iRecHS2

Setting

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National Institute of Advanced Industrial

Science and Technology (AIST) Human Life Technology Research

Institute Systems Brain Science Research Group

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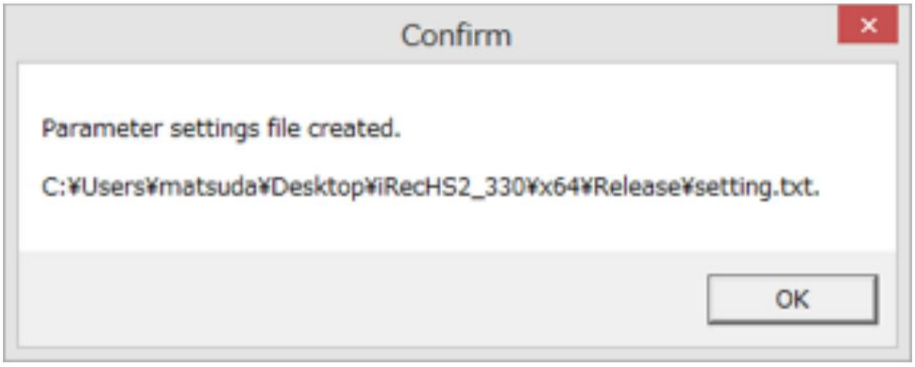
1. Starting and ending iRecHS2

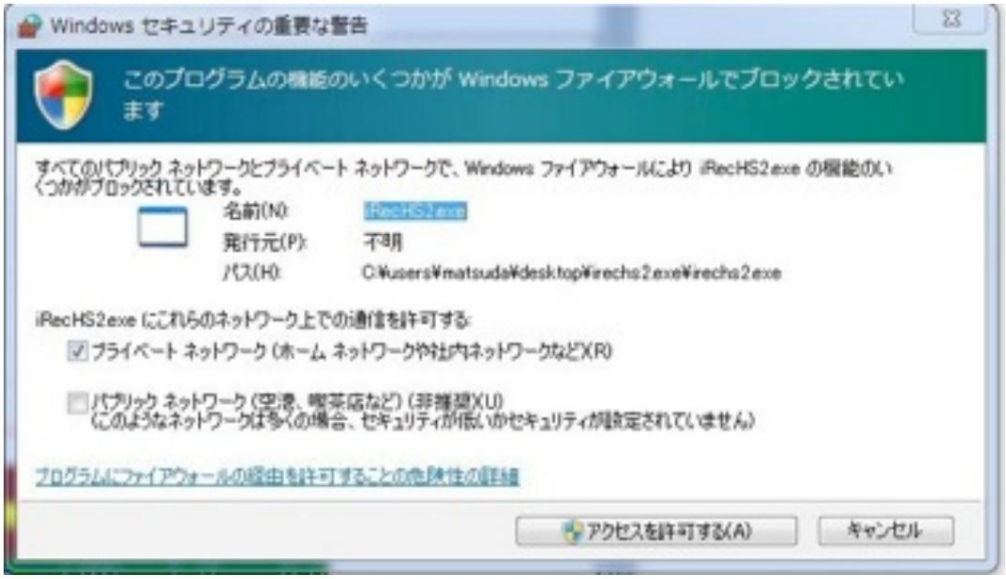
Use FlyCap2.exe to check the operation of Grasshopper (FW camera), Flea3, and Grasshopper3, and confirm that the image is displayed. After closing FlyCap2.exe, start iRecHS2.exe.

1.1 Confirm creation of setting.txt



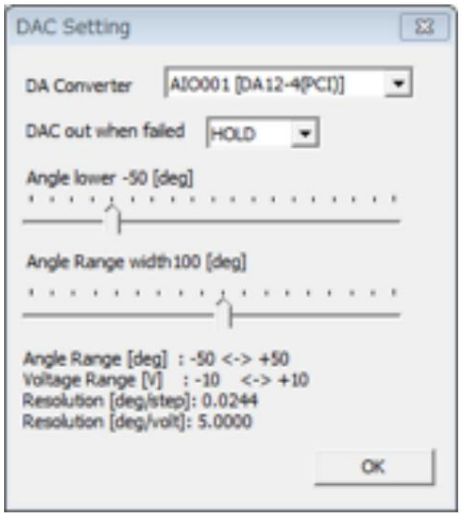
This dialog is a screen to confirm the creation of a file called setting.txt, which records the state of iRecHS2 (various check boxes, visual stimulus presentation positions for calibration, etc.) if it does not exist in the same directory as iRecHS2.exe. If it does not exist, it will start using the default settings and create setting.txt that records the state when the program terminates. Since this file will be referenced when the software is started for the second time or later, the confirmation screen will not appear. Press OK to proceed to the next step. The file path shown depends on where iRecHS2.exe is placed, so it will not be the same as the image.

1.2 Security warning The following scene appears at the first startup as well.



This message appears because iRecHS2.exe has a function to record signals through the network. Press the Allow access button. This setting can be changed from "Allow a program or feature through Windows Firewall" in Windows Firewall in Control Panel.

1.3 DA converter setting dialog If DAC exists, the following screen appears.



DA Converter

Which DA converter to use.

DAC out when failed.

DA converter output when pupil detection fails HOLD: Output the previous value ZERO: Output 0 volt MIN: Minimum value (-10 volt) MAX: Maximum value (+10 volt) Angle lower Represents the direction of the eyeball in angle The minimum value of the angle, the unit is degree Angle Range width The swing width when the direction of the eyeball is expressed as an angle, the unit is degree Angle Range[deg]

Angle lower <--> Angle lower+ Angle Range width Voltage Range[V]

What voltage does the above angle correspond to?

Resolution [deg/step]

Since the DAC has 65535 (16bit) steps, how many steps does one step correspond to?

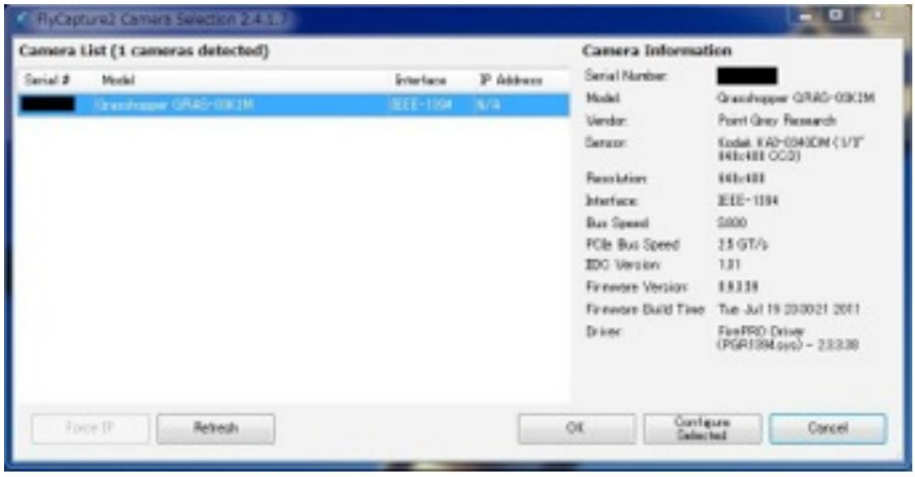
Resolution [deg/volt] How many

degrees does 1 volt correspond to when the movement of the line of sight is expressed in voltage.

You can change these values only at program startup. These values are written to setting.txt and entered as initial values at the next startup. If no changes are required, press the OK button to proceed to the next step. This screen will not appear if there is no DAC. DAC includes AO0...x, AO1...y, AO2...pupil radius,

AO3... The eye opening rate is output. Before calibration, the pupil position is expressed in pixels. The pupil radius is also represented by pixels. The relationship between pixel and voltage is V=(pixel/320)*20-10, pixel<0 V=-10, pixel>320 V=+10.

