

VideoLab 7.5

Quick Start



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www.mitov.com

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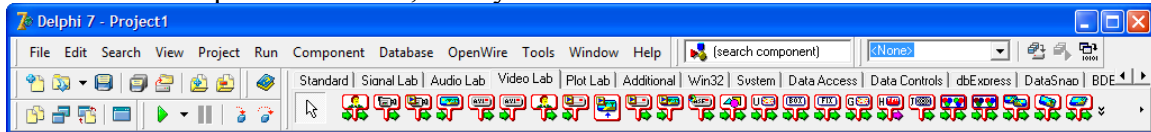
Installation

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

Where is VideoLab?

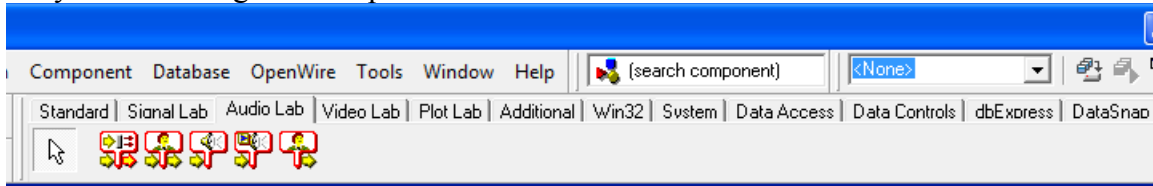
After the installation, start your Delphi or C++ Builder.

Scroll the “Component Palette”, until you see the last four tabs:

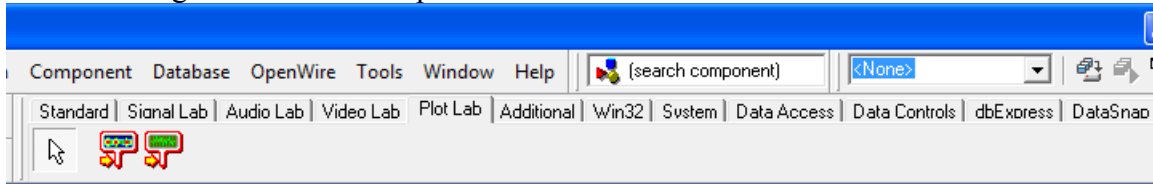


If the installation was successful, they should be named “Video Lab”, “Signal Lab” and “AudioLab”. On the SignalLab palette you will have only a subset of the SignalLab components necessary for processing histogram data. SignalLab is a separated product, and will not be shipped as full with VideoLab.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

Only the following two components of AudioLab will be available:



The following two PlotLab components will be available.



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.

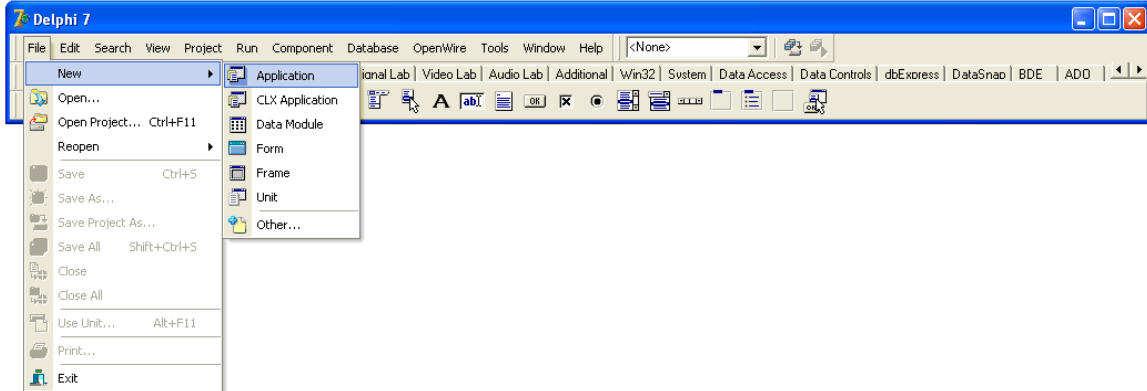
The advantage of the Win32 API components is that they will work on any Windows 95 and up system out of the box, however they are much less capable than the DirectShow components, and should be avoided if not necessary.

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.

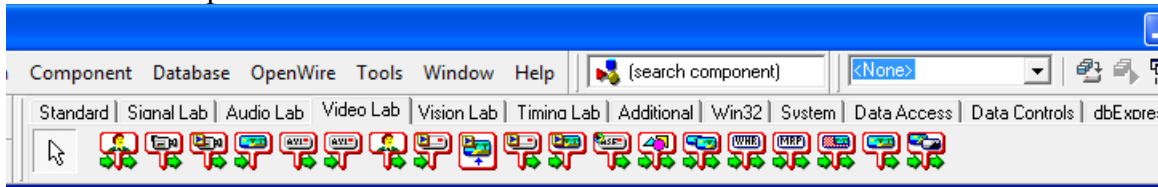
Creating a simple video player using Win32API Components

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:



select and drop on the form the following two components:

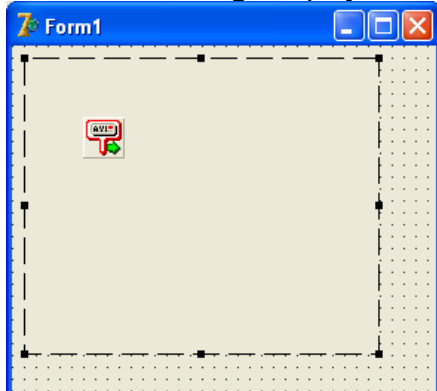


- TVLAVIPlayer

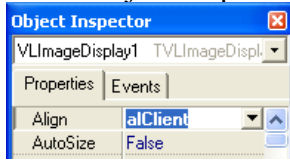


- TVLImageDisplay

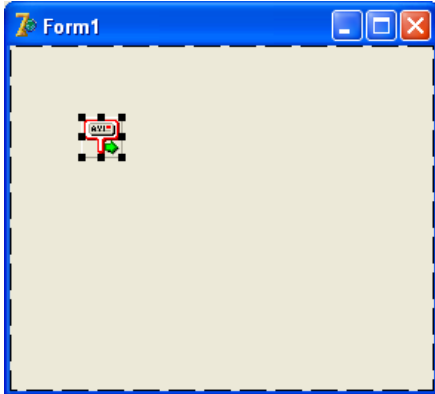
Select the VLIImageDisplay1 component on the form.




