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## Index

# Installation

VideoLab comes with an installation program. Just start the installation by doubleclicking on the Setup.exe file and follow the installation instructions.

# Where is VideoLab?

After the installation, start your Delphi or C++ Builder. Scroll the "Component Palette", until you see the last four tabs:

| 🥻 Delphi 7 - Project1  |  |
|--|--|
| File Edit Search View Project Run Component Database OpenWire Tools Window Help 😽 (search component) 📢                                     | - 🖻 🖡 🔛                                |
| 🔭 🔯 🕶 🗐 🚰 🖄 😰 🖉 💰 Standard   Sianal Lab   Audio Lab   Video Lab   Plot Lab   Additional   Win32   Sustem   Data Access   Data Controls   d | bExpress   DataSnap   BDE <b>⊀   ▶</b> |
|  |  |

If the installation was successful, they should be named "Video Lab", "Signal Lab" and "AudioLab". On the SignalLab palette you will have only a subset of the SignalLab components necessary for processing histogram data. SignalLab is a separated product, and will not be shipped as full with VideoLab. On the AudioLab palette you will have only a subset of the AudioLab components necessary for basic processing audio data. AudioLab is a separated product, and will not be shipped as full with VideoLab. On the shipped as full with VideoLab. Only the following two components of SignalLab will be available:

Only the following two components of AudioLab will be available:

|   |  | E       |
|---|--|---------|
|   | Component Database OpenWire Tools Window Help  | 23 🐴 🎙  |
| Τ | Standard   Signal Lab Audio Lab   Video Lab   Plot Lab   Additional   Win32   System   Data Access   Data Controls   dbExpress   D | ataSnap |
|   |  |         |

The following two PlotLab components will be available.

| Component Database OpenWire Tools             | Window Help   |
|---|---|
| Standard   Signal Lab   Audio Lab   Video Lab | Plot Lab Additional Win32 System Data Access Data Controls dbExpress DataSnap |
|   |   |

# Why some of the examples don't work?

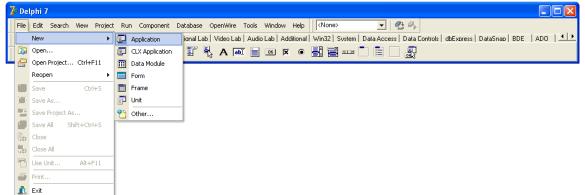
Video lab is a unique library that supports both the Win32 API's AVIFile (VFW) functions (ACM) and DirectShow. You as a developer have the ultimate choice to use either the Win32 API or DirectShow components or both at the same time. The advantage of the Win32 API components is that hey will work on any Windows 95 and up system out of the box, however they are much less capable than the DirectShow components, and should be avoided if not necessary.

The advantage of the DirectShow components is that they will use the latest and greatest capability of DirectShow, the latest video camera devices, and TV Tuners, but they require DirectShow 9.0 or higher to be installed in order to work.

If you don't have DirectX 9.0 or higher installed on your system, you will not be able to use see the DirectShow examples working.

### Creating a simple video player using Win32API **Components**

From the Delphi/C++Builder menu select | File | New | Application |.



An empty form will appear on the screen. From the "Component Palette" select the "Video Lab" tab:

| i Component Database OpenWire Tools Window Help                                | arch component) 🔣 KNone> 💽 🚽 🐴 🍕                                 |
|--|--|
| Standard   Signal Lab   Audio Lab   Video Lab   Vision Lab   Timing Lab   Addi | tional   Win32   System   Data Access   Data Controls   dbExpre: |
|  |  |

select and drop on the form the following two components:



- TVLAVIPlayer

- TVLImageDisplay

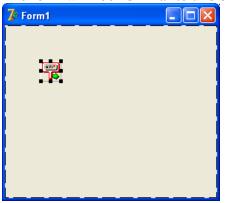
Select the VLImageDisplay1 component on the form.

| 🥻 Form1 📃 🗖 |  |
|-------------|--|
|             |  |
|             |  |
| l           |  |

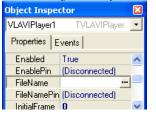
In the Object Inspector set the Align property to alClient:

| Object Inspe                   | ector 🛛 🔀    |  |  |  |  |
|--------------------------------|--------------|--|--|--|--|
| VLImageDisplay1 TVLImageDispl💌 |              |  |  |  |  |
| Properties                     | Events       |  |  |  |  |
| Align                          | alClient 🔹 🔨 |  |  |  |  |
| AutoSize                       | False 💻      |  |  |  |  |

Make the form relatively small. Select the VLAVIPlayer1. The form will look similar to this one:



In the Object Inspector select the FileName property and click the 🛄 button.



A File selection dialog will appear:

| Open   |  |                    |   |       |   | <u>?</u> × |
|--|--|--------------------|---|-------|---|------------|
| Look jn:   | Diffe AVIFiles   |                    | • | 수 🗈 💣 | • |            |
| My Recent<br>Documents<br>Desktop<br>My Documents<br>My Computer | <ul> <li>V0201-indeo3.</li> <li>V0206-indeo3.</li> <li>V0208-indeo3.</li> <li>V0215-indeo3.</li> </ul> | 2.avi<br>2.avi     |   |       |   |            |
| My Network<br>Places   | File <u>n</u> ame:   | V0206-indeo3.2.avi |   | •     |   | ]pen       |
| FIACES   | Files of type:   | AVI files (*.avi)  |   | •     |   | ancel      |

Select a file to play and click "Open".

In the Object inspector select the OutputPin property and click the 🛄 button.

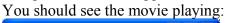
|                             | ./                 |  |  |  |  |  |  |
|-----------------------------|--------------------|--|--|--|--|--|--|
| Object Inspector 🛛 🛛 🔀      |                    |  |  |  |  |  |  |
| VLAVIPlayer1 TVLAVIPlayer 💌 |                    |  |  |  |  |  |  |
| Properties Events           |                    |  |  |  |  |  |  |
| Loop                        | False 🔥            |  |  |  |  |  |  |
| Name                        | VLAVIPlayer1       |  |  |  |  |  |  |
| OutputPin                   | [Disconnected] 🚥 📥 |  |  |  |  |  |  |
| Paused                      | False              |  |  |  |  |  |  |
| D D.                        | (D) (D) (C)        |  |  |  |  |  |  |

You should see the Pin Editor:

| 7 Connections - Source Pin : VLAVIPlayer1.Outp 🔳 🗖 🗙 |                   |      |              |           |    |          |  |  |
|--|-------------------|------|--------------|-----------|----|----------|--|--|
| Form   | : Form1 (Current) |      |              |           | •  | (7)      |  |  |
| Sink   | pin               |      | Component    | Connected | to | OpenWire |  |  |
|  | InputPin          | VLIr | nageDisplay1 |           |    | opennie  |  |  |
|  |                   |      |              |           |    | Bestore  |  |  |

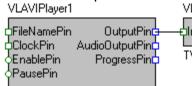
Click on the check box to make it look as in the picture, and then click OK.

Compile and run the application.





Congratulations! You have just created your first VideoLab application. Here are the OpenWire connections in this application:



VLImageDisplay1 InputPin TVLImageDisplay

TVLAVIPlayer

# Creating a simple video player using DirectShow components

WARNING: In order to run the application in this example you must have DirectX 9.0 or higher installed!

| Z | De  | lphi 7                |          |                 |  | $\mathbf{X}$ |  |  |
|---|---|-----------------------|----------|-----------------|--|--------------|--|--|
|   | File Edit Search View Project Run Component Database OpenWire Tools Window Help 🛛 🔿 🕑 🥱 |                       |          |                 |  |              |  |  |
|   |   | New +                 | ۲J       | Application     | ional Lab   Video Lab   Audio Lab   Additional   Win32   Sustem   Data Access   Data Controls   dbExpress   DataSnap   BDE   ADO   🗹 |              |  |  |
| Ť | 3   | Open                  | <u>ت</u> | CLX Application | I 🖁 A 💵 📄 🗷 🗵 💿 📕 🗮 🚥 🗂 🔚 🔄 🧕  |              |  |  |
| - | 2   | Open Project Ctrl+F11 |          | Data Module     |  |              |  |  |
|   |   | Reopen >              | <b>—</b> | Form            |  |              |  |  |
|   |   | Save Ctrl+S           |          | Frame           |  |              |  |  |
|   | ) <b>iii</b> (-   | Save As               | P        | Unit            |  |              |  |  |
|   |   | Save Project As       | 2        | Other           |  |              |  |  |
|   | -   | Save All Shift+Ctrl+S | -        |                 |  |              |  |  |
|   | 10<br>14  |                       |          |                 |  |              |  |  |
|   | la de   | Close All             |          |                 |  |              |  |  |
|   | ٦   | Use Unit Alt+F11      |          |                 |  |              |  |  |
|   | 6   | Print                 |          |                 |  |              |  |  |
|   | i.  | Exit                  |          |                 |  |              |  |  |

From the Delphi/C++Builder menu select | File | New | Application |.

An empty form will appear on the screen.

From the "Component Palette" select the "Video Lab" tab:

| Component Database OpenWire Tools Window Help  | nex 💽 🚽 🐴 🖡                       |
|--|-----------------------------------|
| Standard   Signal Lab   Audio Lab   Video Lab   Vision Lab   Timing Lab   Additional   Win32   System   Data | Access   Data Controls   dbExpres |
| ▖▖▖▖▖▖▖▖▖▖▖▖   |                                   |

From the tab select and drop on the form the following two components:



Select the VLImageDisplay1 component on the form.

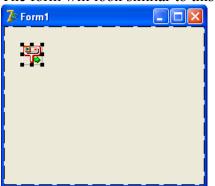
| 🅻 Form1 | ×   |
|---------|-----|
|         |     |
|         | 11  |
|         | 11  |
|         |     |
|         | ::  |
|         | ::  |
|         |     |
|         | ::: |

In the Object Inspector set the Align property to alClient:

| Object Inspector 🛛 🔀 |                       |  |  |
|----------------------|-----------------------|--|--|
| VLDSImage            | Display1 TVLDSImage 🔽 |  |  |
| Properties           | Events                |  |  |
| Align                | alClient 🔹 🔺          |  |  |
| AutoSize             | False 💻               |  |  |

Make the form relatively small. Select the VLDSVideoPlayer1.

The form will look similar to this one:



In the Object Inspector select the FileName property and click the 🛄 button.



A File selection dialog will appear:

| Open                              |  |                    |   |          | ? 🔀          |
|-----------------------------------|--|--------------------|---|----------|--------------|
| Look jn:                          | AVIFiles   |                    | • | 두 🗈 💣 📰• |              |
| My Recent<br>Documents<br>Desktop | <ul> <li>V0201-indeo3.</li> <li>V0206-indeo3.</li> <li>V0208-indeo3.</li> <li>V0215-indeo3.</li> </ul> | 2.avi<br>2.avi     |   |          |              |
| My Documents                      |  |                    |   |          |              |
| My Computer                       |  |                    |   |          |              |
|                                   |  |                    |   |          |              |
| My Network<br>Places              | File <u>n</u> ame:   | V0206-indeo3.2.avi |   | -        | <u>O</u> pen |
|                                   | Files of type:   | AVI files (*.avi)  |   | -        | Cancel       |

Select a file to play and click "Open".

In the Object inspector select the OutputPin property and click the 🛄 button.

| Object Inspe | ctor 🔀              |
|--------------|---------------------|
| VLDSVideoPla | ayer1 TVLDSVideoPI🔽 |
| Properties [ | Events              |
| Name         | VLDSVideoPlayer1 🔥  |
| OutputPin    | (Disconnected)      |
| Paused       | False               |

#### You should see the Pin Editor:

| 🏅 Connections - Source Pin : VLDSVideoPlayer1 🔳 🗖 🔀 |              |              |                   |  |  |
|---|--------------|--------------|-------------------|--|--|
| Form Form1 (Current)                                |              | -            | (7)               |  |  |
| Sink pin  | 🐥 Component  | Connected to | OpenWire          |  |  |
| 🗹 InputPin  | VLDSImageDis |              | opennite          |  |  |
|   |              |              | 🔁 <u>R</u> estore |  |  |

Click on the check box to make it look as in the picture, and then click OK.

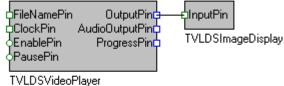
Compile and run the application.

You should see the movie playing:



Congratulations! You have just created your first DirectShow VideoLab application. Here are the OpenWire connections in this application:

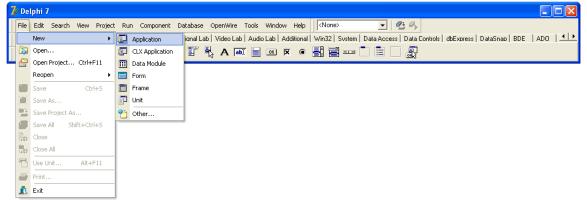
VLDSVideoPlayer1 VLDSImageDisplay1



# Creating applications using video filters and geometric

#### transformations

From the Delphi/C++Builder menu select | File | New | Application |.



An empty form will appear on the screen.

From the "Component Palette" select the "Video Lab" tab:

| Component Database OpenWire Tools Wind                 | ow Help 🛛 📢 (search component) 🔹 🛃 🥵 👯   |
|--|--|
| Standard   Signal Lab   Audio Lab   Video Lab   Vision | Lab   Timino Lab   Additional   Win32   System   Data Access   Data Controls   dbExpre |
|  |  |

From the tab select and drop on the form the following four components:

OneImage: TVLAVIPlayerTwoImage: TVLImageDisplayOneImage: TVLGrayScale

Arrange the form to look like this one and select the VLAVIPlayer1 on the form:

| 🅻 Form1 |         |
|---------|---------|
|         |         |
|         |         |
|         |         |
|         | <br>± ± |

In the Object Inspector select the FileName property and click the 🛄 button.

| Object Inspector 🛛 🛛 🛛 |                |  |  |  |
|------------------------|----------------|--|--|--|
| VLAVIPlayer1           | TVLAVIPlayer 💌 |  |  |  |
| Properties E           | vents          |  |  |  |
| Enabled                | True 🔼         |  |  |  |
| EnablePin              | (Disconnected) |  |  |  |
| FileName               |                |  |  |  |
| FileNamePin            | (Disconnected) |  |  |  |
| InitialFrame           | 0 🗸            |  |  |  |

A File selection dialog will appear:

| Open                              |  | <b>e</b> 11                           |       |       | ? 🗙                    |
|-----------------------------------|--|---------------------------------------|-------|-------|------------------------|
| Look jn:                          | 🗀 AVIFiles   |                                       | • 🗢 🖻 | • 📑 🎽 |                        |
| My Recent<br>Documents<br>Desktop | <ul> <li>V0201-indeo3.2.a</li> <li>V0206-indeo3.2.a</li> <li>V0208-indeo3.2.a</li> <li>V0215-indeo3.2.a</li> </ul> | vi<br>vi                              |       |       |                        |
| My Documents                      |  |                                       |       |       |                        |
| My Computer                       |  |                                       |       |       |                        |
| <b></b>                           |  |                                       |       |       |                        |
| My Network<br>Places              | -  | 0206-indeo3.2.avi<br>VI files (*.avi) |       | •     | <u>O</u> pen<br>Cancel |

Select a file to play and click "Open".