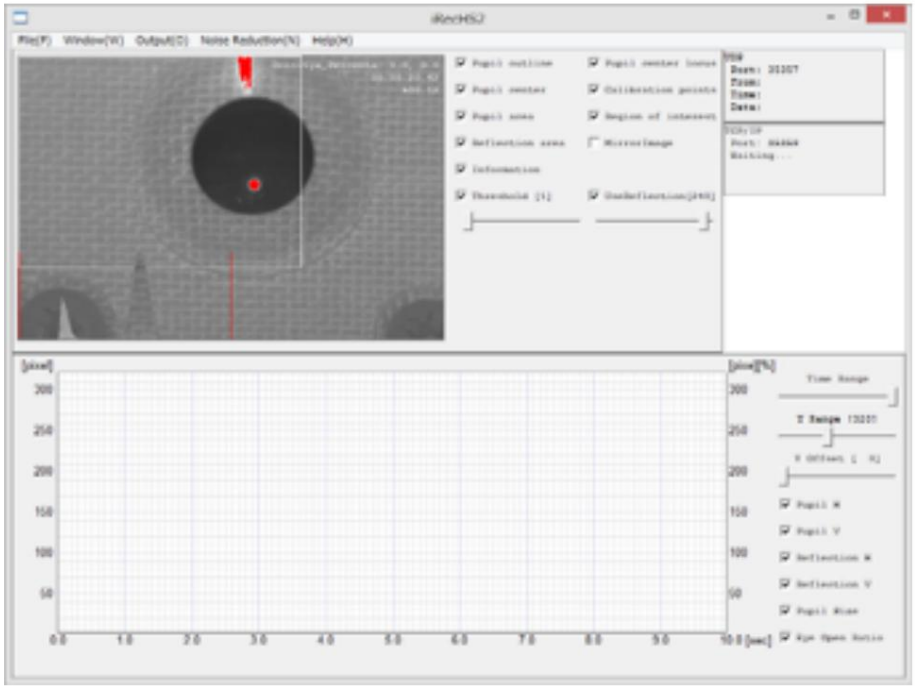
1.4 Camera selection



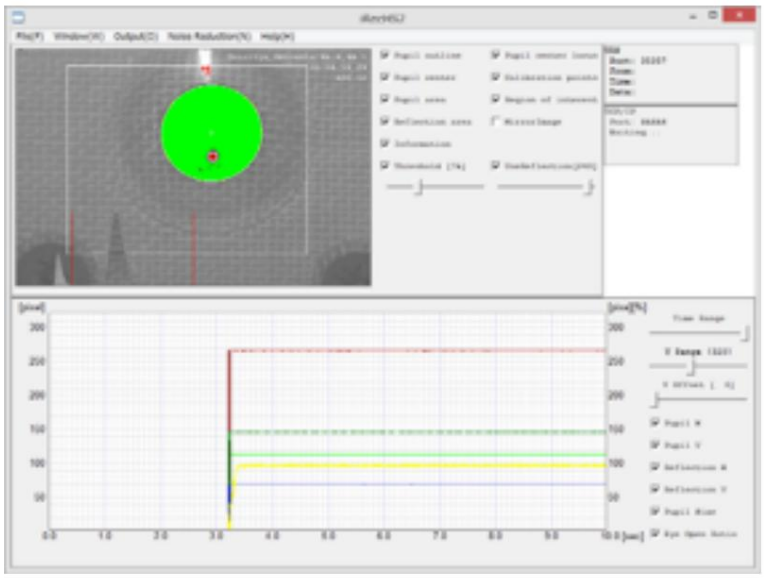
The same camera selection window as FlyCap2.exe appears. If you have multiple cameras, select the one you want to use. If the camera does not appear in the list, check to see if any cables are disconnected. If the camera does not exist, press OK and the program will exit. By pressing Configure Selected, you can change the input status of the camera, but since the input items set here are initialized by iRecHS2.exe, they will not be reflected in the measurement. "FlyCapture2 Camera Selection 2.4.1.7" on the upper left represents the version of the camera driver currently used. If this version does not match the version of the camera driver when iRecHS2.exe was created, it may not work properly. Press OK to proceed to the next step.

1.5 Initial state

If you see a screen like the one in the example and you see the image from the camera, then it's working.

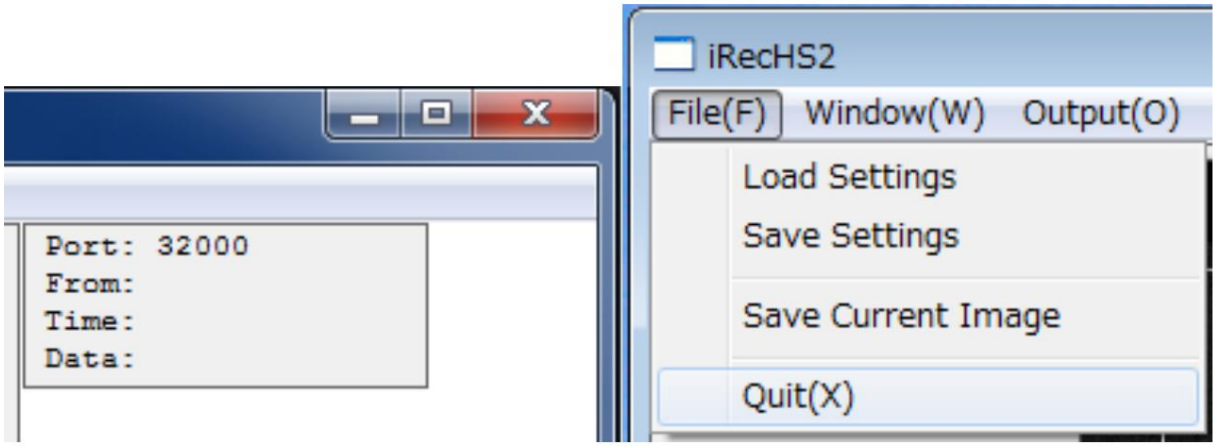


Print a black circle on paper and present it, and set the detection region (ROI) by holding down the left mouse button. Move the Threshold slide bar, set the threshold appropriately, and confirm that the pupil can be detected as shown in the figure below.

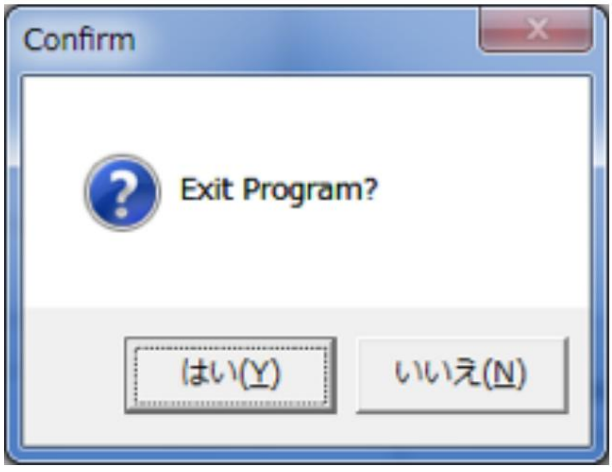


1.6 Click

the "x" at the top right of the exit window.

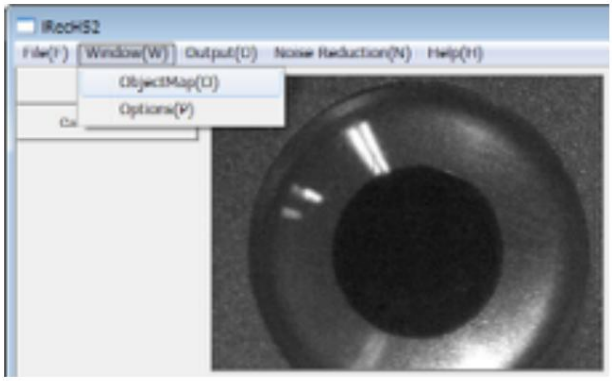


Alternatively, select "Quit(X)" from File in the menu bar. If you do either, the following screen will appear. Select "Yes" to end the program.

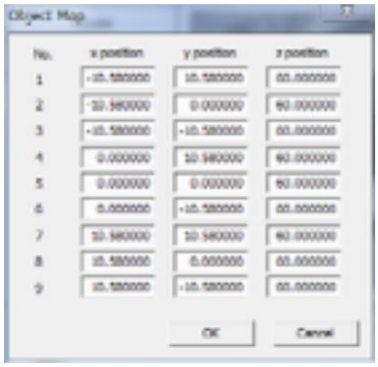


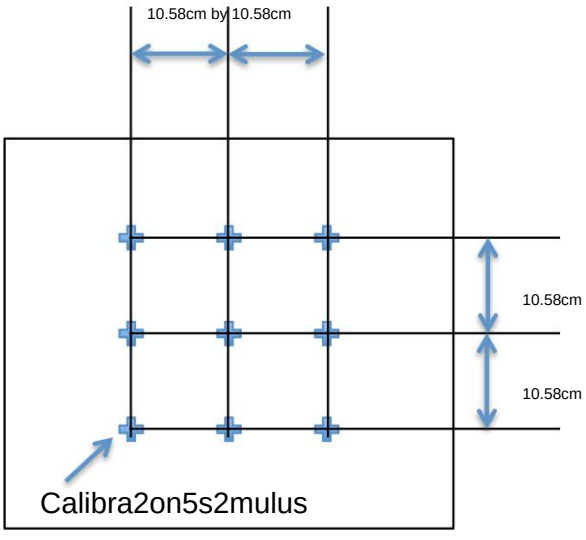
3. Registration of calibration

points Open the ObjectMap dialog from Window->ObjectMap and register calibration points.

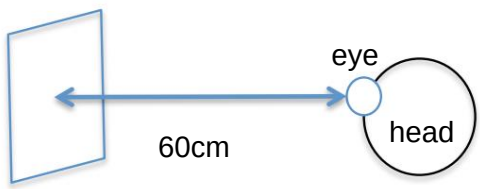


Input in the order in which the visual targets are presented. The number of targets should be at least 3 if the targets are not distributed on a straight line, but in practice it is desirable to use 5 or 9 so as to cover the measurement range. The figure below shows the input when presenting nine points in the center, 10.58 cm left and right, 10.58 cm up and down, 60 cm ahead (atan(10.58/60)=10deg). The foot of the perpendicular drawn from the eyeball to the target surface becomes the central target (5th). The length of the perpendicular is 60 cm. As long as the units are consistent, for example, for No.1, even if you enter -0.1058/0.1058/0.6 in meters, the result will be the same. If you set the Z position to 0 and press the OK button, everything after that line will be blank. These data are written to setting.txt, so if you enter them the first time, you don't have to enter them the second time.





