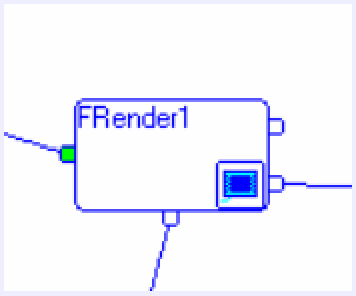
FRender gadget

1. Gadget view and pins functionality



The gadget has one input pin receiving frames (green one), upper output pin for data about mouse activities output, lower output pin for viewed image output as video frame and control pin on down side.

2. How rendering on display is organized

The frame arrived on input pin is going through special analysis and processing sequence.

The first step is input frame analysis for control information. If frames with such information are found, they will be processed (look “FRender Commands”).

If attributes of input frame have strings “x=<X_coordinate>;” and “y=<Y_coordinate>”, the rendering of following images will be done with shift [X,coordinate>,<Y_coordinate>].

After that gadget tries to extract video frames from input frame. If the input frame is a separate video frame, this frame will be selected for rendering. If the input frame is container, the first found frame will be used for rendering. Keep in mind that the last frame added to container will be the first found.

If the video frame is not found, no new rendering process will be initiated.

If the video frame is found, new data for rendering will be prepared and message for image and graphics redrawing will be sent to Windows.

Keep in mind, that not all images and graphics will be obligatory drawn on display, it’s CPU loading dependent, some images may be skipped, but it does not have influence on processing results obtaining, i.e., results view and result data stream are independent. Usually, when the frame rate is less than 10-15 frames per second the all video frames and graphics will be shown.

3. FRender commands going through main input

Commands for FRender are passed through the main input pin and identified by frame type and content.

Command frame type is text. In most cases this frame should be not inside input container frame, but there are exceptions.

Notes:

- Labels are case sensitive.
- Separators are shown as commas (,), but space( ), tab(\t), semicolon (;), underscore (_) and opening parenthesis ('(') could be used.

There is a list of commands in separate text frame.

#	Frame type	Label	Content	Description
1	Text	Scale&Units	<scalar scale as double> <,<Units as string> <,<ScaleX as double> <,<ScaleY as double> <,<Conjugate Scale (0|1) >>>>	The main scale is scalar (first parameter). If Units presented, than on view will be presented measured values with shown units, otherwise pixels will be used. If units presented the additional 3 parameters will be decoded if existing: XScale, YScale and Conjugate flag (if Y is inverted, i.e. from top to down)
2	Text	SetWndHandle	Window handle as string	Handle is number in decimal or hex with 0x prefix presentation.
3	Text	Resize		This is instruction to rendering window to adjust size after host window is changed.
4	Text	**Not "Resize"**	<wh=<host window handle>> <x=<xleft> && y=<ytop> && w=< width> && h=<height>>	Assignment of new host window handle and/or rendering position inside host window. If wh defined, new host will be assigned. If x and y and w and h defined, new position for rendering in host window will be assigned

There is list of commands which could be separate or inside container frame:

#	Frame type	Label	Content	Description
1	Text	SetCenter	Xc=<X of center>; Yc=<Y of center>;	If Xc and Yc will be found in content, view center of current (existed in container) and following presentations will be in assigned point.
2	Text	SaveImage	<<# of images>, ><Directory for saving>	After this command the images will be rendered to FRender window and saved to file. There are 2 parameters: number of images for saving and directory for saving. If a number of images is presented, this number of input images will be saved, otherwise only one image will be saved. If a directory is presented, this directory will be used for image saving. Images will be saved as is, i.e., what is shown in FRender window will be saved. Images will be saved as BMP with name <ImageDir>/<Prefix><TimeStamp><Suffix>.bmp. About prefix and suffix look following commands
3	Text	ImageSavePrefix	Prefix for Image file name or "<label>"	This is some text which will be used as <Prefix> in file name on image saving. If content is string "<label>", then label of video frame will be used as prefix. Word *label* is not case sensitive and if video frame label consists of full path, the only file name without directories, drive letter and extension (for example, ".bmp")will be used as prefix.
4	Text	ImageSaveSuffix	Suffix for Image file name	This is some text which will be used as <Suffix> in file name on image saving

4. FRender commands going through control input.

#	Frame type	Label	Content	Description
1	Text	SetCenter	Xc=<X of center>; Yc=<Y of center>;	If Xc and Yc will be found in content, view center of current (existed in container) and following presentations will be in assigned point.
2	Text		Get `hTargetWindow`	This command returns handle of target window (where rendering performed) on control pin output in format 0x%X

3	Text		Reset	This command clears rendering window content
4	Text		Get Outimage(<number of images>)	This command leads to viewed image output to second output pin as video frame in format RGB (24 bits per pixel). One image per redrawing will be .sentFor example, "set outimage(1)" will lead to one image output when next window redrawing will be done

5. Frames attributes and their influence on graphics view

There are several types of input frames influenced on graphics drawing:

- Figure frame
  - One point
  - Line (2 points)
  - Rectangle (4 points)
  - Random connected points
- Text frame
- Rectangle frame

Frame attributes are processed as property kit (look FXPropertyKit class).