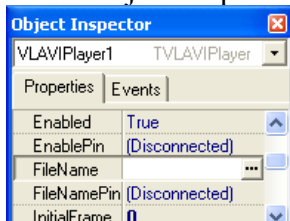
In the Object Inspector set the Align property to alClient:



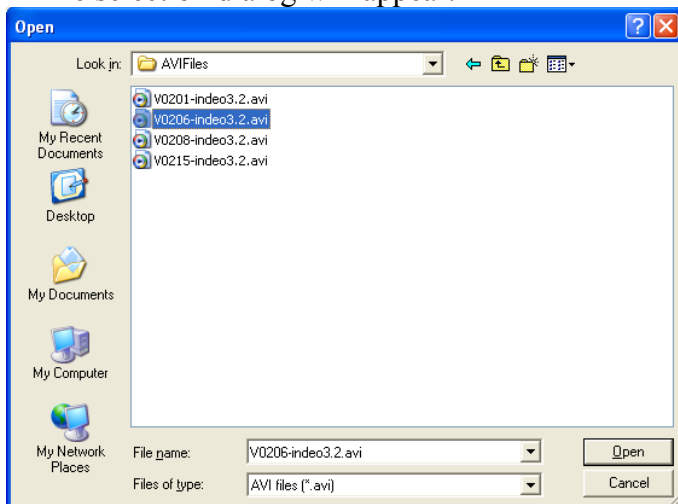
Make the form relatively small.
Select the VLAVIPlayer1.
The form will look similar to this one:




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

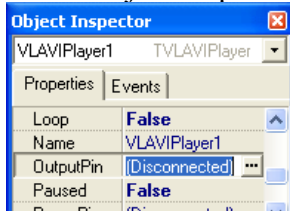


A File selection dialog will appear:

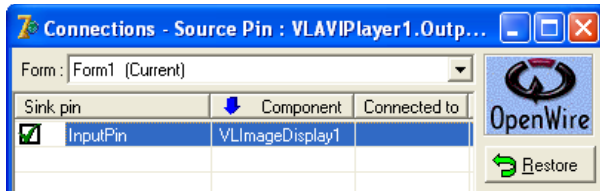


Select a file to play and click “Open”.

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



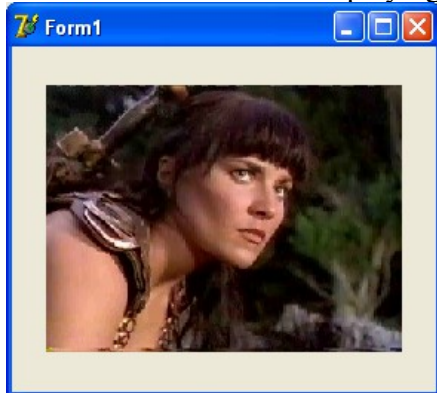
You should see the Pin Editor:



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

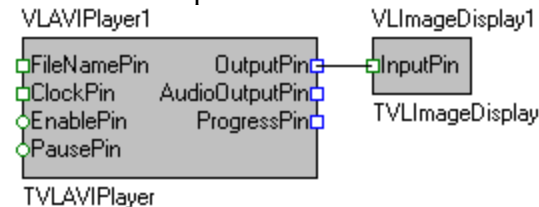
Compile and run the application.

You should see the movie playing:



Congratulations! You have just created your first VideoLab application.

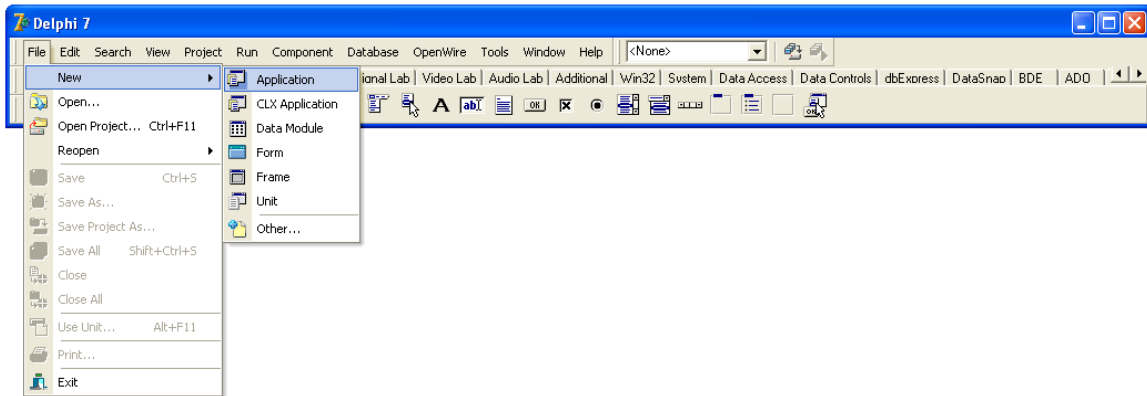
Here are the OpenWire connections in this application:



Creating a simple video player using DirectShow components

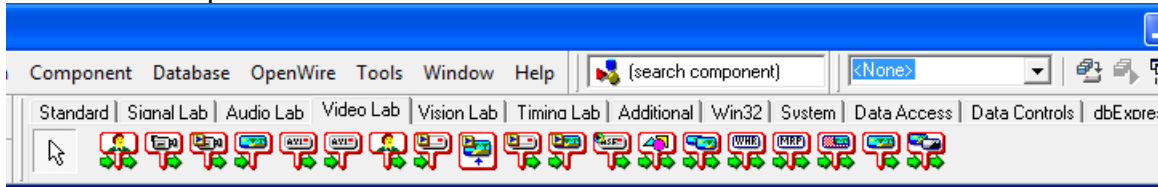
WARNING: In order to run the application in this example you must have DirectX 9.0 or higher installed!

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:



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

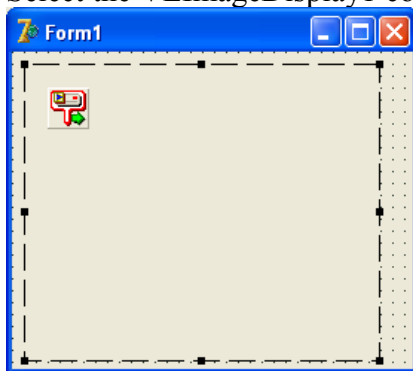


- TVDSVideoPlayer

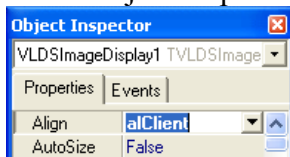


- TVLDSImageDisplay

Select the VLImageDisplay1 component on the form.



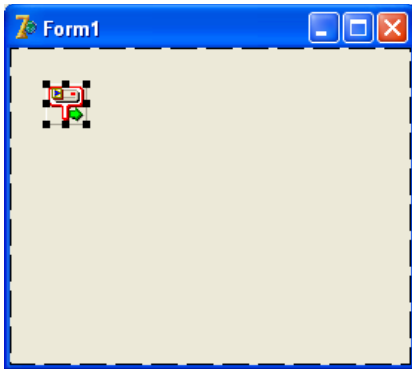
In the Object Inspector set the Align property to alClient:




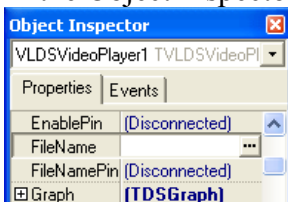
Make the form relatively small.