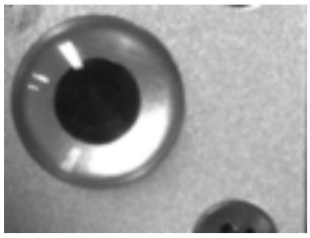
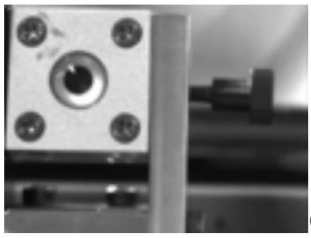
Display

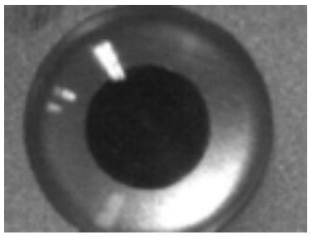
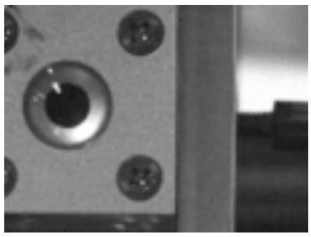


Display

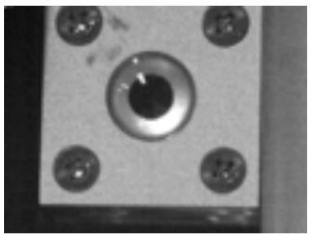
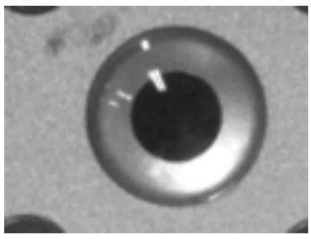
2. Camera settings

Using a 75mm lens, which is the recommended configuration, it is possible to shoot at a distance of 30cm to 90cm from the tip of the lens to the surface of the eyeball (range of focus). The magnitude at each distance is as follows. The angle of view differs depending on the camera. The diameter of the simulated eye lens is 1.2 cm.



Grasshopper 30cm and 90cm

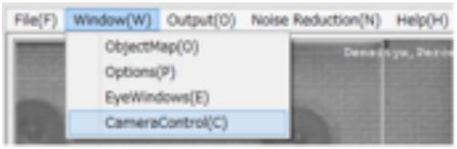


Flea3 (USB3.0) 30cm and 90cm

As for the pupil, it is preferable to photograph it as large as possible. By setting without an infrared filter, adjustments can be made regardless of the position of the lighting. Since the focal position differs between visible light and infrared light, it is necessary to refocus after attaching the infrared filter. By default, Grasshopper cuts out mode0/mono8/320x240/, Flea3 (USB3.0) cuts out mode0/Raw8/1280x1024 to 480x280. In Grasshopper, it is possible to enlarge the pupil by switching the mode from mode1/ mono8/640x480 to 320x240 cropping. See next chapter for change method.



(640x512) and (1280x1024)

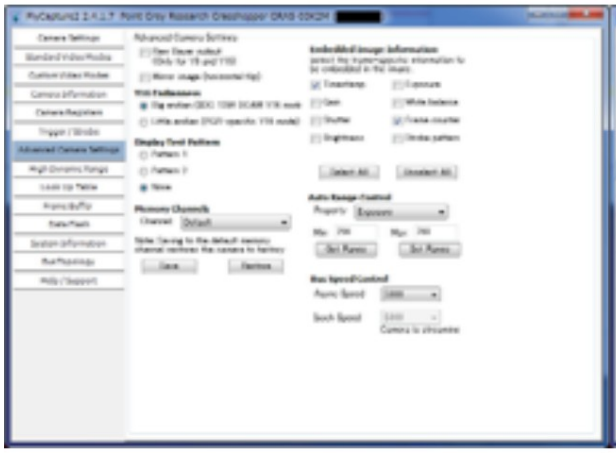
In addition, by changing the lens/attaching an extension tube/attaching a rear converter lens, etc., it is possible to change the distance and angle of view of the object. Change the position of the camera so that the size can be taken as shown in the right figure above. If the position of the camera cannot be changed, take optical measures such as changing the lens, and if that does not solve the problem, change the camera input settings. Depending on the lighting, it may be dark and noisy, making it difficult to shoot. In that case, change the frame rate (lower the frequency) and lengthen the exposure time to improve.

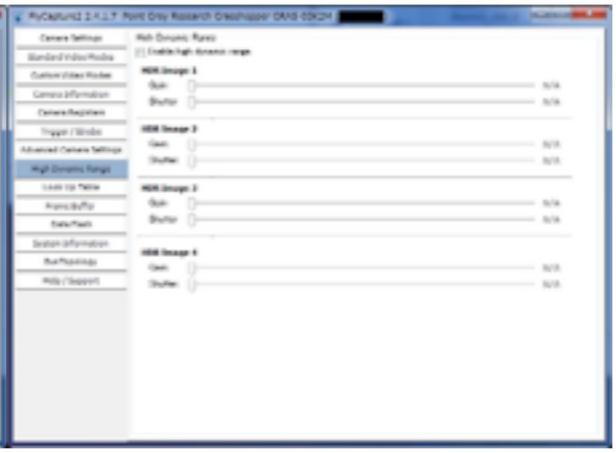
2.1 How to display the camera input change dialog Start iRecHS2.exe.

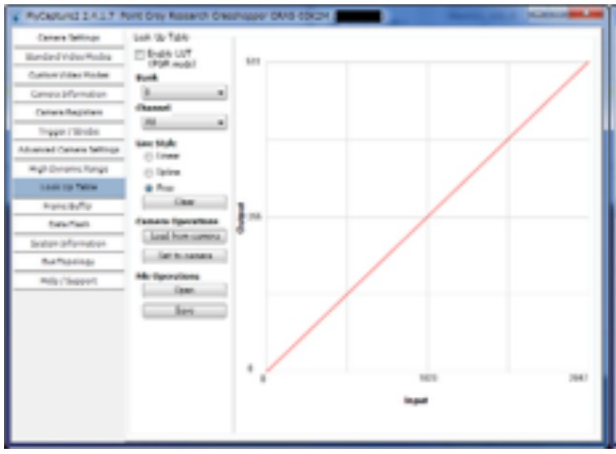


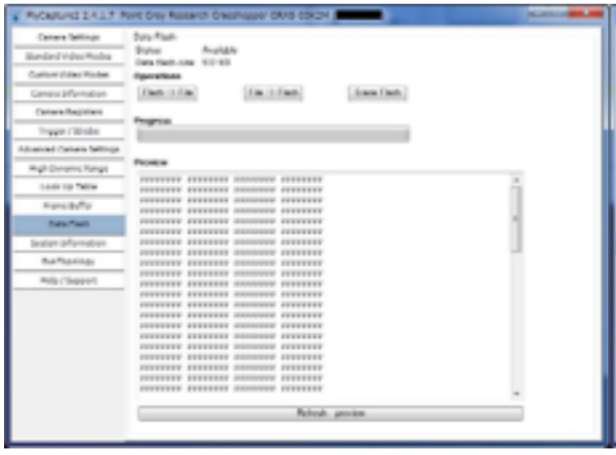
Selecting CameraControl from the Window menu brings up a dialog for changing camera settings. When iRecHS2.exe is started (when setting.txt does not exist), the settings are as shown in the following figure. The display of this dialog affects the measurement (processing failure occurs), so do not display the dialog unless necessary. Select the menu again or close the dialog with the close button of the dialog.

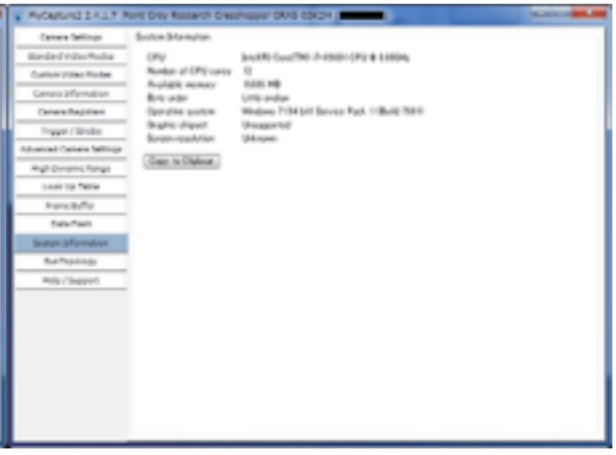
2.2 List of standard settings when using Grasshopper Depending on the computer connected, the description may differ.