In the Object Inspector select the OutputPin property and click the 🛄 button.

| Object Inspector 🛛 🛛 🔀 |                    |  |  |  |
|------------------------|--------------------|--|--|--|
| VLAVIPlayer1           | TVLAVIPlayer 💌     |  |  |  |
| Properties E           | vents              |  |  |  |
| Loop                   | False 🔥            |  |  |  |
| Name                   | VLAVIPlayer1       |  |  |  |
| OutputPin              | (Disconnected) 💻 🔤 |  |  |  |
| Paused                 | False              |  |  |  |
|                        | (D) 1 D            |  |  |  |

You should see the Pin Editor:

| 🥻 Connections - Source Pin : VLAVIPlayer1.Outp 🔳 🗖 🗙 |                       |              |                              |  |  |
|--|-----------------------|--------------|------------------------------|--|--|
| Form : Form1 (Current)                               |                       | •            | 6)                           |  |  |
| Sink pin   | 🐥 Component           | Connected to | OpenWire                     |  |  |
| InputPin   | VLGrayScale1          |              | openwire                     |  |  |
| 🔲 InputPin   | VLImageDisplay1       |              | Bestore                      |  |  |
| 🔲 InputPin   | VLImageDisplay2       |              |                              |  |  |
|  |                       |              | <mark>}⊸{</mark> Link to all |  |  |
|  |                       |              | 💥 <u>U</u> nlink all         |  |  |
|  |                       |              | 🗸 ОК                         |  |  |
| <  |                       |              | 🗙 Cancel                     |  |  |
| Links:3 📃 Shov                                       | v all compatible pins |              |                              |  |  |

#### Make the following selections:

| <b>7</b> 0 c | 🥻 Connections - Source Pin : VLAVIPlayer1.Outp 📃 🗖 🔀 |                 |              |                  |  |
|--------------|--|-----------------|--------------|------------------|--|
| Form         | : Form1 (Current)                                    |                 | •            | $(\overline{a})$ |  |
| Sink         | pin  | 🐥 Component     | Connected to | OpenWire         |  |
|              | InputPin   | VLGrayScale1    |              | openwire         |  |
|              | InputPin   | VLImageDisplay1 |              | Bestore          |  |
|              | InputPin   | VLImageDisplay2 |              |                  |  |
|              |  |                 |              | الحصاطية الأسلا  |  |

Click OK.

Select the VLGrayScale1 on the form.



In the Object Inspector select the OutputPin property and click the 🛄 button.

| Object Inspector 🛛 🔀 |                    |  |  |  |
|----------------------|--------------------|--|--|--|
| VLGrayScale1         | TVLGrayScale 💌     |  |  |  |
| Properties Events    |                    |  |  |  |
| EnablePin            | (Disconnected)     |  |  |  |
| InputPin             | VLAVIPlayer1.Outp  |  |  |  |
| Name                 | VLGrayScale1       |  |  |  |
| OutputPin            | (Disconnected) 💻 📃 |  |  |  |
| Tag                  | 0 🖌                |  |  |  |
| All shown 🥢          |                    |  |  |  |

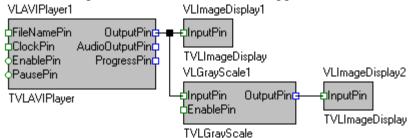
In the Pin Editor make the following selection and click OK:

| 🕻 с  | 🥻 Connections - Source Pin : VLGrayScale1.Outp 🔳 🗖 🗙 |                 |              |  |  |
|------|--|-----------------|--------------|--|--|
| Form | : Form1 (Current)                                    |                 | •            | (~)  |  |
| Sink | pin  | 🐥 Component     | Connected to | OpenWire   |  |
|      | InputPin   | VLImageDisplay1 | VLAVIPlaye   | openwire   |  |
|      | InputPin   | VLImageDisplay2 |              |  |  |
|      |  |                 |              |  |  |
|      |  |                 |              | a contra de la con |  |

Compile and run the application. You should see result similar to this one:



You have just created your first image processing application with VideoLab! Here are the OpenWire connections in this application:



Now let's add a Hipass filter for the gray scale image.

Stop the running application, make the form bigger and drop the following components on it:



#### The form should look something like this and select the VLFixedFilter1:

| 🌈 Form1 |  |  |
|---------|--|--|
| <br>  🖫 |  |  |
|         |  |  |
|         |  |  |
|         |  |  |

In the Object Inspector set the FilterType property to ftHipass:

| Object Inspector 🛛 🛛            |                |  |  |  |
|---------------------------------|----------------|--|--|--|
| VLFixedFilter1 TVLFixedFilter 💌 |                |  |  |  |
| Properties Events               |                |  |  |  |
| EnablePin (Disconnected) 🔼      |                |  |  |  |
| FilterType                      | ftHipass 📃 🗖 🚽 |  |  |  |
| InputPin (Disconnected)         |                |  |  |  |

#### Select the InputPin property and double click on it.

| Object Inspector 🛛 🛛            |                   |  |  |  |
|---------------------------------|-------------------|--|--|--|
| VLFixedFilter1 TVLFixedFilter 💌 |                   |  |  |  |
| Properties Events               |                   |  |  |  |
| EnablePin (Disconnected) 🔼      |                   |  |  |  |
| FilterType ftHipass             |                   |  |  |  |
| InputPin (Disconnected) 💌       |                   |  |  |  |
| MaskSize                        | fms3x3            |  |  |  |
| Name                            | VI FivedFilter1 🔜 |  |  |  |

In the Pin Editor make the following selection:

| <b>]</b> ⊘ c | 7 Connections - Sink Pin : VLFixedFilter1.InputPin 🔳 🗖 🔀 |              |           |          |  |
|--------------|--|--------------|-----------|----------|--|
| Form         | $\boldsymbol{\omega}$                                    |              |           |          |  |
| Sou          | Source pin 🦊 Component Connections                       |              | OpenWire  |          |  |
| 0            | OutputPin  | VLAVIPlayer1 | (2 Links) | openwire |  |
| OutputPin    |  | VLGrayScale1 | VLImageDi | Bestore  |  |
|              |  |              |           |          |  |
|              |  |              |           |          |  |

Click OK.

In the Object Inspector select the OutputPin property, and click the **button**.

| Object Inspector 🛛 🔀            |                |  |  |  |
|---------------------------------|----------------|--|--|--|
| VLFixedFilter1 TVLFixedFilter 💌 |                |  |  |  |
| Properties Events               |                |  |  |  |
| MaskSize                        | fms3x3 🛛 🔥     |  |  |  |
| Name                            | VLFixedFilter1 |  |  |  |
| OutputPin                       | (Disconnected) |  |  |  |
|                                 |                |  |  |  |

In the pin editor check the InputPin of the VLImageDisplay3 and click OK:

| <b>7</b> 0 c | 🥻 Connections - Source Pin : VLFixedFilter1.Out 🔳 🗖 🗙 |                 |              |               |  |
|--------------|---|-----------------|--------------|---------------|--|
| Form         | : Form1 (Current)                                     |                 | •            | 6             |  |
| Sink         | pin   | 🐥 Component     | Connected to | OpenWire      |  |
|              | InputPin  | VLImageDisplay1 | VLAVIPlaye   | openwire      |  |
|              | InputPin  | VLImageDisplay2 | VLGrayScal   | Bestore       |  |
| $\square$    | InputPin  | VLImageDisplay3 |              |               |  |
|              |   |                 |              | → Link to all |  |

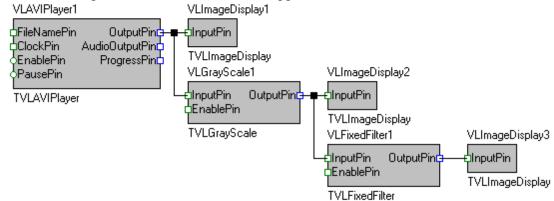
In the Object Inspector set the MaskSize property to fms5x5:

| Object Inspector 🛛 🛛 🛛          |                 |  |  |  |
|---------------------------------|-----------------|--|--|--|
| VLFixedFilter1 TVLFixedFilter 💌 |                 |  |  |  |
| Properties Events               |                 |  |  |  |
| InputPin VLGrayScale1.Outp 🔨    |                 |  |  |  |
| MaskSize fms5x5                 |                 |  |  |  |
| Name                            | VI FivedFilter1 |  |  |  |

Compile and run the application. You should see a result similar to this one:



Here are the OpenWire connections in the application now:



You can observe the results of the VLFixedFilter1 while changing different properties, by double-clicking on the VLFixedFilter1. You will see the following dialog:



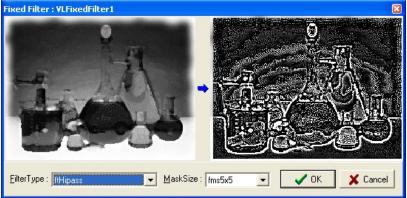
The first picture is a sample image to test the filter. If you want to change the image or to turn it into gray scale, move the mouse cursor over the image and press the left mouse button.

You will see this dialog. You can switch to "Gray scale" by checking the check box as shown here:

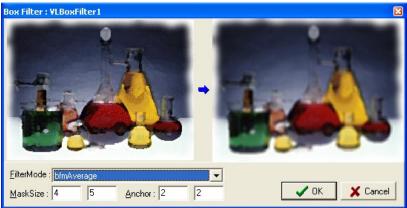


If you would like you can load a different image or a AVI file. Click OK.

Now the dialog will look like this:



Here you can change the properties and see the result of the filter in the second image. There is a similar filter design dialog for the TVLBoxFilter component. You can see it by placing a TVLBoxFilter on the form and double clicking on the component. The dialog will look like this:

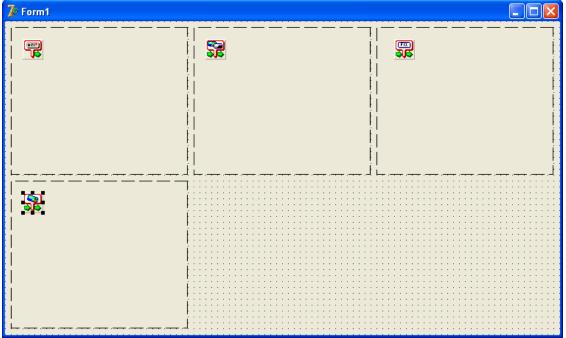


Now we will add a geometric transformation to the original image.

Make the form big enough to accommodate another display, and add the following two components to the form:



The form now should look something like this, and select the VLRotate1 on the form:



In the Object Inspector set the Angle property to 30:

| Object Inspe | ctor      | × |
|--------------|-----------|---|
| VLRotate1    | TVLRotate | • |
| Properties   | Events    |   |
| Angle        | 30        | ^ |
| Enabled      | True      |   |
| E LL D'      | (D): 1 D  |   |

Select and double click on the InputPin property:

| Object Inspector 🛛 🛛 🔀 |                    |  |  |  |
|------------------------|--------------------|--|--|--|
| VLRotate1              | TVLRotate 💽        |  |  |  |
| Properties E           | vents              |  |  |  |
| Height                 | 180 🔨              |  |  |  |
| InputPin               | (Disconnected) 💌 🔤 |  |  |  |
| Interpolation          | itCubic 📃          |  |  |  |
| Name                   | VI Botate1         |  |  |  |

In the Pin Editor Check the OutputPin of the VLAVIPlayer1 and click OK:

| 🅻 Connections - Sink Pin : VLRotate1.InputPin |                                    |                |           |                       |
|---|------------------------------------|----------------|-----------|-----------------------|
| Form : Form1 (Current)                        |                                    |                |           | $\boldsymbol{\omega}$ |
| Sou   | Source pin 🦊 Component Connections |                | OpenWire  |                       |
| $\odot$                                       | OutputPin                          | VLAVIPlayer1   | (2 Links) | openwire              |
| 0   | OutputPin                          | VLFixedFilter1 | VLImageDi | Bestore               |
| 0   | OutputPin                          | VLGrayScale1   | (2 Links) |                       |
|   |                                    |                |           |                       |

In the Object Inspector select the OutputPin property, and click the **button**.

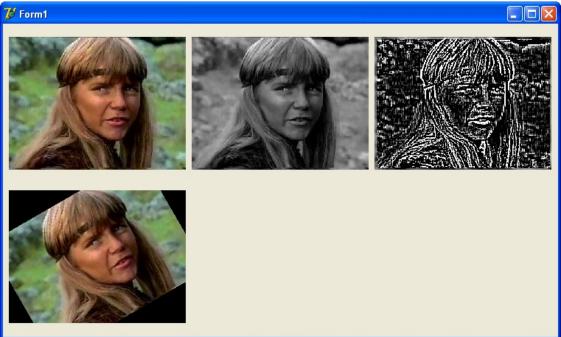


In the Pin Editor check the InputPin of the VLImageDisplay4 and click OK:

| 🅻 Connections - So     | urce Pin : VLRota | te1.OutputPir |                       |
|------------------------|-------------------|---------------|-----------------------|
| Form : Form1 (Current) |                   | •             | $\boldsymbol{\omega}$ |
| Sink pin               | 🛛 🐥 Component     | Connected to  | OpenWire              |
| InputPin               | VLFixedFilter1    | VLGrayScal    | openwire              |
| 🔲 InputPin             | VLGrayScale1      | VLAVIPlaye    | Bestore               |
| InputPin               | VLImageDisplay1   | VLAVIPlaye    |                       |
| InputPin               | VLImageDisplay2   | VLGrayScal    | }–∮Link to all        |
| 🔲 InputPin             | VLImageDisplay3   | VLFixedFilt   |                       |
| 🗹 InputPin             | VLImageDisplay4   |               | 💥 Unlink all          |
|                        |                   |               |                       |

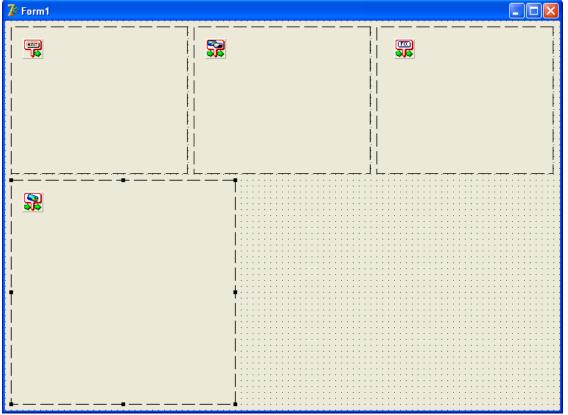
#### Compile and run the application.

You should see result similar to this one:



Note that the rotated image needs bigger frame size than the original image. Stop the application.

Select the VLImageDisplay4 and make it at least 300 by 300 pixels big:



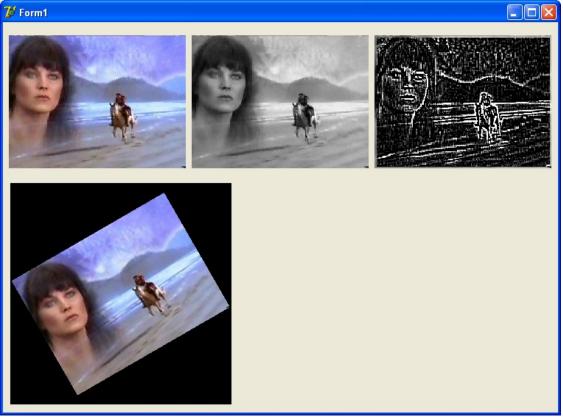
Select the VLRotate1 component:

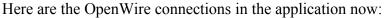


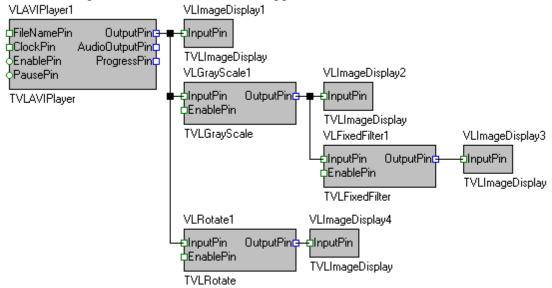
In the Object Inspector change the Width and Height properties to 300:

| Object Inspec | tor                | X |
|---------------|--------------------|---|
| VLRotate1     | TVLRotate          | • |
| Properties E  | vents              |   |
| Enabled       | True               | ^ |
| EnablePin     | (Disconnected)     |   |
| Height        | 300                |   |
| InputPin      | VLAVIPlayer1.Outp  |   |
| Interpolation | itCubic            |   |
| Name          | VLRotate1          | = |
| OutputPin     | VLImageDisplay4.Ir | - |
| SmoothEdge    | False              |   |
| Tag           | 0                  |   |
| Width         | 300                |   |
| ⊞WorkArea     | (TVLOptionalReg    | ¥ |

Compile and run the application. You should see result similar to this one:







If we want we can connect the VLRotate1 to process the filtered image. To do so, select the VLRotate1 on the form:

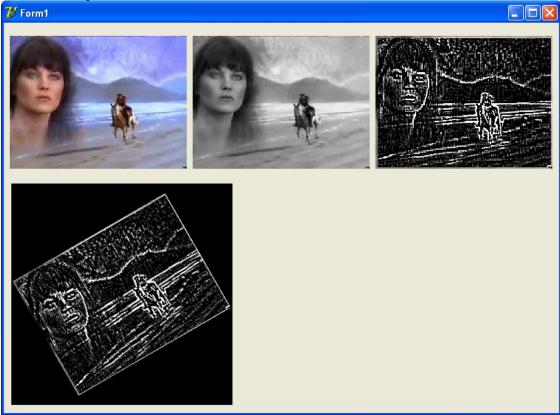
Select and double click on the InputPin property:



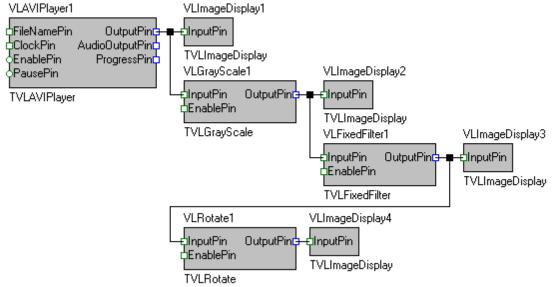
In the Pin Editor check the OutputPin of the VLFixedFilter1 and click OK:

| <b>7</b> 0 c | onnections - Sinl | CPin:VLRotate  | l.InputPin  |          |
|--------------|-------------------|----------------|-------------|----------|
| Form         | : Form1 (Current) |                | •           | 6        |
| Sour         | ce pin            | 🐥 Component    | Connections | OpenWire |
| 0            | OutputPin         | VLAVIPlayer1   | (3 Links)   | openwire |
| $\odot$      | OutputPin         | VLFixedFilter1 | VLImageDi   | Bestore  |
| 0            | OutputPin         | VLGrayScale1   | (2 Links)   |          |
|              |                   |                |             |          |

Compile and run. Here is what you should see:



Here are the OpenWire connections in the application now:



Now you have all the necessary knowledge to build complex video filtering and geometric transformation applications.

