



Elecard YUV Viewer

User Guide

Version 2.1

Notices

Elecard YUV Viewer User Guide

First edition: August, 2006

Date modified: August 21, 2008.

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1. Introduction

1.1 Preface

The Elecard YUV Viewer is a powerful tool designed for professionals and prosumers in the video compression field.

The Elecard YUV Viewer is designed to view YUV data sequence in YUV video files, compare files against one another to find out if binary images match, and view the result of comparison. The application also allows the user to calculate quality metrics, such as PSNR, NQI and VQM. It has been designed and implemented for reverse engineering and analysis.

1.2 Describing Elecard YUV Viewer

The following section defines the specifications and features of Elecard YUV Viewer. It includes definitions and descriptions of the supported file types. It also describes the features of Elecard YUV Viewer.

1.2.1 Supported File Types

- *IYUV*
- *YV12*
- *UYVY*
- *YV16*

1.2.2 Features

- Displays YUV sequences
- Compares files for binary image matching
- Displays the comparison results
- Calculates quality metrics(PSNR, NQI, VQM)

1.3 Using this Guide

1.3.1 Purpose

This guide is intended to help the user utilize the Elecard YUV Viewer. It describes the YUV Viewer GUI, settings and functions and provides instructions for using the viewer.

1.3.2 Abbreviations and Terminology

The following section defines terms used throughout this document:

- **PSNR** - Peak Signal-to-Noise Ratio.
- **NQI** - New Quality Metrics.
- **VQM** - Video Quality Measurement Techniques.
- **YV12**- this is the format of choice for many software MPEG codecs. It comprises an NxM Y plane followed by (N/2)x(M/2) V and U planes.
- **IYUV** (and **I420**)- these formats are identical to YV12 except that the U and V plane order is reversed. They comprise an NxM Y plane followed by (N/2)x(M/2) U and V planes.
- **UYVY** - YUV 4:2:2 (Y sample at every pixel, U and V sampled at every second pixel horizontally on each line). A macropixel contains 2 pixels in 1 u_int32.
- **YV16** - 8 bit Y plane followed by 8 bit 2x1 subsampled V and U planes.

Note: For detailed definition of video formats please read Microsoft® DirectX® documentation or find the information at <http://fourcc.org/yuv.php>.

1.3.3 Topics Covered

- **Section 1: Introduction** – provides a general overview of Elecard YUV Viewer and describes the purpose of the document and its contents.
- **Section 2: Getting Started** – describes how to install, uninstall and run Elecard YUV Viewer.
- **Section 3: Using Video QuEst** – describes the Elecard YUV Viewer GUI and provides instructions for comparing video streams, and viewing the results of comparison.

1.4 System Requirements

1.4.1 Hardware Requirements

- SSE-enhanced CPU (Intel® Pentium III, Celeron, AMD® Athlon, Opteron etc.)

- 128 MB RAM
- DirectX 7.0 (and higher) compatible VGA card

1.4.2 Software Requirements

- Windows® 2000/XP/2003 Server

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2. Getting Started

The following section details the procedures for installing, registration, uninstalling, and running Elecard YUV Viewer.

2.1 Installing Elecard YUV Viewer

Elecard YUV Viewer is supplied as part of the Elecard StreamEye Studio.

1. Download the Elecard YUV Viewer installation file from the Elecard download page or its mirrors.
2. Run Elecard YUV Viewer Setup.
To run, unzip the Player and run the application Elecard YUV Viewer X.X.exe (X.X is the version number).
3. The Elecard YUV Viewer setup window will appear. Read the recommendations and warnings. Click **Next**.
4. The license agreement will appear. Read the agreement and if you accept the terms within, check the “Yes I agree with the terms of this license agreement” check box. Click **Next**.
5. Select the installation folder in which you want to install Elecard YUV Viewer. To select an installation folder, click Browse and find the folder in which you would like to install Elecard YUV Viewer. Click **Next**.
6. Select program group. Click **Next** twice.
7. To complete installation, follow the onscreen instructions.
When setup has finished installing all of the necessary files on your computer, the Elecard YUV Viewer has been successfully installed dialog box will appear, and the program is ready to run. You do not need to reboot your computer.

2.1.1 Elecard YUV Viewer Registration

1. Run the Elecard Registrator. Click *Start->Programs->Elecard->Elecard YUV Viewer X.X->Registrator* . The **Registrator** window opens.
2. Select the Elecard YUV Viewer from the product list and press **Activate** button.
3. Use your Serial number to complete the activation process.

