

White paper about motorized lenses with mvBlueCOUGAR-XD

Zoom, zoom, zoom

Whereas machine vision applications usually use constant lighting, there has been a trend to use GigE Vision cameras due to long cable length also in outdoor applications such as traffic monitoring, security, or sports. This enforces the need for controlling the image brightness by means of automatic gain or auto exposure on the one hand but also have possibilities to adjust field of view or zoom, or focus, or iris.

Why using motorized lenses?

Manual fixed focal length lenses have usually two settings. One sets focus and one sets iris.

Typically these settings are set once and are not or should not be changed afterwards.



Variable focal lenses allow changing the AOI depending on the focal length setting.

Lenses with motors offer the possibility to remotely manipulate these settings by command switches or via programmatic routines.

Types of motorized lenses and their controls

Motorized lenses differ by the fact what element is motorized and how

- Zoom
- Focus
- Iris
 - Motor
 - Video
 - DC

Lenses with motors differ by the voltage they accept and by certain wiring specialties.

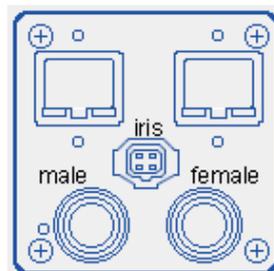
Driving voltages may be between 3 and 12V DC, wiring may be 2 wires per motor (aka bipolar) or with one wire per motor and common ground.

Some lenses offer potentiometers so that the actual position can be measured by a resistance. These potentiometers are not supported by the mvBlueCOUGAR-XD camera.

How to connect a motorized lens to a camera?

Connecting the direct drive lens motors

mvBlueCOUGAR-XD offers two Hirose connectors at the back.



Use the female one on the right side for lens connection. Pinning is shown in the table on the left side below.

Pin.	Signal
1	Opto DigIn3
2	Opto GNDB
3	OptoDigIn4
4	Focus+
5	Focus-
6	Zoom+
7	Zoom-
8	Iris+
9	Iris-
10	Channel4+
11	Channel4-
12	GND

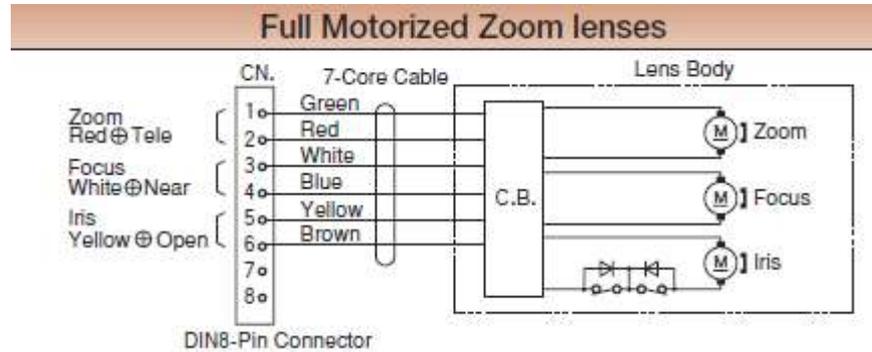


Image above shows a typical lens wiring. The three independent motors can be seen.

- Connect Hirose Pin4 (Focus+) to CN Pin4.
- Connect Hirose Pin5 (Focus-) to CN Pin3.
- etc.

mvBlueCOUGAR-XD can deliver up to 100mA current with a selectable voltage to the outputs Focus, Zoom and Iris. Please note that the voltage applied is **independent** of the supply voltage of the camera. Channel 4 can be left open.