### Creating a simple video capture application using DirectShow

WARNING: In order to run the application in this example you must have DirectX 9.0 or higher installed!

From the Delphi/C++Builder menu select | File | New | Application |.

| 70  | De  | lphi 7                   |            |                 |  |         |
|-----|-----|--------------------------|------------|-----------------|--|---------|
| F   | ile | Edit Search View Project | Ru         | n Component Da  | Database OpenWire Tools Window Help  |         |
|     |     | New >                    | ۲ <u>.</u> | Application     | ianal Lab   Video Lab   Audio Lab   Additional   Win32   Sustem   Data Access   Data Controls   dbExpress   DataSnap   BDE   / | ADO 🚺 🕨 |
| Ťί  | 2   | Open                     | (T         | CLX Application | · Î  |         |
| Ľ é | -   | Open Project Ctrl+F11    | •••        | Data Module     |  |         |
|     |     | Reopen +                 | <u> </u>   | Form            |  |         |
| 1   |     | Save Ctrl+S              |            | Frame           |  |         |
| )   | ŧ,  | Save As                  | ľ          | Unit            |  |         |
| 8   | 1   | Save Project As          | <b>*</b>   | Other           |  |         |
| l.  | -   | Save All Shift+Ctrl+S    | -          |                 |  |         |
| 9   |     | Close                    |            |                 |  |         |
| 1   | #   | Close All                |            |                 |  |         |
| 1   | Ľ   | Use Unit Alt+F11         |            |                 |  |         |
| 4   | 7   | Print                    |            |                 |  |         |
| L   | ٦.  | Exit                     |            |                 |  |         |

An empty form will appear on the screen.

From the "Component Palette" select the "Video Lab" tab:

| _ | Component Database OpenWire Tools Window Help   | 1 |
|---|---|---|
|   | Standard   Sianal Lab   Audio Lab   Video Lab   Vision Lab   Timina Lab   Additional   Win32   System   Data Access   Data Controls   dbExpre | ž |
|   |   |   |

From the tab select and drop on the form the following three components:

| One | 🕎 - TVLDSCapture    |
|-----|---------------------|
| One | - TVLDSImageDisplay |
| One | - TVLDSVideoLogger  |
|     |                     |

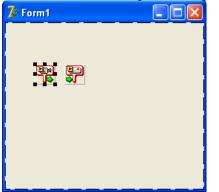
On the form select the TVLDSImageDisplay component. Your form will look something like this:

| 🌈 Form1 📃 |           |
|-----------|-----------|
| ¶         | <b>-!</b> |
|           |           |
|           |           |
| .  <br>■  |           |
|           |           |
|           | ļ::       |
|           |           |
| •••       |           |

In the Object Inspector set the Align property to alClient:

| Object Insp | ector 🛛 🛛             |
|-------------|-----------------------|
| VLDSImageD  | )isplay1 TVLDSImage 💌 |
| Properties  | Events                |
| Align       | alClient 🔹 🔨          |
| AutoSize    | False                 |

#### Select the TVLDSCapture component:



In the Object Inspector select the OutputPin property and click the 🛄 button.

| Object Inspector 🛛 🛛 🛛   |                |  |
|--------------------------|----------------|--|
| VLDSCapture <sup>-</sup> | TVLDSCapture 💌 |  |
| Properties E             | vents          |  |
| Name                     | VLDSCapture1   |  |
| OutputPin                | (Disconnected) |  |
| Tag                      | 0              |  |

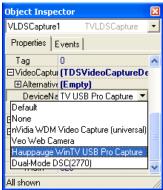
Make the following selection in the Pin Editor and click OK:



Expand the VideoCaptureDevice property:

| Object Inspector    | ×            |
|---------------------|--------------|
| VLDSCapture1 TVI    | LDSCapture 💌 |
| Properties Events   |              |
| Tag                 | 0 🔨          |
| ⊟VideoCaptureDevice | (TDSVide     |
|                     | (Empty)      |
| DeviceName          | Default 💌 💼  |
| VideoFormat         | vfRGB 📃      |
| ⊞VideoPreview       | (TVLDSVi 🔽   |
| All shown           |              |

Click on the arrow and select a video capture device from the list:



Select the VLADSVideoLogger1:



In the Object Inspector set the "FileName" property to "CaptureVideo.avi":

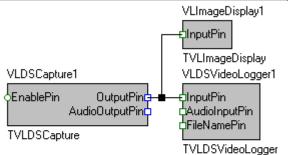
| Object Inspe | ctor 🛛 🔀             |
|--------------|----------------------|
| VLDSVideoLo  | gger1 TVLDSVideoLogg |
| Properties E | vents                |
| ⊞AudioCompr  | (TALDSAudioCompre 📥  |
| AudioInputF  | (Disconnected)       |
| Enabled      | True                 |
| EnablePin    | (Disconnected)       |
| FileName     | CaptureVideo.avi 💻 🔳 |
| FileNamePir  | (Disconnected)       |

Compile and run the application. You should see the captured video. Here is an example of captured video from a TV Tuner:



Congratulations! You have created your first DirectShow video capture application with VideoLab.

Here are the OpenWire connections in the application:



You probably have noticed that the application logs only the video, but not the audio. It would be even better if we can hear the audio as it is captured.

We can easily do that.

Stop the running application.



In the Object Inspector expand the AudioCaptureDevice property and select a device name for the DeviceName sub property from the list:



If you want to hear the captured audio, expand the AudioPreview property and set Enabled sub property to True:

| Object Inspector 🛛 🛛 🛛 |  |  |  |  |  |
|------------------------|--|--|--|--|--|
| •                      |  |  |  |  |  |
|                        |  |  |  |  |  |
| ^                      |  |  |  |  |  |
|                        |  |  |  |  |  |
|                        |  |  |  |  |  |
|                        |  |  |  |  |  |
|                        |  |  |  |  |  |

WARNING: Setting the Enable to true if you are capturing from a microphone is not advised, as you may experience a feedback from the speakers!

In the Object Inspector select the AudioOutputPin property and click the 🛄 button.

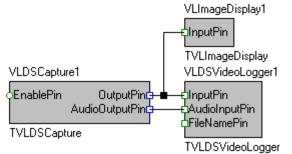


Make the following selection in the Pin Editor and click OK:

| <b>7</b> 0 c | 🕻 Connections - Source Pin : VLDSCapture1.Audio 📒 🗖 🔀 |                  |          |  |           |  |
|--------------|---|------------------|----------|--|-----------|--|
| Form         | Form1 (Currer   | •                | 6        |  |           |  |
|              | Sink pin  | Coni             | OpenWire |  |           |  |
|              | AudioInputPin   | VLDSVideoLogger1 |          |  | openwire  |  |
|              |   |                  |          |  | S Restore |  |

Compile and run the application. This time you will hear the captured audio and the audio will also be logged. Be aware that if you are capturing from the microphone, and it is near the speakers you may experience a very noisy feedback. To avoid that set the Enabled sub property of the AudioPreview to False.

Here are the OpenWire connections in the application:



Now you have a fully featured video and audio capture application.

# Creating a simple video capture application using Win32API

From the Delphi/C++Builder menu select | File | New | Application |.

|   |                 | 1                        |          |                 |      |   |              |          |               |            | 1                |                |                        |       |
|---|-----------------|--------------------------|----------|-----------------|------|---|--------------|----------|---------------|------------|------------------|----------------|------------------------|-------|
| 7 | De              | lphi 7                   |          |                 |      |   |              |          |               |            |                  |                |                        |       |
|   | File            | Edit Search View Project | R        | un Component D  | atab | ase OpenWire Tool                       | s Window     | Help     | <none></none> | ·          | - 🖭 🐴            |                |                        |       |
|   |                 | New 🕨                    | C٦       | Application     | iana | al Lab 🗍 Video Lab 🗍 Au                 | dio Lab   Ac | ditional | Win32 Svster  | n Ì Data A | Access   Data Co | ntrols   dbExc | oress   DataSnap   BDB | ADO 💶 |
| Ť |                 | Open                     | ø        | CLX Application | Đ    | ĩ 🖏 A 📠 🗎                               | <u> </u>     |          | ei ei         |            |                  |                |                        |       |
|   | <u> </u>        | Open Project Ctrl+F11    |          | Data Module     | H    | , i i i i i i i i i i i i i i i i i i i |              |          |               |            |                  |                |                        |       |
|   |                 | Reopen >                 | <b>—</b> | Form            |      |   |              |          |               |            |                  |                |                        |       |
|   |                 | Save Ctrl+S              |          | Frame           |      |   |              |          |               |            |                  |                |                        |       |
|   | ) <b>())</b> (; | Save As                  | P        | Unit            |      |   |              |          |               |            |                  |                |                        |       |
|   |                 | Save Project As          | <b>?</b> | Other           |      |   |              |          |               |            |                  |                |                        |       |
|   |                 | Save All Shift+Ctrl+S    | -        |                 |      |   |              |          |               |            |                  |                |                        |       |
|   |                 | Close                    |          |                 |      |   |              |          |               |            |                  |                |                        |       |
|   | illi<br>Lynte   | Close All                |          |                 |      |   |              |          |               |            |                  |                |                        |       |
|   | ٦               | Use Unit Alt+F11         |          |                 |      |   |              |          |               |            |                  |                |                        |       |
|   | 8               | Print                    |          |                 |      |   |              |          |               |            |                  |                |                        |       |
|   | i.              | Exit                     |          |                 |      |   |              |          |               |            |                  |                |                        |       |

An empty form will appear on the screen. From the Object Inspector change the form Caption to Video Capture Demo.

From the "Component Palette" select the "Standard" tab:

|   |   | L |
|---|---|---|
|   | Component Database OpenWire Tools Window Help   |   |
| Τ | Standard   Signal Lab   Audio Lab   Video Lab   Plot Lab   Additional   Win32   System   Data Access   Data Controls   dbExpress   DataSnap | 1 |
|   |   |   |

select and drop on the form a TPanel.



Set the Align property of the Panel1 to alBottom:

| Object Inspector 🛛 🛛 |              |  |  |  |  |
|----------------------|--------------|--|--|--|--|
| Panel1               | TPanel 🔽     |  |  |  |  |
| Properties Events    |              |  |  |  |  |
| Align                | alBottom 🗾 🔺 |  |  |  |  |
| Alignment            | taCenter     |  |  |  |  |

Remove the text of the Caption of the Panel1.

| Object Inspector 🛛 🔀 |                    |   |  |  |  |
|----------------------|--------------------|---|--|--|--|
| Panel1               | TPanel             | • |  |  |  |
| Properties Eve       | ents               |   |  |  |  |
| BorderWidth          | 0                  | ^ |  |  |  |
| Caption              |                    |   |  |  |  |
| Color                | ☐ clBtnFace        |   |  |  |  |
| ⊞ Constraints        | (TSizeConstraints) |   |  |  |  |

Place 3 TButton components on the TPanel.



Rename the buttons to "SourceButton", "StartButton", and "StopButton". Set the button captions to "Select Source", "Start", and "Stop". The form should look like this one:

| を Form1                               |      |  |
|---------------------------------------|------|--|
|                                       |      |  |
|                                       |      |  |
|                                       |      |  |
| · · · · · · · · · · · · · · · · · · · |      |  |
| · · · · · · · · · · · · · · · · · · · |      |  |
|                                       |      |  |
|                                       |      |  |
|                                       |      |  |
|                                       |      |  |
|                                       |      |  |
| · · · · · · · · · · · · · · · · · · · |      |  |
|                                       |      |  |
| Select Source Start                   | Stop |  |

From the "Component Palette" select the "Video Lab" tab:

|                                  |                        |                                      |                    | -                        |
|----------------------------------|------------------------|--------------------------------------|--------------------|--------------------------|
| Component Database Oper          | Wire Tools Window      | Help search component)               | <none></none>      | - 🖻 🖡 🛛                  |
| Standard   Signal Lab   Audio La | b Video Lab Vision Lab | Timing Lab   Additional   Win32   Sv | stem   Data Access | Data Controls   dbExpre: |
|                                  | R R R R R              |                                      |                    |                          |

select and drop on the form the following three components:



Select the VLImageDisplay1 component on the form.

| 🥻 Form1                  |  |
|--------------------------|--|
|                          |  |
|                          |  |
|                          |  |
|                          |  |
| •  <br>♣                 |  |
|                          |  |
| Select Source Start Stop |  |

In the Object Inspector set the Align property to alClient:

| Object Inspector 🛛 🛛 |                              |  |  |  |
|----------------------|------------------------------|--|--|--|
| VLImageDispla        | y <b>1</b> TVLImageDisplay 💌 |  |  |  |
| Properties E         | vents                        |  |  |  |
| Align                | alClient 💌 🔺                 |  |  |  |
| AutoSize             | False                        |  |  |  |

The form should look similar to this one:

| 🎾 Form1                  |  |
|--------------------------|--|
|                          |  |
|                          |  |
|                          |  |
|                          |  |
|                          |  |
|                          |  |
|                          |  |
|                          |  |
|                          |  |
| Select Source Start Stop |  |

Select the VLAVILogger1 and set its "FileName" property to "CaptureVideo.avi" :

| Object Inspector 🛛 🛛 |                    |  |  |  |
|----------------------|--------------------|--|--|--|
| VLAVILogger1         | TVLAVILogger 💌     |  |  |  |
| Properties Events    |                    |  |  |  |
| E Compression        | (TVLLoggerCompre 🔥 |  |  |  |
| Enabled              | True               |  |  |  |
| EnablePin            | (Disconnected)     |  |  |  |
| FileName             | CaptureVideo.avi 😐 |  |  |  |
| FileNamePin          | (Disconnected)     |  |  |  |

Select the VLCapture1 component on the form.