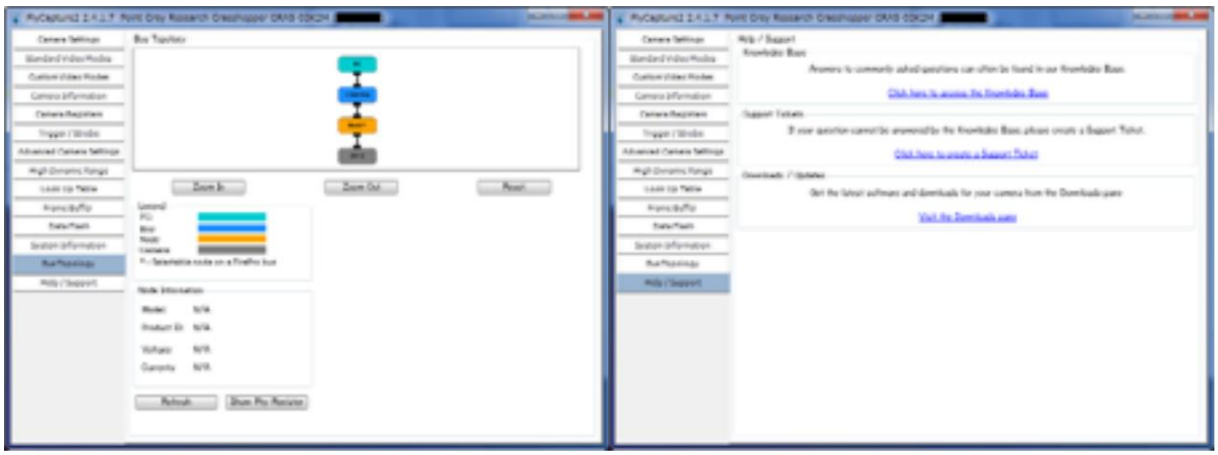




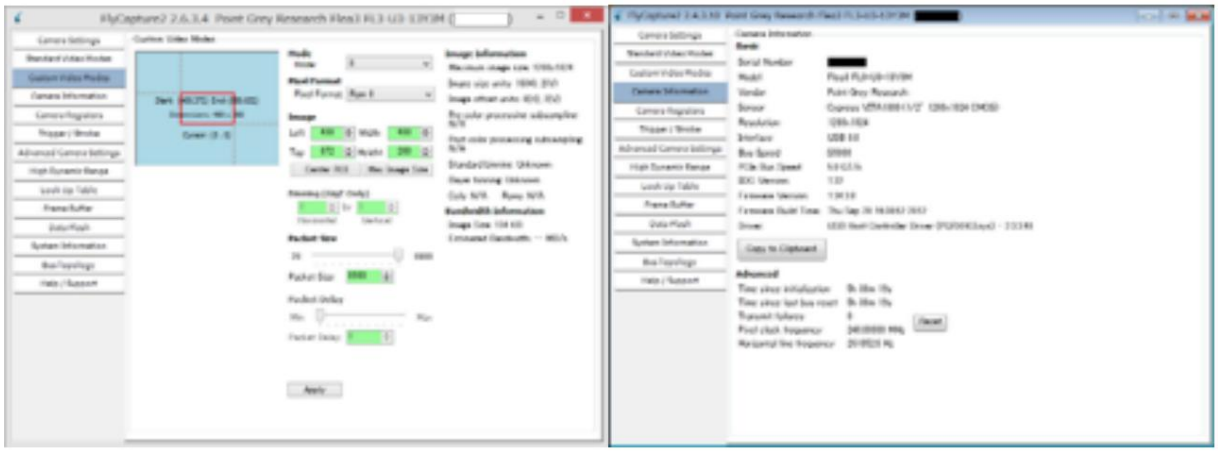


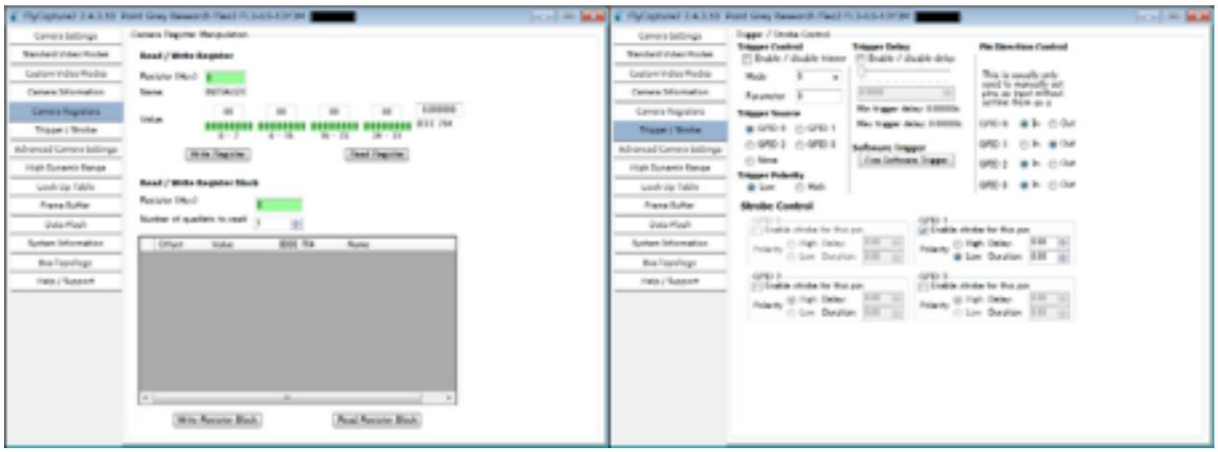


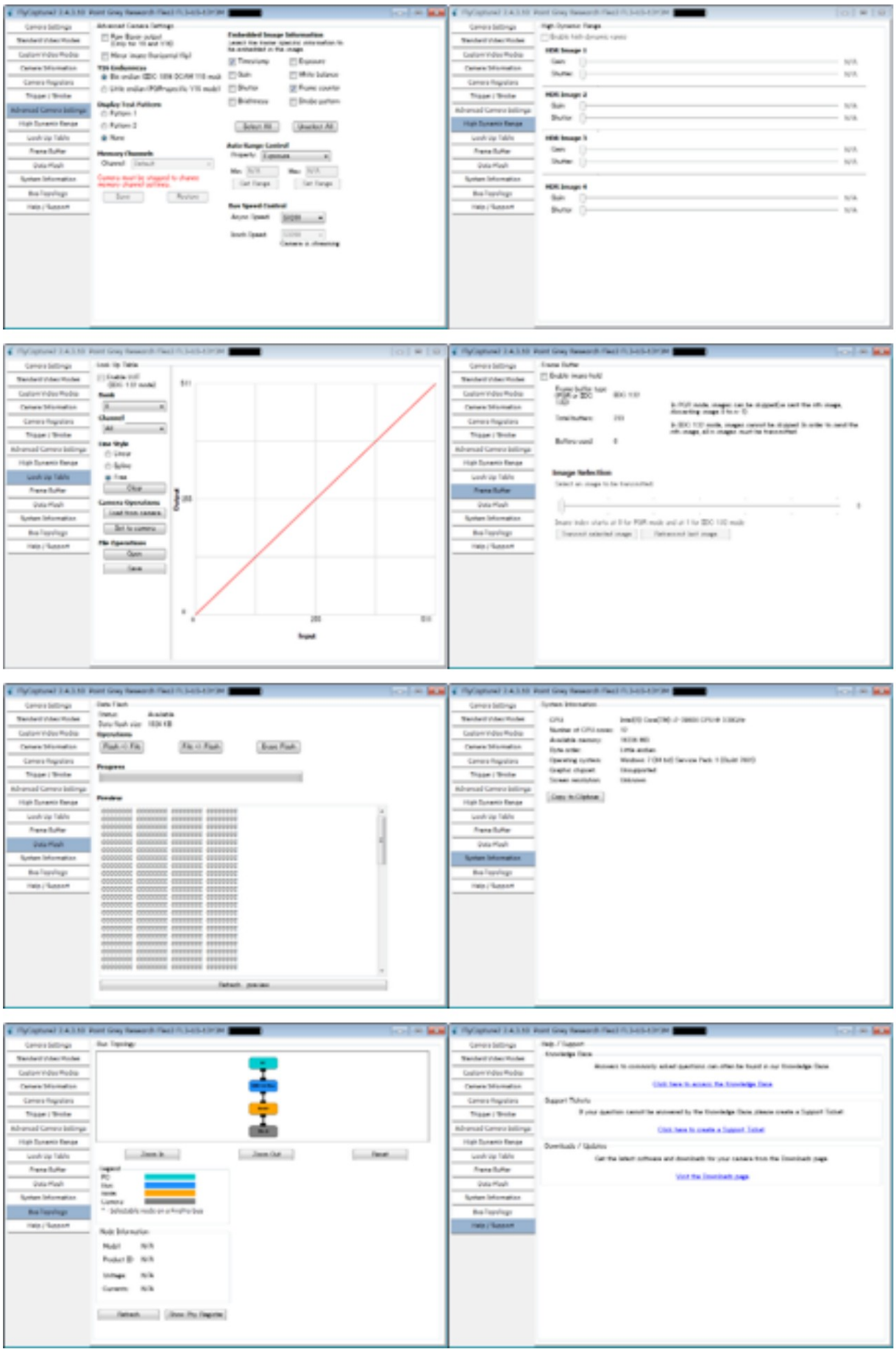




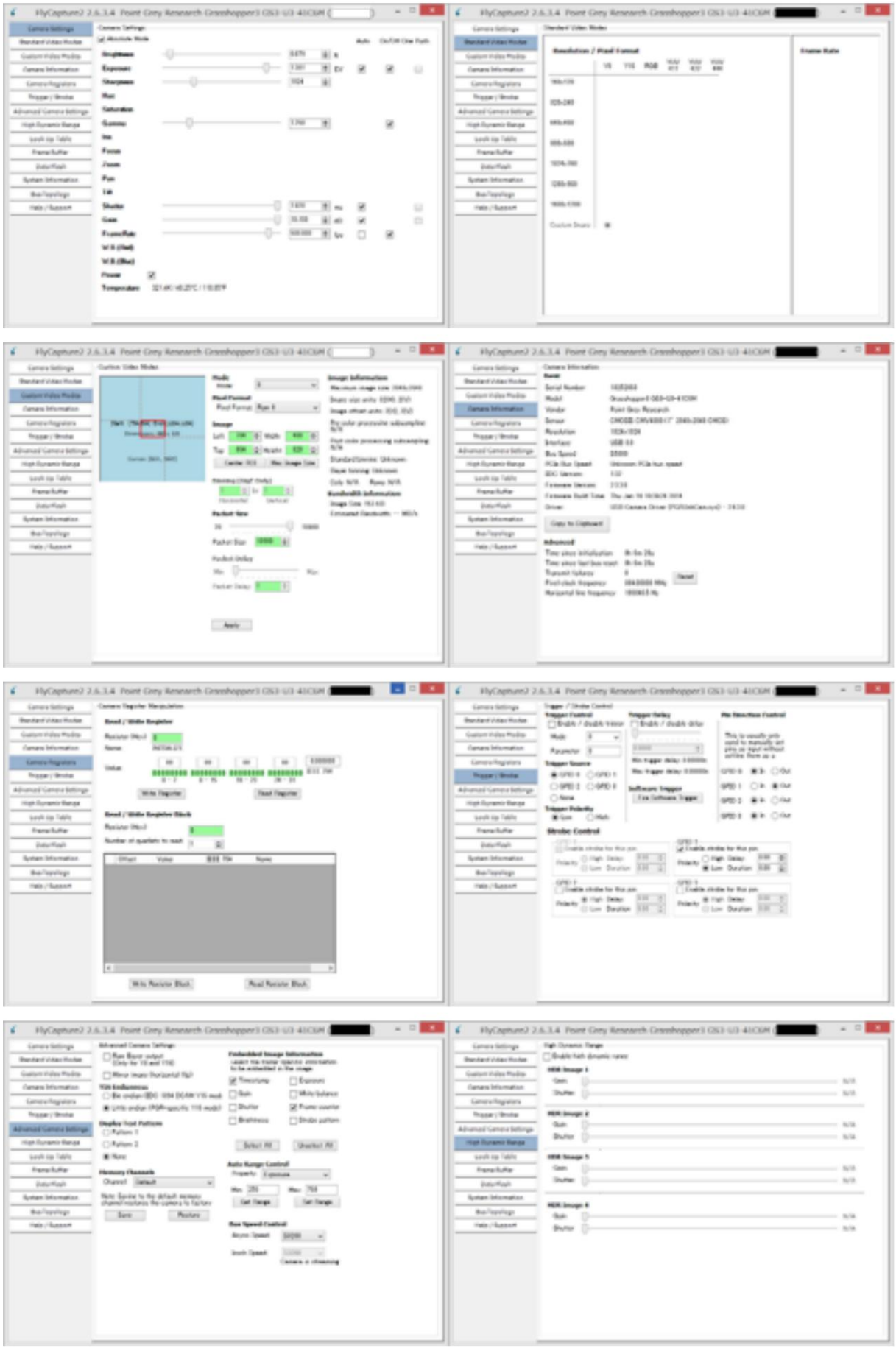
2.3 List of standard settings when using Flea3 (USB3.0)

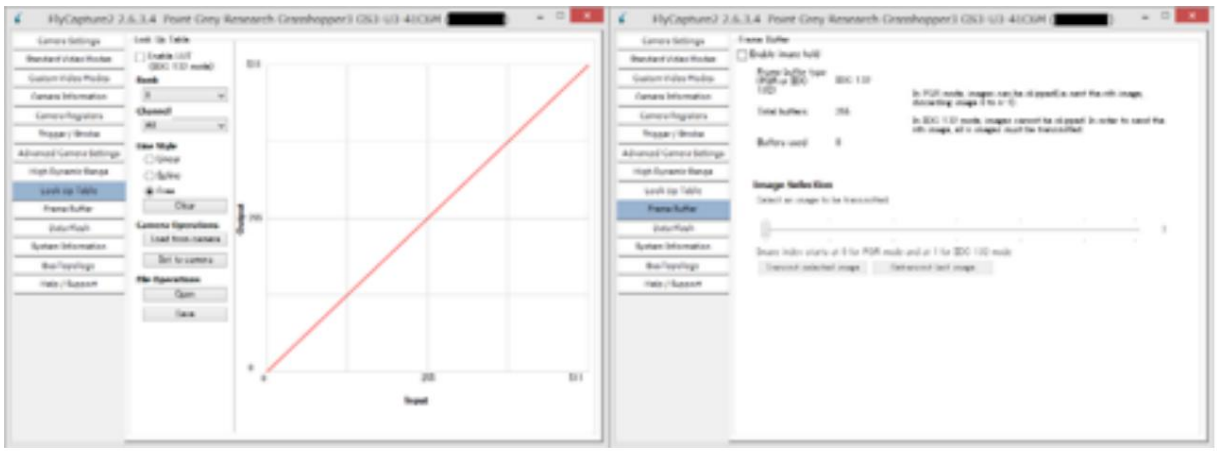


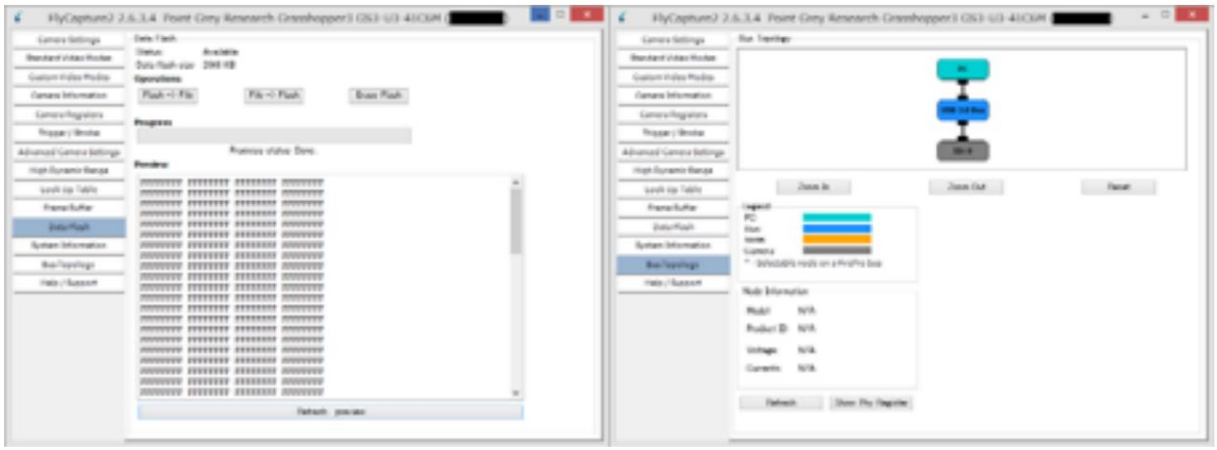




2.4 List of standard settings when using Grasshopper3







A faster sampling frequency can be achieved by changing the imaging area. Change the settings as follows. As the height is reduced, the sampling speed becomes faster (when reduced to 162 pixels, measurement exceeding 1 kHz is possible). If you are using a lens that supports 2/3 inch, the image may be distorted or not captured in the peripheral area, so change to shoot in the central area.