Select the VLDSVideoPlayer1.

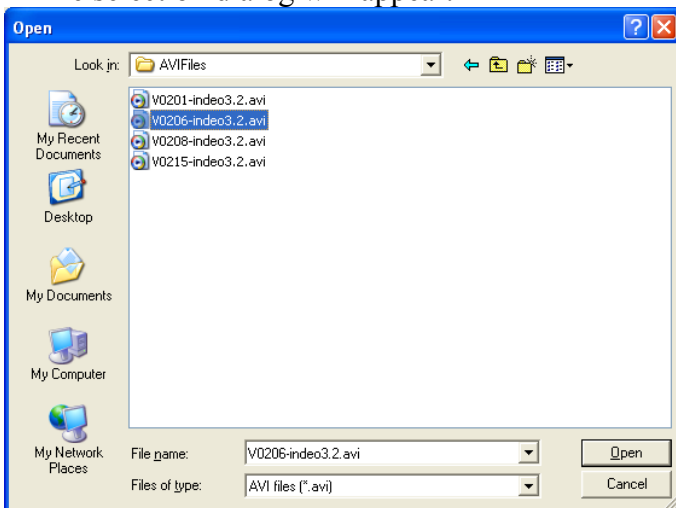
The form will look similar to this one:




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

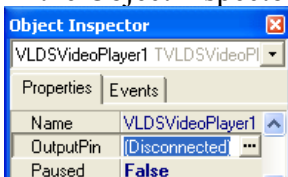


A File selection dialog will appear:

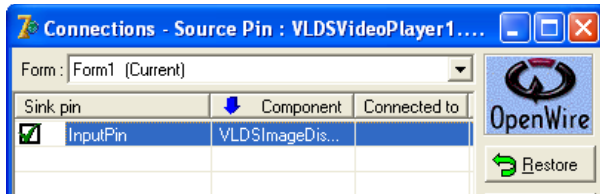


Select a file to play and click "Open".

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



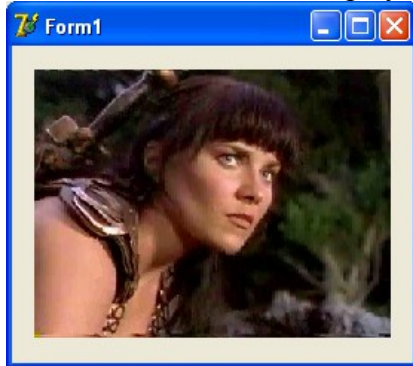
You should see the Pin Editor:



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

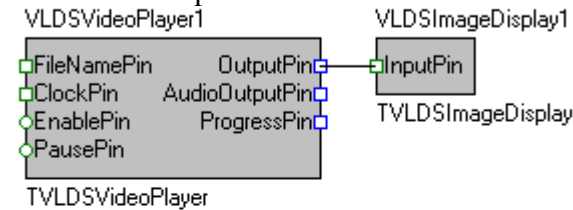
Compile and run the application.

You should see the movie playing:



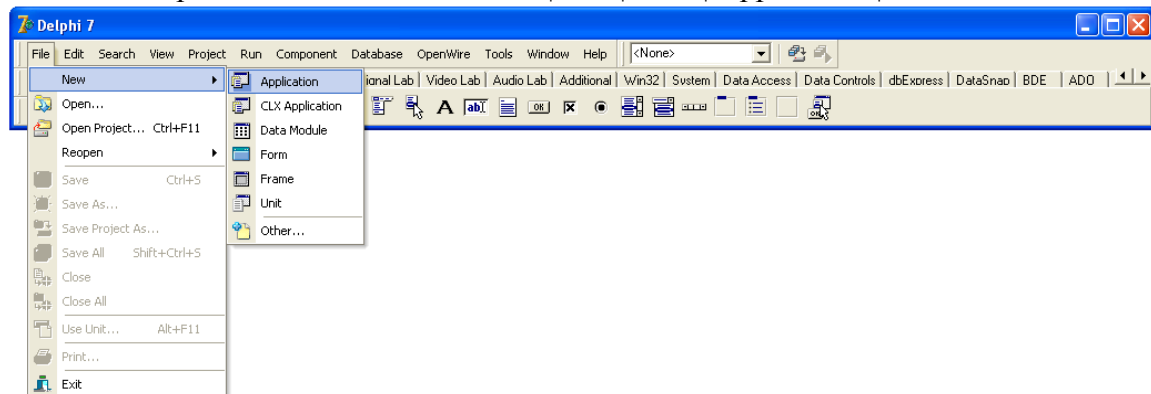
Congratulations! You have just created your first DirectShow VideoLab application.

Here are the OpenWire connections in this application:



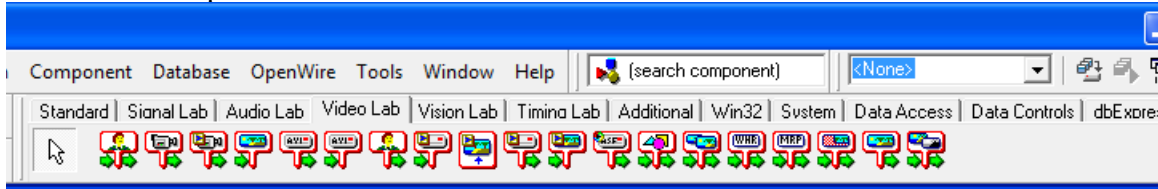
Creating applications using video filters and geometric transformations

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






An empty form will appear on the screen.

