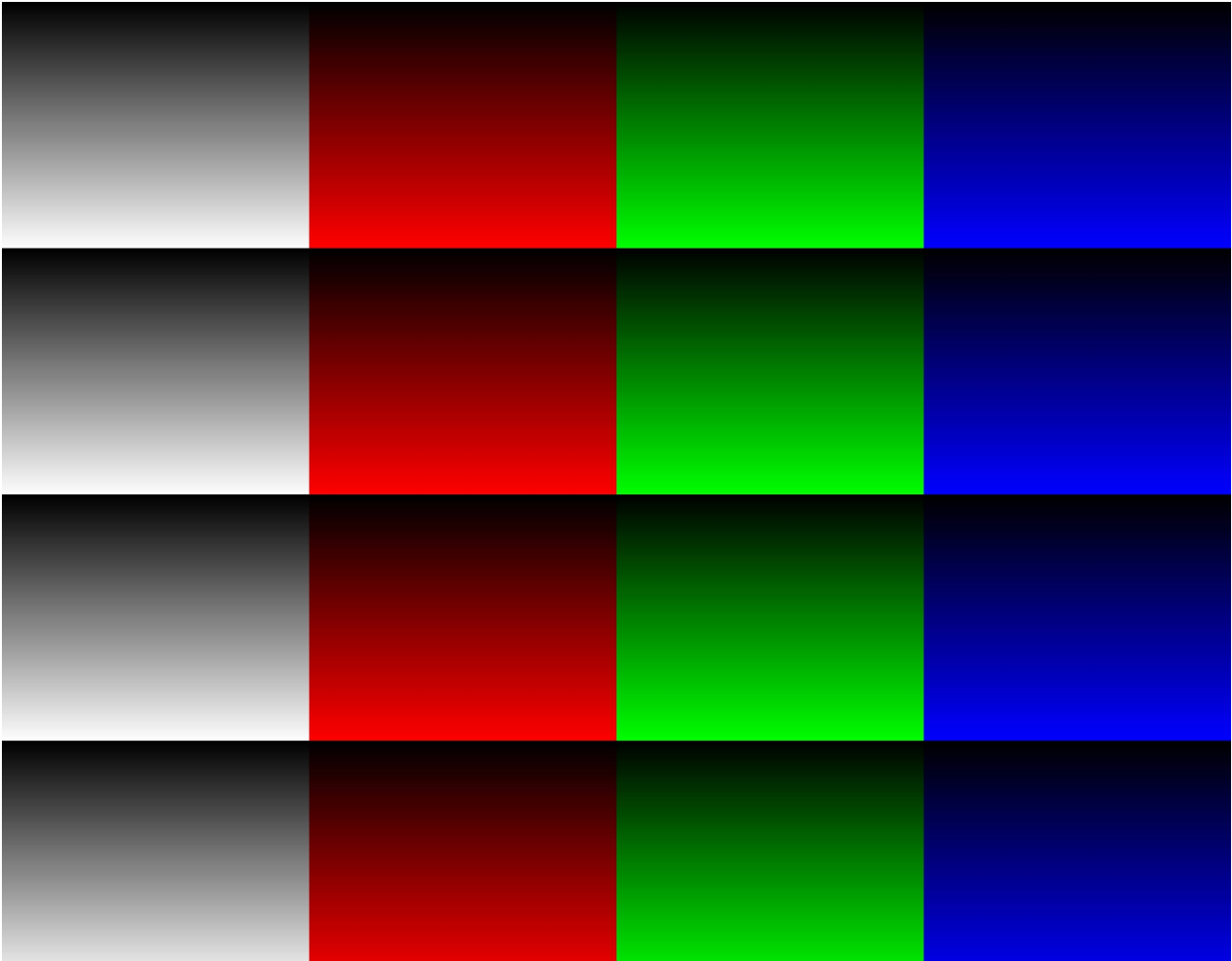


Figure 15 : Vertical color pattern

5. Diagonal ramp – a gray scale diagonal gradient as shown in Figure 16.

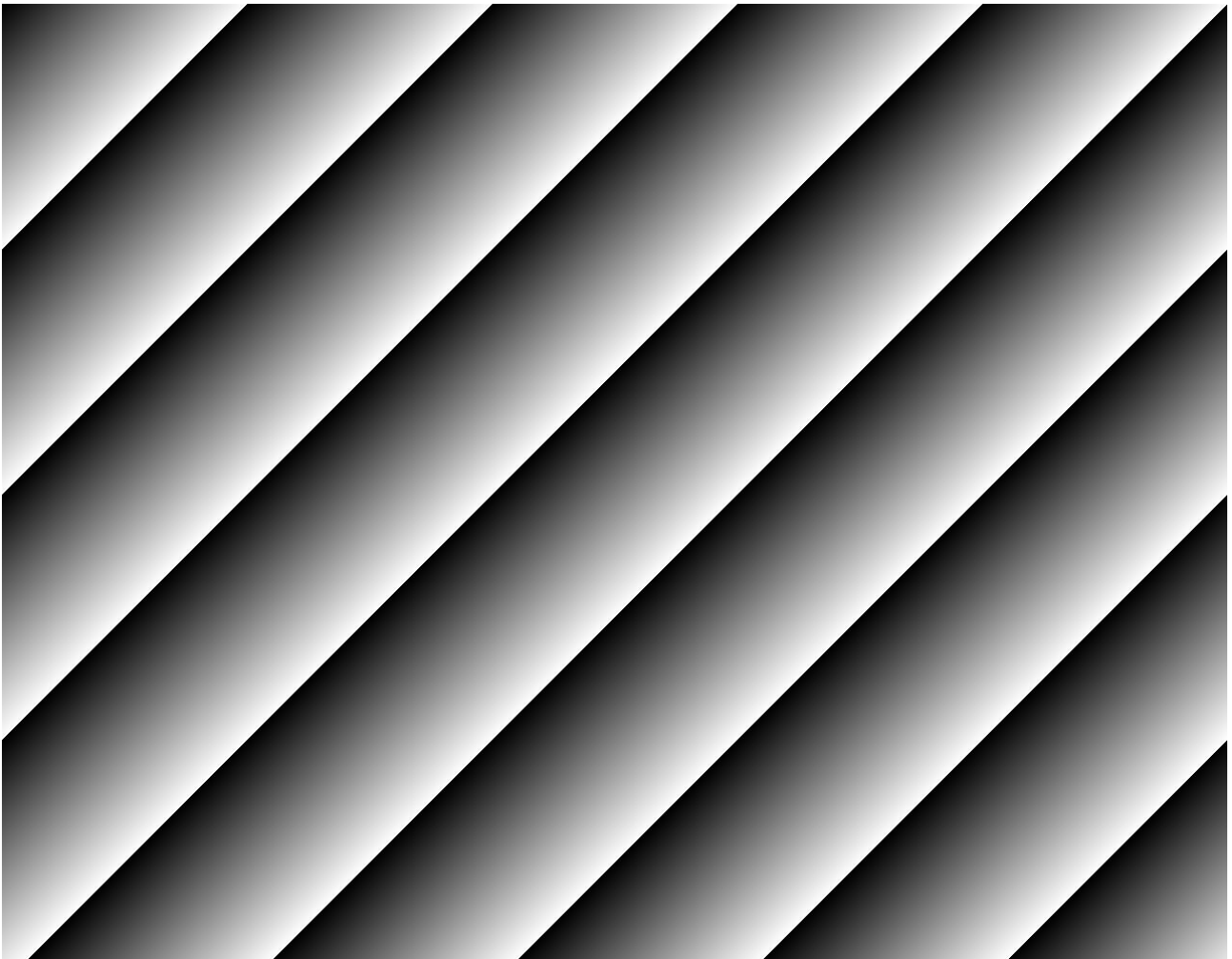