In the Object Inspector set the DriverName property to "Microsoft WDM Image Capture(Win32)":

| Object Inspect    | or 🗵                   |  |
|-------------------|------------------------|--|
| VLCapture1        | TVLCapture 💽           |  |
| Properties Events |                        |  |
| DriverIndex       | 0 🔨                    |  |
| DriverName        | apture (Win32) 💌       |  |
| Microsoft WDM I   | mage Capture (Win32) 😑 |  |
| EnablePin         | (Disconnected)         |  |

In the Object Inspector set DriverIndex to 0. then select the OutputPin property and click the induction.

| Object Inspector 🛛 🛛 🛛 |  |  |  |
|------------------------|--|--|--|
| TVLCapture 💽           |  |  |  |
| ints                   |  |  |  |
| 60 🔥                   |  |  |  |
| VLCapture1             |  |  |  |
| (Disconnected) 💻 🔜     |  |  |  |
| 0                      |  |  |  |
| (Disconnected)         |  |  |  |
|                        |  |  |  |

You should see the Pin Editor:

| <b>7</b> 0 c |             |                 |              |       |                              |
|--------------|-------------|-----------------|--------------|-------|------------------------------|
| Form         | : Form1 (Cu | rrent)          |              | •     | 6)                           |
|              | Sink pin    | Component       | Connected to | Conne | OpenWire                     |
|              | InputPin    | VLImageDisplay1 |              |       | openwire                     |
| $\square$    | InputPin    | VLAVILogger1    |              |       | Bestore                      |
|              | VideoFor    | VLCapture1      |              |       |                              |
|              | VideoSo     | VLCapture1      |              |       | <mark>}⊸{</mark> Link to all |

Check the boxes as shown on the picture, and then click the OK button. This will connect the output pin of the VLCapture1 component to the input pins of VLImageDisplay1 and VLAVILogger1.

# If you are using Delphi, Double click the "SourceButton" and write the following code in the OnClick event handler:

```
procedure TForm1.SourceButtonClick(Sender: TObject);
begin
    VLCapture1.ShowVideoSourceDialog();
end;
```

# Double click the "StartButton" and write the following code in the OnClick event handler:

procedure TForm1.StartButtonClick(Sender: TObject);

```
begin
VLCapture1.Enabled := True;
end;
```

Double click the "StopButton" and write the following code in the OnClick event handler:

```
procedure TForm1.StopButtonClick(Sender: TObject);
begin
    VLCapture1.Enabled := False;
end;
```

If you are using C++ Builder, double click the "SourceButton" and write the following code in the OnClick event handler:

```
void fastcall TForm1::SourceButtonClick(TObject *Sender)
```

```
{
   VLCapture1->ShowVideoSourceDialog();
```

Double click the "StartButton" and write the following code in the OnClick event handler:

```
void __fastcall TForm1::StartButtonClick(TObject *Sender)
{
    VLCapture1->Enabled = true;
```

Double click the "StopButton" and write the following code in the OnClick event handler:

```
void __fastcall TForm1::StopButtonClick(TObject *Sender)
{
    VLCapture1->Enabled = false;
}
```

Compile and run the application.

Press the "Select Source" button. A source dialog similar to the one below will appear.

| Video Sour             | ce                  |           |                  | ? 🔀        |
|------------------------|---------------------|-----------|------------------|------------|
| Advanced               | Capture Source      | Device Se | ettings   Camera | a Controls |
|                        |                     |           |                  |            |
| Select a V             | ideo Device:        |           |                  |            |
| Hauppau                | ge Win TV USB Pr    | o Capture |                  | •          |
| Select a V<br>Video Tu | ideo Source:<br>ner |           |                  | •          |
|                        | TV Tuner ]          |           |                  |            |
|                        |                     | ок        | Cancel           | Apply      |

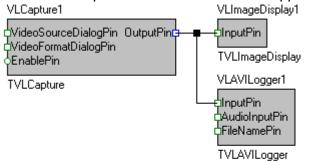
In this dialog you can select your video source, such as TV Tuner or video camera, as well as the TV channel, etc:

| Properties   |                                       |   |
|--|---------------------------------------|---|
| TVTuner Property Page<br>Channel<br>63<br>1 2 3<br>4 5 6 | Country Tuning Space                  | Tuning Mode                                 |
| 7 8 9<br>0 Enter<br>AutoTune                             | Input<br>C 1 C Antenna<br>C 2 C Cable | VTSC_M Video: 765250000<br>Audio: 769750000 |
|  | OK                                    | Cancel <u>Apply</u>                         |

After you have set your source and the source properties, you can click the "Start" button on the main form. If you have picked a valid source you should see the captured video. Here is an example of video captured from a TV Tuner:



Congratulations! You have created your first video capture application with VideoLab. Here are the OpenWire connections in the application:



# Capturing a frame into a TBitmap

From the Delphi/C++Builder menu select | File | New | Application |.

| 70  | Delph   | ıi 7                 |          |                 |  |  |
|-----|---|----------------------|----------|-----------------|--|--|
| Fi  | File Edit Search View Project Run Component Database OpenWire Tools Window Help |                      |          |                 |  |  |
|     | Ne  | ew 🕨                 | ۲D       | Application     | ianal Lab   Video Lab   Audio Lab   Additional   Win32   System   Data Access   Data Controls   dbExpress   DataSnap   BDE    ADO    💶 🕨 |  |
| Ť G | 🧿 Op  | ben                  | ()       | CLX Application | IT 🖏 A 💵 📄 🗷 🗵 🖷 🗮 📰 🗖 📰 📄 🔜 🌉   |  |
| 4   | 📄 Op  | oen Project Ctrl+F11 | :::      | Data Module     |  |  |
|     | Re  | eopen 🕨              | <u> </u> | Form            |  |  |
| 1   | 📕 Sa  | ive Ctrl+S           |          | Frame           |  |  |
| )   | i Sa  | ive As               | P        | Unit            |  |  |
| 9   | Sa Sa   | ive Project As       | <b>*</b> | Other           |  |  |
| i i | 📕 Sa  | we All Shift+Ctrl+S  | _        |                 |  |  |
| 9   | la Clo  | ose                  |          |                 |  |  |
| 8   | de Clo  | ose All              |          |                 |  |  |
|     | 💾 Us  | e Unit Alt+F11       |          |                 |  |  |
| 4   | T) Pri  | int                  |          |                 |  |  |
| i i | Ex  | (it                  |          |                 |  |  |

An empty form will appear on the screen.

From the "Component Palette" select the "Video Lab" tab:

|   |   | Ŀ |
|---|---|---|
| I | Component Database OpenWire Tools Window Help   | ę |
|   | Standard   Signal Lab   Audio Lab   Video Lab   Vision Lab   Timing Lab   Additional   Win32   System   Data Access   Data Controls   dbExp | e |
| - |   |   |

From the tab select and drop on the form the following two components:



From the "Component Palette" select the "Additional" tab:

|   |   | Ŀ      |
|---|---|--------|
| I | Component Database OpenWire Tools Window Help   |        |
| Τ | Standard   Signal Lab   Audio Lab   Video Lab   Plot Lab Additional   Win32   System   Data Access   Data Controls   dbExpress   Data   | taSnap |
|   | Standard   Signal Lab   Audio Lab   Video Lab   Plot Lab   Additional   Win32   Svstem   Data Access   Data Controls   dbExpress   Data<br>Image: Standard   Signal Lab   Audio Lab   Video Lab   Plot Lab   Additional   Win32   Svstem   Data Access   Data Controls   dbExpress   Data       Image: Standard   Signal Lab   Audio Lab   Video Lab   Plot Lab   Additional   Win32   Svstem   Data Access   Data Controls   dbExpress   Data       Image: Standard   Signal Lab   Audio Lab   Video Lab   Plot Lab   Additional   Win32   Svstem   Data Access   Data Controls   dbExpress   Data       Image: Standard   Signal Lab   Audio Lab   Video Lab   Plot Lab   Additional   Win32   Svstem   Data Access   Data Controls   dbExpress   Data       Image: Standard   Signal Lab   Audio Lab   Video Lab   Plot Lab   Additional   Win32   Svstem   Data Access   Data       Image: Standard   Signal Lab   Audio Lab   Video Lab   Plot Lab   Plot Lab   Additional   Win32   Svstem   Data Access   Data       Image: Standard   Signal Lab   Audio Lab   Video Lab   Plot Lab   Plot Lab   Plot Lab   Plot   Plot | i i    |

select and drop on the form a TImage:



Arrange the form to look like this, and select the VLAVIPlayer1 on the form:

| 🅻 Form1 📃 🗖 🗙 |
|---------------|
|               |
|               |
| 1             |
| 1             |
| l             |
|               |
|               |
|               |
|               |

In the Object Inspector select the FileName property and click the 🛄 button.

| Object Inspect | or 🔀           |
|----------------|----------------|
| VLAVIPlayer1   | TVLAVIPlayer 💽 |
| Properties Eve | ents           |
| EnablePin      | (Disconnected) |
| FileName       |                |
| FileNamePin    | (Disconnected) |
| InitialFrame   | 0              |

A File selection dialog will appear:

| Open                              |  | ? 🛛                    |
|-----------------------------------|--|------------------------|
| Look jn:                          | AVIFiles 💌 🗢 🗈 📸 🖽   |                        |
| My Recent<br>Documents<br>Desktop | <ul> <li>V0201-indeo3.2.avi</li> <li>V0206-indeo3.2.avi</li> <li>V0208-indeo3.2.avi</li> <li>V0215-indeo3.2.avi</li> </ul> |                        |
| My Documents                      |  |                        |
| My Computer                       |  |                        |
|                                   |  |                        |
| My Network<br>Places              | File name:     V0206-indeo3.2.avi       Files of type:     AVI files (".avi)   | <u>O</u> pen<br>Cancel |

Select a file to play and click "Open".

In the Object Inspector select the OutputPin property and click the 🛄 button.

| Object Inspect | or 🔀           |
|----------------|----------------|
| VLAVIPlayer1   | TVLAVIPlayer 💽 |
| Properties Ev  | ents           |
| Loop           | False 🔥        |
| Name           | VLAVIPlayer1   |
| OutputPin      | (Disconnected) |
| Paused         | False          |
| PausePin       | (Disconnected) |

In the Pin Editor check the InputPin of the VLGenericFilter1 and click OK:

| 7 Connections - Source Pin : VLAVIPlayer1.Output 🔳 🗖 🔀 |                        |                  |              |      |          |  |  |  |  |  |
|--|------------------------|------------------|--------------|------|----------|--|--|--|--|--|
| Form   | Form : Form1 (Current) |                  |              |      |          |  |  |  |  |  |
|  | Sink pin               | Component        | Connected to | Coni | OpenWire |  |  |  |  |  |
|  | InputPin               | VLGenericFilter1 |              |      | openwire |  |  |  |  |  |
|  |                        |                  |              |      | Bestore  |  |  |  |  |  |

Double click the VLGenericFilter1 on the form:



#### If you are using Delphi, in the event handler add the following code:

```
procedure TForm1.VLGenericFilter1ProcessData(Sender: TObject;
    InBuffer: IVLImageBuffer; var OutBuffer: IVLImageBuffer;
    var SendOutputData: Boolean);
begin
    // Capture Image.
    InBuffer.ToBitmap( Image1.Picture.Bitmap );
    // Update Screen.
    Image1.Refresh();
end;
```

If you are using C++ Builder, in the event handler add the following code:

```
void __fastcall TForm1::VLGenericFilter1FilterData(TObject *Sender,
	TVLCVideoBuffer InBuffer, TVLCVideoBuffer &OutBuffer,
	bool &SendOutputData)
{
	// Capture Image.
	InBuffer.ToBitmap( Image1->Picture->Bitmap );
	// Update Screen.
	Image1->Refresh();
}
```

#### Compile and run the application.

You should see the captured frames inside the TImage component:



You have just learned how to capture bitmaps from the video stream.

## Displaying a video histogram into a Scope component

VideoLab includes a simple but useful Scope component. The component can be used to display video histogram data. The next chapter will show how you can use other Plot components to achieve the same.

From the Delphi/C++ Builder menu select | File | New | Application |.

| 2 | 🕻 Delphi 7  |                       |          |                 |  |  |  |  |  |  |
|---|---|-----------------------|----------|-----------------|--|--|--|--|--|--|
|   | File Edit Search View Project Run Component Database OpenWire Tools Window Help |                       |          |                 |  |  |  |  |  |  |
|   | New 🕨 👔   |                       |          | Application     | ianal Lab   Video Lab   Audio Lab   Additional   Win32   Sustem   Data Access   Data Controls   dbExpress   DataSnap   BDE   ADD   💶 🕨 |  |  |  |  |  |
| Ť |   | Open                  | ()       | CLX Application | I 🖁 A 🛋 📄 🗷 🖉 🖷 🔜 📄 🗎 🔛 🖳  |  |  |  |  |  |
| 1 | 2   | Open Project Ctrl+F11 |          | Data Module     | · <u> </u>   |  |  |  |  |  |
|   |   | Reopen 🕨              |          | Form            |  |  |  |  |  |  |
|   |   | Save Ctrl+S           |          | Frame           |  |  |  |  |  |  |
|   | ) <b>()</b> (;  | Save As               |          | Unit            |  |  |  |  |  |  |
|   |   | Save Project As       | <b>*</b> | Other           |  |  |  |  |  |  |
|   | -   | Save All Shift+Ctrl+S | -        |                 |  |  |  |  |  |  |
|   | ₿.<br>₩₽  | Close                 |          |                 |  |  |  |  |  |  |
|   | ill<br>Hete   | Close All             |          |                 |  |  |  |  |  |  |
|   | ъ   | Use Unit Alt+F11      |          |                 |  |  |  |  |  |  |
|   | 8   | Print                 |          |                 |  |  |  |  |  |  |
|   | i.  | Exit                  |          |                 |  |  |  |  |  |  |

An empty form will appear on the screen.

From the "Component Palette" select the "Video Lab" tab:

|         |             |          |          |        |      |              |           |     |          |               | L.       |
|---------|-------------|----------|----------|--------|------|--------------|-----------|-----|----------|---------------|----------|
| Compone | nt Database | e OpenWi | re Tools | Window | Help | 齃 (search co | omponent) |     | None>    | -             | 🔁 🐴 🎙    |
|         |             |          |          |        |      |              |           |     |          | Data Controls | dbExpre: |
|         |             |          | <b>e</b> | ŞP 📴   |      | <b>R R S</b> |           | 🥽 💭 | <b>7</b> |               |          |

From the tab select and drop on the form the following components:

One III - TVLAVIPlayer



From the "Component Palette" select the "Plot Lab" tab:

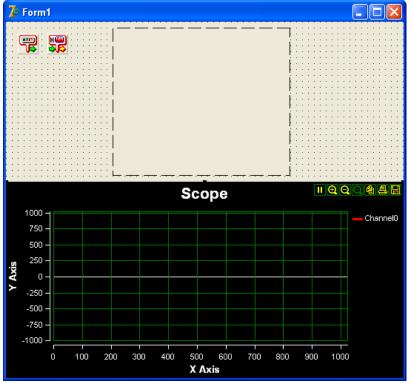
| I | Component Database OpenWire Tools             | Window Help   |
|---|---|---|
| Τ | Standard   Signal Lab   Audio Lab   Video Lab | Plot Lab Additional Win32 System Data Access Data Controls dbExpress DataSnap |
|   | k 💭 💭   |   |

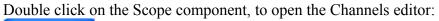
select and drop on the form the following component:

One

- TSLScope

Arrange the form to look like this:







Click twice on the "Add New" 🛅 button to create two more channels:



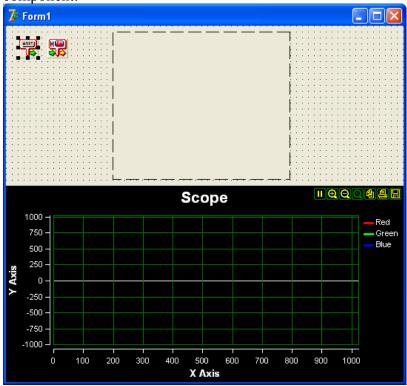
Rename the Channels to Red, Green and Blue:



For each channel set the ChannelMode property to cmBar, and the Width to 3:

| Object Inspector 🛛 🛛 🔀 |                         |  |  |  |  |
|------------------------|-------------------------|--|--|--|--|
| SLScope1.Chan          | nels[0] TSLScopeChan 💌  |  |  |  |  |
| Properties Eve         | ents                    |  |  |  |  |
| ChannelMode            | cmBar                   |  |  |  |  |
| Color                  | <b>clRed</b>            |  |  |  |  |
| InputPin               | VLHistogram1.OutputPins |  |  |  |  |
| Name                   | Red                     |  |  |  |  |
| ⊞ Points               | (TSLScopePoints)        |  |  |  |  |
| Visible                | True                    |  |  |  |  |
| Width                  | 3                       |  |  |  |  |
|                        |                         |  |  |  |  |
|                        |                         |  |  |  |  |
|                        |                         |  |  |  |  |
| All shown              | 1.                      |  |  |  |  |

On the form which should look similar to the picture, double-click on the VLAVIPlayer1 component:



A File selection dialog will appear:

| Open                              |  |   |   |           | ? 🔀                    |
|-----------------------------------|--|---|---|-----------|------------------------|
| Look jn:                          | 🔁 AVIFiles   |   | • | • 🖬 📩 🖬 • |                        |
| My Recent<br>Documents<br>Desktop | <ul> <li>V0201-indeo3,</li> <li>V0206-indeo3,</li> <li>V0208-indeo3,</li> <li>V0215-indeo3,</li> </ul> | 2.avi<br>2.avi                          |   |           |                        |
| My Documents                      |  |   |   |           |                        |
| My Computer                       |  |   |   |           |                        |
| <b></b>                           |  |   |   |           |                        |
| My Network<br>Places              | File <u>n</u> ame:<br>Files of <u>t</u> ype:   | V0206-indeo3.2.avi<br>AVI files (*.avi) |   | - [<br>-  | <u>O</u> pen<br>Cancel |

Select a file to play and click "Open".

