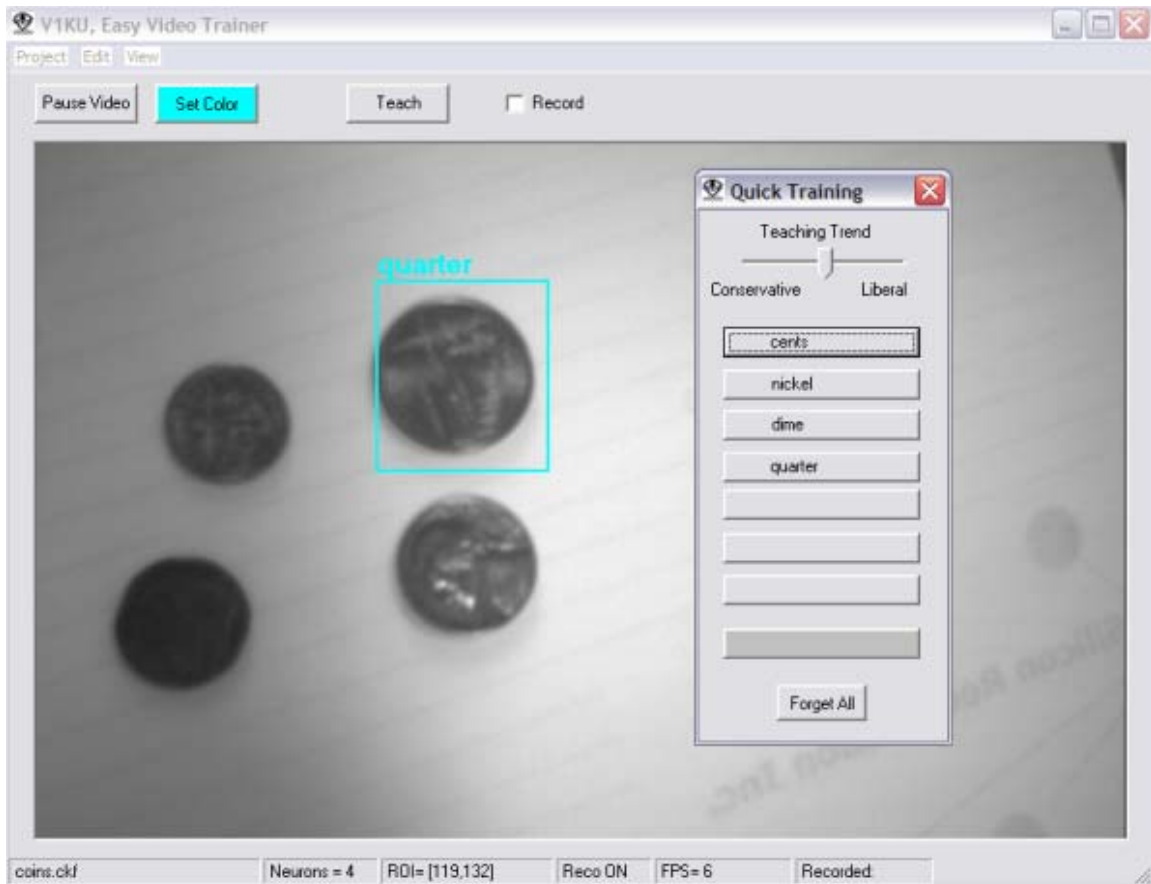


# Easy\_Video\_Trainer

Teaching and Monitoring software  
for the V1KU module



Version 1.8

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## **Introduction**

Easy Video Trainer software is intended for use with the V1KU module when configured with the default CogniSight engine for object recognition. The application lets you adjust the video acquisition settings, define a region of interest in the video images, teach the neurons what you want to recognize. Once you are satisfied with the accuracy of the recognition monitored on the Easy Video Trainer screen, you can activate the use of the I/O lines and RS485 communication to interface directly with actuators and other applications. At this point, V1KU can be disconnected from the PC (provided that it is connected to an external power supply) and inspect autonomously. It will resume inspection at power-up. The application can save the knowledge file to disk and to the Flash memory of the camera.

If you decide to disconnect the camera from the USB port and connect it to an external power supply, the recognition will resume autonomously at power up (provided that the project was saved to the Flash memory of the camera).