Custom Video Mode

Mode:0

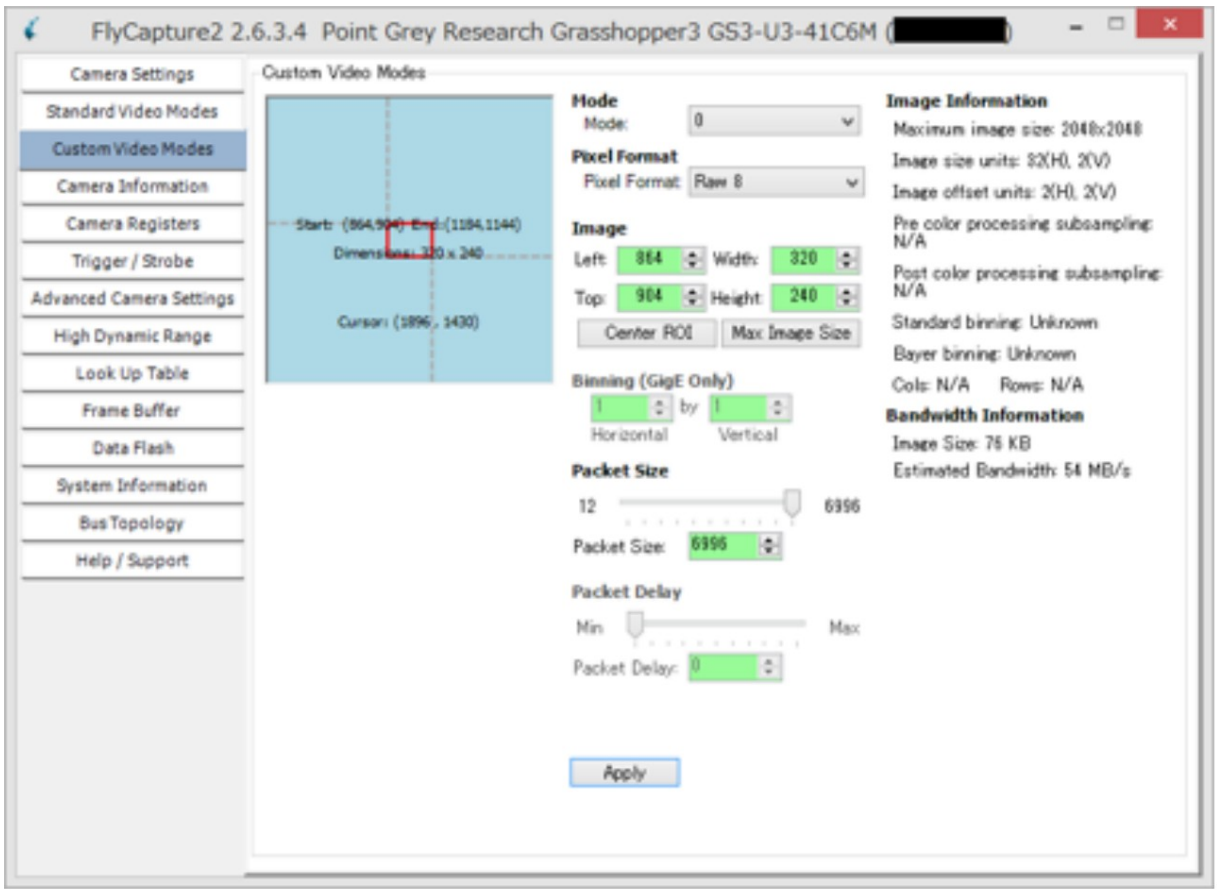
Left 864 Width 320

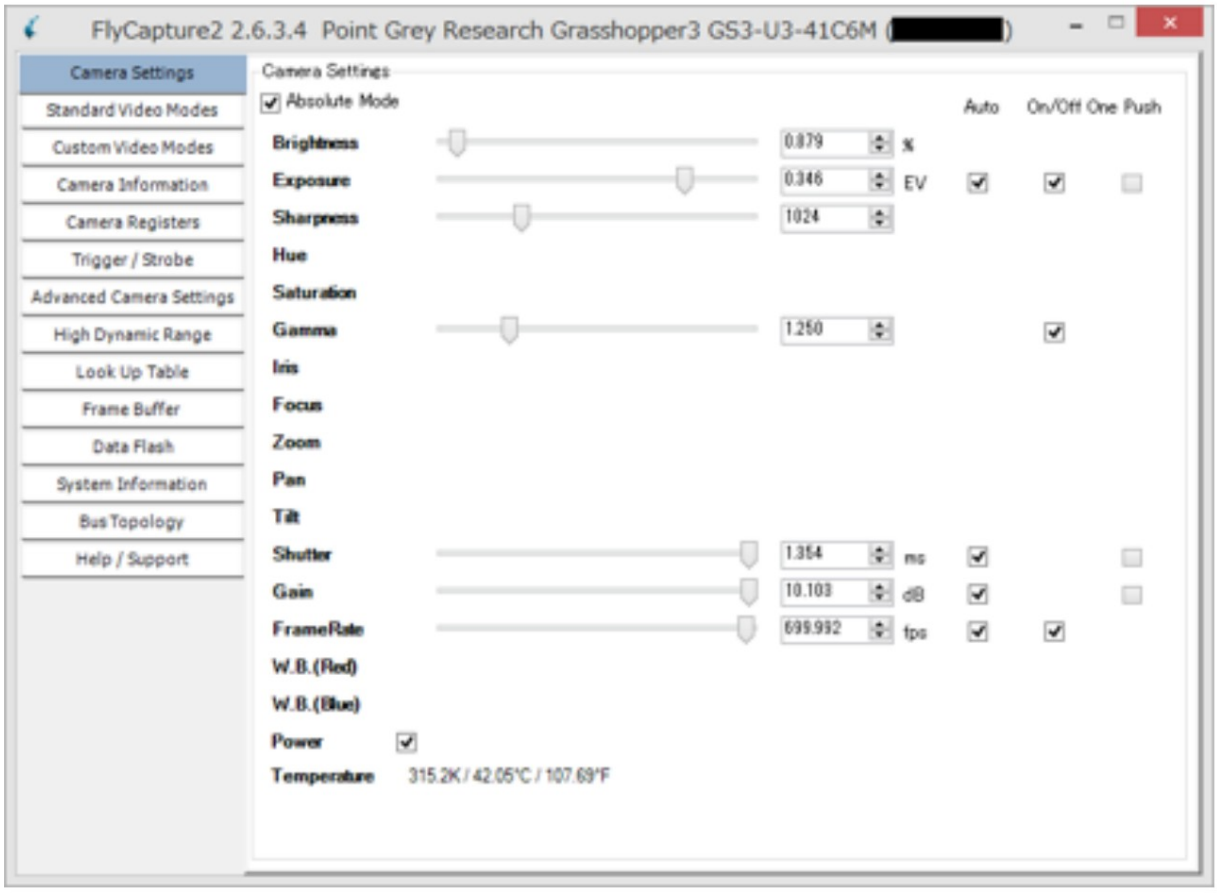
Top 904 Height 240 After changing the settings, press the Apply button.

Camera Settings

Check the Sutter checkbox Check the Gain checkbox Check both FrameRate checkboxes.

Machine Translated by Google





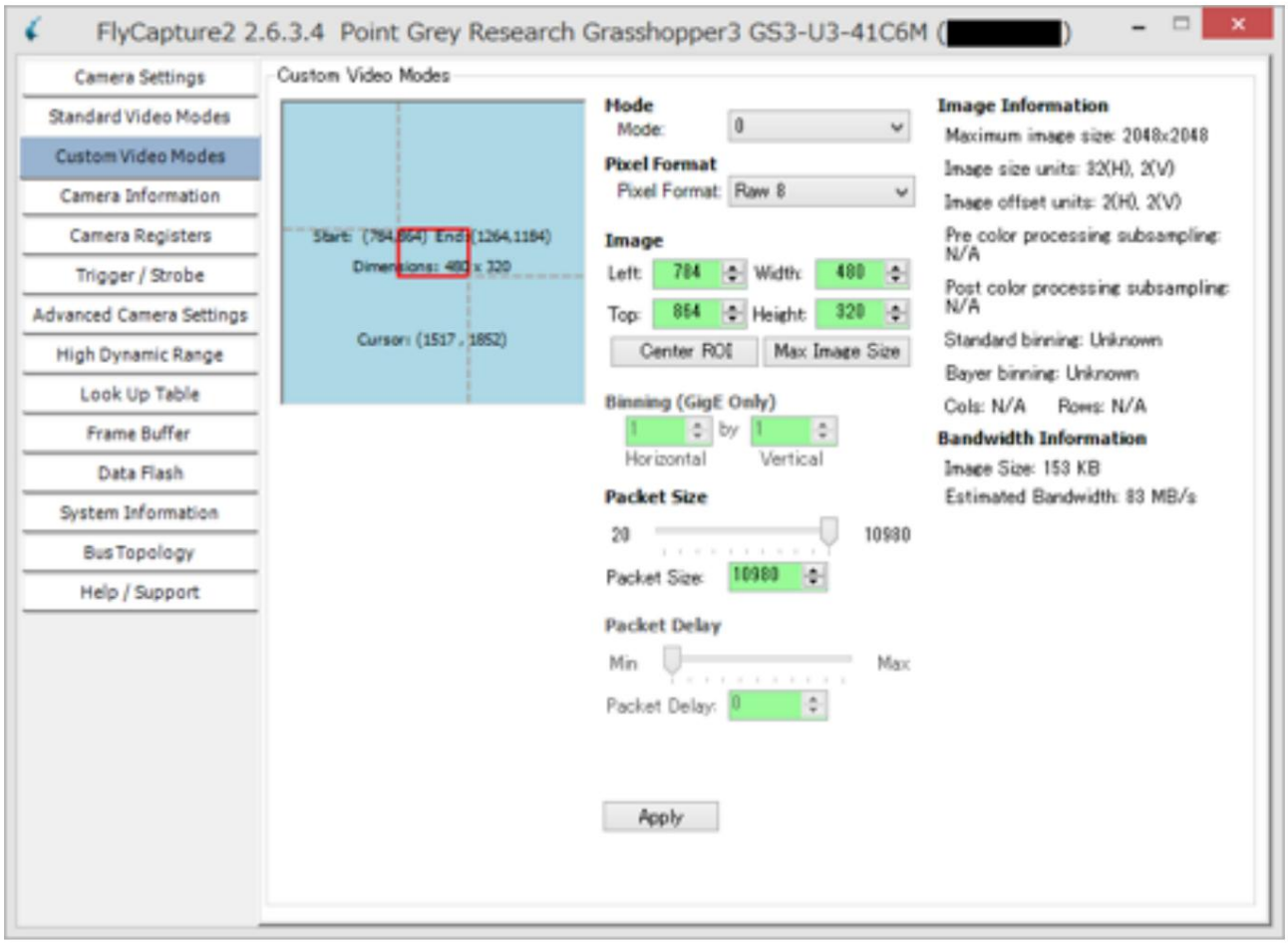
If you want to take a wider shooting range, set as follows.