Figure 16 : Diagonal pattern

6. Diagonal color ramp – diagonal gradient of several color stripes as shown in Figure 17.

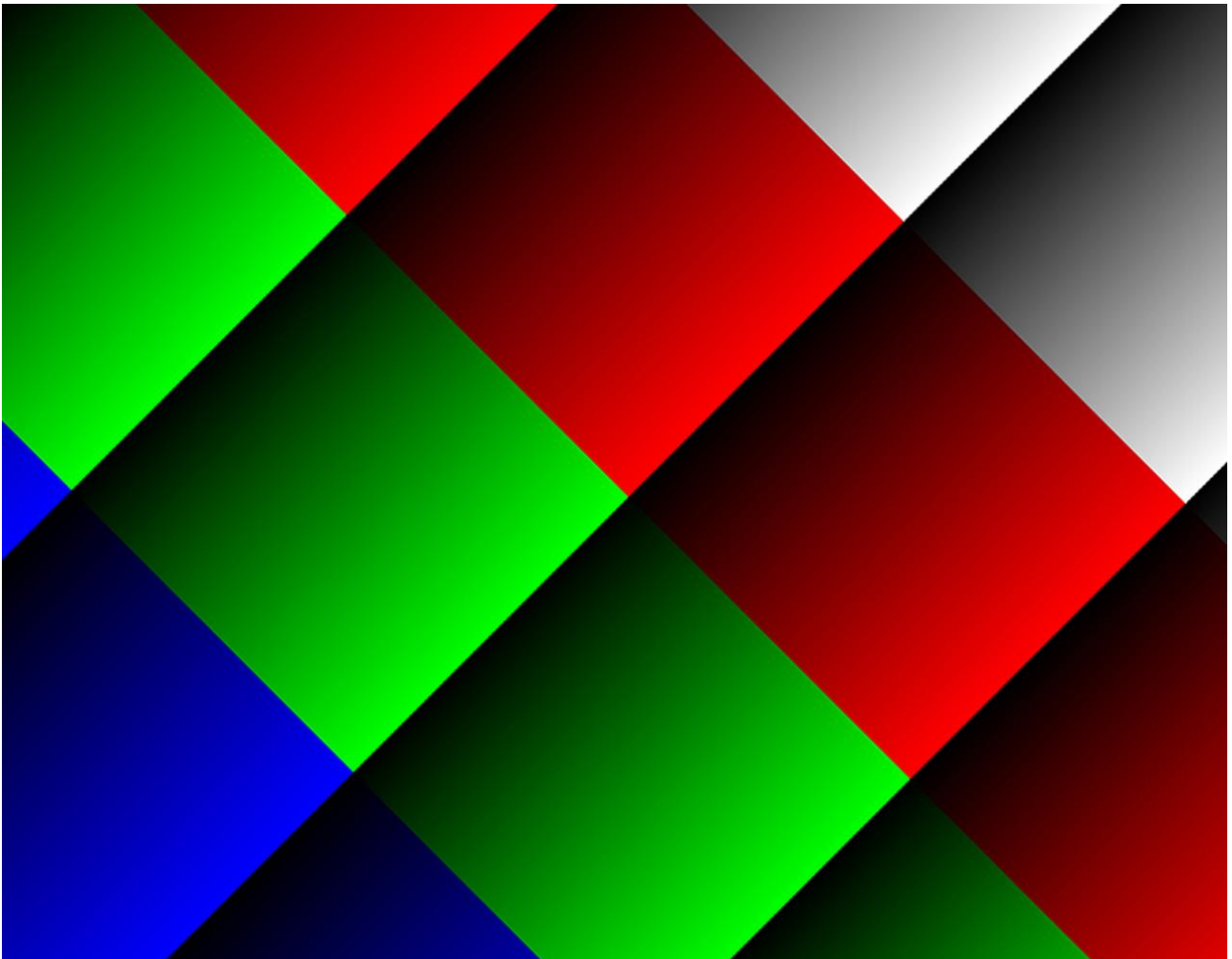


Figure 17 : Diagonal color pattern

7. Fixed – Fixed color filling of the entire frame

In case a Fixed pattern type is selected a color configuration controls are enabled as shown in Figure 18.

