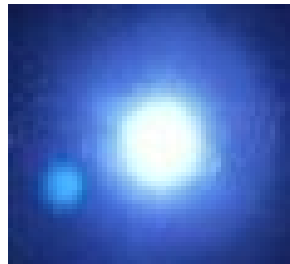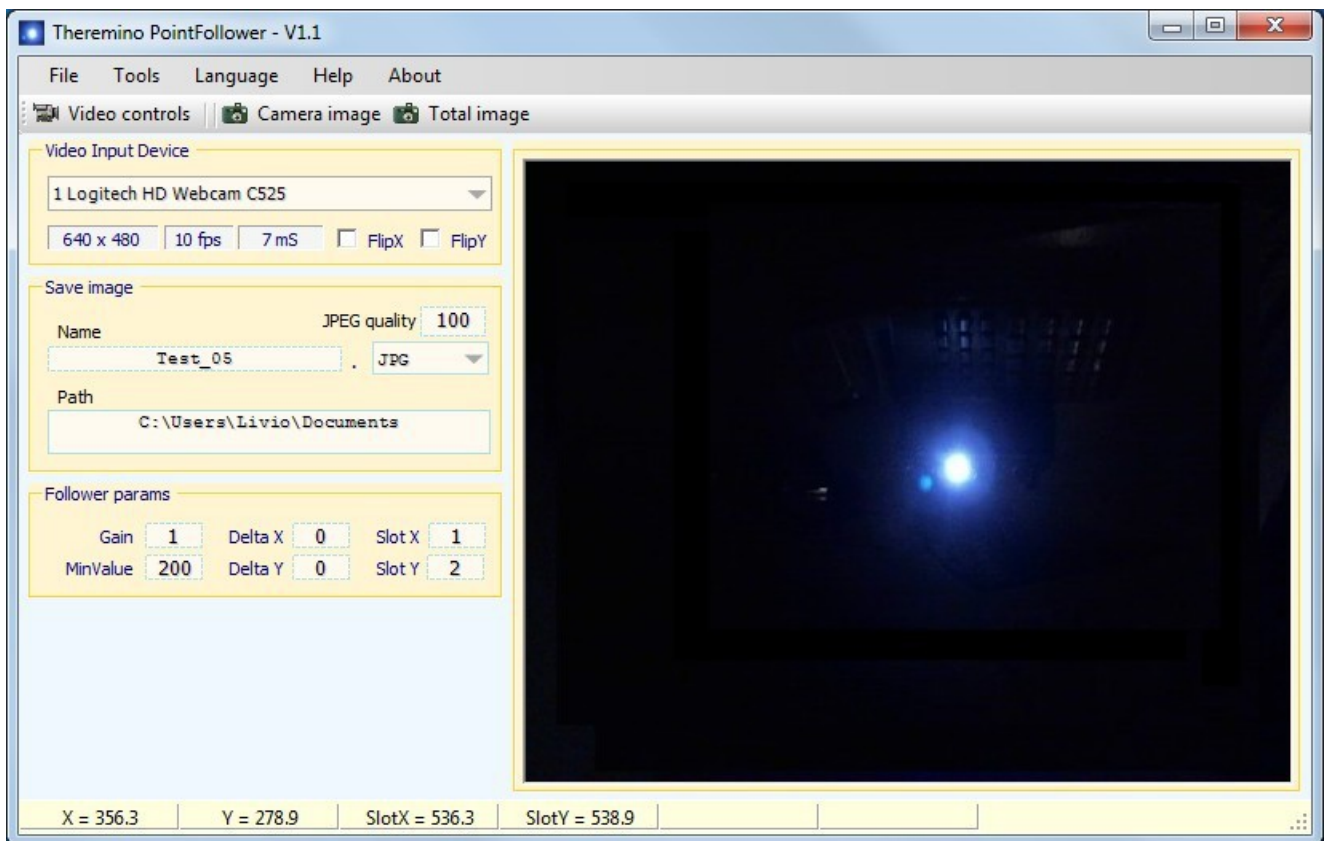Theremino **System**

Theremino PointFollower Instructions

Theremino PointFollower

This application reads the image from a camera and locates the center of gravity of a bright spot.