Custom Video Mode

Mode:0

Left 784 Width 480

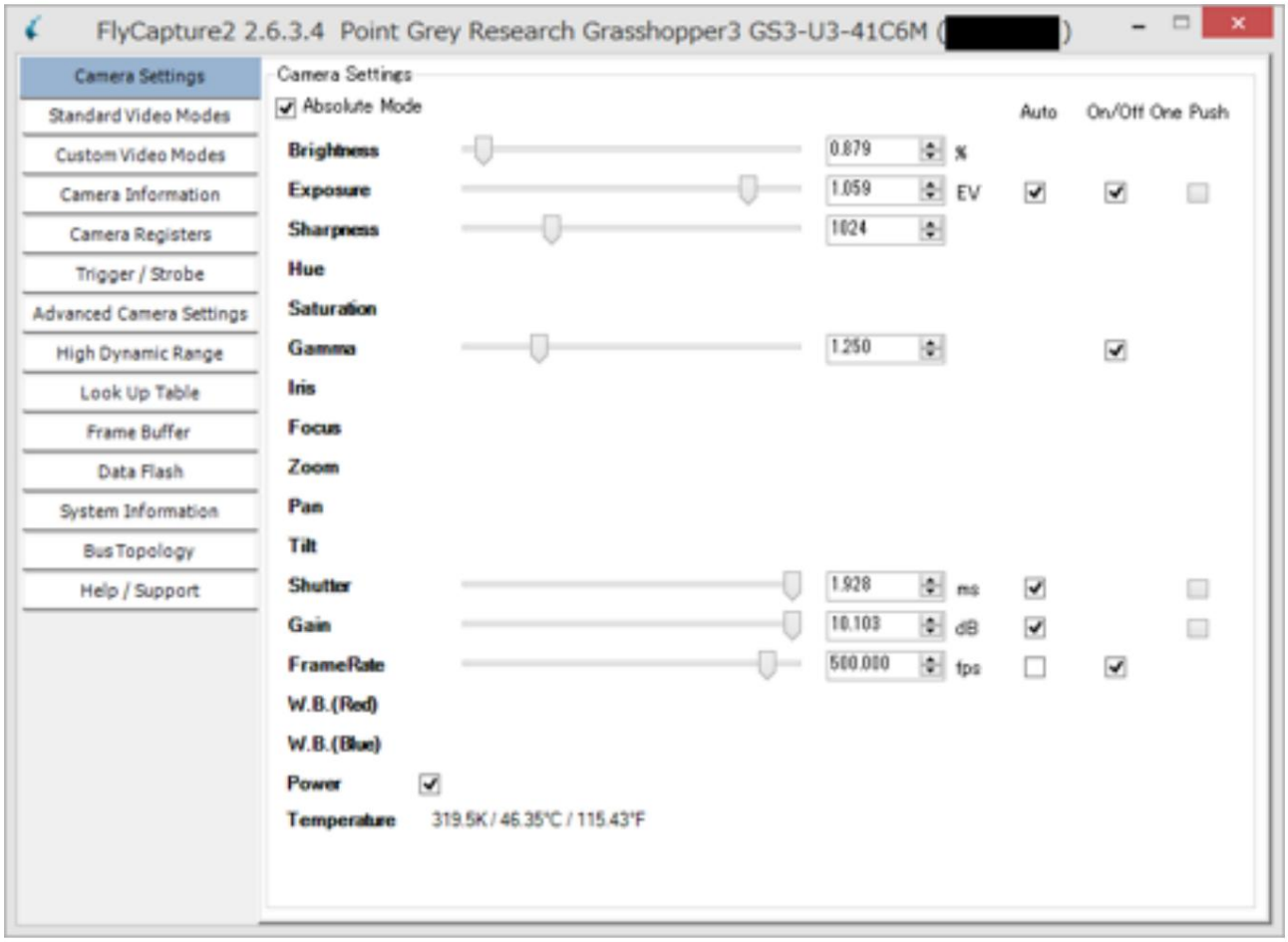
Top 864 Height 320



If you want to set the sampling frequency to 500Hz, change it as follows.

Camera Settings

Remove the check on the left side of the FrameRate check box and enter the frequency in the text box.



2.5 Change frame rate (change input frequency)

Change the value of Camera Settings->FrameRate. Depending on the firmware version, input images may not be synchronized if the maximum value is used.

2.6 Change shutter release

time If the image is blurred, you can reduce blur by shortening the shutter release time. Also, you can make the image brighter by lengthening the shutter open time. If you need a brighter picture, you can extend the shutter open time by decreasing the value of FrameRate. If you want to change it, you can change it by moving the slide bar or entering a numerical value after removing the Auto check box in Camera Settings->Sutter. The setting when the camera is started is Auto. Once changed, the value will be retained until the camera is turned off and on again.

2.7 Gain change

Normally, you can use Auto, but if you want to change it manually, move the slide bar or enter a value after removing the Auto check box in Camera Settings->Gain. can. The setting when the camera is started is Auto. Once changed, the value will be retained until the camera is cycled.

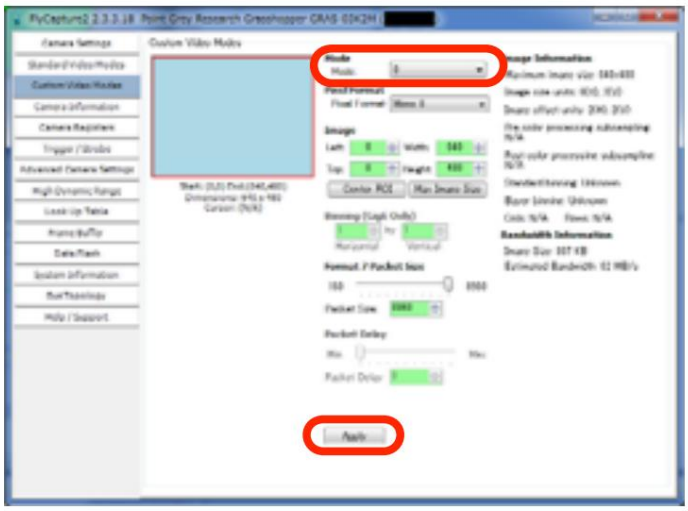
2.8 Enlarging the Input Image/Changing

the Input Area Grasshopper initially inputs at 320x240 pixels (640x512 for Flea3), but the same area can be input at 640x480 pixels (1280x1024 for Flea3). It is used when you want to enlarge the image twice and input it.

2.8.1 For Grasshopper

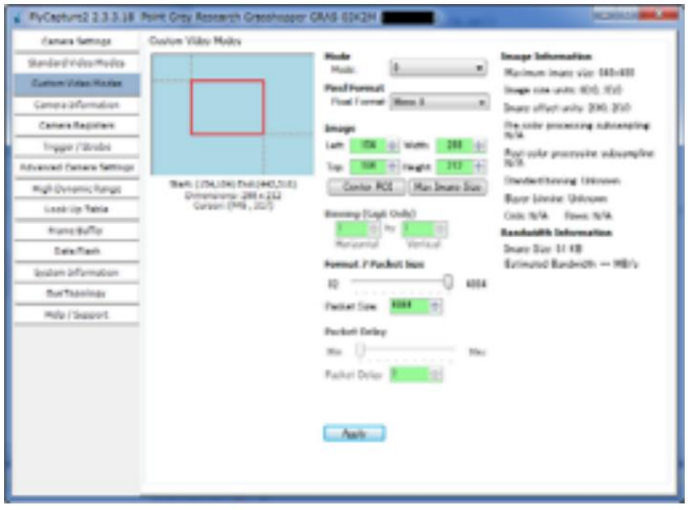
2.8.1.1 Change resolution

In Custom Video Modes, set Mode to 0 and press Apply button. This will give you the same angle of view with twice the resolution.

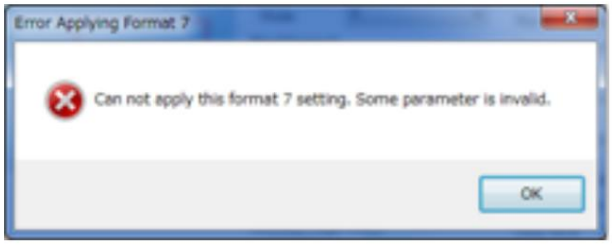


2.8.1.2 Setting the input

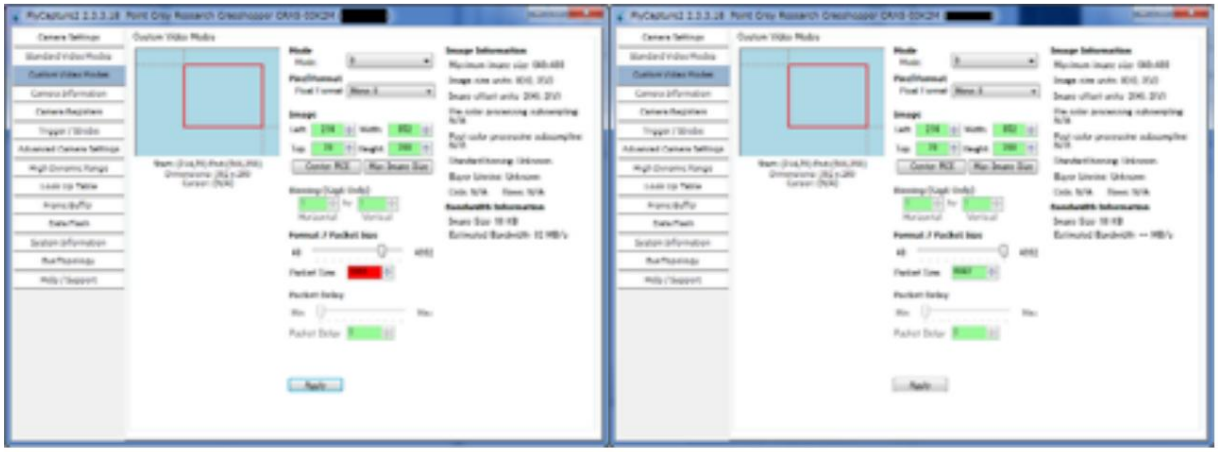
range While viewing the input image, set an appropriate image input range with the mouse (red frame in the figure below). You can also change the range by entering numerical values in Image Left/Width/ Top/Height. After setting, press the Apply button. If the range is not set, the frame rate will be 200Hz as the upper limit. By limiting the input range, it is possible to increase the frame rate.