There are few methods to select the desired color:

- The numeral values of individual color can be modified.
- The scales on the right may be used by dragging individual color until the desired result is achieved.
- The interactive color pane can be moved on the circular axle as well as the square shade pane to select the desired color.
- The “Pick” button may be clicked to activate the color sampling tool (resembles to the Eyedropper tool in Photoshop). Once the button is clicked, the next cursor selection will determine the color.
- The HEX value can be modified directly if a color value is known. The “Hex” value represents a combined color value that consists of all the color planes. Each color is represented by 2 bytes (16 bits) in the Hex value LSB aligned. The first color plane is on the left side of the value. For example for an RGB 10 bits format with R=255, G=1, B=512 the hex value will be #00FF00010200.

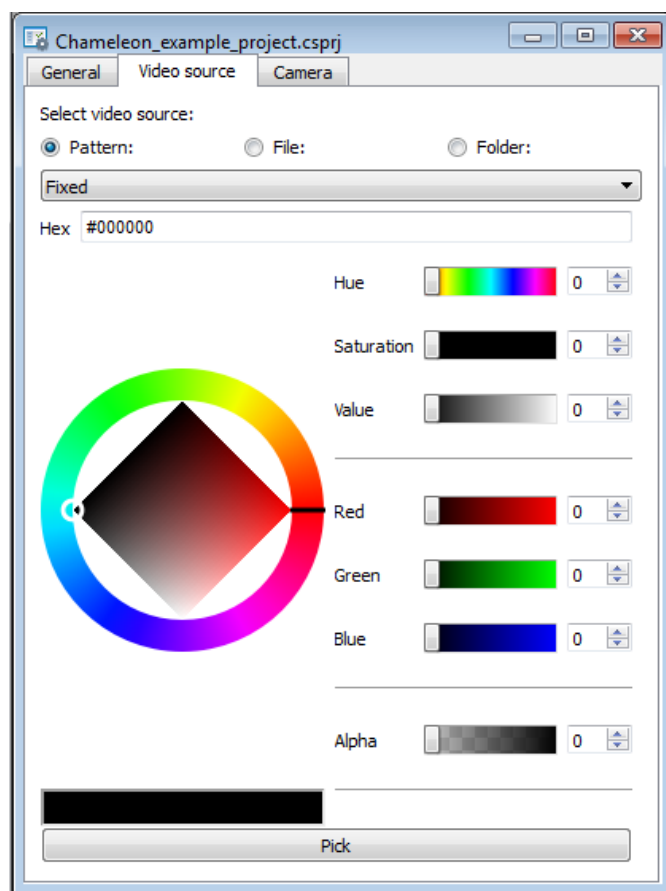


Figure 18 : Fixed color pattern

4.7.2 File source

The Chameleon App supports loading of images from BMP, PNG, TIFF and RAW files. When a file source is selected, the Chameleon App loads an image from a single file. Please refer to Table 2 for the supported image formats that can be stored in each file type.

	RAW	BMP	TIFF	PNG
Mono/ Bayer 8 bit	✓	✓	✓	✓
Mono/ Bayer 10-16 bit	✓	✗	✓	✓
RGB 8 bit	✓	✓	✓	✓
RGB 10-16 bit	✓	✗	✓	✓
RGBA 8 bit	✓	✗	✓	✓
RGBA 10-16 bit	✓	✗	✓	✓
YCbCr 8 bit	✓	✗	✗	✗
YCbCr 10-16 bit	✓	✗	✗	✗
YUV 8 bit	✓	✗	✗	✗
YUV 10-16 bit	✓	✗	✗	✗

Table 2 : Supported image formats

NOTE:

1. If the source file resolution, color format or bit-width of BMP, TIFF and PNG files do not match the selected camera parameters, it will be rescaled automatically to match the camera. An appropriate message will appear in the log for this case.
2. The 8 bit formats are stored on a single byte basis, while 10, 12, 14 and 16 bit ones are stored on two byte basis LSB aligned.
3. The RAW files must match the camera parameters; otherwise they won't be loaded correctly.

RAW files are files that contain only the bitmap data of an image with no header.