The following table shows possible rendering attributes.

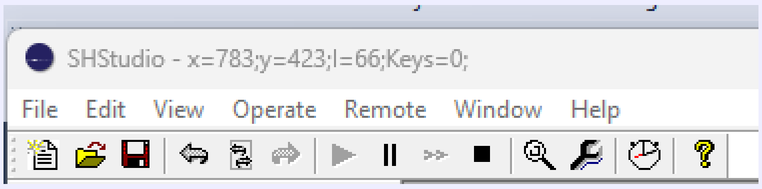
#	Property	Applied to	Value	Description and Samples
1	color	All types	String holding decimal, binary or hex number	Value = (Blue<<16) + (Green<<8) + Red 8 bits per color **color=0;** - black color **color=255;** or **color=0xff;-** red color **color=0xffff00;** - cyan color
2	Sz	Text Figure (point)	Text size in Pt Cross side on point view in pixels	**Sz=14;** default value is 12 **Sz=5;** - cross side will be 5 pixels; default value is 1 (cross size will be 3x3 pixels)
3	thickness	Figure Rectangle	Line thickness in pixels	**thickness=3;** default value is 1
4	style	Figure Rectangle	Draw style	**style=2;** default value is 0 (solid) Available styles: 0(solid), 1 (dash ----), 2(dot ….), 3 (dash-dot ._._._._), 4 (dash-dot-dot _.._.._..)
5	back	Text	Background color for text as hexadecimal without prefix	Coding as in **color.** If **back** is present then text will be drawn on appointed background, if not – background will be transparent.
6	x	Text	X position of text on image	**X=100;** If x and y are present in attributes, text frame content will be shown ([x,y] is coordinates of left top point of text).
7	y	Text	X position of text on image	**Y=200;** If x and y are present in attributes, text frame content will be shown ([x,y] is

				coordinates of left top point of text).
8	message	Text	Content string	**message=OK;** If content of text frame is empty, message content will be shown.

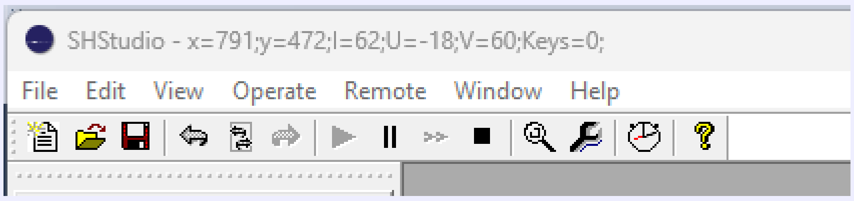
6. Manual view control and Setup dialog

The left button click on image leads to pixel under cursor parameters showing.

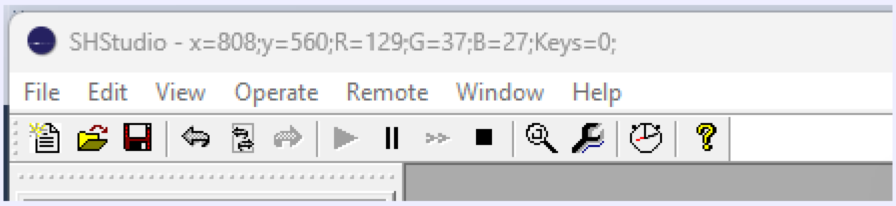
Pixel parameters will be added to caption of main window. For monochrome image the pixel coordinates (x and y) and intensity (I) will be shown.


SHStudio - x=783;y=423;I=66;Keys=0;

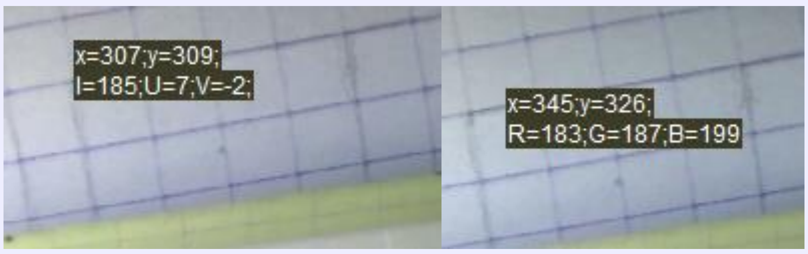
For color image the color components (U and V) will be added to caption.