### **What can I do with Easy Video Trainer?**

- View the live video images to adjust the positioning of the camera
- Adjust the sensor settings to obtain the best image quality
- Define the region of interest to monitor
- Teach up to 7 categories of objects
- Activate the output lines of the camera
- Save the knowledge you have built by teaching examples

### **Limitations**

- Discrimination of 7 categories of objects with the same size
- Single region of interest, resizable and movable manually
- Limited adaptivity to change of scale and orientation
- Limited adaptivity to change of intensity

Easy\_Video\_Trainer is very simple and easy to use, but does not show the full potential of the CogniMem technology available on the camera. For serious image recognition applications, it is highly recommended to build and validate your recognition engine with sophisticated tools such as the Image Knowledge Builder (IKB) from General Vision.

## Installation

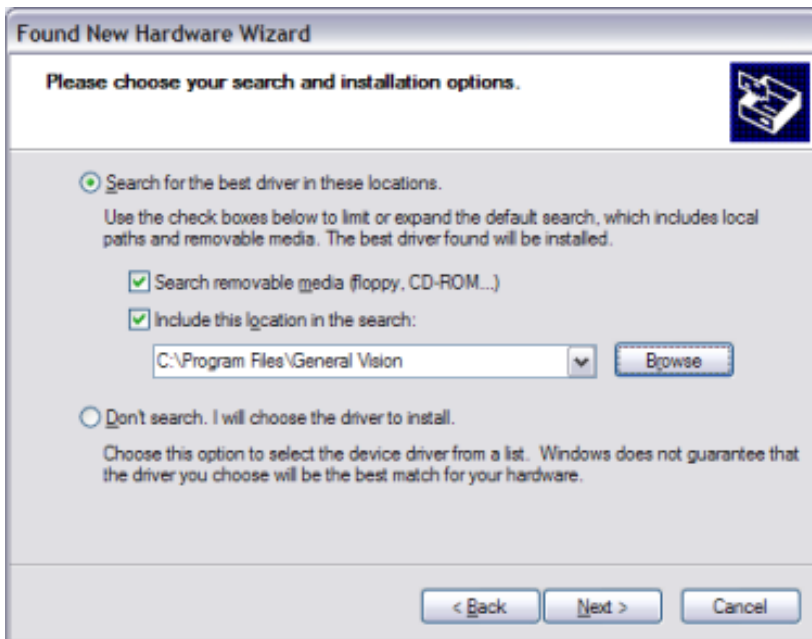
Install the Easy Video Trainer software.

Plug V1KU to the USB port of your PC.

If it is the first time you are connecting V1KU to a PC, a prompt will notify you that a new USB device is detected.



Choose to install from a specific location. In the following dialog box, click Browse and locate the folder C:\Program Files\General Vision.



Click Next.

Click Continue Anyway in the following warning message box.



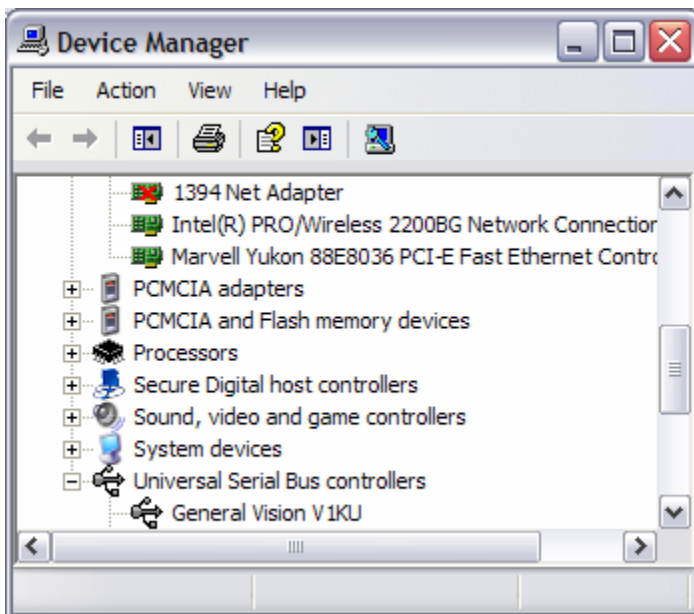
Upon successful termination of the installation, click at the Windows Start menu and select Start\All\_Programs\General Vision\Easy Video Trainer. Verify that you have a live video image on screen.