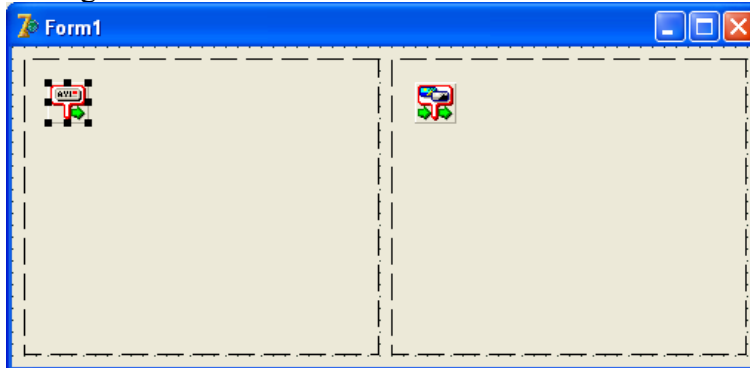
From the “Component Palette” select the “Video Lab” tab:



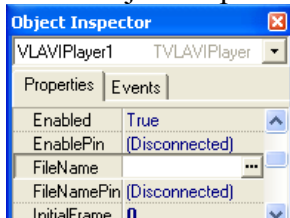
From the tab select and drop on the form the following four components:

- One  - TVLAVIPlayer
- Two  - TVLImageDisplay
- One  - TVLGrayScale

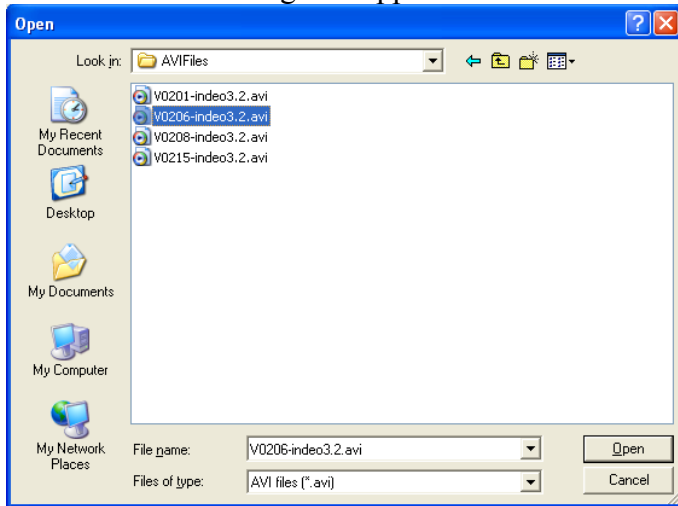
Arrange the form to look like this one and select the VLAVIPlayer1 on the form:




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



A File selection dialog will appear:

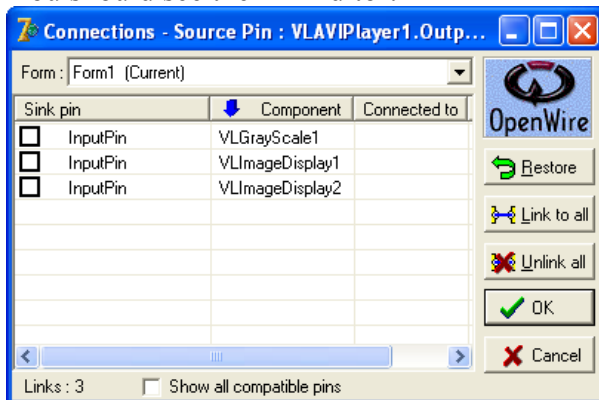


Select a file to play and click “Open”.

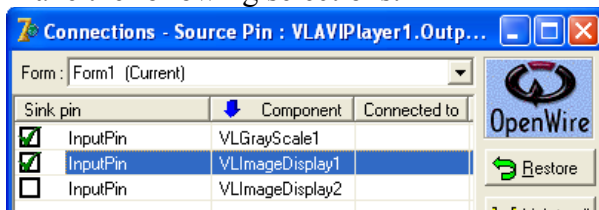
In the Object Inspector select the OutputPin property and click the  button.



You should see the Pin Editor:

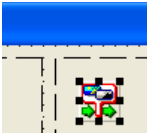


Make the following selections:

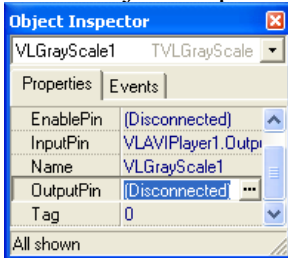


Click OK.

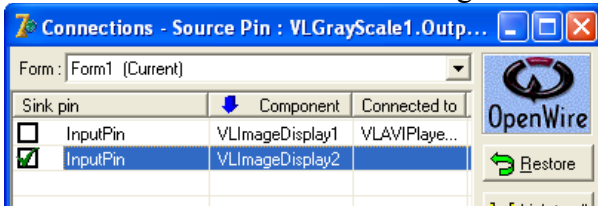
Select the VLGrayScale1 on the form.



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

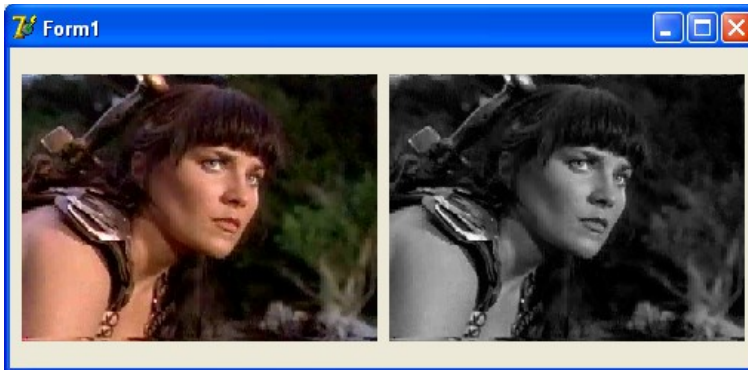


In the Pin Editor make the following selection and click OK:

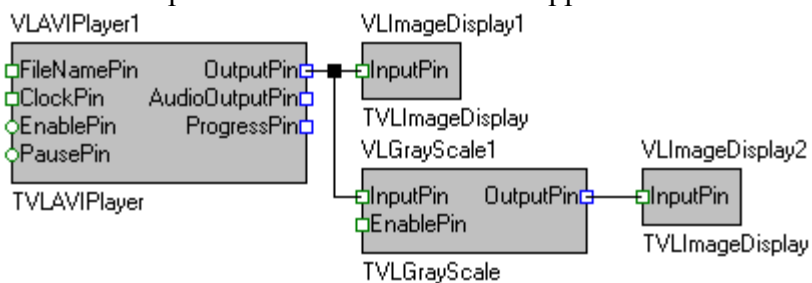


Compile and run the application.