In the Object Inspector select the OutputPin property and click the 🛄 button.

| Object Inspector 🛛 🔀 |                |  |  |  |  |
|----------------------|----------------|--|--|--|--|
| VLAVIPlayer1         | TVLAVIPlayer 💽 |  |  |  |  |
| Properties Eve       | ents           |  |  |  |  |
| Loop                 | False 🔥        |  |  |  |  |
| Name                 | VLAVIPlayer1   |  |  |  |  |
| OutputPin            | (Disconnected) |  |  |  |  |
| Paused               | False          |  |  |  |  |
| PausePin             | (Disconnected) |  |  |  |  |

In the Pin Editor click the "Link to all" button, and then click OK.

| <b>7</b> 0 c | onnections | - Source Pin : VLA | VIPlayer1.Out  | put. | 💶 🗖 📈                        |
|--------------|------------|--------------------|----------------|------|------------------------------|
| Form         | Form1 (Cur | •                  | $(\mathbf{a})$ |      |                              |
|              | Sink pin   | Component          | Connected to   | Coni | OpenWire                     |
|              | InputPin   | VLImageDisplay1    |                |      | openwire                     |
|              | InputPin   | VLHistogram1       |                |      | 🔁 <u>R</u> estore            |
|              |            |                    |                |      |                              |
|              |            |                    |                |      | <mark>}⊸{</mark> Link to all |

Select the VLHistogram1 component on the form:



In the Object Inspector click on the 🗄 button to expand the OutputPins:

| Object Inspector 🛛 🛛 🔀 |                        |  |  |  |  |
|------------------------|------------------------|--|--|--|--|
| VLHistogram1           | TVLHistogram 💌         |  |  |  |  |
| Properties Events      |                        |  |  |  |  |
| InputPin               | VLAVIPlayer1.OutputPin |  |  |  |  |
| LowerLevel             | 1                      |  |  |  |  |
| Name                   | VLHistogram1           |  |  |  |  |
| ⊞ OutputPins           | 3 Pins                 |  |  |  |  |
| Tag                    | 0                      |  |  |  |  |

## Select the Red of the OutputPins and click on the 🛄 button:

| Object Inspector 🛛 🛛 🕅 |                        |  |  |  |  |
|------------------------|------------------------|--|--|--|--|
| VLHistogram1           | TVLHistogram 💽         |  |  |  |  |
| Properties Eve         | ents                   |  |  |  |  |
| InputPin               | VLAVIPlayer1.OutputPin |  |  |  |  |
| LowerLevel             | 1                      |  |  |  |  |
| Name                   | VLHistogram1           |  |  |  |  |
| OutputPins             | 3 Pins                 |  |  |  |  |
| Red                    | (Disconnected)         |  |  |  |  |
| Green                  | (Disconnected)         |  |  |  |  |
| Blue                   | (Disconnected)         |  |  |  |  |
| Tag                    | 0                      |  |  |  |  |

In the Pin Editor select the InputPins.Red of the SLScope1 and click OK:

| 🥻 Connections - Source Pin : VLHistogram1.Outpu 🔳 🗖 🔀 |                   |           |              |    |                 |  |  |
|---|-------------------|-----------|--------------|----|-----------------|--|--|
| Form  | : Form1 (Current) |           |              | •  | 6               |  |  |
| 1   | Sink pin          | Component | Connected to | Cc | OpenWire        |  |  |
| Ø   | InputPins.Red     | SLScope1  |              |    | openwire        |  |  |
|   | InputPins.Green   | SLScope1  |              |    | Bestore         |  |  |
|   | InputPins.Blue    | SLScope1  |              |    |                 |  |  |
|   |                   |           |              |    | ไม่ Link to all |  |  |

In the Object Inspector select the Green of the OutputPins and click on the 🛄 button:

| Object Inspector 🛛 🔀 |                        |  |  |  |  |
|----------------------|------------------------|--|--|--|--|
| VLHistogram1         | TVLHistogram 💌         |  |  |  |  |
| Properties Eve       | ents                   |  |  |  |  |
| InputPin             | VLAVIPlayer1.OutputPin |  |  |  |  |
| LowerLevel           | 1                      |  |  |  |  |
| Name                 | VLHistogram1           |  |  |  |  |
| OutputPins           | 3 Pins                 |  |  |  |  |
| Red                  | SLScope1.InputPins.Red |  |  |  |  |
| Green                | (Disconnected) 🛛 😐     |  |  |  |  |
| Blue                 | (Disconnected)         |  |  |  |  |
| Tag                  | 0                      |  |  |  |  |

In the Pin Editor select the InputPins.Green of the SLScope1 and click OK:

| 🌈 с  | onnections - S  | ource Pin : VLHist | togram1.Out  | pu. | . 💶 🗖 🔀                     |
|------|-----------------|--------------------|--------------|-----|-----------------------------|
| Form | Form1 (Current) | •                  | 6            |     |                             |
| 1    | Sink pin        | Component          | Connected to | Cc  | OpenWire                    |
|      | InputPins.Red   | SLScope1           | VLHistogra   | Bi  | openwire                    |
|      | InputPins.Green | SLScope1           |              |     | Bestore                     |
|      | InputPins.Blue  | SLScope1           |              |     |                             |
|      |                 |                    |              |     | <mark>}{</mark> Link to all |

In the Object Inspector select the Blue of the OutputPins and click on the 🛄 button:

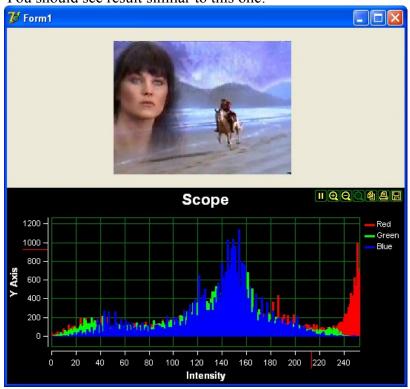
| Object Inspector 🛛 🛛 🛛 |                         |  |  |  |  |
|------------------------|-------------------------|--|--|--|--|
| VLHistogram1           | TVLHistogram 💽          |  |  |  |  |
| Properties Eve         | ents                    |  |  |  |  |
| InputPin               | VLAVIPlayer1.OutputPin  |  |  |  |  |
| LowerLevel             | 1                       |  |  |  |  |
| Name                   | VLHistogram1            |  |  |  |  |
| 🗆 OutputPins           | 3 Pins                  |  |  |  |  |
| Red                    | SLScope1.InputPins.Red  |  |  |  |  |
| Green                  | SLScope1.InputPins.Gree |  |  |  |  |
| Blue                   | (Disconnected)          |  |  |  |  |
| Tag                    | 0                       |  |  |  |  |

In the Pin Editor select the InputPins.Blue of the SLScope1 and click OK:

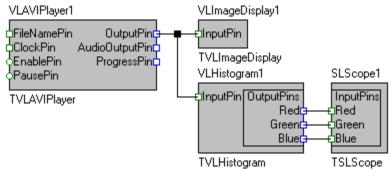
| <b>7</b> 0 c | onnections - S    | ource Pin : VLHist | togram1.Out  | pu. |                              |
|--------------|-------------------|--------------------|--------------|-----|------------------------------|
| Form         | : Form1 (Current) |                    |              | •   | 6                            |
| 1            | Sink pin          | Component          | Connected to | Cc  | OpenWire                     |
|              | InputPins.Red     | SLScope1           | VLHistogra   | Bi  | openwire                     |
|              | InputPins.Green   | SLScope1           | VLHistogra   | Bi  | Bestore                      |
| $\mathbf{Z}$ | InputPins.Blue    | SLScope1           |              |     |                              |
|              |                   |                    |              |     | <mark>}⊸{</mark> Link to all |

### Compile and run the application.

You should see result similar to this one:



Here are the OpenWire connections in this application:



You have just learned how to process image histogram with VideoLab.

# Displaying a video histogram in a Third Party plot component

This example is very similar to the previous one, except that here you will learn how to display the Histogram data into a third party component such as the TeeChart component that is included in the Professional or Enterprise version of Delphi and C++ Builder. The example assumes that you have the TeeChart component. The TeeChart component is included in the Professional or Enterprise version of Delphi and C++ Builder. You can

download a trial version of the component from <u>http://www.steema.com/</u>. You can also change the example a little bit and use a different chart or plot component.

|              | 1                          |  |
|--------------|----------------------------|--|
| <b>7</b> 0 D | elphi 7                    |  |
| File         | e Edit Search View Project | un Component Database OpenWire Tools Window Help 🛛 🔨 🖳 🖉   |
|              | New 🕨                      | Application ianal Lab   Video Lab   Audio Lab   Additional   Win32   System   Data Access   Data Controls   dbExoress   DataSnao   BDE   ADO |
| Ť 🔉          | Open                       | CLX Application 🛛 🛐 🔩 A 📷 📄 📧 🗷 💿 📲 🗃 🚥 🗂 🖹 🔄 👧  |
| <u> </u>     | Open Project Ctrl+F11      | Data Module  |
|              | Reopen •                   | Form   |
|              | Save Ctrl+S                | Frame  |
| 3            | E Save As                  | Unit   |
|              | Save Project As            | Other  |
|              | Save All Shift+Ctrl+S      |  |
|              | ¢ Close                    |  |
|              | Elose All                  |  |
|              | Use Unit Alt+F11           |  |
| 6            | Print                      |  |
| 1            | L Exit                     |  |

From the Delphi/C++Builder menu select | File | New | Application |.

An empty form will appear on the screen.

From the "Component Palette" select the "Additional" tab:

|   |   | E |
|---|---|---|
| I | Component Database OpenWire Tools Window Help   | Ę |
| Τ | Standard   Signal Lab   Audio Lab   Video Lab   Plot Lab   Additional   Win32   System   Data Access   Data Controls   dbExpress   DataSnac | 5 |
|   | 🕟 📨 🕖 🛲 🖫 🎴 🎝 🗌 🃰 🗄 + 🧛 🗈 🛠 🃰 🚟 🖀 🖬 🖷   | Ţ |

From the tab select and drop on the form a TChart component.



From the "Component Palette" select the "Video Lab" tab:

| Component Database OpenWire Tools Window Help Karch component) Kones I 🕾 🦓 🥵   |
|--|
| Standard Signal Lab Audio Lab Video Lab Vision Lab Timing Lab Additional Win32 System Data Access Data Controls dbExpre: |
|  |
|  |

From the tab select and drop on the form the following components:

| One | 🕎 - TVLAVIPlayer  |
|-----|-------------------|
| One | - TVLImageDisplay |
| One | 🕎 - TVLHistogram  |

-

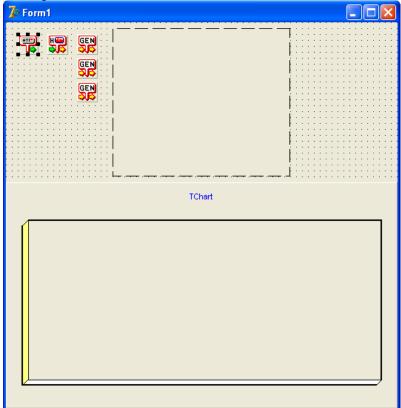
From the "Component Palette" select the "Signal Lab" tab:

| 🥻 Delphi 7 - Project1  |                  |
|--|------------------|
|  |                  |
| 🎌 🔯 🗸 🗐 🍙 🖉 🖄 🏟 Standard Signal Lab 🛛 Audio Lab 🛛 Plot Lab 🖉 Control Lab 🕽 Additional 🛛 Win32 🛛 Svstem 🗋 Data Access 🗋 Data Controls 🗋 dbExoress 🗎 | DataSnap  BD ◀ ▶ |
|  |                  |

From the tab select and drop on the form the following components:



Arrange the form to look like this, and double-click on the VLAVIPlayer1 component:



A File selection dialog will appear:

| Open  |  | ? 🗙                    |
|---|--|------------------------|
| Look in:  | 🔁 AVIFiles 💽 🗢 🖻 📸   |                        |
| My Recent<br>Documents<br>Desktop<br>My Documents | VU201-indeo3.2.avi<br>VU206-indeo3.2.avi<br>VU208-indeo3.2.avi<br>VU215-indeo3.2.avi |                        |
| My Network<br>Places                              | File name:     V0206-indeo3.2.avi       Files of type:     AVI files (".avi)         | <u>O</u> pen<br>Cancel |

Select a file to play and click "Open".

In the Object Inspector select the OutputPin property and click the 🔤 button.

| Object Inspector 🛛 🔀 |                  |  |  |  |
|----------------------|------------------|--|--|--|
| VLAVIPlayer1         | TVLAVIPlayer 💽   |  |  |  |
| Properties Events    |                  |  |  |  |
| Name                 | VLAVIPlayer1     |  |  |  |
| OutputPin            | (Disconnected) 😐 |  |  |  |
| Paused               | False            |  |  |  |
| PausePin             | (Disconnected)   |  |  |  |

In the Pin Editor click the "Link to all" button, and then click OK.

| <b>]</b> ¢ c | onnections -   | Source Pin : VLAV | IPlayer1.Outp | ut. | 🗆 🗙                           |
|--------------|----------------|-------------------|---------------|-----|-------------------------------|
| Form         | : Form1 (Curre | nt)               |               | •   | $(\overline{a})$              |
| 1            | Sink pin       | Component         | Connected to  | Сс  | OpenWire                      |
|              | InputPin       | VLHistogram1      |               |     | openwire                      |
|              | InputPin       | VLImageDisplay1   |               |     | Bestore                       |
|              |                |                   |               |     |                               |
|              |                |                   |               |     | <mark>} →{</mark> Link to all |

Select the VLHistogram1 component on the form:



In the Object Inspector click on the 🗉 button to expand the OutputPins:

| Object Inspector 🛛 🛛 🛛 |                        |  |
|------------------------|------------------------|--|
| VLHistogram1           | TVLHistogram 💌         |  |
| Properties Events      |                        |  |
| InputPin               | VLAVIPlayer1.OutputPir |  |
| LowerLevel             | 1                      |  |
| Name                   | VLHistogram1           |  |
| ⊞ OutputPins           | 3 Pins                 |  |
| Tag                    | 0                      |  |
| Unnert evel            | 255                    |  |

Select the Red of the OutputPins and click on the **w** button:

| Object Inspector 🛛 🔀 |                        |  |  |  |
|----------------------|------------------------|--|--|--|
| VLHistogram1         | TVLHistogram 💌         |  |  |  |
| Properties Events    |                        |  |  |  |
| InputPin             | VLAVIPlayer1.OutputPir |  |  |  |
| LowerLevel           | 1                      |  |  |  |
| Name                 | VLHistogram1           |  |  |  |
| OutputPins           | 3 Pins                 |  |  |  |
| Red                  | (Disconnected)         |  |  |  |
| Green                | (Disconnected)         |  |  |  |
| Blue                 | (Disconnected)         |  |  |  |
| Teo                  | 0                      |  |  |  |

In the Pin Editor select the InputPin of the SLGenericReal1 and click OK:

| 🥻 Connections - Source Pin : VLHistogram1.Outpu 🔳 🗖 🗙 |                 |                |              |    |                             |
|---|-----------------|----------------|--------------|----|-----------------------------|
| Form  | Form1 (Current) |                |              | •  | 6)                          |
| 1   | Sink pin        | Component      | Connected to | Cc | OpenWire                    |
|   | InputPin        | SLGenericReal1 |              |    | opennie                     |
|   | InputPin        | SLGenericReal2 |              |    | Bestore                     |
|   | InputPin        | SLGenericReal3 |              |    |                             |
|   |                 |                |              |    | <mark>}{</mark> Link to all |