A correction value is sent to the two slots, the values of which represent the decentralization in horizontal and vertical. When the point is perfectly centered the slots contain the value 500. By suitably adjusting the parameters of tracking, you can control two multi-turn servo motors.

For information on servo motors read here: http://www.theremino.com/en/hardware/outputs/motors#multiturn

This mode of operation has been prepared for telescopes, to center the artificial star produced by a laser. But the same principle can be used for the process control, in industrial and scientific applications.

Theremino PointFollower is the basic application to read and process a video signal.

To create new applications we recommend to copy this application, change name and follow these instructions: http://www.theremino.com/en/downloads/notes-on-software#advices
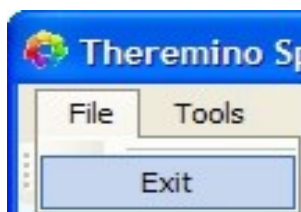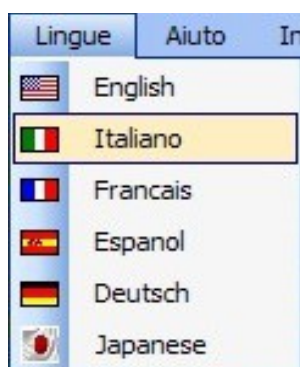
The menu commands

The menu "File" has only the "Exit" command, that can be used to close the application.
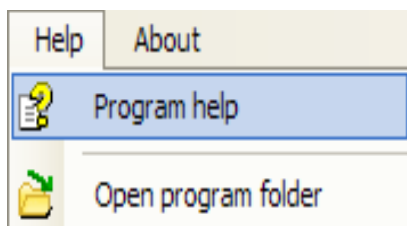
To close the application you can also use the white cross on a red background in the upper right corner of the window.
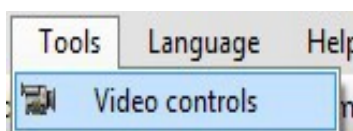
Opening of the WebCam control panel.

Choice of languages.

Operating instructions (this document).

This command opens the application folder, to control and edit documents of languages and other files.

The tool bar controls
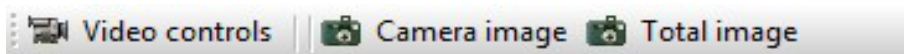
Video Controls
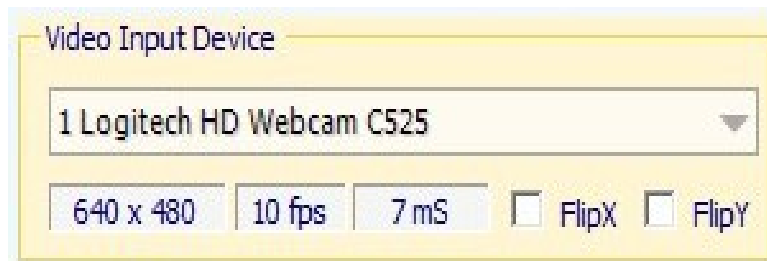With the button "Video Control" opens the panel to adjust the parameters of the input video.

Save room picture
With this button you save the image of one area of the room.

Save image total
With this button you save the image of the total application.

The video device panel

Selecting the video input device

Clicking on the name you choose the input device. When you buy a device to be careful not to be fooled by the many mega-pixels that are often declared. The mega pixels interpolated by software always very much more of the real hardware resolution, but you have to identify the real resolution, which is often the usual 640 x 480.

Flip X - Flip Y

Flip Horizontal and vertical image. Use these commands causes a small additional workload for the CPU. The minimum work for the CPU you get with FlipX Flipy disabled and enabled.

Information boxes of video input device
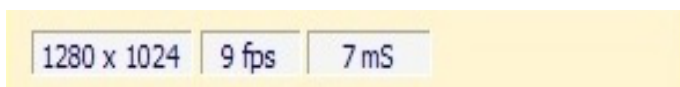
The first box shows the currently set resolution.

The second box shows the frames per second "actual". When you set a high value for the parameter "Exposure" does not fall below the value of the frames per second set in the control panel.

The third box indicates the milliseconds used by the software to process the image. This time determines the CPU usage and it is good that it is as low as possible. Depending on the characteristics of the PC and what options are used in the program, this time can go from a few milliseconds, up to a maximum of a few tens. The total consumption of the CPU is given by milliseconds multiplied by the frames per second.