2.2 Uninstalling Elecard YUV Viewer

To uninstall Elecard YUV Viewer

1. Click *Start*→*Programs*→*Elecard*→*Elecard YUV Viewer X.X*→*Uninstall Elecard YUV Viewer X.X*.
2. Follow the onscreen instructions to complete the removal of Elecard YUV Viewer.

2.3 Running Elecard YUV Viewer

To run Elecard YUV Viewer click *Start*→*Programs*→*Elecard*→*Elecard YUV Viewer X.X*.

3. Using Elecard YUV Viewer

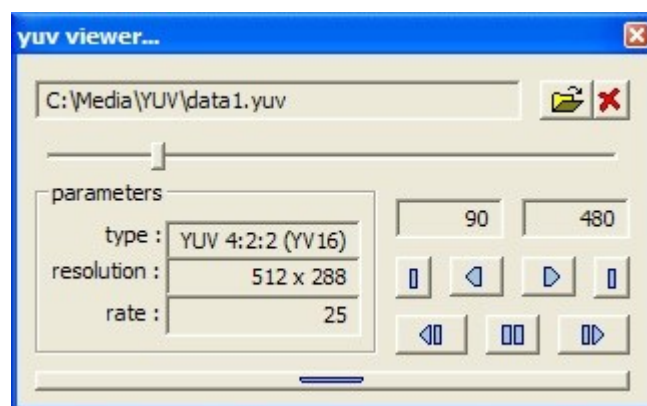
3.1 Introduction

The following section describes the Elecard YUV Viewer GUI (graphic user interface), its features, and instructions for viewing YUV sequences, comparing files, and viewing the results of comparison.

3.2 Describing Elecard YUV Viewer GUI







The following section describes the Elecard YUV Viewer GUI.






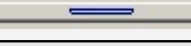


Figure 1. Elecard YUV Viewer GUI



The following table describes the main window controls.

Table 1. Elecard YUV Viewer Controls

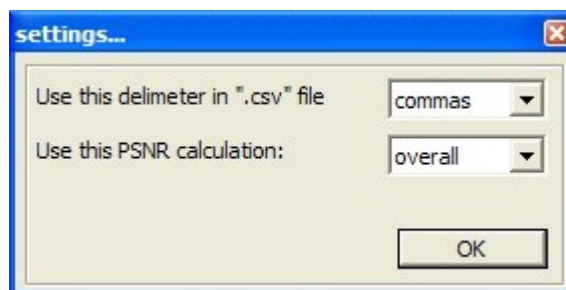
Button	Function	Hot Key
 Open File	Opens a folder from which a file can be chosen.	
 Close File	Closes the file.	
 Pointer	Marks the current playback and analysis position.	
 Go to the Start Position	Sets the pointer to the start position for playback.	<Home>
 Rewind/Backward Playback	Rewinds the files. Starts reverse playback of a file from the current position.	<Up>
 Play	Starts playback of a file from the current	<Down>

Button	Function	Hot Key
	position.	
Go to the End Position 	Sets the pointer to the End position.	<End>
Step Backward by Frame 	Steps backward by frame. Click to look backwards through a movie by frame.	<Left>, Mouse scroll up
Pause 	Pauses playback of a file.	<Space>
Step Forward by Frame 	Shows a file by frame forward. Click to view file forwards by frame.	<Right>, Mouse scroll down
Open Golden Eye dialog 	Opens the <i>Golden Eye</i> dialog. See the description of Golden Eye below in the document.	<~>
Exit 	Closes the YUV Viewer and a file.	<Esc>
Frame number 	Shows the number of frames analyzed so far (first field) and the total number of frames (second field).	

3.2.1 Settings dialog

To open the **Settings...** dialog, right-click the title bar of the Elecard YUV Viewer window and select the **Settings...** command.

Figure 2. Elecard YUV Viewer GUI: Settings Dialog



This dialog allows you to select data delimiter (commas or semicolons) for saving of the statistic information to *.csv*-file and PSNR calculation method. The following expressions describe recommended methods.

Overall PSNR:

$$mse = \frac{1}{N \cdot W \cdot H} \sum_{t=1}^N \sum_{x=1, y=1}^{W, H} (F'_{t,x,y} - F_{t,x,y})^2$$

$$OPSNR = 10 \log \left(\frac{255^2}{mse} \right)$$

Average PSNR:

$$mse_t = \frac{1}{W \cdot H} \sum_{x=1, y=1}^{W, H} (F'_{t,x,y} - F_{t,x,y})^2$$

$$APSNR = \frac{1}{N} \sum_{t=1}^N 10 \log \left(\frac{255^2}{mse_t} \right)$$

Where N – number of frames, W – frame width, H – frame height.