You are now ready to use the V1KU miniature vision sensor!

## **Troubleshooting**

1) verify that the proper driver is in use

- Open the Windows Control Panel and select System\Device manager
- V1KU should appear under the list of USB devices under the name General Vision V1KU.



## Getting started

At program launch, the live video appears in a window and the settings of the project currently loaded on the camera are retrieved. They include the size and position of the region of interest (ROI) and the names of the categories. The ROI represents the area to learn and/or recognize and its coordinates are reported in the status bar. The program continuously reports the result of the recognition made on the camera. The settings of the sensor can be modified and several output formats can be transmitted to the IO lines of the camera.

A new project consists of the 6 easy steps described below:

- Configure the camera
- Define the categories of objects to recognize
- Define the size of the objects to recognize
- Teach examples
- Monitor results on screen
- Save to the camera when ready to let the camera run autonomously

Several utilities are also available such as the ability to review the knowledge loaded into the neurons of the camera and the possibility to collect images and save them to disk. These images can be used for further training and validation using other applications compatible with V1KU.

## Configure the camera

This menu allows to adjust the video acquisition and output settings.



The **Auto-Gain** and **Auto-Exposure** options adjust the gain and shutter automatically in order to maintain the best intensity dynamic and contrast when the ambient light varies. Auto Gain and Auto Exposure are turned on by default.

**Gain** is the sensor analog gain. It can be changed when AutoGain is turned off and its value ranges between 16 and 64.

**Shutter** is the total integration time of the sensor in number of rows. It can be changed when AutoExposure is turned off and its value ranges between 0 and 480. This value multiplied by 30 gives the exposure time of the sensor in micro seconds.

The 50Hz and 60Hz **anti-flicker** buttons set the shutter speed to a value limiting the flickering effects of a fluorescent light powered with a 50 or 60 hertz power supply.

**External Trigger** sets the sensor to trigger mode. A new frame is captured only upon receipt of an external trigger

pulse. This pulse must be received by the pins 6 and 10 of the J6 connector, corresponding to the anode and cathode of the input opto\_coupler of the camera.

**Opto outputs** enables the transmission of the last 2 bits of the recognized category to the two opto-coupled output lines of the camera. Bit 0 can be read between pin 3 and 4 and Bit 1 can be read between pin 5 and 6.

**Pulsed** sets the output of the opto-coupled lines to a pulse format instead of the default sustained output. In this case the pulse lasts from the end of the recognition till the beginning of the next frame.

## Name your categories of objects

Seven categories of objects can be taught. Their default names are Category 1, Category 2, etc. The names can be changed by clicking at the corresponding button while pressing down the right mouse button. An Edit box is prompted and a new name can be edited.

The first button is reserved for the “Unknown” or null category.

Examples of categories for a part inspection application:

- Good (category 1)
- Acceptable (category 1)
- Recyclable (category 2)
- Grade A (category 1)
- Grade B (category 2)
- Grade C (category 3)

Examples of categories for a traffic monitoring application:

- Car (category 1)
- Truck (category 2)
- Van (category 3)

## Define the region of Interest

### Which size ?

The Region of interest must be a rectangle with a size such that it contains the objects or patterns to classify. Depending on your application, you may have the choice to include a layer of background pixels, or on the contrary to exclude any background and edge information. For example, if you want to differentiate good or defective parts based on the presence or absence of a few screws in the center of the part, you do not have to include the edges of the part in the expert region, but rather want to select the smallest area containing all the screws to identify.

In the case of texture classification, the ROI size should be the minimum size of the repetitive pattern. The smaller the size, the more sensitivity to possible variations in the learned patterns (to either assimilate or discriminate them).

### Resize in the image window

To resize the region of interest (ROI), click at its lower right corner and drag the mouse cursor while keeping the right button of the mouse depressed.