The RAW file must be structured as follows:

- No header or Metadata is to be a part of the file.
- Upper-Left pixel has to be located first in the file.
- All the pixels in the RAW file should be packed and no intra-pixel and intra-line alignment allowed.
- For multi-byte color data, the byte-order is "Little Endian", i.e., LSB goes first.
- A RAW file can contain more than one frame. Only full frames will be taken from a RAW file, i.e. if there is a partial frame at the end of the file, it will be ignored.

4.7.3 Folder source

In case a folder source is selected, a type and maximum number of frames to be loaded must be specified. Only the files of selected type will be loaded in alphabetical order (as they are located in the folder). If there are more frames in the files than the maximum number specified, the simulator will load the maximum number of frames ignoring the rest. In case there are less frames in files, the last frame will be multiplied until maximum number of frames is mounted.

The rules that apply to the single file also apply to the folder source.

For the RAW files, the number of frames in each file in the folder can vary.

4.8 Controlling a simulation


There are several ways for controlling the simulation:

1. Using the Toolbar Menu buttons
2. From the "Simulator Control" menu
3. Using the "Acquisition Start" and "Acquisition Stop" commands from the "Camera" configuration tab.
4. Using the "Acquisition Start" and "Acquisition Stop" commands from the frame grabber

NOTE: A project has to be loaded and video source have to be selected to start the simulation. Once a simulation is started, a window with the currently transmitted frame will be shown. See section 3.4

4.8.1 Controlling simulation from Toolbar Menu and “Simulator Control” menu

In order to start the simulation from Toolbar Menu, simply press the  button

To stop the simulation from toolbar, press the  button.

To start the simulation from window menu, open “Simulator Control” menu and click “Start”

To stop the simulation from window menu, open “Simulator Control” menu and click “Stop”

4.8.2 Controlling simulation from camera configuration

To control simulation from camera configuration, open the “Camera” tab in the project widow and expand the “Acquisition Control” category as shown in **Error! Reference source not found..**

To start the simulation click the Execute button near “Acquisition Start”

To stop the simulation click the Execute button near “Acquisition Stop”

4.8.3 Controlling the acquisition from the frame grabber

Different frame grabbers have a different approach to starting an acquisition. On several models the “Acquisition Control Start” / “Acquisition Control Stop” commands are automatically written to the camera when frame grabber starts the acquisition, while on others it’s needed to manually issue GenCam command or direct write to the camera register.

Please refer to the frame grabber documentation for more information.

Several applications require a triggered frame/line output. In such case a simulator waits for trigger event before sending a new line/frame. In case of frame scan cameras, each trigger event results in full frame output. In case of line scan cameras each trigger event results in full line output.

In order to configure the simulator in triggered mode the following steps should be taken, as shown in Figure 19:

1. Open the “Camera” tab in the project window
2. Under “Simulation Control” category select “Triggered” for “Trigger Mode”
3. Under “Simulation Control” category select the right source for “Simulation Trigger Source”.