SHStudio - x=791;y=472;I=62;U=-18;V=60;Keys=0;

When ViewRGB selection in setup dialog is true, information about color will be shown in RGB form.


SHStudio - x=808;y=560;R=129;G=37;B=27;Keys=0;

If keyboard ‘I’ is pressed when left button pressed, then information about pixel under cursor will be shown directly on image (format dependent on ViewRGB flag in setup).


x=307;y=309;
I=185;U=7;V=-2;

x=345;y=326;
R=183;G=187;B=199

Second left button pressed when ‘I’ is pressed, then pixel info on image view will be switched off.

If cursor goes out of image, then pixel info on image view will be switched off.

If keyboard ‘F’ is pressed when left button pressed, then ViewGRB flag will be toggled.

‘Keys’ value is bit mask shows what keyboard keys are pressed:

Bit 0 is 1 when Control is pressed (left and/or right).

Bit 1 is 1 when Shift is pressed (left and/or right).

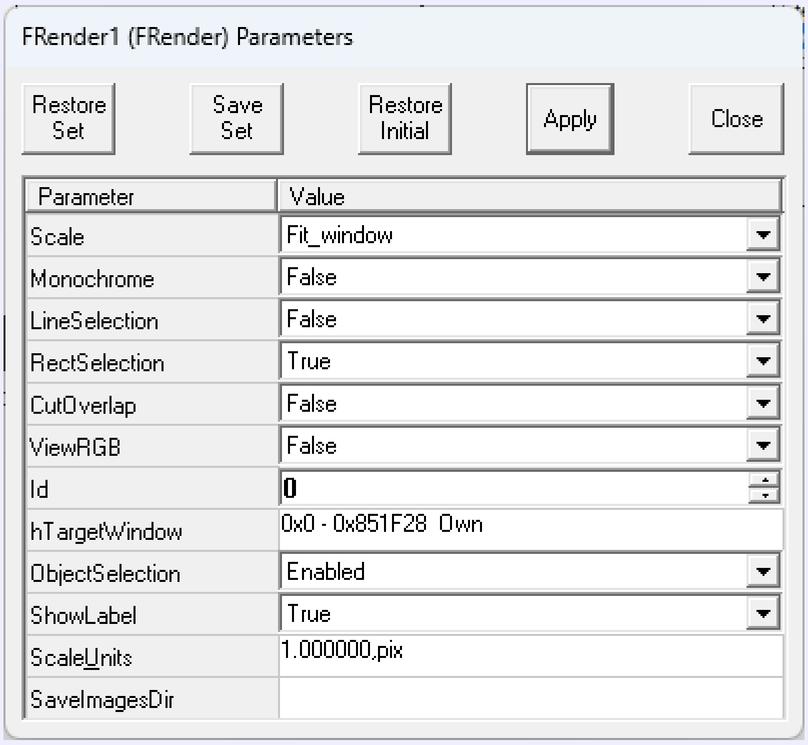
Bit 2 is 1 when Left Control is pressed.

Bit 3 is 1 when Right Control is pressed.

Bit 4 is 1 when Left Shift is pressed.

Bit 5 is 1 when Right Shift is pressed.

Setup dialog shown on following image.



Parameter	Value
Scale	Fit_window
Monochrome	False
LineSelection	False
RectSelection	True
CutOverlap	False
ViewRGB	False
Id	0
hTargetWindow	0x0 - 0x851F28 Own
ObjectSelection	Enabled
ShowLabel	True
ScaleUnits	1.000000,pix
SaveImagesDir	

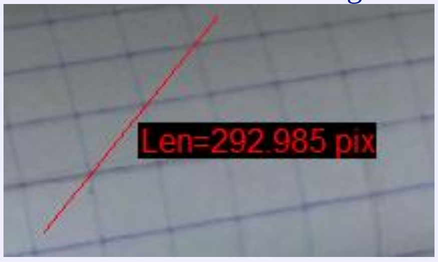
Scale allows change scale of displaying

- x1 (image pixel to pixel)
- x2 (image pixel to square 2x2 pixels)
- x4 (image pixel to square 4x4 pixels)
- x8 (image pixel to square 8x8 pixels)
- x16 (image pixel to square 16x16 pixels)
- Fit Window

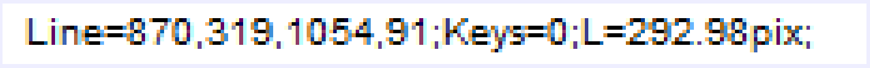
Monochrome option allows switch color-monochrome type of displaying. Monochrome displaying takes less processor resources.