In the Object Inspector select the Green of the OutputPins and click on the 🛄 button:

| Object Inspector 🛛 🛛 🛛 🕅 |                        |  |  |
|--------------------------|------------------------|--|--|
| VLHistogram1             | TVLHistogram 💽         |  |  |
| Properties Ev            | ents                   |  |  |
| InputPin                 | VLAVIPlayer1.OutputPii |  |  |
| LowerLevel               | 1                      |  |  |
| Name                     | VLHistogram1           |  |  |
| OutputPins               | 3 Pins                 |  |  |
| Red                      | SLGenericReal1.InputF  |  |  |
| Green                    | (Disconnected)         |  |  |
| Blue                     | (Disconnected)         |  |  |
| Т                        | 0                      |  |  |

In the Pin Editor select the InputPin of the SLGenericReal2 and click OK:

| <b>7</b> 0 c | onnections -  | Source Pin : VLHis | togram1.Out  | pu. |                               |
|--------------|---------------|--------------------|--------------|-----|-------------------------------|
| Form         | Form1 (Curren | )                  |              | •   | 6)                            |
| 1            | Sink pin      | Component          | Connected to | Cc  | OpenWire                      |
|              | InputPin      | SLGenericReal1     | VLHistogra   | Bi  | openwire                      |
|              | InputPin      | SLGenericReal2     |              |     | Bestore                       |
|              | InputPin      | SLGenericReal3     |              |     |                               |
|              |               |                    |              |     | <mark>}⊸{ L</mark> ink to all |

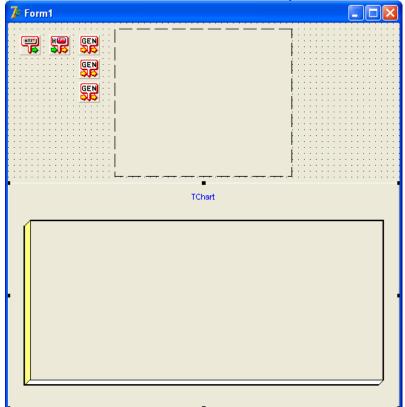
In the Object Inspector select the Blue of the OutputPins and click on the in button:

| Object Inspect | tor 🛛 🛛                |  |  |  |  |
|----------------|------------------------|--|--|--|--|
| VLHistogram1   | TVLHistogram 💌         |  |  |  |  |
| Properties Ev  | ents                   |  |  |  |  |
| InputPin       | VLAVIPlayer1.OutputPir |  |  |  |  |
| LowerLevel     | 1                      |  |  |  |  |
| Name           | VLHistogram1           |  |  |  |  |
| OutputPins     | 3 Pins                 |  |  |  |  |
| Red            | SLGenericReal1.InputF  |  |  |  |  |
| Green          | SLGenericReal2.InputF  |  |  |  |  |
| Blue           | (Disconnected)         |  |  |  |  |
| т              | 0                      |  |  |  |  |

In the Pin Editor select the InputPin of the SLGenericReal3 and click OK:

| 🅻 с       | onnections - S    | ource Pin : VLHis | togram1.Out  | pu | . 💶 🗖 🔀                      |
|-----------|-------------------|-------------------|--------------|----|------------------------------|
| Form      | : Form1 (Current) |                   |              | •  | 6                            |
| 1         | Sink pin          | Component         | Connected to | Cc | OpenWire                     |
|           | InputPin          | SLGenericReal1    | VLHistogra   | Bi | openwire                     |
|           | InputPin          | SLGenericReal2    | VLHistogra   | Bi | Bestore                      |
| $\square$ | InputPin          | SLGenericReal3    |              |    |                              |
|           |                   |                   |              |    | <mark>}⊸{</mark> Link to all |

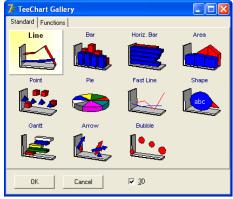
On the form double click on the Chart1 component:



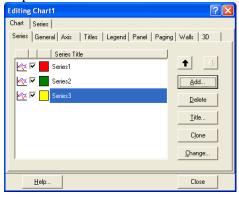
The component editor will open:

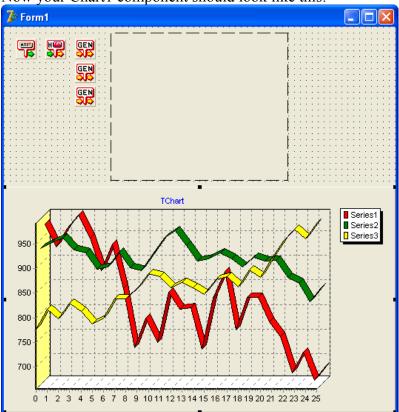
| The component cattor will                              | open.  |
|--|--|
| Editing Chart1   | ? 🔀  |
| Chart Series   |  |
| Series General Axis   Titles   Legend   Panel   Paging | Walls   3D   |
| Series Title   | Image: Angle of the second |
|  |  |
| Help   | Close  |

Click the "Add.." button to add new series, and select Line, then click OK:



Repeat this two more times and click Close:





Now your Chart1 component should look like this:

If you are using Delphi, switch to the Code Editor and add the following line in the implementation section of the unit code:

uses SLDataBuffer, SLSimpleDataBuffer;

Switch to the form and double click the SLGenericReal1:

| 2   | 6 | Fo  | 0 | m | 1 |         |    |   |   |            |
|-----|---|-----|---|---|---|---------|----|---|---|------------|
|     | C | V   | 2 | : | ( | HI<br>S | j, | 9 |   |            |
| 11  | 1 |     |   | 1 | 1 | 1       | 1  | 1 | 1 | GEN        |
|     |   |     |   | · |   |         |    |   | · | 26         |
| 1.1 | • | • • | · | · | · | •       | ·  | · | · |            |
| 11  | 1 |     |   | 1 | 1 | ÷       | 1  | : | 1 | <b>BEN</b> |

In the event handler add the following code:

#### If you are using Delphi:

```
procedure TForm1.SLGenericReal1ProcessData(Sender: TObject;
InBuffer: ISLRealBuffer; var OutBuffer: ISLRealBuffer;
var SendOutputData: Boolean);
var
I : Integer;
begin
Chart1.Series[ 0 ].Clear();
```

```
for I := 0 to InBuffer.GetSize() - 1 do
   Chart1.Series[ 0 ].Add(InBuffer.Items[ I ], '', clRed );
```

If you are using C++ Builder:

end;

In the Object Inspector set the SynchronizeType property to stSingleBuffer:

| Object Inspector  | ×                    |
|-------------------|----------------------|
| SLGenericReal1    | TSLGenericReal 💌     |
| Properties Events | ;]                   |
| InputPin          | VLHistogram1.Outpu 木 |
| Name              | SLGenericReal1       |
| OutputPin         | (Disconnected)       |
| SynchronizeType   | stSingleBuffer 💌 🧾   |
| Tag               | 0 🔽                  |

Switch to the form and double click the SLGenericReal2:



In the event handler add the following code:

### If you are using Delphi:

```
procedure TForm1.SLGenericReal2ProcessData(Sender: TObject;
    InBuffer: ISLRealBuffer; var OutBuffer: ISLRealBuffer;
    var SendOutputData: Boolean);
var
    I : Integer;
begin
    Chart1.Series[ 1 ].Clear();
    for I := 0 to InBuffer.GetSize() - 1 do
        Chart1.Series[ 1 ].Add(InBuffer.Items[ I ], '', clGreen );
end;
```

#### If you are using C++ Builder:

```
void __fastcall TForm1::SLGenericReal2ProcessData(TObject *Sender,
TSLCRealBuffer InBuffer, TSLCRealBuffer &OutBuffer,
```

```
bool &SendOutputData)
```

```
Chart1->Series[ 1 ]->Clear();
for( int i = 0; i < InBuffer.GetSize(); i ++ )
  Chart1->Series[ 1 ]->Add(InBuffer[ i ], "", clGreen );
```

In the Object Inspector set the SynchronizeType property to stSingleBuffer:

| Object Inspector 🛛 🛛 🛽 |                      |  |  |  |  |  |
|------------------------|----------------------|--|--|--|--|--|
| SLGenericReal2         | TSLGenericReal 💽     |  |  |  |  |  |
| Properties Events      | ;]                   |  |  |  |  |  |
| InputPin               | VLHistogram1.Outpu 木 |  |  |  |  |  |
| Name                   | SLGenericReal2       |  |  |  |  |  |
| OutputPin              | (Disconnected)       |  |  |  |  |  |
| SynchronizeType        | stSingleBuffer 💌 🧾   |  |  |  |  |  |
| The                    | 0                    |  |  |  |  |  |

{

Switch to the form and double click the SLGenericReal3:

| I | r. |   | 1 | 187 | <u> </u> | J | • | l | н. |   | ч  | • | 1   | 6  | - 1 | N.         |    |   |   |
|---|----|---|---|-----|----------|---|---|---|----|---|----|---|-----|----|-----|------------|----|---|---|
| I | ł. | • |   | ٦   | E        | < | ٠ |   | X. | E | ۲. | ٠ | - 2 | X) | E   | ۲.         | •  | • |   |
| I | ł. | · |   | 4   | •        | ~ |   |   | ~  |   | •  |   | 1   | ~  |     | •          | ·  |   |   |
| I | Ŀ. |   |   |     |          |   |   |   |    |   |    |   |     |    |     | _          |    |   |   |
| I | Ł  |   |   |     |          |   |   |   |    |   |    |   | 1   | 68 | ĒÌ  | A)         |    |   | 1 |
| I | Ł  |   |   |     | ÷        | · | · |   |    | ÷ | ·  | · | 12  | λì | E   | e.         |    |   |   |
| I | Ł  | · | ÷ | ÷   | ÷        | ÷ | · | ÷ | ÷  | ÷ | ÷  | · | 2   | ~  |     | •          | ·  | ÷ | 1 |
| I | Ł  | · |   |     |          |   | • |   |    |   |    | • | ۰.  |    |     |            | Ŀ. |   | 1 |
| I | Ł  | · | · |     | ÷        | · | · |   | ÷  | ÷ | ·  | · | Ц   | GI | EI  | чL         |    | · |   |
| I | Ł  | · | · |     | ·        | · | · |   | ÷  | · | ·  | · |     | ×1 | E   | <li>T</li> | ۰. | · | 1 |
| I | Ł  | · | • |     | ·        | · | · |   | ·  | · | ·  | · | ÷   | ~  | c   | •          | 1  | • |   |
| I | Ł  | · | · |     | ·        | · | · |   | ÷  | · | ·  | · |     | 1  |     |            |    | · |   |
| I | Ł  | · | · |     | ÷        | · | · |   | ÷  | ÷ | ·  | · | ·   | ÷  | ·   | •          | ·  | ÷ | 1 |
|   |    |   |   |     |          |   |   |   |    |   |    |   |     |    |     |            |    |   |   |

In the event handler add the following code:

### If you are using Delphi:

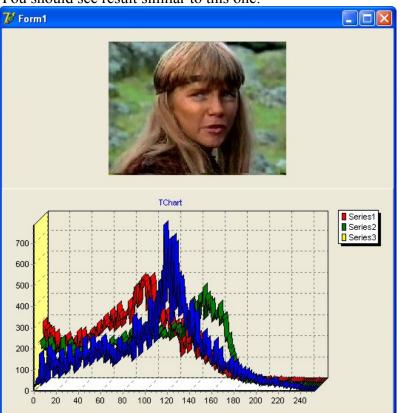
```
procedure TForm1.SLGenericReal3ProcessData(Sender: TObject;
InBuffer: ISLRealBuffer; var OutBuffer: ISLRealBuffer;
var SendOutputData: Boolean);
var
I : Integer;
begin
Chart1.Series[ 2 ].Clear();
for I := 0 to InBuffer.GetSize() - 1 do
Chart1.Series[ 2 ].Add(InBuffer.Items[ I ], '', clBlue );
end;
```

#### If you are using C++ Builder:

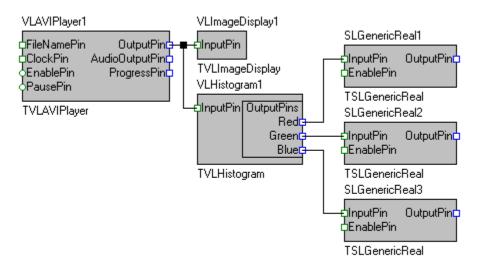
In the Object Inspector set the SynchronizeType property to stSingleBuffer:

| 5                 | 1                    |
|-------------------|----------------------|
| Object Inspector  | ×                    |
| SLGenericReal3    | TSLGenericReal 💌     |
| Properties Events | ;]                   |
| InputPin          | VLHistogram1.Outpu 木 |
| Name              | SLGenericReal3       |
| OutputPin         | (Disconnected)       |
| SynchronizeType   | stSingleBuffer 💌 🧾   |
| Tan               | 0 🔍                  |

Compile and run the application. You should see result similar to this one:



Here are the OpenWire connections in this application:



You have just learned how to process image histogram with VideoLab, and display it into a Third Party Component.

# Displaying audio into a Scope component

From the Delphi/C++ Builder menu select | File | New | Application |.

| 🕻 D           | elphi 7                    |  |                 |
|---------------|----------------------------|--|-----------------|
| File          | e Edit Search View Project | Component Database OpenWire Tools Window Help  |                 |
|               | New 🕨                      | Application ional Lab   Video Lab   Audio Lab   Additional   Win32   System   Data Access   Data Controls   dbExpress   DataSnap | BDE   ADO   💶 🕨 |
| Ť             | Open                       | 1X Application 📱 🎙 A 📷 📄 📧 🗷 💿 📲 🗃 🚥 🗂 🖹 📃 🌉   |                 |
| Ľ 2           | Open Project Ctrl+F11      | Data Module  |                 |
|               | Reopen >                   | form   |                 |
|               | Save Ctrl+S                | rame   |                 |
| ) <b>i</b> ii | 🦕 Save As                  | Init   |                 |
|               | Save Project As            | Other  |                 |
|               | Save All Shift+Ctrl+S      |  |                 |
|               |                            |  |                 |
|               | g Close All                |  |                 |
|               | Use Unit Alt+F11           |  |                 |
|               | Print                      |  |                 |
| 1             | . Exit                     |  |                 |

An empty form will appear on the screen.

From the "Component Palette" select the "Video Lab" tab:

| Component Database OpenWire Tools Window Help  | one> 💽 🛃 🐴 🎙                          |
|--|---------------------------------------|
| Standard   Sianal Lab   Audio Lab   Video Lab   Vision Lab   Timino Lab   Additional   Win32   Svstem   Da | ata Access   Data Controls   dbExpre: |
| 한 바라 바라 바라 바라 바라 다 바 다 바 다 나 나 나 나 나 나 나 나 나 나 나 나 나 나 나   |                                       |

From the tab select and drop on the form the following components:



From the "Component Palette" select the "Signal Lab" tab:

| 🏂 Delphi 7 - Project1  |
|--|
| File Edit Search View Project Run Component Database OpenWire Tools Window Help 🛼 (search component) 🚺 🕄 🗣 🛱   |
| 👚 🖏 👻 🗐 🍘 🚰 😰 😰 🖉 Standard Signal Lab   Audio Lab   Plot Lab   Control Lab   Additional   Win32   Svstem   Data Access   Data Controls   dbExpress   DataSnap   BD 💶 |
| \$\$\$ \$\$ \$\$ \$\$ \$\$ \$\$ \$\$ \$\$ \$\$ \$\$ \$\$ \$\$ \$\$   |

One III - TALAudioToReal

From the "Component Palette" select the "Plot Lab" tab:



From the tab select and drop on the form the following component:



- TSLScope



In the Object Inspector select the FileName property and click the 🛄 button.

| Object Inspector 🛛 🛛 |                |     |  |  |  |
|----------------------|----------------|-----|--|--|--|
| VLAVIPlayer1         | TVLAVIPlayer   | •   |  |  |  |
| Properties Eve       | ents           |     |  |  |  |
| EnablePin            | (Disconnected) | ~   |  |  |  |
| FileName             | ••             | · - |  |  |  |
| FileNamePin          | (Disconnected) |     |  |  |  |

A File selection dialog will appear:

| Open                              |   |   |   |          | ? 🛛                    |
|-----------------------------------|---|---|---|----------|------------------------|
| Look jn:                          | AVIFiles  |   | • | ⇐ 🗈 💣 📰• |                        |
| My Recent<br>Documents<br>Desktop | <ul> <li>V0201-indeo3,</li> <li>V0206-indeo3,</li> <li>V0208-indeo3,</li> <li>V0208-indeo3,</li> <li>V0215-indeo3,</li> </ul> | 2.avi<br>2.avi                          |   |          |                        |
| My Documents                      |   |   |   |          |                        |
| My Computer                       |   |   |   |          |                        |
| My Network<br>Places              | File <u>n</u> ame:<br>Files of <u>t</u> ype:  | V0206-indeo3.2.avi<br>AVI files (*.avi) |   | <b>•</b> | <u>O</u> pen<br>Cancel |

Select a file to play and click "Open".