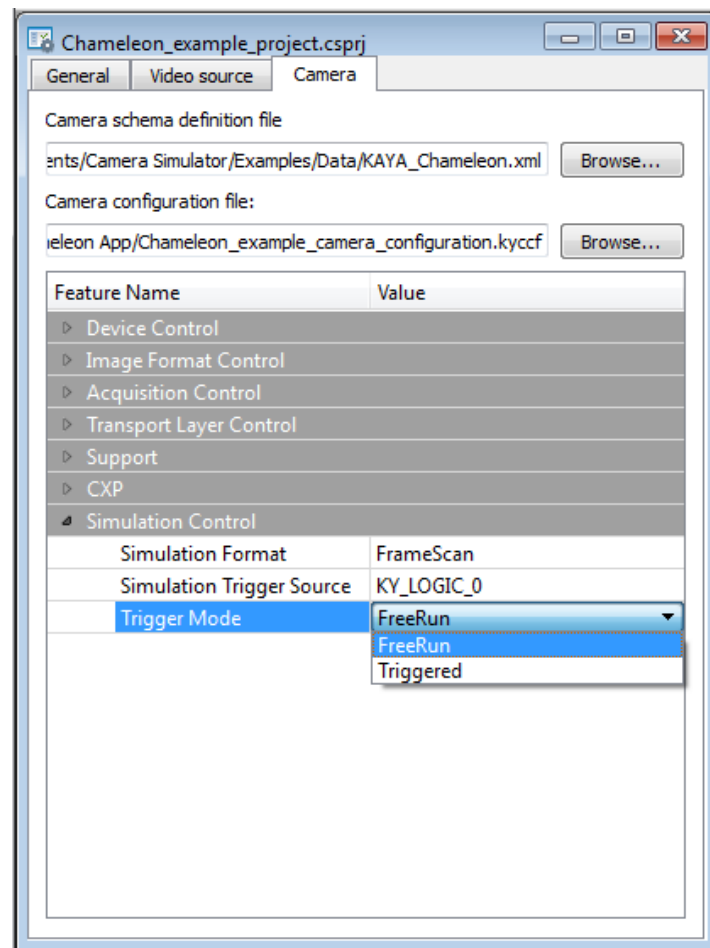



Figure 19: Selecting triggered mode

The trigger event can be generated by:

- Software trigger, by pressing the  in the Toolbar Menu or clicking the “Trigger” from “Simulator Control” menu. This overrides the external trigger.
- External trigger that is received from GPIO or from CoaXPress link. The available sources for the trigger are described in Table 3 : Trigger source options

Simulation Trigger Source	Description
Logic 0	Fixed Logical 0
Isolated Input 0	Isolated Input 0 from external connector
Isolated Input 1	Isolated Input 1 from external connector
Isolated Input 2	Isolated Input 2 from external connector
Isolated Input 3	Isolated Input 3 from external connector
LVDS Input 0	LVDS Input 0 from external connector
LVDS Input 1	LVDS Input 1 from external connector
LVDS Input 2	LVDS Input 2 from external connector
LVDS Input 3	LVDS Input 3 from external connector
TTL Input 0	TTL Input 0 from external connector
TTL Input 1	TTL Input 1 from external connector
TTL Input 2	TTL Input 2 from external connector
TTL Input 3	TTL Input 3 from external connector
TTL Input 4	TTL Input 4 from external connector
TTL Input 5	TTL Input 5 from external connector
TTL Input 6	TTL Input 6 from external connector
TTL Input 7	TTL Input 7 from external connector
LVTTL Input 0	LVTTL Input 0 from external connector
LVTTL Input 1	LVTTL Input 1 from external connector
LVTTL Input 2	LVTTL Input 2 from external connector
LVTTL Input 3	LVTTL Input 3 from external connector
CXP Trigger	Trigger Input from CoaXPress Link
CXP GPIO 0	GPIO Input 0 from CoaXPress Link
CXP GPIO 1	GPIO Input 1 from CoaXPress Link
CXP GPIO 2	GPIO Input 2 from CoaXPress Link
CXP GPIO 3	GPIO Input 3 from CoaXPress Link
Logic 1	Fixed Logical 1

Table 3 : Trigger source options


In order to simulate a custom camera, a new project has to be created. The following components are required:

1. GenCam XML file from the camera you wish to simulate
2. Required values for the properties described in the XML file

NOTE: The custom XML file size limitation is 256 Kbytes. If your file is bigger than that it will have to be compressed to ZIP file.

NOTE: The user address space on the KAYA simulators is 32 Kbytes in size (Not including the XML file) and spans from 0x6000 to 0xDFFF. Any other addresses out of this range are ignored.

To start a new design:

1. Click the  button in the Toolbar Menu or click “New Project” from the “File” menu
2. A project window as shown in Figure 20 will be opened.