To limit the CPU consumption do not overdo it with the resolution of the camera. Set over 1024 or 1280 at best a waste, because it is definitely a resolution "fake," interpolated into the driver.

Always to limit the consumption of CPU is recommended to limit the frames per second in the settings of the video device (the panel of the next page). Setting 9 or 10 frames per second is obtained a considerable saving of the CPU, while maintaining a reasonable speed of response.

Adjusting input video parameters

These properties are only accessible if you use devices with video driver type "WMV". If you only have drivers "VFW" it will be necessary to use "Open source panel" and "Open format panel" as shown on the next page.

Depending on the device selected video some of these properties may be missing or disabled.

Exposure time	
Gain	
Brightness	
Contrast	
Gamma	
BackLight	
Saturation	
White Balance	
Tint	
Zoom	
Pan	
Tilt	
Sharpness	
Default for all parameters	

Video Input Controls

Open Source Panel | Open Format Panel

Compression: YUY2 | Video size: 640 x 480 | Max FPS: 9

Default Auto

Exp. □ -3
Gain 0
☼ 0
◑ 32
⊿ 100
Back light 0
Satur. 64
White □ 650
Hue 0
Zoom 0
↔ 0
↕ 0
Sharp 30
◯ Default all | Close
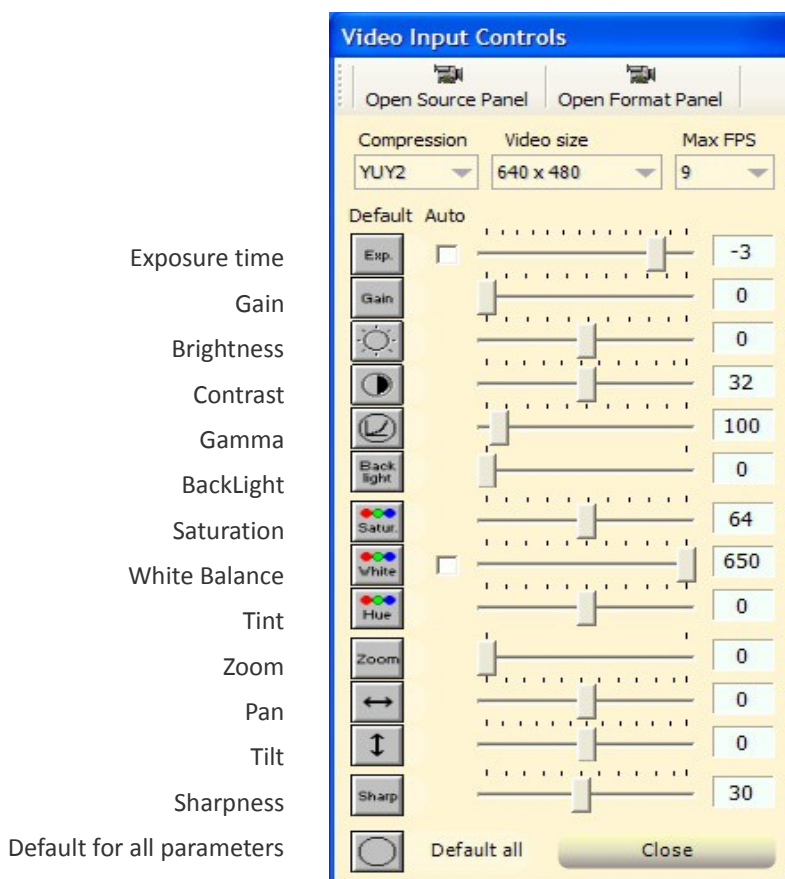
Many device drivers video contain errors or have been written in a "rough". One of the most common defects is losing the settings (you reopen the program and something of this panel is changed). Some drivers rehabilitate the boxes "Auto" every time you turn on the computer or changing the USB port. In other cases it also happens that at the start, the actual settings of the "White Balance" or "compression" are not the ones that are shown in this panel.

These defects are not due to the Theremino Spectrometer application, if you replace the driver everything is in place (or defects change).