3.2.2 Hot Keys

The following table describes the Elecard YUV Viewer hot keys.

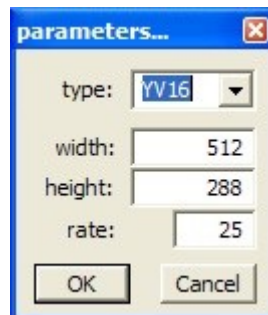
Table 2. Elecard YUV Viewer Hot Keys

Hot Key	Description
<Down>	Starts playback of a file from the current position.
<End>	Sets the pointer to the End position.
<Esc>	Closes the YUV Viewer and a file.
<Home>	Sets the pointer to the start position for playback.
<Left>	Shows a file by frame backward.
<Right>	Shows a file by frame forward.
<Space bar>	Pauses playback of a file.
<Up>	Starts reverse playback of a file from the current position.
<~>	Opens the Golden Eye dialog.
<1>	Switches the video display to the YUV mode type in Golden Eye .
<2>	Switches the video display to the Y mode type in Golden Eye .
<3>	Switches the video display to the U mode type in Golden Eye .
<4>	Switches the video display to the V mode type in Golden Eye .
<G>	Shows/hides the grid on the frame in Golden Eye .
<R>	Re-opens the last original file opened in Golden Eye .
<Page up >	Jumps forwards by 10 frames
<Page Down>	Jumps backwards by 10 frames

3.2.3 Defining YUV Viewer Parameters

The section gives an overview of the **Parameters...** dialog window displayed when the user opens a file to be analyzed.

Figure 3. Elecard YUV Viewer: Parameters Dialog Window



The following table describes functions of each button or field.

Table 3. Elecard YUV Viewer: Parameters Dialog Fields

Button/Field	Function
Type	Specifies the type of the YUV data to be analyzed.
Width	Specifies the width of the frame for the file to be analyzed.
Height	Specifies the height of the frame for the file to be analyzed.
Rate	Specifies the frame rate for the file to be analyzed.
Ok	Confirms the specified parameters.
Cancel	Closes the Dialog.

3.2.4 Describing Golden Eye statistic details

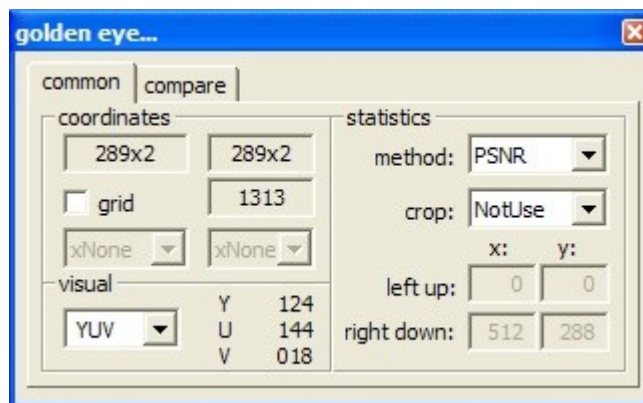
The section gives an overview of the **Golden Eye** dialog window displayed when the user clicks the Open **Golden Eye...** dialog button.

There are two tabs in the **Golden Eye** dialog window:

- **Common**
- **Compare**

3.2.4.1 Common Tab

Figure 4. Elecard YUV Viewer Golden Eye Dialog Window: Common Tab



On the **Common** tab there are three sections: **Coordinates**, **Visual Mode** and **Statistics**.

In the **Coordinates** section the upper left field displays the coordinates of a point on a frame where the mouse pointer rests on.

The upper right field displays the grid intersection coordinates of a point where the mouse pointer rests on. The values are displayed according to motion vector, in pixels.

The field located under the grid intersection coordinates shows the block number on the grid.

The **Grid** box allows the user to switch on/off the grid and its motion vector settings.

In the **Visual mode** section there is a box allowing the user to specify what color space components should be displayed in the video window: YUV, Y, U, or V.