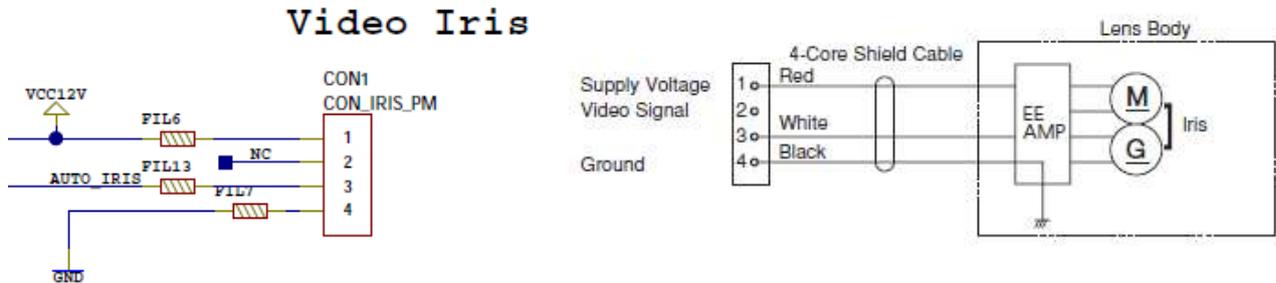
Connecting the Video Iris

mvBlueCOUGAR -XD camera generates a video like signal containing average brightness information and sync signals to drive a Video-Iris type lens.

The diaphragm of the lens closes at increasing brightness keeping the resulting overall brightness reaching the sensor constant.

Advantage of Video-Iris against AutoExposure: Bigger range of brightness variation avoids smear in CCD as it blocks extreme bright light to hit the sensor; but is slower than AutoExposure and AutoGain which is also supported by the camera.

Pining of the standardized Video Iris connector (4 pin EIAJ) is shown below.



Use the square 4 pin connector of the camera to directly connect the Video Iris.

How to control the lens via viewer or the API (aka mvIMPACT Acquire)

Usage of the lens control wizard of wxPropView is recommended for setup:



Select the "Drive level" voltage according to the lens type.

Focus, Zoom and Iris buttons drive the motors at a selectable speed.

Video Iris can be selected to open or completely close the Iris (for setup) and for auto mode.

Note: Additional settings such as **Level** (sensitivity) and/or **ALC** (peak or average) may be possible directly at the lens (via poti).

ALC settings do not have effect due to digital video signal!

Consult the manual of the lens for more details. Using AGC/AEC & *mvIrisAuto* may lead to oscillating brightness.

Video Iris settings example

Purpose is to bring the Video Iris into a usable range so that during operation it can open if brightness goes down and further close if brightness goes up.

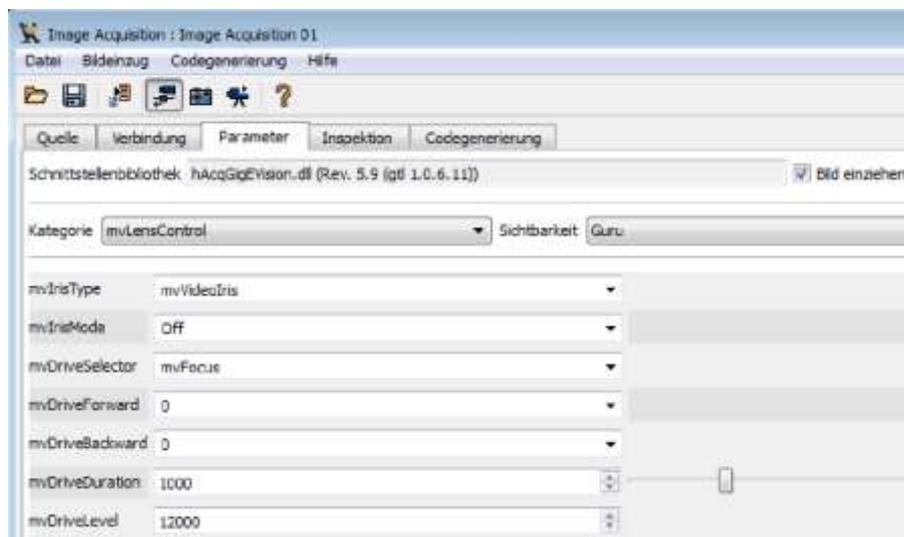
- Open Iris by using *mvIrisOpen* command: This opens Iris to the min. F number (f/N) supported by the lens, e.g. f/1.2 (see lens manual)
- Set exposure of camera so that the image is not saturated
- Set exp = 4 x min.
- Iris auto will move the lens to f/2.4
- Set working exposure = 16 X min will move the Iris auto to f/4.8.

How to control lens via 3rd party libraries or APIs?