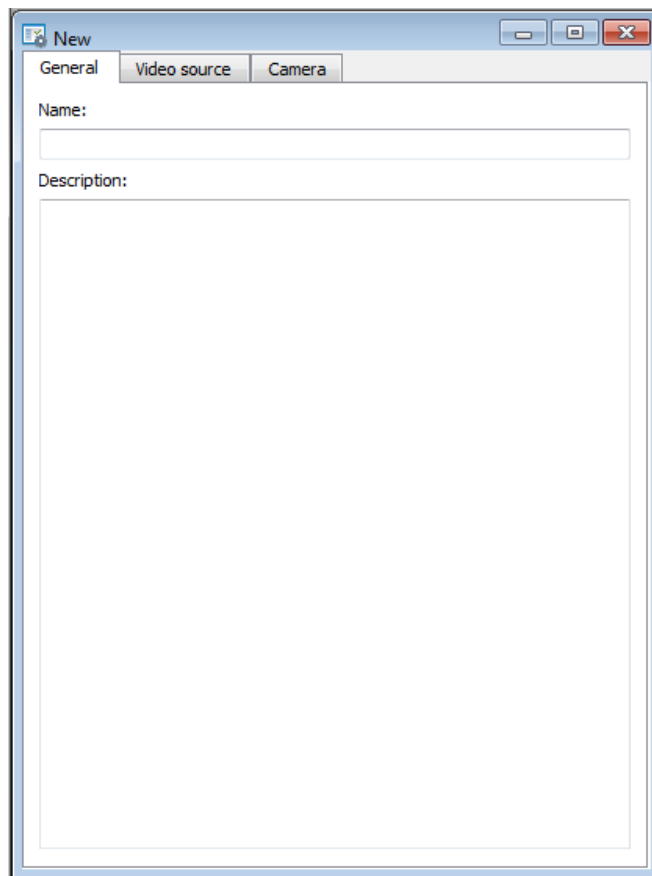


Figure 20: New project window

3. Write a project name and description under the “General” tab.
4. Switch to “Camera” tab and specify the GenCam XML file and a name for camera configuration file as shown in Figure 21. The later will hold all the camera parameters values.