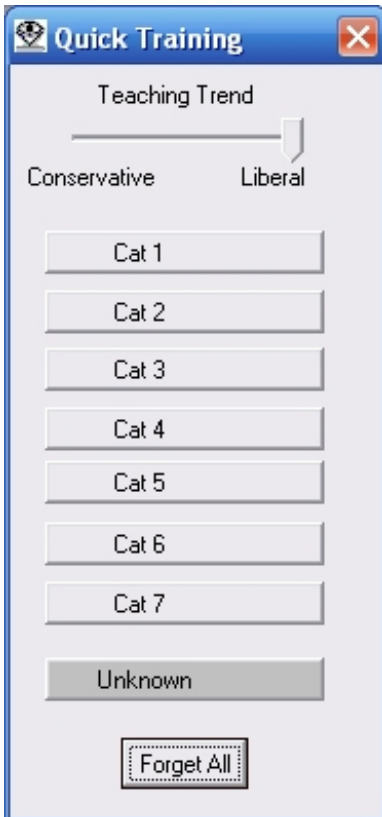
Since the knowledge stored in the neurons is directly related to the size of the learned region, resizing the region on screen is handled as follows: (1) if no knowledge exists, the region of interest becomes the drawn region; (2) if a knowledge exists, the region of interest becomes the closest to the drawn region but with the same aspect ratio. This last measure ensures that the knowledge will perform as well on the new size of the region of interest.

## Change position

To change the position of the region of interest (ROI), click at its upper left corner and drag the mouse cursor while keeping the left button of the mouse depressed.

## *Teach examples*

To teach an example, move the **ROI** over a relevant location and click at a corresponding category button. Examples can be picked up at different locations in different images.



As soon as one example is taught, the camera starts recognizing the region of interest in real-time. The recognized category is reported in the image window.

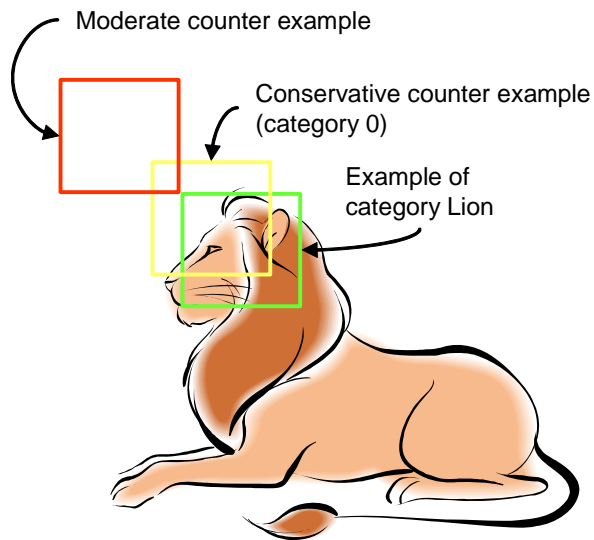
At first, the engine will classify all images as belonging to the one and only known category. If the image content looks really different from the learned example, the response can be "Unknown". This will continue until a second and more categories are taught. The more teaching, the better the discrimination between different categories of objects.

Click **Forget All** to clear the entire knowledge and start a learning session from scratch.

Remember that teaching an incorrect example can corrupt an entire knowledge, so back up can be important. The knowledge can be saved at any time during a learning session using the **File/Save project** menu. It is a good idea to do so regularly naming the project file with an incremental index as the number of neurons increases.

Three tendencies of teaching are available: **Liberal, Moderate and Conservative.**

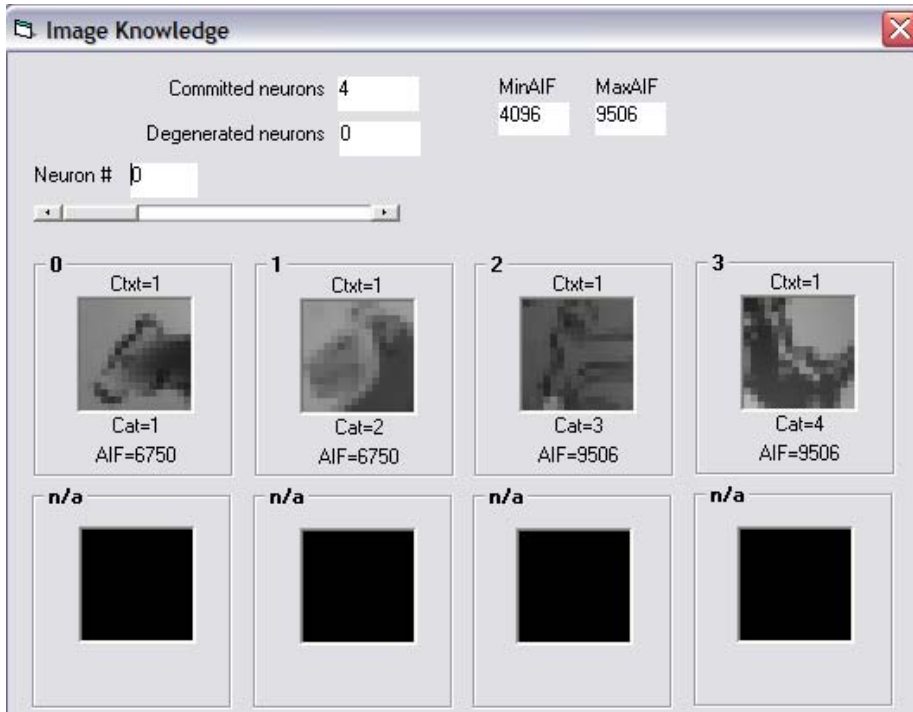
- Liberal** Learn the example inside the region of interest. This method uses the most the generalization capabilities of the neurons.
- Moderate** Learn the example inside the region of interest, plus one counter-example (category 0) taken in the upper left adjacent region of interest.
- Conservative** Learn the example inside the region of interest, plus one counter-example (category 0) taken in the upper left block from the center of the region.



