ProgRes_Cam

ImageJ plugin for the control of Jenoptik ProgRes® Cameras and the acquisition of single images and live image streams

Manual

Dear user,

Please read the following information about the operation of the ProgRes® ImageJ driver carefully before you start the operation. By complying with the advice contained in this manual, optimum use of the functions can be made.

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Signs and abbreviations used in this manual

Signs and symbols

- Enumeration

☞ Advice / Important / Important advice

→ Reference (to a text passage or image)

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1 Description

ProgRes_Cam is an ImageJ plugin for the control of all available ProgRes® camera types and the acquisition of single images and live image streams. Single images and live image streams are displayed in true ImageJ Image Windows, thus enabling the user to apply at least some of the methods of the ImageJ tool bar. ProgRes_Cam is entirely written in Java.

2 Installation

It is required that the camera driver is already installed (Driver/SDK Version 3.3.2.0) when starting to work with ProgRes_Cam. Please copy all files shown in the table below into the corresponding folders of the ImageJ pathway. Please make sure that there are no additional copies or older versions of the Dlls mentioned below anywhere in the Windows pathway!

File	ImageJ Target Folder
ProgRes_Cam.class	ImageJ\plugins\JenOptik(*)
ProgResPaintThread.class	ImageJ\plugins\JenOptik(*)
ProgResStdPanel.class	ImageJ\plugins\JenOptik(*)
ProgResConstants.class	ImageJ\plugins\JenOptik(*)
IJ_ProgResControl.dll	ImageJ
ProgRes.png	ImageJ
FireCamJ.dll	ImageJ
MexJCam.dll	ImageJ
ProcessLib.dll	ImageJ
canconj.dll	ImageJ

(*) Folder JenOptik has to be created if not already present

Under Windows, you may carry out the installation also by double-clicking *Install_IJ_PlugIn.vbs.* The Jenoptik target folder is automatically created by that script. If you use your own path for plugins, the script should not be used.

It may be necessary to define the memory that will be used by ImageJ. When working with Windows, commands like the following are found in the file ImageJ.cfg:

```
jre\bin\javaw.exe
-Xmx400m -cp ij.jar ij.ImageJ
```

400m means that a memory capacity of 400 MB is reserved for ImageJ. This capacity may be too small when dealing with a large number of 3x16 Bit RGB images in high resolution. In these cases, the memory should be increased, i.e. to 800m. In any case the set value must not be higher than the physical memory of your machine. After the relaunch of ImageJ, the new memory allocation becomes effective.

Please make sure that your ImageJ version is 1.39p or higher!

Close all instances of ImageJ and restart ImageJ. Depending on the ImageJ version you will find the plugin in the menu *Plugins -> JenOptik -> ProgRes Cam* or *Plugins -> Miscellaneous -> ProgRes Cam*.

3 Working with the plugin

When running the plugin, a camera control dialogue appears, and shows the "Main"- panel. There are two panels, "Main"and "Advanced", which can be accessed by clicking the corresponding buttons at the top of the panel. The "Main"-panel is always displayed after the start of the plugin.

3.1 Connect

Initially, the button [Connect] is enabled. The plugin is connecting to the first camera found on the firewire bus, and is starting the live stream acquisition in a separate ImageJ Image Window.

As initial camera settings, the settings of the previous session when the camera was closed or the default settings are used. When the plugin is closed, the session data are stored automatically in the user path under Windows in the registry:

HKCU\Software\JavaSoft\Prefs\I/J_/Prog/Res/Plug/In\a_number

Dialogue appearing after the colour camera ProgRes C7 was connected, *Main* panel

3.2 Controls

The control elements in the dialogue can be classified generally into 2 groups: **Non Live Controls** and **Live Controls**.

Non Live Controls can only be used when the image acquisition was explicitly stopped before (button [Stop Video]). Only the controls for changing the live resolutions and the trigger functions belong to this group. All other controls are **Live Controls**, and can be used without stopping the image acquisition. Nevertheless, the image acquisition may be stopped automatically in some cases, for instance when capturing a single image (button [Capture]).

3.3 Image acquisition

Live image streams are only available in 8 bit grey or 3 x 8 bit RGB. Single images can be captured additionally in 16 bit data words, grey and also in 3 x 16 bit RGB in normal 16 bit data mode or in square root mode (see also your camera documentation). 3 x 16 bit RGB are displayed in ImageJ as Composite RGB Hyperstack where every colour channel is separately accessible.

Please keep in mind that the current camera types do not completely fill 16 bit data words. Depending on the type, only 14 bit, 12 bit or 10 bit are significant.

☞ **Note:** 16 bit data word images must not be saved in BMP-format, use TIFF-format.

4 Brief description of the controls

4.1 Button bar on top (always visible)

The button bar "Set" contains the buttons [1]…[6] for saving and loading camera settings in preset user profiles. Up to 6 user profiles can be saved and loaded.

Saving a user profile

Right-click onto a button [1]…[6] to save the current settings as a user profile in the user path.

Loading a user profile

Left-click onto a button [1]…[6] to load the respective user profile.