In the Object Inspector select the OutputPin property and click the 🛄 button.

| Object Inspector 🛛 🔀 |                |  |  |  |  |  |
|----------------------|----------------|--|--|--|--|--|
| VLAVIPlayer1         | TVLAVIPlayer 💽 |  |  |  |  |  |
| Properties Ev        | rents          |  |  |  |  |  |
| Loop                 | False 🔥        |  |  |  |  |  |
| Name                 | VLAVIPlayer1   |  |  |  |  |  |
| OutputPin            | (Disconnected) |  |  |  |  |  |
| Paused               | False          |  |  |  |  |  |
| PausePin             | (Disconnected) |  |  |  |  |  |

You should see the Pin Editor:

| <b>]</b> @ c | 🅻 Connections - Source Pin : VLAVIPlayer1.OutputPin 💦 🔲 🔀 |                 |  |  |           |  |  |  |
|--------------|---|-----------------|--|--|-----------|--|--|--|
| Form         | Form : Form1 (Current)                                    |                 |  |  |           |  |  |  |
| ₽            | Sink pin Component Connected to Connection Type           |                 |  |  | OpenWire  |  |  |  |
|              | InputPin  | VLImageDisplay1 |  |  | openwire  |  |  |  |
|              |   |                 |  |  | S Restore |  |  |  |

Click on the check box to make it look as in the picture, and then click OK.

In the Object Inspector select the AudioOutputPin property and click the 🛄 button.

| ./              |                    |
|-----------------|--------------------|
| Object Inspecto | or 🔀               |
| VLAVIPlayer1    | TVLAVIPlayer 💽     |
| Properties Eve  | nts                |
| AudioBuffersAl  | 0 🔥                |
| AudioEnabled    | False              |
| AudioOutputPir  | (Disconnected) 📃 🔤 |
| ClockPin        | (Disconnected)     |
| ClockSource     | csInternal         |

In the Pin Editor select the InputPin of the ALWaveToReal1 and click OK:

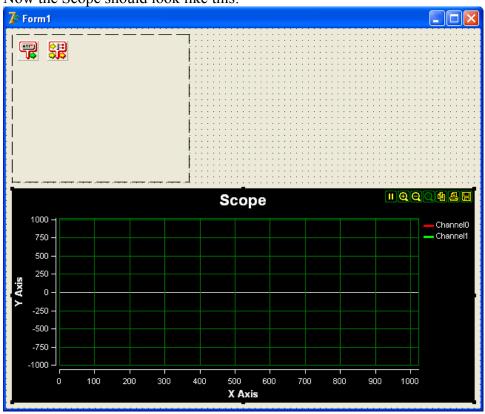
| <b>]</b> ⊘ c | 🏅 Connections - Source Pin : VLAVIPlayer1.AudioOutput 🔳 🗖 🔀 |                |  |   |                   |  |  |
|--------------|---|----------------|--|---|-------------------|--|--|
| Form         | : Form1 (0  | Current)       |  | • | <b>(</b> )        |  |  |
|              | Sink pin Component Connected to Connection Type             |                |  |   | OpenWire          |  |  |
|              | InputPin  | ALAudioToReal1 |  |   | opennie           |  |  |
|              |   |                |  |   | 🔁 <u>R</u> estore |  |  |
|              |   |                |  |   |                   |  |  |

Double click on the Scope component, to open the Channels editor:



Click on the "Add New" 🛅 button to create one more channel:





### Now the Scope should look like this:

On the form select the ALAudioToReal1 component:



In the Object Inspector click on the 🗄 button to expand the OutputPins:

| Object Inspector 🛛 🛛 🛛 |                      |  |  |  |  |  |
|------------------------|----------------------|--|--|--|--|--|
| ALAudioToReal1         | TALAudioToReal 💌     |  |  |  |  |  |
| Properties Eve         | ents                 |  |  |  |  |  |
| CountChannels          | 2                    |  |  |  |  |  |
| InputPin               | ALAudioIn1.OutputPin |  |  |  |  |  |
| Name                   | ALAudioToReal1       |  |  |  |  |  |
| ⊞ OutputPins           | 2 Pins               |  |  |  |  |  |
| Tag                    | 0                    |  |  |  |  |  |
|                        |                      |  |  |  |  |  |

Click the **button** of the Pin[0] sub property:

| Object Inspector 🛛 🛛 |                         |  |  |  |  |
|----------------------|-------------------------|--|--|--|--|
| ALAudioToReal1       | TALAudioToReal 💌        |  |  |  |  |
| Properties Eve       | ents                    |  |  |  |  |
| CountChannels        | 2                       |  |  |  |  |
| InputPin             | VLAVIPlayer1.AudioOutpu |  |  |  |  |
| Name                 | ALAudioToReal1          |  |  |  |  |
| OutputPins           | 2 Pins                  |  |  |  |  |
| Pin [0]              | (Disconnected)          |  |  |  |  |
| Pin [1]              | (Disconnected)          |  |  |  |  |
| Tag                  | 0                       |  |  |  |  |

In the Pin Editor select the InputPins.Channel0 of the SLScope1 and click OK:

| <b>]</b> ⊘ c | 🏅 Connections - Source Pin : ALAudioToReal1.OutputPin 🔳 🗖 🔀 |           |              |                 |            |  |  |
|--------------|---|-----------|--------------|-----------------|------------|--|--|
| Form         | Form1 (0  | Current)  |              | •               | <b>(</b> ) |  |  |
|              | Sink pin  | Component | Connected to | Connection Type | OpenWire   |  |  |
|              | InputPi   | SLScope1  |              |                 | opennie    |  |  |
|              | InputPi   | SLScope1  |              |                 | Bestore    |  |  |
|              |   |           |              |                 |            |  |  |

In the Object Inspector click the in button of the Pin[1] sub property of the OutputPins:

| Object Inspector 🛛 🕅 |                         |  |  |  |  |
|----------------------|-------------------------|--|--|--|--|
| ALAudioToReal1       | TALAudioToReal 💌        |  |  |  |  |
| Properties Eve       | ents                    |  |  |  |  |
| CountChannels        | 2                       |  |  |  |  |
| InputPin             | VLAVIPlayer1.AudioOutpu |  |  |  |  |
| Name                 | ALAudioToReal1          |  |  |  |  |
| OutputPins           | 2 Pins                  |  |  |  |  |
| Pin [0]              | SLScope1.InputPins.Char |  |  |  |  |
| Pin [1]              | (Disconnected) 😐        |  |  |  |  |
| Tag                  | 0                       |  |  |  |  |

In the Pin Editor select the InputPins.Channel1 of the SLScope1 and click OK:

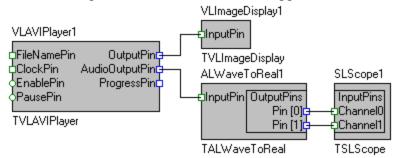
| 1 | 🏅 Connections - Source Pin : ALAudioToReal1.OutputPin 🔳 🗖 🔀 |          |           |              |                    |          |  |
|---|---|----------|-----------|--------------|--------------------|----------|--|
| 1 | Form  | Form1 (0 | Current)  |              | •                  | 6        |  |
|   | ٠   | Sink pin | Component | Connected to | Connection Type    | OpenWire |  |
|   |   | InputPi  | SLScope1  | ALAudioTo    | Bi-directional ( S | opennie  |  |
| ł | 2   | InputPi  | SLScope1  |              |                    | Bestore  |  |
|   |   |          |           |              |                    |          |  |

### Compile and run the application.

You should see result similar to this one:



Here are the OpenWire connections in this application:



You have just learned how to display audio data with VideoLab.

# Performing filter or transformation over TBitmap

From the Delphi/C++Builder menu select | File | New | Application |.

| 7 | 🖟 Delphi 7   |                       |          |                 |  |  |  |  |
|---|--|-----------------------|----------|-----------------|--|--|--|--|
|   | File Edit Search View Project Run Component Database OpenWire Tools Window Help (None) 💽 🚱 🗞 |                       |          |                 |  |  |  |  |
|   |  | New >                 | C٦       | Application     | ional Lab   Video Lab   Audio Lab   Additional   Win32   Svstem   Data Access   Data Controls   dbExpress   DataSnap   BDE   ADO   💶 🕨 |  |  |  |
| Ť | 3  | Open                  | <u>و</u> | CLX Application | I 🖁 A 💵 📄 💌 🗵 🖷 📰 🗖 🔤 🔜 🔜 🔜  |  |  |  |
|   | <u> </u>   | Open Project Ctrl+F11 |          | Data Module     | ·  |  |  |  |
|   |  | Reopen +              | <u> </u> | Form            |  |  |  |  |
|   |  | Save Ctrl+S           |          | Frame           |  |  |  |  |
|   |  | Save As               |          | Unit            |  |  |  |  |
|   |  | Save Project As       | <b>*</b> | Other           |  |  |  |  |
|   |  | Save All Shift+Ctrl+S | -        |                 |  |  |  |  |
|   | 副計   | Close                 |          |                 |  |  |  |  |
|   | i<br>Litte   | Close All             |          |                 |  |  |  |  |
|   | Ъ  | Use Unit Alt+F11      |          |                 |  |  |  |  |
|   | 8  | Print                 |          |                 |  |  |  |  |
|   | i.   | Exit                  |          |                 |  |  |  |  |

An empty form will appear on the screen.

From the "Component Palette" select the "Additional" tab:

|   |   | Ŀ      |
|---|---|--------|
|   | Component Database OpenWire Tools Window Help   |        |
| T | Standard   Signal Lab   Audio Lab   Video Lab   Plot Lab   Additional   Win32   System   Data Access   Data Controls   dbExpress   Data | taSnap |
|   | - K 📨 🖉 🎟 🖫 🗣 🛶 斗 📰 😫 🕂 🧛 🕕 🛠 🏗 🕷 🗑 🏧 🎇 👪 🗄   | i i    |

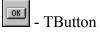
From the tab select and drop on the form the following two components.



From the "Component Palette" select the "Standard" tab:

|   |  | Ŀ        |
|---|--|----------|
|   |  | 🔁 🐴 🎙    |
|   | Standard Signal Lab Audio Lab Video Lab Plot Lab Additional Win32 System Data Access Data Controls dbExpress I | DataSnap |
| - | 🕞 🗂 🖺 🖣 🖬 📄 🚥 🖉 🌒 🕱 💿 🐺 💿 🛃  |          |

From the tab select and drop on the form a TButton component.



From the "Component Palette" select the "Video Lab" tab:

|   | L                        |
|---|--------------------------|
| Component Database OpenWire Tools Window Help   | 💽 🔁 🐴 🦞                  |
| Standard   Sianal Lab   Audio Lab   Video Lab   Vision Lab   Timina Lab   Additional   Win32   System   Data Access | Data Controls   dbExpres |
|   |                          |

From the tab select and drop on the form the following component:



Change the Button1.Caption to "Process".

Arrange the form to look something like this, and select the VLWarp1 component:

| 🅻 Form1 |       |
|---------|-------|
| F       |       |
|         |       |
|         |       |
|         |       |
|         | ····· |
|         | ····· |
|         |       |
|         |       |
| Buttoni |       |

In the Object Inspector set the component properties to match the following:

| Object Inspector 🛛 🛛 |                |   |  |
|----------------------|----------------|---|--|
| VLWarp1              | TVLWarp 💽      | ] |  |
| Properties Eve       | ints           |   |  |
| InverseTransfo       | False 🔥        |   |  |
| □ LeftBottomOffs     | (TVLOffset)    | - |  |
| CX                   | 0              |   |  |
| CY                   | -6             |   |  |
| ⊟LeftTopOffset       | (TVLOffset)    |   |  |
| CX                   | 30             |   |  |
| CY                   | 10             |   |  |
| Name                 | VLWarp1        |   |  |
| OutputPin            | (Disconnected) |   |  |
| RightBottomOfl       | (TVLOffset)    |   |  |
| CX                   | -10            |   |  |
| CY                   | -30            |   |  |
| RightTopOffsel       | (TVLOffset)    |   |  |
| CX I                 | -60            |   |  |
| CY                   | 0              |   |  |
| SmoothEdge           | False          |   |  |
| The                  | 0              |   |  |

### Select the Image1 component on the form:

| 🅻 Form1                               |       |
|---------------------------------------|-------|
| • • • • • • • • • • • • • • • • • • • |       |
| :   : : : : : : : : : :               |       |
|                                       |       |
|                                       |       |
| •                                     |       |
|                                       |       |
|                                       |       |
|                                       | ····· |
|                                       |       |
| : Button1                             |       |

In the Object Inspector select the Picture property and click the 🛄 button.

| Object Inspector 🛛 🛛 🛛 🛛 |             |  |
|--------------------------|-------------|--|
| lmage1                   | TImage 🔽    |  |
| Properties               | Events      |  |
| Name                     | Image1 🔥    |  |
| ParentSho                | wHir True   |  |
| Picture                  | (None) ···· |  |
| PopupMer                 | าน          |  |
| Proportion               | -I Eslas    |  |

### In the Picture Editor click the "Load..." button.

| Picture Editor |                |
|----------------|----------------|
| (None)         | Cancel<br>Help |
| Load Save      | Clear          |

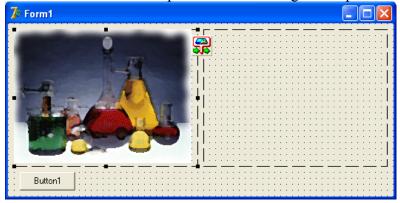
In the file dialog select a bitmap file and click Open.

| Load Picture   |  |   |           |            |  | l l       |   |
|--|--|---|-----------|------------|--|-----------|---|
| Look jn:   | 256Color   |   | • +       | <b>E</b> 💣 | <b>.</b>                               | (240x180) | Q |
| My Recent<br>Documents<br>Desktop<br>My Documents<br>My Computer | chemical.bmp<br>factory.bmp<br>finance.bmp<br>handshak.bmp<br>shipping.bmp |   |           |            |  |           |   |
| My Network<br>Places   | File <u>n</u> ame:<br>Files of <u>type</u> :                               | chemical.bmp<br>All (*.jpg;*.jpeg;*.bmp;*.ico;*.e | mf;*.wmf) | •          | <u>O</u> pen<br>Cancel<br><u>H</u> elp |           |   |

#### In the Picture Editor click OK.



You should see the bitmap loaded in the Image1 component:



Double click on the Button1 component to create an event handler:



#### If you are using Delphi, in the event handle write the following code:

```
procedure TForm1.Button1Click(Sender: TObject);
begin
VLWarp1.ProcessBitmap(Image1.Picture.Bitmap,
Image2.Picture.Bitmap);
end;
```

If you are using C++ Builder, in the event handle write the following code:

```
void __fastcall TForm1::Button1Click(TObject *Sender)
{
    VLWarp1->ProcessBitmap( Image1->Picture->Bitmap, Image2->Picture-
>Bitmap );
}
```

Compile and run the application.

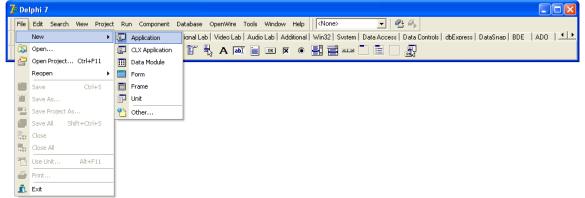
Press the "Process" button. The processed image should appear in Image2:



You just have created a bitmap processing application.