If **LineSelection** is not false, line will be drawn by left mouse button (line begin will be in point where left mouse button is pressed, line end will be in point where button was released). Two operations will be done:

a. Line will be shown on image with printed line length.

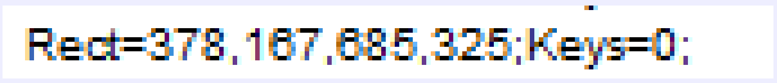


b. Text frame will be sent to the gadget output. This frame will consist of line begin and end coordinates, Keys status and line length.



```
Line=870,319,1054,91;Keys=0;L=292.98pix;
```

If **RectSelection** is true, the rectangle can be marked on image by right mouse button. When this button is released the rectangle data will be sent to the output pin.



```
Rect=378,167,685,325;Keys=0;
```

CutOverlap parameter is not in using now (it’s for several images overlap).

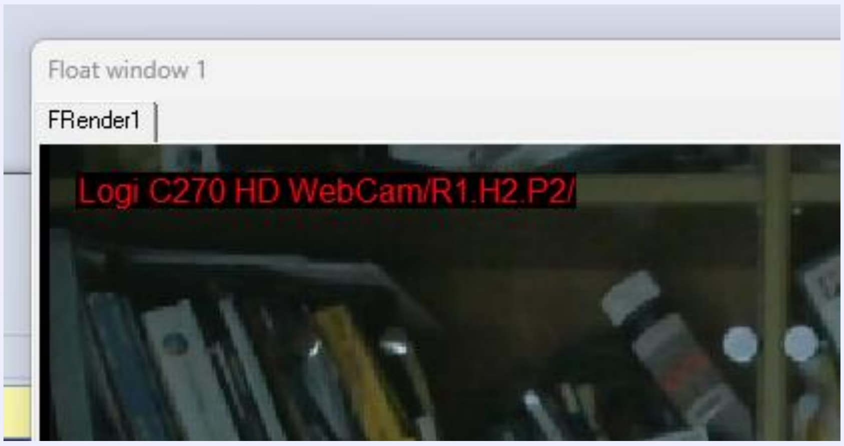
ViewRGB parameter controls color parameters presentation as texts.

RenderId B is not in use in the current version.

hTargetWindow is a Windows handle for image and graphics rendering. If this value is zero, the assigned by default window will be used. User can put to this field existing handle of any window on desktop (this done is for experiments only). Usually, UI application assigns or reassigns this parameter.

ObjectSelection is not in use in current version.

ShowLabel allows image label presentation on image (if enabled, following label will be shown in left top image corner).

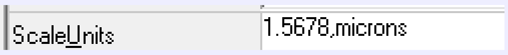


Logi C270 HD WebCam/R1.H2.P2/

ScaleUnits is a field for image scale and measurement units entry. Format is

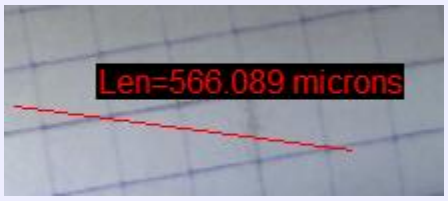
<Scale in units per pixel><,<units as string>>

This parameter is used for length presentation. For content is



ScaleUnits 1.5678,microns

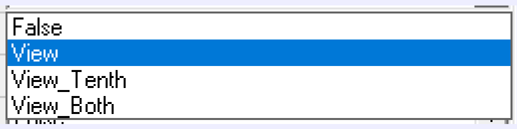
Length will be presented as



Len=566.089 microns

Units part is not mandatory. If it's not present, the word "pix" will be shown as units.

LineSelection field has several options:



False
View
View_Tenth
View_Both

When units are 'um' or 'microns' the measured length could be viewed in microns, in tenths (1 tenths = 2.54 microns) or in both forms.

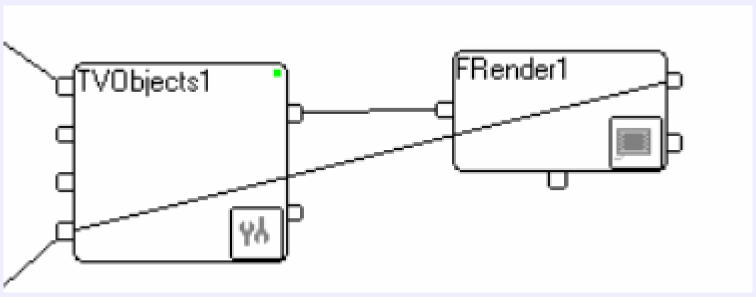
When units are 'mm' the measured length could be viewed in mm, in tenths (1 tenths = 2.54 microns) or in both forms.