If you do not find a better driver you need to get used to its flaws. Give a look at these settings each time you start a session of measurements and possibly change some of the controls until the video device behaves correctly.

This panel can be docked to the right or left of the main window, or placed wherever you like on the screen. Moving it with the mouse, its position will be remembered.

Adjusting properties for VFW devices

If the video device driver (webcam) is a WFV its properties are accessible only through the "Settings Panel" and the "panel sizes."

With some drivers, some control of lesser importance might be accessible only by means of these panels.
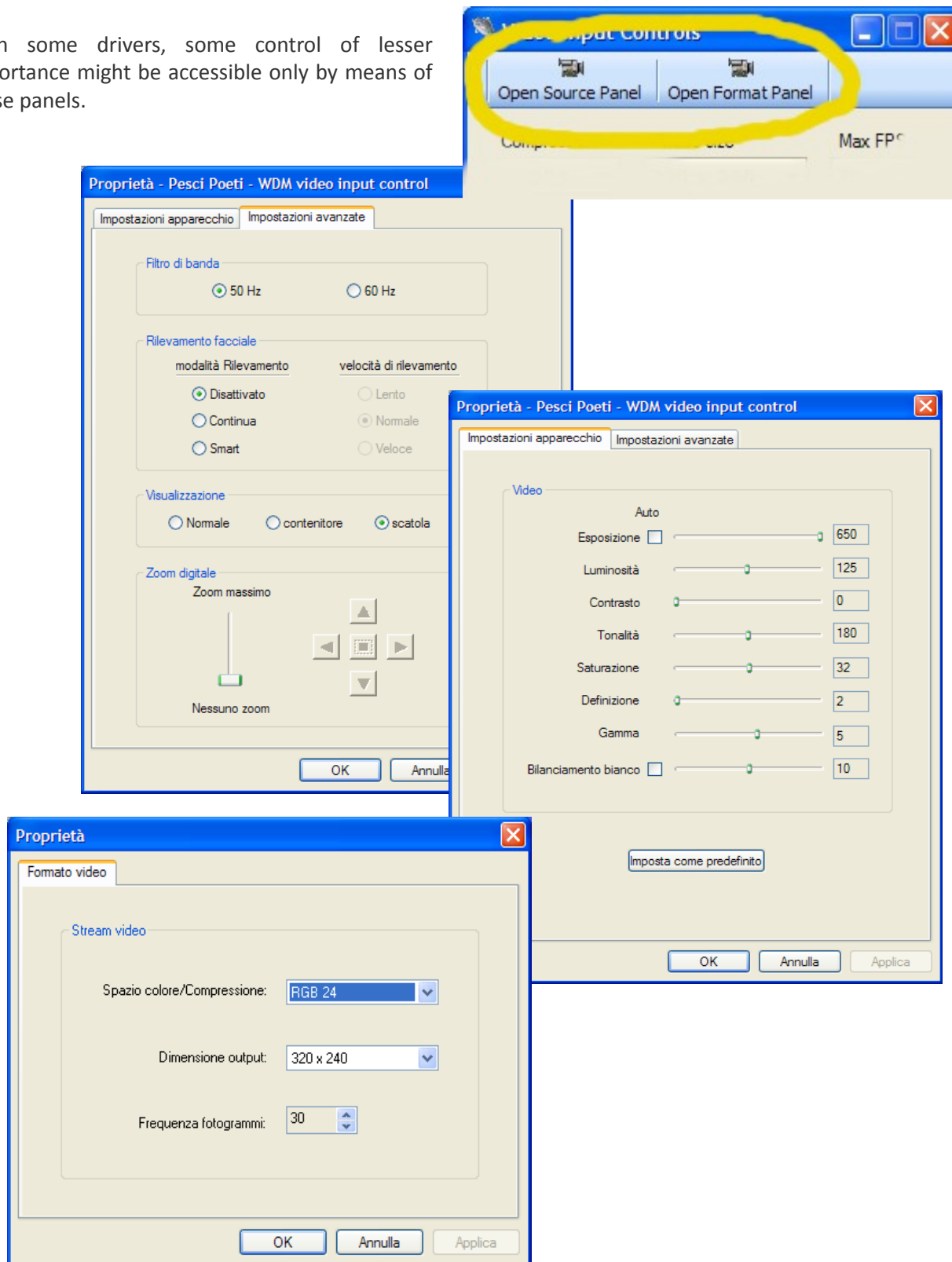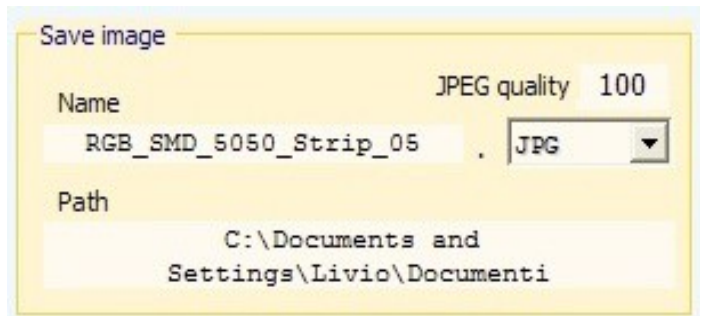
Settings for images on file