# Creating your own filter

From the Delphi/C++Builder menu select | File | New | Application |.



An empty form will appear on the screen.

| From the "Component Palette" select the "Video Lab" tab:   |                     |
|--|---------------------|
|  | L                   |
| Component Database OpenWire Tools Window Help  | 💽   🔁 🐴 🖫           |
| Standard   Sianal Lab   Audio Lab   Video Lab   Vision Lab   Timina Lab   Additional   Win32   Sustem   Data Access   Data | Controls 🛛 dbExpre: |
| ▖▖▖▖▖▖▖▖▖▖▖▖▖  |                     |

From the tab select and drop on the form the following components:

One TVLAVIPlayer One TVLGenericFilter Two TVLImageDisplay

| 🎖 Form1   |                 |   |
|-----------|-----------------|---|
|           |                 | · |
| <b></b> - |                 |   |
|           |                 |   |
|           |                 |   |
|           |                 | ļ |
| ·         | - , , , , , , , |   |

Arrange the form to look like this one, and select the VLAVIPlayer1 :

In the Object Inspector select the FileName property and click the 🛄 button.

| Object Inspector 🛛 🔀 |                |  |  |
|----------------------|----------------|--|--|
| VLAVIPlayer1         | TVLAVIPlayer 💽 |  |  |
| Properties Events    |                |  |  |
| Enabled              | True 🔥         |  |  |
| EnablePin            | (Disconnected) |  |  |
| FileName             |                |  |  |
| FileNamePin          | (Disconnected) |  |  |
| 1                    | n =            |  |  |

A File selection dialog will appear:

| Open                              |  |                    |   |           | ? 🔀                    |
|-----------------------------------|--|--------------------|---|-----------|------------------------|
| Look <u>i</u> n:                  | C AVIFiles   |                    | • | 🗢 🗈 💣 📰 • |                        |
| My Recent<br>Documents<br>Desktop | <ul> <li>V0201-indeo3.;</li> <li>V0206-indeo3.;</li> <li>V0208-indeo3.;</li> <li>V0208-indeo3.;</li> <li>V0215-indeo3.;</li> </ul> | 2.avi<br>2.avi     |   |           |                        |
| My Documents                      |  |                    |   |           |                        |
| My Computer                       |  |                    |   |           |                        |
|                                   |  |                    |   |           |                        |
| My Network<br>Places              | File <u>n</u> ame:   | V0206-indeo3.2.avi |   | • [       | <u>O</u> pen<br>Cancel |
|                                   | Files of type:   | AVI files (*.avi)  |   | <u> </u>  | Lancel                 |

Select a file to play and click "Open".

In the Object Inspector select the OutputPin property and click the 🛄 button.

| Object Inspector 🛛 🔀 |                     |  |  |  |
|----------------------|---------------------|--|--|--|
| VLAVIPlayer1         | TVLAVIPlayer 💽      |  |  |  |
| Properties Events    |                     |  |  |  |
| Name                 | VLAVIPlayer1        |  |  |  |
| OutputPin            | (Disconnected) ···· |  |  |  |
| Paused               | False               |  |  |  |
| PausePin             | (Disconnected)      |  |  |  |

In the Pin Editor check the following two pins, then click OK.

| 70   | Connectio    | ns - Source Pin  | : VLAVIPlaye | r1.OutputPin    |                 |
|------|--------------|------------------|--------------|-----------------|-----------------|
| Forr | n : Form1 (l | Current)         |              | •               | <b>(</b> )      |
|      | Sink pin     | Component        | Connected to | Connection Type | OpenWire        |
|      | InputPin     | VLImageDisplay1  |              |                 | openwire        |
|      | InputPin     | VLImageDisplay2  |              |                 | Bestore         |
|      | InputPin     | VLGenericFilter1 |              |                 |                 |
|      |              |                  |              |                 | 🏻 🍋 Link to all |

Select the VLGenericFilter1 on the form.



In the Object Inspector select the OutputPin property and click the 🔤 button.

| Object Inspector 🛛 🛛 🔀              |                        |  |  |
|-------------------------------------|------------------------|--|--|
| VLGenericFilter1 TVLGenericFilter 💌 |                        |  |  |
| Properties Events                   |                        |  |  |
| Enabled                             | True                   |  |  |
| EnablePin                           | (Disconnected)         |  |  |
| InputPin                            | VLAVIPlayer1.OutputPin |  |  |
| Name                                | VLGenericFilter1       |  |  |
| OutputPin                           | (Disconnected)         |  |  |
| SynchronizeTy                       | stNone                 |  |  |
| T                                   | 0                      |  |  |

In the Pin Editor check the InputPin of the VLImageDisplay2 and click OK.

| 🕻 с  | onnectio               | ns - Source Pin | : VLGenericFilter1.0   | utputPin           |                |
|------|------------------------|-----------------|------------------------|--------------------|----------------|
| Form | Form : Form1 (Current) |                 |                        |                    |                |
|      | Sink pin               | Component       | Connected to           | Connecti           | OpenWire       |
|      | InputPin               | VLImageDisplay1 | VLAVIPlayer1.OutputPin | <b>Bi-directic</b> | openwire       |
|      | InputPin               | VLImageDisplay2 |                        |                    | Bestore        |
|      |                        |                 |                        |                    |                |
|      |                        |                 |                        |                    | ≽⊸ Link to all |

Double click the VLGenericFilter1 on the form:



If you are using Delphi, write the following event handler:

```
procedure TForm1.VLGenericFilter1ProcessData(Sender: TObject;
    InBuffer: IVLImageBuffer; var OutBuffer: IVLImageBuffer;
    var SendOutputData: Boolean);
var
    X, Y : Integer;
begin
    for X := 0 to OutBuffer.Width - 1 do
       for Y := 0 to OutBuffer.Height - 1 do
```

```
OutBuffer [ X, Y ] := ( Integer(InBuffer[ X, Y ] ) and
$C0C0C0 ) or $151515;
end;
```

#### If you are using C++ Builder, write the following event handler:

```
void __fastcall TForm1::VLGenericFilter1ProcessData(TObject *Sender,
	TVLCVideoBuffer InBuffer, TVLCVideoBuffer &OutBuffer,
	bool &SendOutputData)
{
	for ( int x = 0; x < OutBuffer.GetWidth(); x ++ )
	for ( int y = 0; y < OutBuffer.GetHeight(); y ++ )
	OutBuffer.Pixels[ x ][ y ] = (InBuffer.Pixels[ x ][ y ] &
	0xC0C0C0 ) | 0x151515;
```

Compile and run the application. You should see a result similar to this one:



This example demonstrated how you can access individual bits in the image.

Now we will change the event handler to the following one: **If you are using Delphi:** 

```
procedure TForm1.VLGenericFilter1ProcessData(Sender: TObject;
InBuffer: IVLImageBuffer; var OutBuffer: IVLImageBuffer;
var SendOutputData: Boolean);
var
X, Y : Integer;
begin
for X := 0 to OutBuffer.Width - 1 do
for Y := 0 to OutBuffer.Height - 1 do
begin
OutBuffer.Red[ X, Y ] := InBuffer.Green[ X, Y ];
OutBuffer.Green[ X, Y ] := InBuffer.Blue[ X, Y ];
end;
end;
```

#### If you are using C++ Builder:

```
void __fastcall TForm1::VLGenericFilter1ProcessData(TObject *Sender,
        TVLCVideoBuffer InBuffer, TVLCVideoBuffer &OutBuffer,
        bool &SendOutputData)
{
    for ( int x = 0; x < OutBuffer.GetWidth(); x ++ )
        for ( int y = 0; y < OutBuffer.GetHeight(); y ++ )
            {
            OutBuffer.Red[ x ][ y ] = InBuffer.Green[ x ][ y ];
            OutBuffer.Green[ x ][ y ] = InBuffer.Blue[ x ][ y ];
            }
        }
    }
}
```

Compile and run the application. You should see a result similar to this one:



This example demonstrated how you can access individual colors of a pixel in the image.

Now we will change the event handler to the following one:

#### If you are using Delphi:

```
procedure TForm1.VLGenericFilter1ProcessData(Sender: TObject;
  InBuffer: IVLImageBuffer; var OutBuffer: IVLImageBuffer;
  var SendOutputData: Boolean);
var
 BytePtrIn : PBYTE;
 BytePtrOut : PBYTE;
 Counter : Integer;
begin
 BytePtrIn := InBuffer.Read();
 BytePtrOut := OutBuffer.Write();
 for Counter := 0 to OutBuffer.GetByteSize() - 1 do
   begin
   BytePtrOut^ := ( BytePtrIn^ ) and $C0;
   Inc( BytePtrIn );
    Inc( BytePtrOut );
    end;
end;
```

#### If you are using C++ Builder:

```
void __fastcall TForm1::VLGenericFilter1ProcessData(TObject *Sender,
	TVLCVideoBuffer InBuffer, TVLCVideoBuffer &OutBuffer,
	bool &SendOutputData)
{
	const BYTE *InPtr = InBuffer.Read();
	BYTE *OutPtr = OutBuffer.Write();
	for ( int i = 0; i < OutBuffer.GetByteSize(); i ++ )
	*OutPtr++ = *InPtr++ & 0xC0;
}
```

Compile and run the application. You should see a result similar to this one:



This example demonstrated how you can access the whole frame buffer at once.

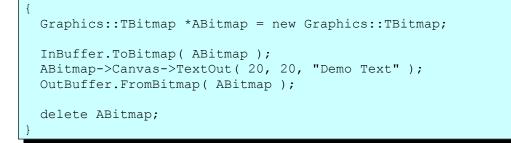
Now we will change the event handler to the following one:

#### If you are using Delphi:

```
procedure TForm1.VLGenericFilter1ProcessData(Sender: TObject;
InBuffer: IVLImageBuffer; var OutBuffer: IVLImageBuffer;
var SendOutputData: Boolean);
var
ABitmap : TBitmap;
begin
ABitmap := TBitmap.Create();
InBuffer.ToBitmap(ABitmap);
ABitmap.Canvas.TextOut(20, 20, 'Demo Text');
OutBuffer.FromBitmap(ABitmap);
ABitmap.Free();
end;
```

#### If you are using C++ Builder:

```
void __fastcall TForm1::VLGenericFilter1ProcessData(TObject *Sender,
    TVLCVideoBuffer InBuffer, TVLCVideoBuffer &OutBuffer,
    bool &SendOutputData)
```



Compile and run the application. You should see a result similar to this one:



This example demonstrated how you can access the whole frame as a bitmap.

By now you should have some good basic understanding how you can process the frames from within your code.

# Using the TSLCRealBuffer in C++ Builder and Visual C++

The C++ Builder version of the library comes with a powerful data buffer class, called TSLCRealBuffer.

The TSLCRealBuffer is capable of performing basic math operations over the data as well as some basic signal processing functions. The data buffer also uses copy on write algorithm improving dramatically the application performance.

The TSLCRealBuffer is an essential part of the SignalLab generators and filters, but it can be used independently in your code.

You have seen already some examples of using TSLCRealBuffer in the previous chapters. Here we will go into a little bit more details about how TSLCRealBuffer can be used.

In order to use TSLCRealBuffer you must include SLCRealBuffer.h directly or indirectly (trough another include file):

#include <SLCRealBuffer.h>

Once the file is included you can declare a buffer: Here is how you can declare a 1024 samples buffer: TSLCRealBuffer Buffer(1024); Version 4.0 and up does not require the usage of data access objects. The data objects are now obsolete and have been removed from the library.

You can obtain the current size of a buffer by calling the GetSize method: Int ASize = Buffer.GetSize(); // Obtains the size of the buffers

You can resize (change the size of) a buffer: Buffer.Resize( 2048 ); // Changes the size to 2048

You can set all of the elements (samples) of the buffer to a value: Buffer.Set( 30 ); // Sets all of the elements to 30.

You can access individual elements (samples) in the buffer:

```
Buffer [ 5 ] = 3.7; // Sets the fifth elment to 3.7
```

```
Double AValue = Buffer [ 5 ]; // Assigns the fifth element to a variable
```

You can obtain read, write or modify pointer to the buffer data:

```
const double *data = Buffer.Read() // Starts reading only
double *data = Buffer.Write()// Starts writing only
double *data = Buffer.Modify()// Starts reading and writing
```

Sometimes you need a very fast way of accessing the buffer items. In this case, you can obtain a direct pointer to the internal data buffer. The buffer is based on copy on write technology for high performance. The mechanism is encapsulated inside the buffer, so when working with individual items you don't have to worry about it. If you want to access the internal buffer for speed however, you will have to specify up front if you are planning to modify the data or just to read it. The TSLCRealBuffer has 3 methods for accessing the data Read(), Write(), and Modify (). Read() will return a constant pointer to the data. You should use this method when you don't intend to modify the data and just need to read it. If you want to create new data from scratch and don't intend to preserve the existing buffer data, use Write(). If you need to modify the data you should use Modify (). Modify () returns a non constant pointer to the data, but often works slower than Read() or Write(). Here are some examples:

```
const double *pcData = Buffer.Read(); // read only data pointer
double Value = *pcData; // OK!
*pcData = 3.5; // Wrong!
double *pData = Buffer.Write(); // generic data pointer
double Value = *pData; // OK!
*pData = 3.5; // OK!
```

You can assign one buffer to another: Buffer1 = Buffer2;

You can do basic buffer arithmetic:

```
TSLCRealBuffer Buffer1( 1024 );
TSLCRealBuffer Buffer2( 1024 );
TSLCRealBuffer Buffer3( 1024 );
Buffer1.Set( 20.5 );
Buffer2.Set( 5 );
Buffer3 = Buffer1 + Buffer2;
Buffer3 = Buffer1 - Buffer2;
Buffer3 = Buffer1 * Buffer2;
Buffer3 = Buffer1 * Buffer2;
```

In this example the elements of the Buffer3 will be result of the operation (+,-,\* or /) between the corresponding elements of Buffer1 and Buffer2.

```
You can add, subtract, multiply or divide by constant:
// Adds 4.5 to each element of the buffer
Buffer1 = Buffer2 + 4.5;
// Subtracts 4.5 to each element of the buffer
Buffer1 = Buffer2 - 4.5;
// Multiplies the elements by 4.5
Buffer1 = Buffer2 * 4.5;
// Divides the elements by 4.5
Buffer1 = Buffer2 / 4.5;
```

You can do "in place" operations as well:

Buffer1 += Buffer2; Buffer1 += 4.5; Buffer1 -= Buffer2; Buffer1 -= 4.5; Buffer1 \*= Buffer2; Buffer1 \*= 4.5; Buffer1 /= Buffer2; Buffer1 /= 4.5;

Those are just some of the basic buffer operations provided by SignalLab.

If you are planning to use some of the more advanced features of TSLCRealBuffer please refer to the online help.

SignalLab also provides TSLCComplexBuffer and TSLCIntegerBuffer. They work similar to the TSLCRealBuffer but are intended to be used with Complex and Integer

data. For more information on TSLCComplexBuffer and TSLCIntegerBuffer please refer to the online help.

# Deploying your 32 bit application with the IPP DLLs

The compiled applications can be deployed to the target system by simply copying the executable. The application will work, however the performance can be improved by also copying the Intel IPP DLLs provided with the library.

The DLLs are under the [install path]\LabPacks\IppDLL\Win32 directory( [install path] is the location where the library was installed).

In 32 bit Windows to deploy IPP, copy the files to the [Windows]\System32 directory on the target system.

In 64 bit Windows to deploy IPP, copy the files to the [Windows]\SysWOW64 directory on the target system.

[Windows] is the Windows directory - usually C:\WINNT or C:\WINDOWS This will improve the performance of your application on the target system.

# Deploying your 64 bit application

The current version of the library requires when deploying 64 bit applications, the Intel IPP DLLs to be deployed as well.

The DLLs are under the [install path]\LabPacks\IppDLL\Win64 directory( [install path] is the location where the library was installed).

To deploy IPP, copy the files to the [Windows]\System32 directory on the target system. [Windows] is the Windows directory - usually C:\WINNT or C:\WINDOWS This will improve the performance of your application on the target system.