Reset camera to default settings

Click the button [def]. The default settings cannot be changed by the user.

The following parameters are parts of the user profile; the default values available by clicking the [def]-button are indicated in brackets:

Exposure time	(100 ms)
Auto exposure state	(off)
Gamma	(0.5 if applicable)
Gain	(1 if applicable)
Cooling	(off if applicable)
Live Resol.	(First or second value in selection box, depending on camera model)
Capture Resolution	(index 0 or 3, depending on camera model)
Capture Bit Depth index	(8 Bit)
Color Interpolation index	(fast++)
Color Correction index	(no)
White Balance	(1.0, 1.0, 1.0 if applicable)

Triggers modes are shut off.

4.2 Controls in the “Main”-panel

Input box “Exp. time range” and time slider (Main panel)

The range of the time slider can be inserted into the input box. Using the time slider, the exposure can be selected. The total exposure time range is 1 msec to 10 sec.

Checkbox “Autoexp.” (Main panel)

When the checkbox is marked, the optimum exposure time is set by the camera. As a reference, the entire image with an average brightness of 60 % is used.

Checkbox “WB Pick” and button [Reset WB] (Main Panel)

These controls enable the setting of the white balance, and are only active for colour cameras. After activating [WB Pick], click onto a white area in the live image. The camera now tries to find the correct white balance to achieve a natural look of the colours. By clicking [Reset WB], the white balance values are reset to those of the previous white balance.

“Gamma”-slider (Main Panel)

The Gamma value can be set in a wide range from 0.2 to 5.0.

“Gain”-slider (Main Panel)

The Gain value may be set in a wide range from 1.0 to 8.0.

Button [Capture] (Main Panel)

When clicking this button, a single image is displayed in a separated window, which has the selected properties. The acquisition of live image streams is stopped and can be restarted by clicking the button [Start Video].

A captured image can be saved by the “Save as”-command in ImageJ menu “File”. Please keep in mind that 16 bit images (B/W and colour) must not be saved in BMP format. Use the TIFF format for these images.

Buttons [Start Video], [Stop Video] (Main Panel)

By clicking these buttons, the acquisition of live image streams is started or stopped. When the live image display window is closed, the acquisition of live images is stopped. The window can be reopened by clicking the button [Start Video].

Button [Connect] (Main Panel)

The connection of ImageJ and the camera is set up. Refer to chapter 3.1 “Connect” for a detailed explanation.

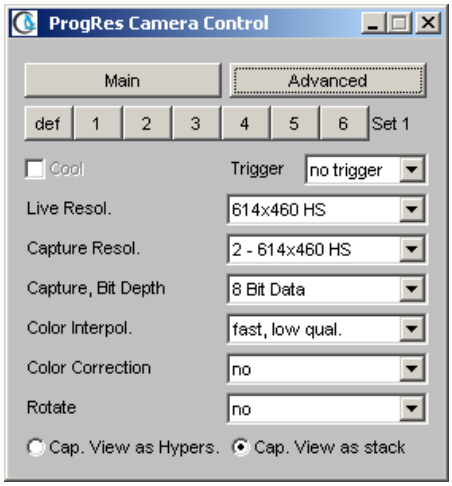
Textfields at the bottom (Main Panel)

The actual shutter time, the frame rate per second averaged over 20 frames and the current camera model are shown.

4.3 Controls in the "Advanced"-panel

Check box *Cool* (Advanced panel)

If the camera is equipped with cooling, the cooling function can be switched on or off by activating or deactivating this checkbox.



Advanced Panel

Drop down list *Trigger* (Advanced panel)

Only the Trigger-IN modes falling and rising edge of the trigger signal can be selected. The pin "Trigger Out" is fixed to the status "high".

When the camera receives a trigger signal, a single image is captured and displayed in a separate window. Its resolution corresponds to the actual settings for the live image. The trigger mode is switched off by selecting "No trigger".

Selections "Live Resol." and "Capture Resol." (Advanced panel)

In these drop-down lists, the resolutions for the live image and the captured image can be selected. To the selection of "Capture Resol.", an index is added as a prefix. The index should be used when assigning the desired resolution by macros (see below).

For live images, only 8 bit grey or 3x8 bit RGB are possible.

Selection "Capture, Bit Depth" (Advanced panel)

For captured single images, different bit modes can be selected. Please keep in mind that only 10 bit, 12 bit or 14 bit of a 16 bit data word are significant depending on the camera type. The pixel data are arranged in a way that the highest bits of a 16 Bit data word are significant. In case of a 16 Bit color data word, ImageJ will show a black image when it is very strongly over-exposed although a completely white image would be expected.

Selections "Color Interpol." and "Color Correction" (Advanced panel)

Different modes can be selected here for processing colour images (refer also to the documentation of your camera).

Selection "Rotate" (Advanced panel)

The display of live and captured images can be rotated by 90°, 180° or 270° with respect to the normal orientation.