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:

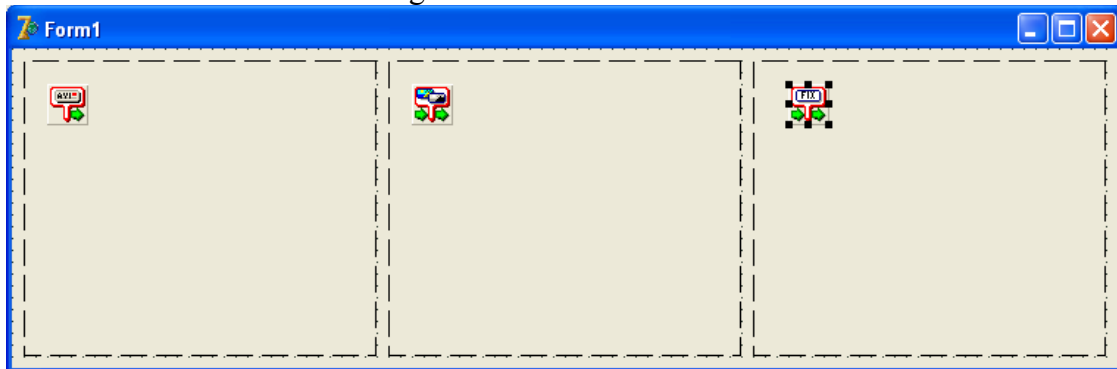


- TVLImageDisplay

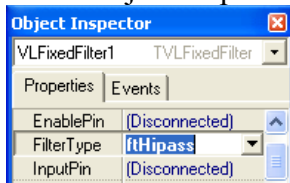


- TVLFixedFilter

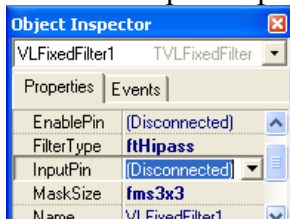
The form should look something like this and select the VLFixedFilter1:



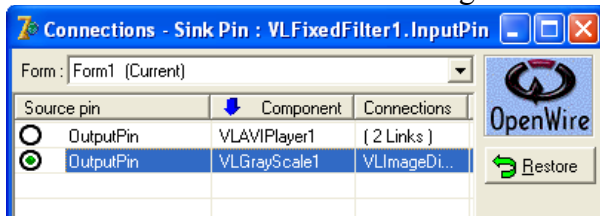
In the Object Inspector set the FilterType property to ftHipass:




Select the InputPin property and double click on it.

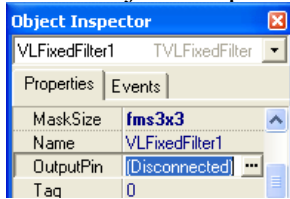


In the Pin Editor make the following selection:

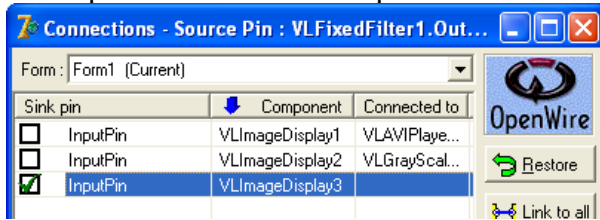


Click OK.

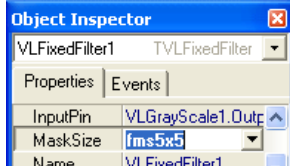
In the Object Inspector select the OutputPin property, and click the  button.



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



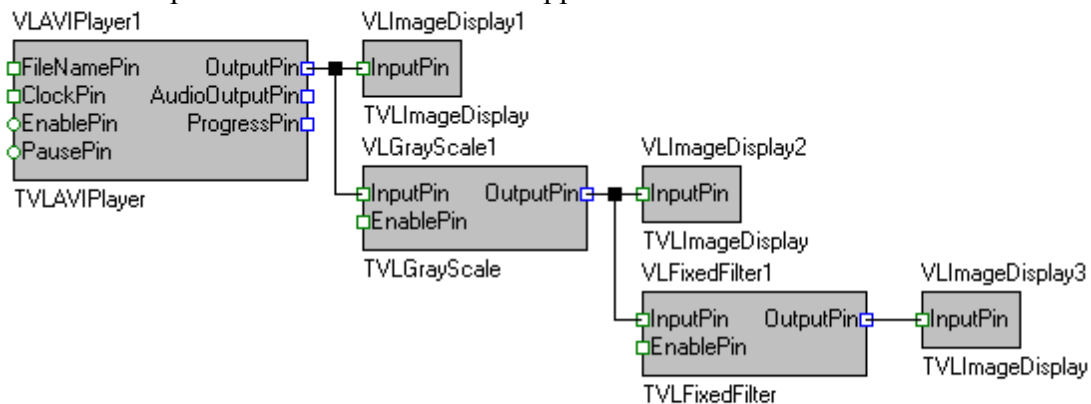
In the Object Inspector set the MaskSize property to fms5x5:



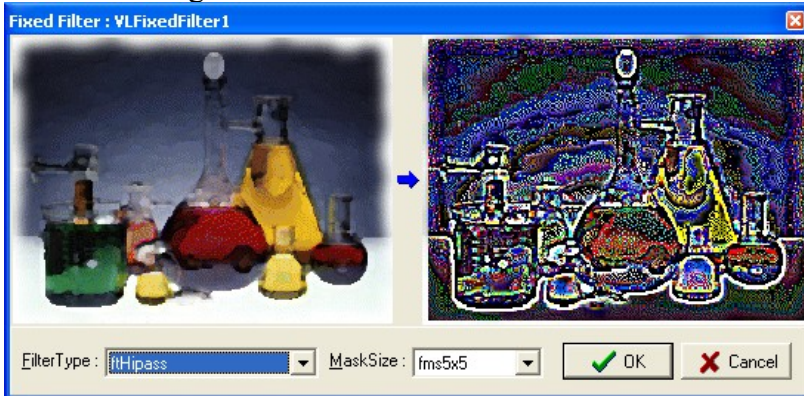
Compile and run the application. You should see a result similar to this one:



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:



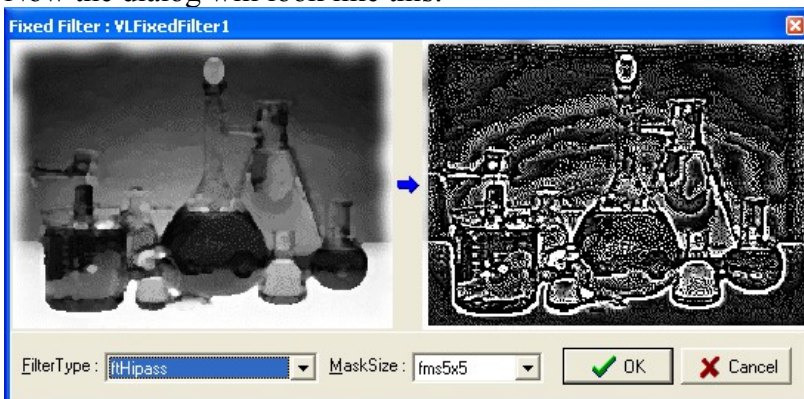
The first picture is a sample image to test the filter. If you want to change the image or to turn it into gray scale, move the mouse cursor over the image and press the left mouse button.