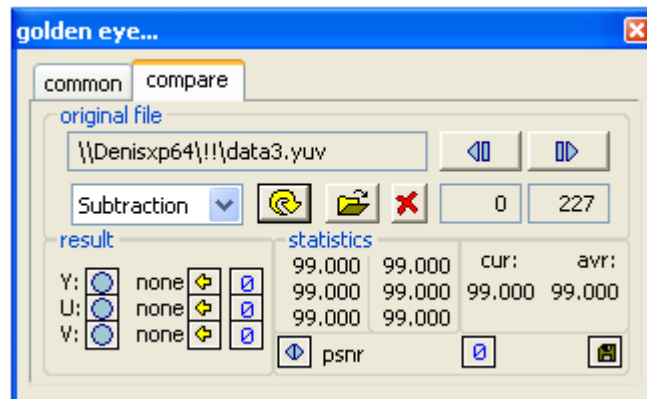
In the **Statistics** section the **Method** box allows the user to specify the method of statistic data collecting: None, PSNR, NQI, VQM, and All.

The **Crop** box allows the user to specify whether the crop function should be used. There are three options: **NotUse** – statistic data is collected for the whole frame, **NormalCrop** – statistic data is collected for the outlined area of the frame, and **InverseCrop** – statistic data is collected for the whole frame, except for the outlined area.



The **Left Up** and **Right Down** fields allow the user to outline an area by specifying the values in the X and Y columns.

3.2.4.2 Compare Tab


Figure 5. Elecard YUV Viewer Golden Eye Dialog Window: Compare Tab





There are three sections on the **Compare** tab of the **Golden Eye** dialog window: **Original file**, **Result** and **Statistics**.



In the **Original file** section there is a field for a path to the original file. Next to it reside the **Step Backward by Frame** and **Step Forward by Frame** buttons  . They allow by frame adjustment of the original file, in case the streams start with different frames.




Below the original file path there is a box allowing the user to choose how to display the comparison result with the options: **None**, **Subtraction**, **Comparison**. The comparison result will be displayed in the **Subtraction** window.

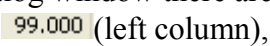



The **Re-open** button  allows the user to re-open the latest original file analyzed by the application.




The **Browse** button  allows the user to open an original file to be analyzed.

The **Close** button  allows the user to close the original file.

The fields under the **Step Backward by Frame** and **Step Forward by Frame** buttons   show the number of frames played back so far and the total number of frames respectively.

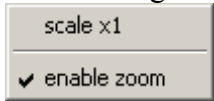
In the **Result** section of the **Compare** tab of the **Golden Eye** dialog window there are the compliance indicators  (blue colour indicates compliance, red- incompliance), corresponding buttons to go to the first frame where incompliance is spotted , and the incompliance result clear buttons  enabling the system ignore the previous frame where incompliance is found.

In the **Statistics** section of the **Compare** tab of the **Golden Eye** dialog window there are current playback values arranged by color space components YUV  (left column), average playback values arranged by color space components YUV  (right column), and the average values of the left  and right  columns.

On the bottom right there are the **Method Switch** button  (active when the method ALL is selected on the **Common** tab), the **Result Clear** button , and the **Result Save** button  (data is saved as *.cvs file).

3.3 Mouse Gestures

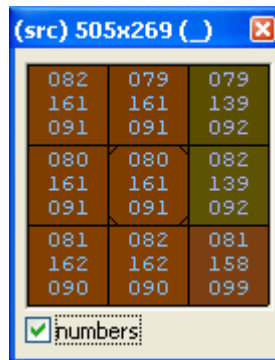
Click the right mouse button anywhere in the video window to see the following menu



Scale x1 – restores the original video window size.

Enable Zoom – shows the **Zoom** window that is used to visualize the information regarding the selected 3x3 pixel rectangle. When the **Numbers** check box is selected the values of YUV components are displayed in the digital form.


Figure 6. Elecard YUV Viewer: Zoom Window



Click the left mouse button in the video window to fix/unfix the **Zoom** window central pixel.

3.4 Basic YUV Viewer Operations

I. To open a file:

1. Start the YUV Viewer by clicking “*Elecard YUV Viewer*” from the **Start** menu or double-clicking the viewer icon .
2. Select the file you wish to playback and open it via the open file dialog.
3. A **Parameters** dialog window will open where you should specify the file type (YV12 or IYUV), screen width, height, and frame rate.

II. To compare files for binary image matching and display the comparison results:

1. Open a file.
2. Open the *Golden Eye dialog->Compare->Open file->*.

3. See the comparison data displayed the **Result** section of the viewer on the **Comparison** tab.

III. To calculate quality metrics (PSNR, NQI, VQM):

1. Open a file.
2. Open the *Golden Eye dialog->Compare->Open file->*.
3. On the **Golden Eye Common** Tab select the statistics method and, if required, the **Crop** method.
4. See the quality metrics data in the **Statistics** section of the viewer on the **Compare** tab.