If the following warning appears after pressing the Apply button.



After pressing OK to close the window, fix the incorrect values shown in red. In the following cases, move the Format 7 Packet Size slider to the right to maximize the packet size. Confirm that the number has turned green and press the Apply button.



2.8.1.3 Change frame rate Press

the Camera Settings button. Next, check the Auto checkbox for FrameRate. By checking it, the range of FrameRate that can be placed in the current input range is set (maybe a bug?). Then uncheck the Auto checkbox and then the desired
Set FrameRate.

Close this dialog as soon as you are done with the settings.

2.8.2 Flea3 (USB3.0) The difference

from Grasshopper is that the PixelFormat is Raw8 and the maximum image size is 1280x1024.

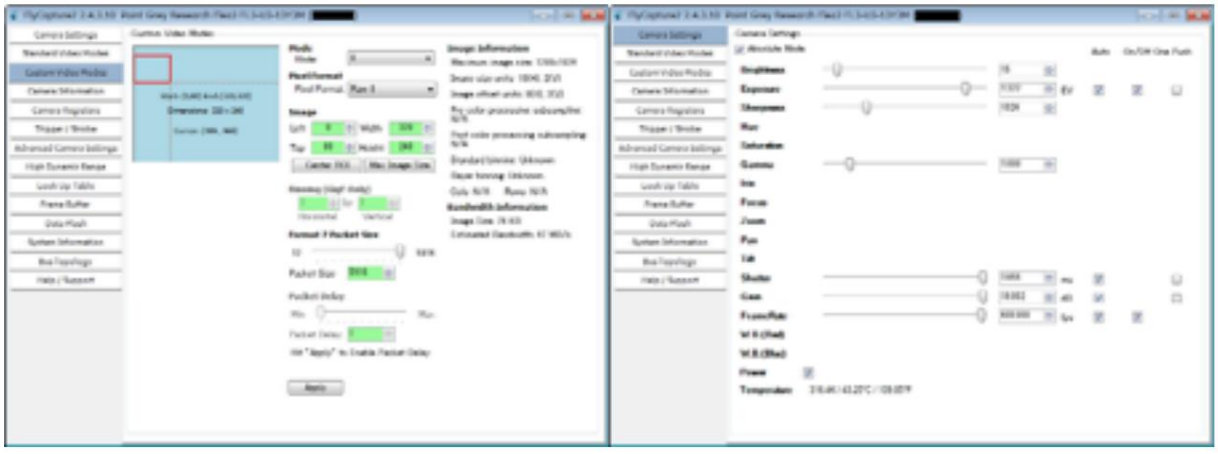
Compared to Grasshopper, the angle of view is smaller (the image appears larger).

2.8.2.1 Change resolution

In Custom Video Modes, set Mode to 0 and press the Apply button. This means that the same angle of view can be captured at twice the resolution.

2.8.2.2 Setting the input range and frame rate

While looking at the input image, set an appropriate image input range with the mouse (red frame in the figure below). You can also change the range by entering numerical values in Image Left/Width/Top/Height. After setting, press the Apply button. If no range is set, the frame rate will be capped at 150Hz. By limiting the input range, it is possible to increase the frame rate. The method of changing the frame rate is the same as Grasshopper. By limiting the range to 320x240, you can set it up to 600Hz.



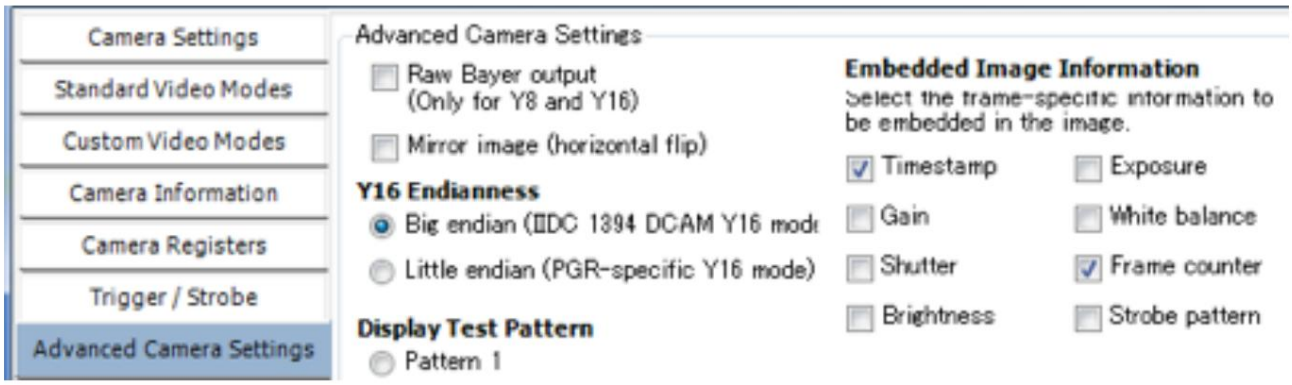
Close this dialog as soon as you are done with the settings.

2.8.3 Refer to Grasshopper3

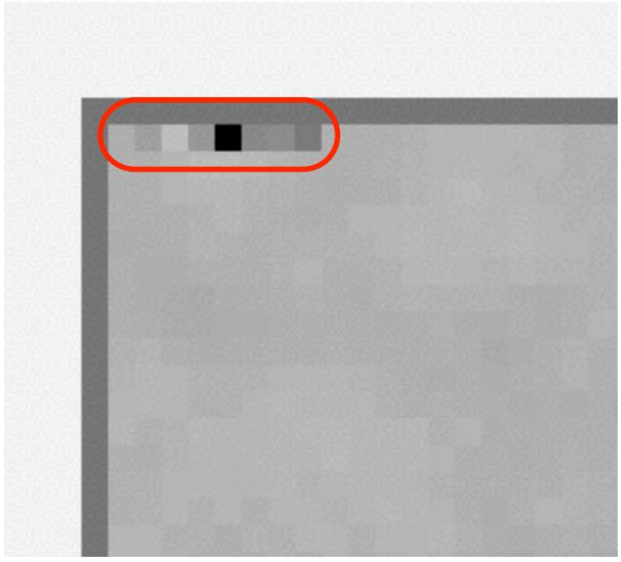
2.4.

2.9 Settings that should not

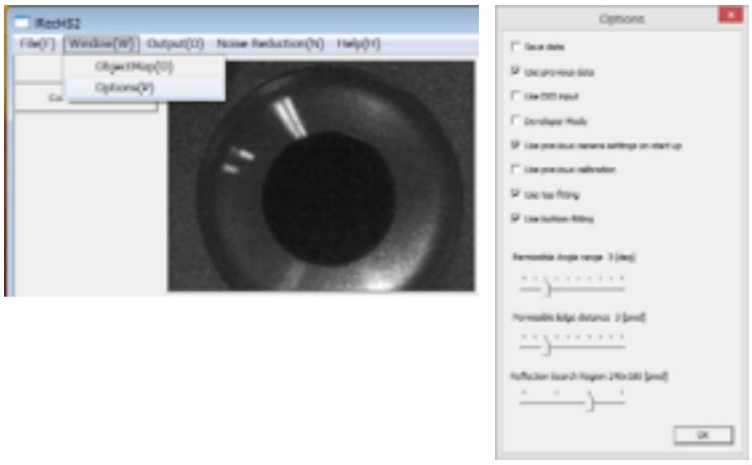
be changed Do not uncheck Timestamp and Frame counter of Embedded Image Information in Advanced Camera Settings.



A time stamp and frame counter are added to each image. This program uses this information. This information is recorded in the upper left pixel of the image (red frame). The display of this part is not a bug.



2.10 Saving camera capture settings (ver.0.225 or later)



Open the Options dialog from Window->Options, check Use previous camera settings on start up, and press OK.

This saves the current Mode/Image position (Left/Top/Width/Height)/FrameRate. Information is recorded in setting.txt in the same directory as iRecHS2.exe. If this check is absent, the default settings are used.