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



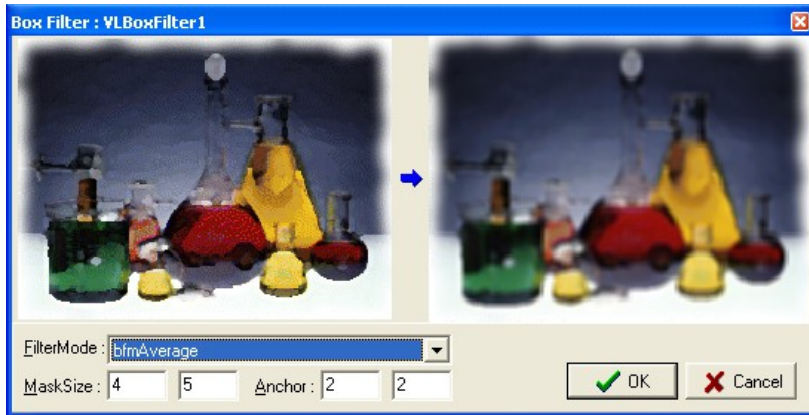
If you would like you can load a different image or a AVI file. Click OK.

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:

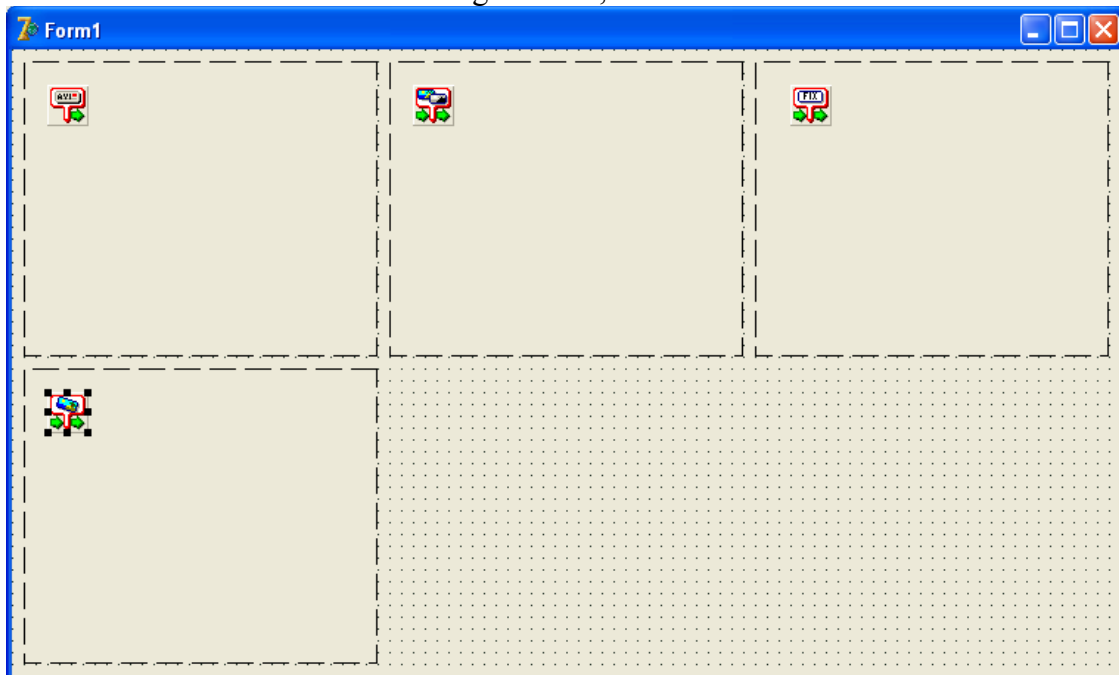


- TVLImageDisplay



- TVLRotate

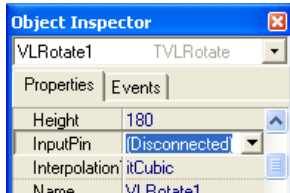
The form now should look something like this, and select the VLRotate1 on the form:



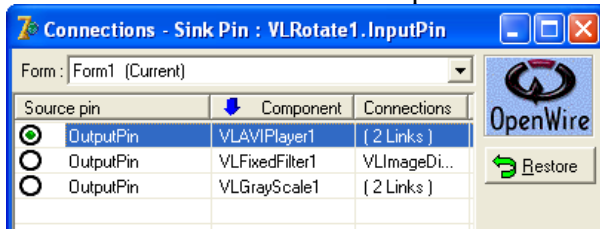
In the Object Inspector set the Angle property to 30:



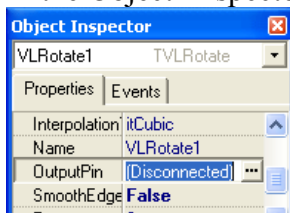
Select and double click on the InputPin property:



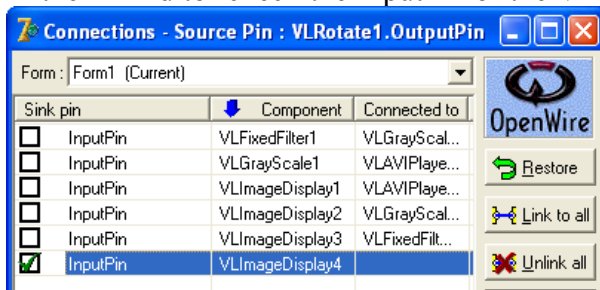
In the Pin Editor Check the OutputPin of the VLAVIPlayer1 and click OK:



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



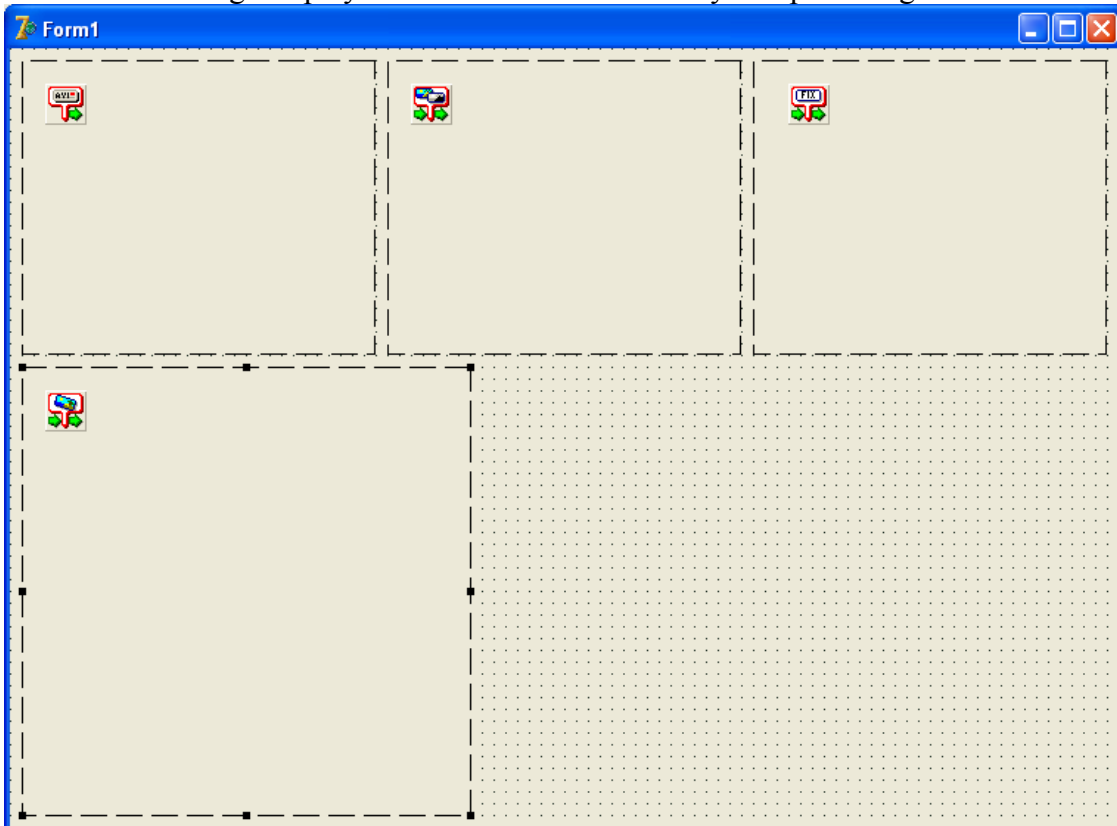
In the Pin Editor check the InputPin of the VLImageDisplay4 and click OK:



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



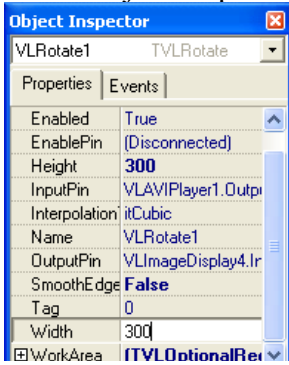
Note that the rotated image needs bigger frame size than the original image.
Stop the application.
Select the VImageDisplay4 and make it at least 300 by 300 pixels big:



Select the VLRotate1 component:

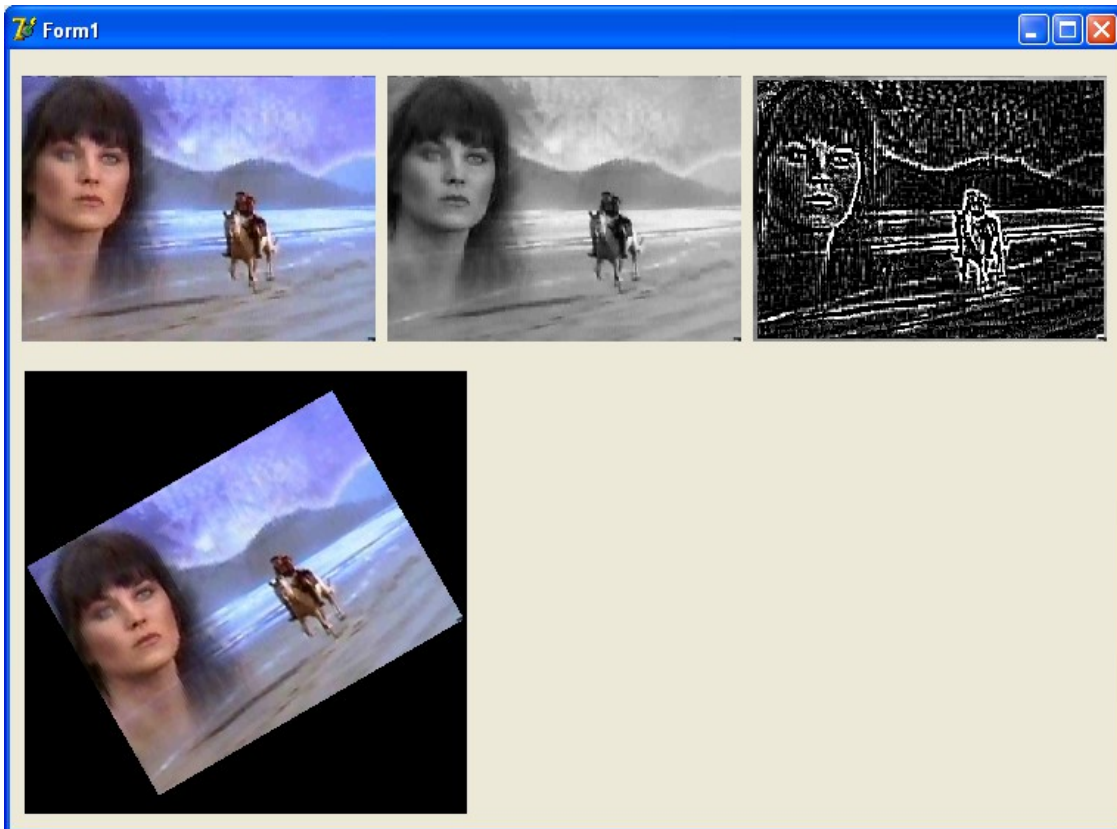


In the Object Inspector change the Width and Height properties to 300:

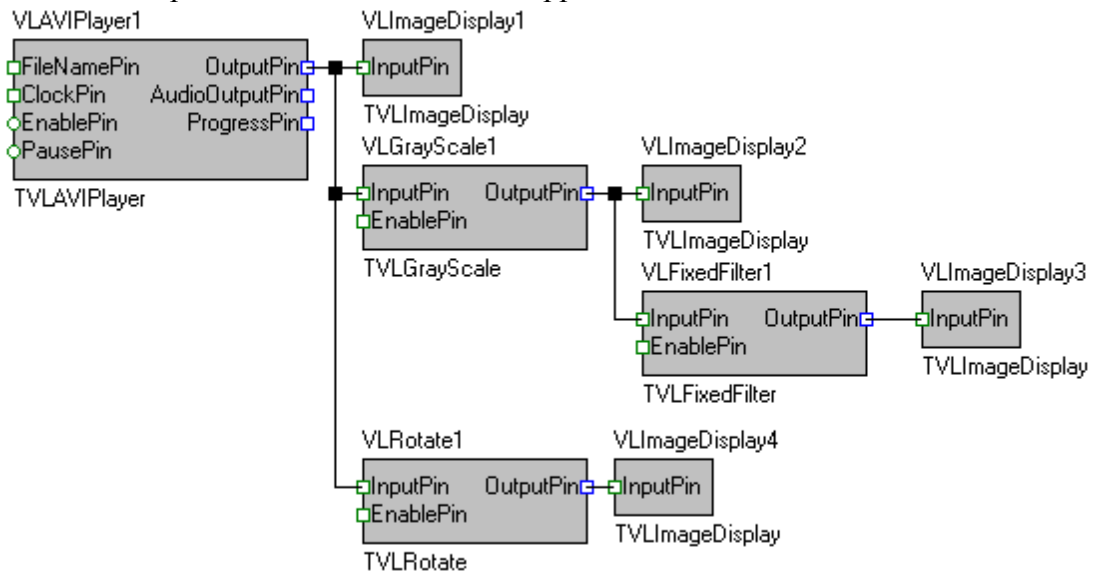


Compile and run the application.