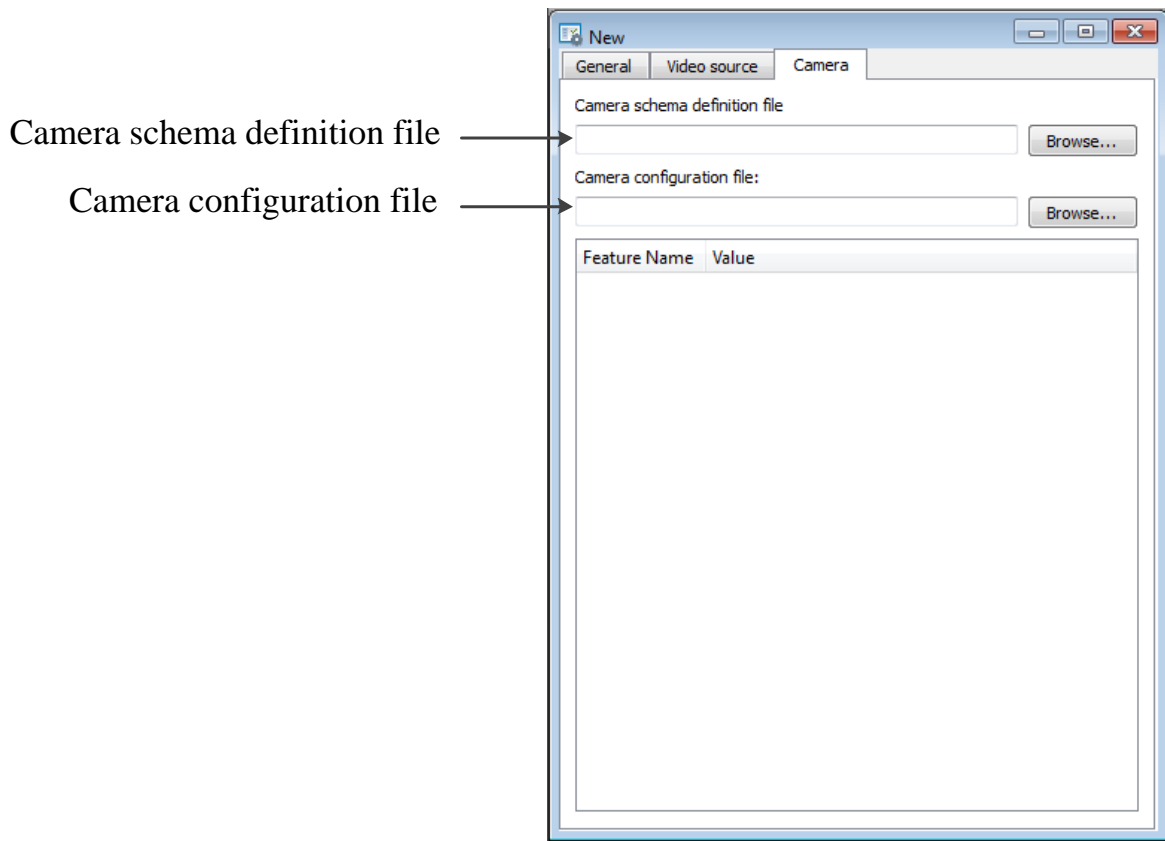


Figure 21: New project camera parameters

5. Once the XML file is specified, camera properties will be displayed and loaded with default values as shown in Figure 22. If the XML file doesn’t load correctly, an error probably exists in the chosen file. In this case the XML file structure must be repaired or another XML file is to be loaded.

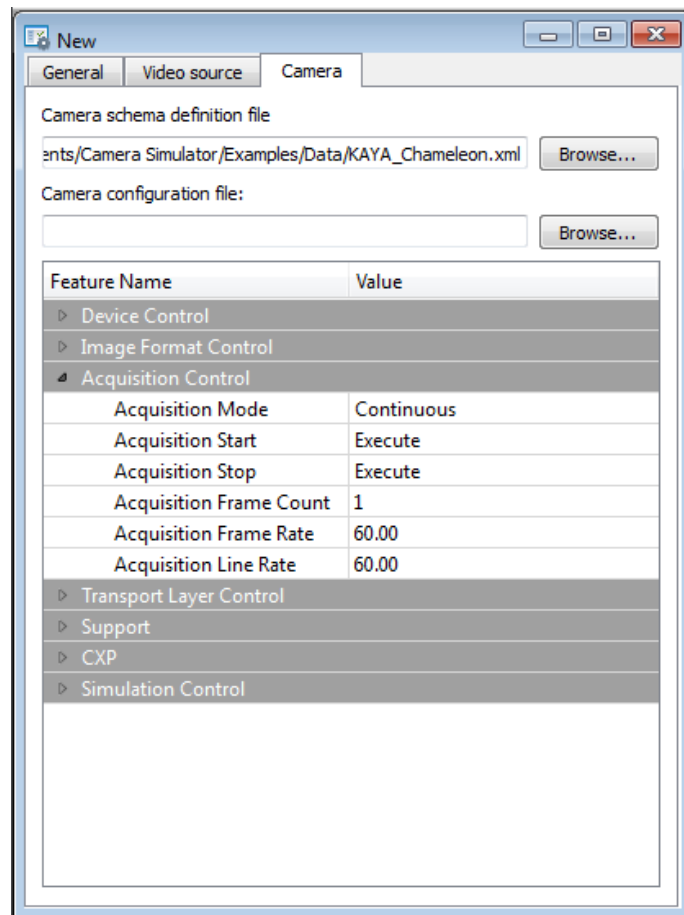


Figure 22: New XML file loaded

6. At this stage a value for each property have to be specified in order to match the simulated camera settings by filling the values manually.
7. Specify video settings and video source as shown in section 4.7 and save the project
8. Now a simulation can be started for the custom camera.

A pre-defined project example is located under *Examples\Chameleon App* in the installation directory.

The example simulates a 640 x 480 x60 fps camera.

The parameters of the example are:

1. Width : 640
2. Height : 480
3. Frame rate : 60 fps
4. Pixel Format: RGB 8 bit per pixel
5. Acquisition mode : Continuous
6. Video source : BMP Image

- CoaXPress standard (http://jiia.org/en/standard_dl/CoaXPress-wg/)
- Gen*i*cam standard (<http://www.emva.org/cms/index.php?idcat=47>)
- Chameleon Installation and hardware reference manual
- Chameleon API reference manual

Version	Date	Notes
0.1	1/5/2014	Initial Release

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