Counter examples can always be selected and taught manually by teaching the "Unknown" or category 0 manually.

## Review the knowledge

The View Knowledge menu allows to review the contents of the neurons, the pattern they hold, their category (Cat), and active influence field (AIF). This utility can be helpful to understand why some erroneous or uncertain classifications occur. It can also point to examples which are irrelevant because showing too much background.



The AIF is an attribute of the neuron limiting its generalization capabilities. It is a dynamic attribute entirely controlled by the neuron itself. From the time the neuron is created, its influence field can only reduce as new examples are taught and the knowledge gets more accurate. The smaller the influence field the more conservative the neuron. For a complete description, please refer to the CogniMem Reference Guide.

## Image Collection

The CogniMem neural network has very good generalization capabilities and is also very adaptive. It is best taught by showing as many examples as possible, representative of the variety of products and conditions encountered in an application.

When applicable, it is a good idea to collect images per type of objects to recognize and store them into corresponding folders. Examples can also be organized per type of working conditions they represent such as lighting conditions, cases of known and/or unknown background, ranges of scale, ranges of angular positions, etc. The resulting images can be used to build and validate recognition engine with more sophisticated application such as the Easy\_Image\_Trainer and Image Knowledge Builder.

## *Project Management*

Projects defined under Easy\_Video\_Trainer can be saved to disk in a project file or to the Flash memory of the camera. This last operation ensures that the camera can resume recognition at its next power-up without any need for a computer!

The File menu allows to save project to disk on a file called CogniMem Knowledge File (\*.ckf), or to the Flash memory of the camera.

An CogniMem Knowledge file includes all the necessary information to resume the current recognition:

- Sensor settings,
- Definition of the region of interest
- Knowledge or the contents of the neurons
- Names of the categories

## *From assisted to autonomous image recognition*

The commands initiated from the Easy\_Video\_Trainer are executed by the camera itself which means that when the application is closed, the camera continues recognizing the video images and transmitting results through the serial port and opto-coupled output lines if enabled.

Furthermore, if the camera is powered through an external power supply, the USB cable can be plugged and unplugged without impact on the recognition executed on the camera. The only requirement is to have the USB connected when the Easy\_Video\_Trainer is started.

## Troubleshooting

### **V1KU is an unknown USB device**

The USB drivers for the V1KU board are supplied with its accompanying software and must be copied in Windows/System32/CyLoad.

- The first driver to select is mi2usb.sys and mi2usb.inf
- The second driver to select is cyload.sys, cyload.inf and cyload.spt

Note that the above drivers are copied to Windows/System32/CyLoad by the Easy\_Video\_Trainer and the V1KU\_Diagnostics application.

When found properly, the V1KU board is listed as Micron Imaging USB demo2 board under the Control Panel/Hardware Settings. This is due to the fact that V1KU derives from a Micron reference design (now Aptina) licensed to General Vision with its accompanying firmware.

- Unplug and replug the V1KU board. Wait until it appears in the list of USB devices.
- Go to the Windows Control Panel\System\Hardware\Device Manager
- If it appears as “unknown”, click at the tab Driver and try installing again the driver CyLoad.sys stored in c:\Windows\System32\cyload