If keyboard ‘L’ is pressed when left button pressed the **LineSelection** field will be switched.

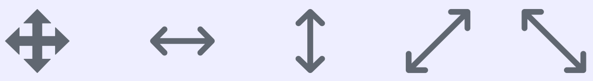
SaveImagesDir shows where images will be saved. Saving can be done by command only, look p.2 in this document.

7. Interactive video object ROI editing

FRender gadget can be used for video object positions editing in TVObjects gadget. Connection between FRender output pin and TVObjects input pin 4 should be done for this functionality using (blue line on following picture).



When cursor moving over ROI edge of a video object, the cursor changes form to resize or move arrows.



The real view of these arrows is dependent on specific computer settings.

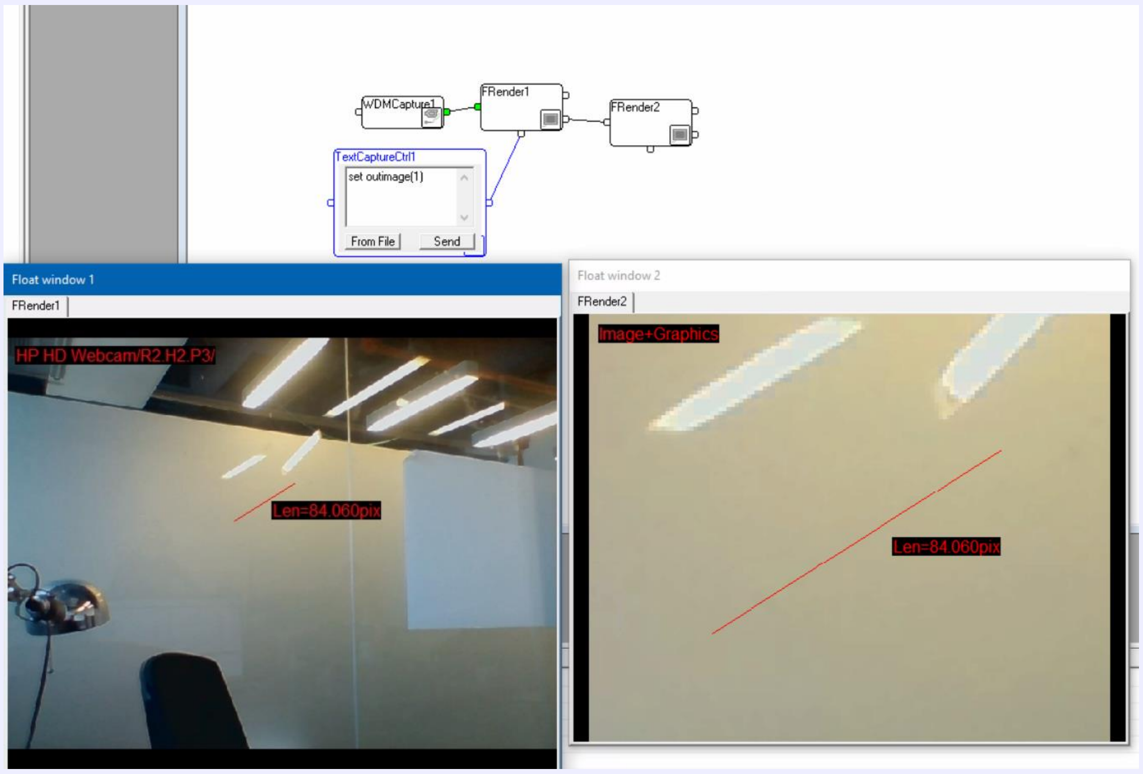
When cursor has one of these forms, do press CTRL button on keyboard, press mouse left button, move mouse to arrows direction and release mouse left button. Video object ROI will be changed.

Don’t forget to save the graph with new video object parameters.

8. Images with graphics output as video frame

When command “set outimage(<# of images>) received on control pin, Frender will send next <# of images> pictures to lower output on each of rendering cycles.

For example, Frender1 did send to Frender2 image when zoom **was** 4, the original image with fitted to window zoom is presented on Frender1.



WDMCapture1
FRender1
FRender2
TextCaptureCtrl1
set outimage(1)
From File
Send
Float window 1
FRender1
HP HD Webcam/R2.H2.P3/
Len=84.060pix
Float window 2
FRender2
Image+Graphics
Len=84.060pix