The properties for *mv Lens Control* are MATRIX VISION specific but appear in the camera's XML-file according to GigE Vision standards and SFNC (standard feature naming convention) thanks to the standard. This makes it possible to use the features from third party applications or programs without problems.

mv Lens Control	
mv Iris Type	mvVideoIris
mv Iris Mode	Off
mv Drive Selector	Off
int mvDriveForward()	mvIrisAuto
int mvDriveBackward()	mvIrisOpen
mv Drive Duration	mvIrisClose
mv Drive Level	12000

The screenshot below shows how the properties appear under MVTEC Halcon's image acquisition assistant:



The next screenshot shows the respective Hdevelop example under Halcon for the same settings:

```

Programmer
main (...)
1 * Image Acquisition 01: Code generated by Image Acquisition 01
2 i:=0 0.037 ms
3 k:=0 0.016 ms
4 open_framegrabber ('GigEVision', 0, 0, 0, 0, 0, 0, 'default', -1, 'default', -1, 'false', 'default', '0', 2.088 ms
5 grab_image_start (AcqHandle, -1) 3.061 ms
6
7 while (k<=2) 0.001 ms
8
9     if (k=0) 0.001 ms
10        * --- Changing focus --- *
11        set_framegrabber_param (AcqHandle, 'mvDriveSelector', 'mvFocus') 3.298 ms
12        set_framegrabber_param (AcqHandle, 'mvDriveDuration', 5000) 1.814 ms
13        message ('Changing focus') 0.026 ms
14    elseif (k=1) 0.001 ms
15        * --- Changing iris --- *
16        set_framegrabber_param (AcqHandle, 'mvDriveSelector', 'mvIris') 0.078 ms
17        set_framegrabber_param (AcqHandle, 'mvDriveDuration', 5000) 1.549 ms
18        message ('Changing iris') 0.020 ms
19    elseif (k=2) 0.001 ms
20        * --- Changing zoom --- *
21        set_framegrabber_param (AcqHandle, 'mvDriveSelector', 'mvZoom') 0.072 ms
22        set_framegrabber_param (AcqHandle, 'mvDriveDuration', 5000) 2.224 ms
23        message ('Changing zoom') 0.020 ms
24    endif 0.001 ms
25
26    * Driving forward *
27    while (i <= 500) 0.001 ms
28        disp_message (3600, message, 'window', 12, 12, 'black', 'true') 0.344 ms
29        set_framegrabber_param (AcqHandle, 'mvDriveBackward', 1) 2.196 ms
30        grab_image_async (Image, AcqHandle, -1) 5.895 ms
31        i:=i+1 0.038 ms
32    endwhile -
33    wait_seconds (3) 3.000 ms
34    i:=0 0.032 ms
35
36    * Driving backward *
37    while (i <= 500) 0.001 ms
38        disp_message (3600, message, 'window', 12, 12, 'black', 'true') 0.340 ms
39        set_framegrabber_param (AcqHandle, 'mvDriveForward', 1) 2.204 ms
40        grab_image_async (Image, AcqHandle, -1) 5.829 ms
41        i:=i+1 0.038 ms
42    endwhile -
43    wait_seconds (3) 3.000 ms
44    i:=0 0.033 ms
45
46    k:=k+1 0.021 ms
47
48 endwhile -
49 close_framegrabber (AcqHandle) 5.827 ms

```

List of usable lenses

Motorized lenses differ by the max. sensor diameter they support and by resolution limits.

mvBlueCOUGAR-XD cameras use sensors with 2/3" to 1.1" diameter.

Lens/camera combinations must be selected having these properties in mind.

The following is a list of usable lenses. It is provided for reference only. Exclusion from this list does not mean that the product is not usable with the camera per se.

If you are in doubt, please ask our support@matrix-vision.com for additional information.

Manufacturer	Details	Motorized Iris	Motorized Focus	Motorized Zoom	Video Iris
KOWA	Motorized LMZ-series up to 1" and 5 MPix resolution	x	x	x	x
Goyo Optical	GAZ series 2/3" – 1"	x		x	x
Linor	Mevis motorized	x	x		
Schneider Optics	Cinegon/Xenoplan: motorized iris	x			x
Computar	2/3" M6Z series	x	x	x	
Fujinon	2/3" and 1" series	x	x	x	x

Additional information and support

Please ask our support@matrix-vision.com for additional information on this topic and have a look on our website www.matrix-vision.com.

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<https://www.matrix-vision.com>