Name

Here you can set a name for the images to be saved, with every shot the final figures will be increased automatically.

The number of digits is respected so if you want a four-digit numbering must be low, for example, with "xxxx 0001" which will be incremented into "xxxx 0002", "xxxx 0003" etc ...

No matter what's left of the digits, space or hyphen or another, the first non-numeric character from right is considered the end of the name.

The name can not begin or end with a space, any leading or trailing spaces are automatically removed.

Path

The box labeled "Path" indicates the destination folder, to change it double click on the box, select a folder and press OK.

You can also change the "Path" manually or by copying and pasting.

JPEG Quality

Usually you use a quality equal to 100, the resulting files are still quite small (about 100k to 300k). If you must have very small file reduce this parameter. With 50 images are still reasonably good, under 30 flaws become apparent.

File Format

Usually you use the JPG format with quality 100. If you want a higher quality PNG is a good format that uses a compression without loss of information.

If a JPG image is loaded and then saved a very large number of times, should theoretically worsen gradually (but in practice you do not notice any change). Instead PNG images can be saved and reloaded an infinite number of times and are always identical to the original.

Even TIFF, EXIF and BMP formats are lossless but produce unnecessarily large files.
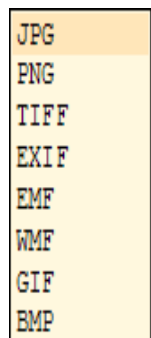
Motor control parameters

Gain
This value determines the relationship between the decentralization of the light and the movement of the motors. The value "1" with each pixel displacement, causes a variation of a point, in the motor control signal. The value "-1" reverses the output values and motors turn in the opposite direction.

You can increase the gain to get a more precise fix, but if you overdo it, the system can auto-oscillate. It is recommended to increase the gain, up to the auto-oscillation and then reduce it by 50%.

Min
This parameter eliminates the low lighted pixels from calculations, it saves work to the CPU and improves the calculated center stability.

Usually a value between 100 and 200 should be fine. To improve the stability it is good, to use also the control parameters of the video image.

Delta X / Y Delta
Regulations to improve the centering end correct the systematic errors, due a do not perfect balance of the motor signals.

Slot X / Y Slot
These are the SLOT on which signals are sent to the motors. The two numbers should correspond to the PIN motor SLOTS, set in the application HAL.

Appendix 1 - Adjusting the text box numerical values

The numerical text boxes of this application (and all other system applications Theremino) have been developed by us (note 1) to be more comfortable and flexible than the original Microsoft TextBox.

The numerical values are adjustable in multiple ways

- By clicking and holding down the left mouse button and moving the mouse up and down.
- With the mouse wheel.
- Using the keys arrow-up and arrow-down on the keyboard.
- With conventional methods that are used to write numbers with the keyboard.
- Using standard copy and paste selection methods.

- The method of moving the mouse up and down allows wide and fast adjustments.
- The mouse wheel allows convenient and immediate adjustments.
- The arrow keys allow fine adjustments, without having to look away from the present operation.

(Note 1) Like all our software, the source files are available (Freeware and Open Source licensed under Creative Commons) and can be downloaded from here: **www.theremino.com/downloads/uncategorized#customcontrols**
These controls can be used freely in any project without a name but also the source.