Radio Buttons Cap.View as Hypers. and Cap. View as stack (Advanced panel)

☞ **Note:** These options are only available if 16 bit color depth is set. Please select the color depth in the respective drop-down list “Capture-Bit depth” in the “Advanced”-panel.

Cap.View as Hypers.:

This option displays the captured image as a composite 3 sliced hyper stack, each slice consisting of a 16 bit colour channel. 3x16 bit colour images loaded from a TIFF file are normally displayed by ImageJ in this way.

Cap. View as stack:

This option displays the captured image as a 2 sliced stack. The first slice named “High” contains the 8 most significant bits, the second slice (“Low”) displays the residual bits for every pixel. The bit depth of the “High”-slice is identical with the image in the Live View window.

☞ Please keep in mind that images captured in any of the 2 modes can only be saved in TIFF-format.

5 Running the plugin by macro commands

For using macros, it is necessary that a camera is already **connected** to the plugin. Moreover, the dialogue window has to remain open, since closing the window would disconnect the camera. All macro actions are inserted in the record-window, and are recorded and confirmed by the system in a dialogue window.

Macro commands are performed according to the following syntax:

Run ("ProgRes Cam", "some_command");

☞ Please observe that there is a blank space between "ProgRes" and "Cam" and the quotations marks!

Command	Sample	Remark
AutoShutter=ON, AutoShutter=OFF,	run ("ProgRes Cam", "AutoShutter=ON");	Enables or disables Auto shutter.
Capture	run ("ProgRes Cam", "Capture");	Captures a single image; camera is not anymore in the live mode after this command!
CaptureResolution=some_integer_value	run ("ProgRes Cam", "CaptureResolution=2");	Sets the CaptureResolution; resolution is corresponding to the indicated index (index is shown as prefix in selection box)
Gain=some_float_value	run ("ProgRes Cam", "Gain=1.1");	Sets the Camera to Gain 1.1
Preset==some_integer_value	run ("ProgRes Cam", "Preset=1");	Sets the Camera to settings saved under the indicated preset button
Shutter=some_integer_value	run ("ProgRes Cam", "Shutter=750");	Sets manual shutter to desired time in ms
StartCamera	run ("ProgRes Cam", "StartCamera");	Starts live image acquisition
StopCamera	run ("ProgRes Cam", "StopCamera");	Stops live image acquisition

☞ **Important Note:** The actions triggered with the macro commands like “Set” and “Capture” need some time to be completed. Therefore, please wait some time before inserting the next macro commands, since any subsequent macro commands sent before the action is completed will be rejected. Enter a wait statement into your macro script if you want to execute macro commands after Preset or Capture statements.

The following macro sample is demonstrating this procedure:

```
macro "ProgRes CaptureResolution-Capture-Restart"
{
// Sequence of macro commands
        run ("ProgRes Cam","CaptureResolution=1");    // Sets capture resolution
        run ("ProgRes Cam","Capture");                 // Captures a single image
// ---------------------------------------------------------------
//  The camera stops acquisition after performing the Capture command.
//  If restart of acquisition is desired, waiting for 5000 ms is required.
//  The wait statement is absolutely necessary for successful restart.
//  Depending on speed of PC hardware, the necessary wait time may be shorter or even longer.
//  The necessary minimum wait time must be estimated by trial and error.
//  If  the wait time is too short, subsequent macros commands are rejected.
// ---------------------------------------------------------------
        wait(5000);  // waiting for 5000 ms
        run ("ProgRes Cam","StartCamera"); // Starts live image acquisition again
   }
```

6 Trouble shooting

☞ Please make sure that only one process is accessing the driver DLLs listed in section “Installation”. The camera must not be accessed by other applications or by more than one instance of ImageJ.

Symptom	Solution
Black image, no live image acquisition	This symptom may occur when the camera is set into the automatic exposure mode, and the light path was briefly closed. Solution: Switch off automatic exposure and set the time slider to a reasonable value.
Black Image when connecting but live image acquisition according to fps display	The registry entry for the camera may be damaged. Solution: Close the plugin. Delete the registry entry for the camera (regedit): HKCU\Software\JavaSoft\Prefs\I/J_/Prog/Res/Plug/In\a_number If there are more of these entries, first look into the folder a_number where you will find the camera name. Run the plugin and connect the camera. Camera starts with default settings.
Plugin does not connect to the camera although it is physically connected.	There may be more than one reason. Solution for almost all: Close all instances of ImageJ and any other applications using Java. Close all other applications which may run the camera. Look into the Task Manager whether the process javaw.exe (Java Virtual Machine) is still persisting. Cancel it. Remove the cable from the camera for a moment. Start only one instance of ImageJ and run the plugin. The camera should connect now.
Exception notice in ImageJ when trying to call the plugin	Most likely there are old or current versions of the driver Dlls in the Windows pathway (normally C:\Windows\system32). If so, remove or rename them. For more information, refer to the section “Installation”.

Symptom	Solution
Camera stops live image acquisition	This may happen for certain high speed resolutions (designated with HS) at exposure times close to the minimum. Solution: Increase the exposure time manually and click the buttons [Stop Video] and then [Start Video].

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