You should see result similar to this one:



Here are the OpenWire connections in the application now:

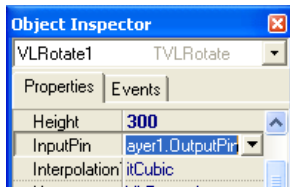


If we want we can connect the VLRotate1 to process the filtered image.

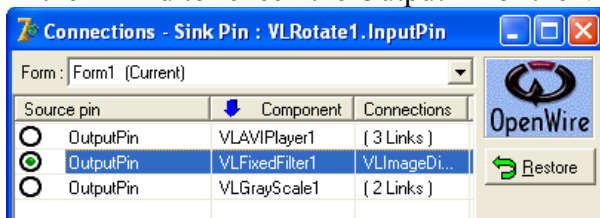
To do so, select the VLRotate1 on the form:



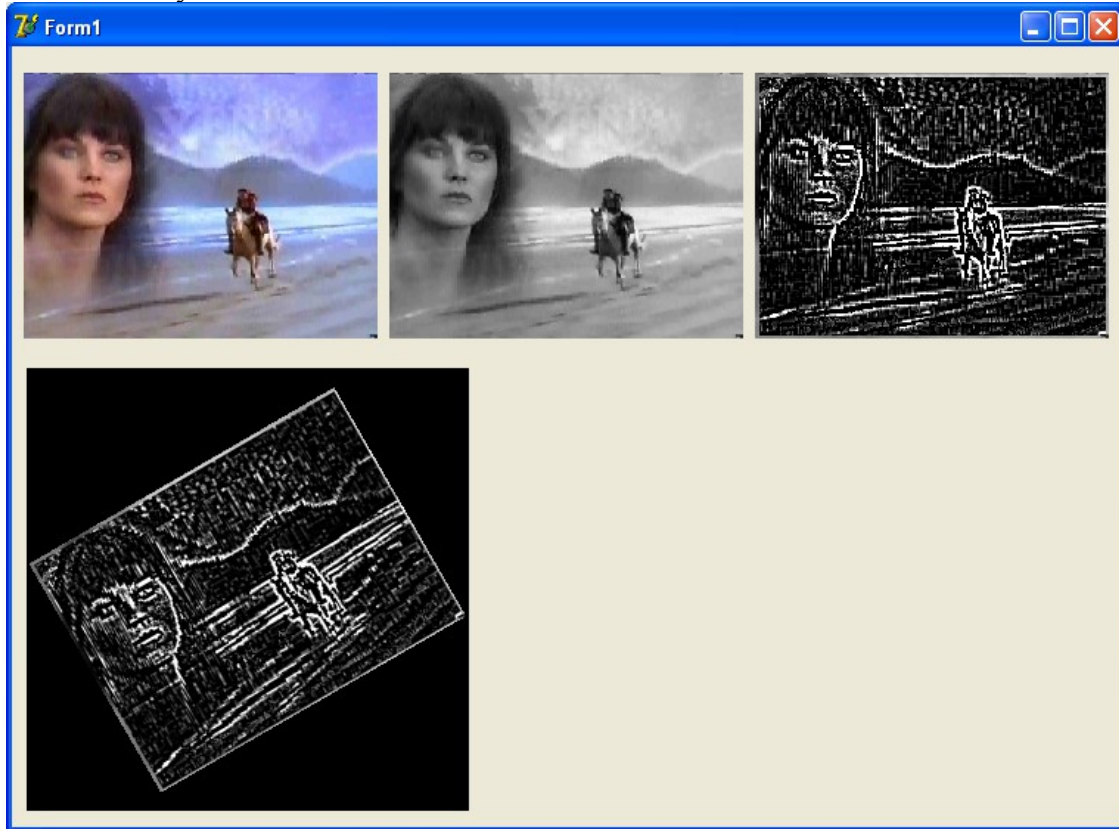
Select and double click on the InputPin property:



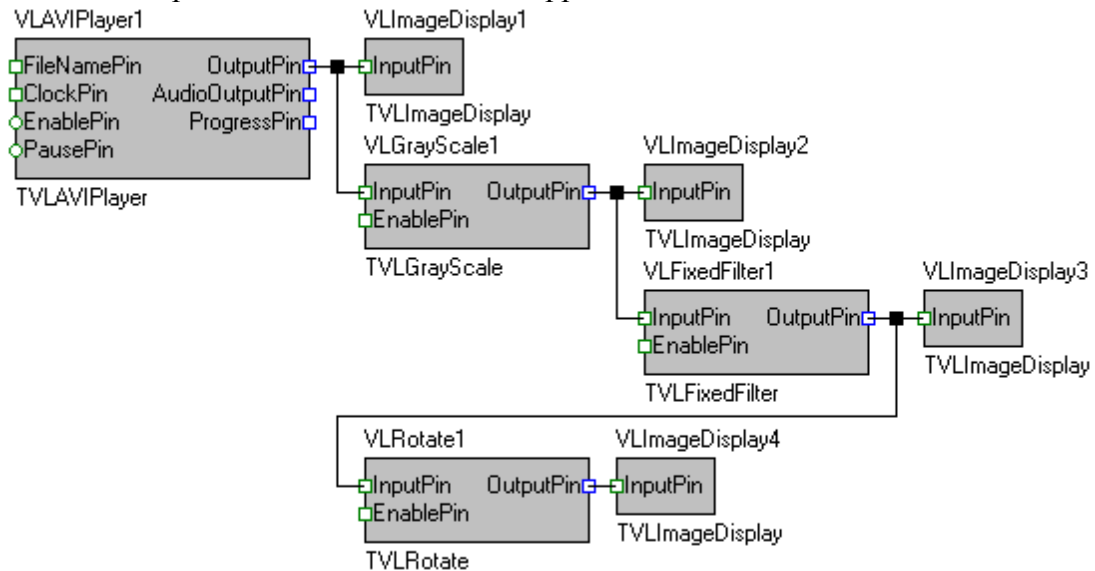
In the Pin Editor check the OutputPin of the VLFixedFilter1 and click OK:



Compile and run.
Here is what you should see:



Here are the OpenWire connections in the application now:

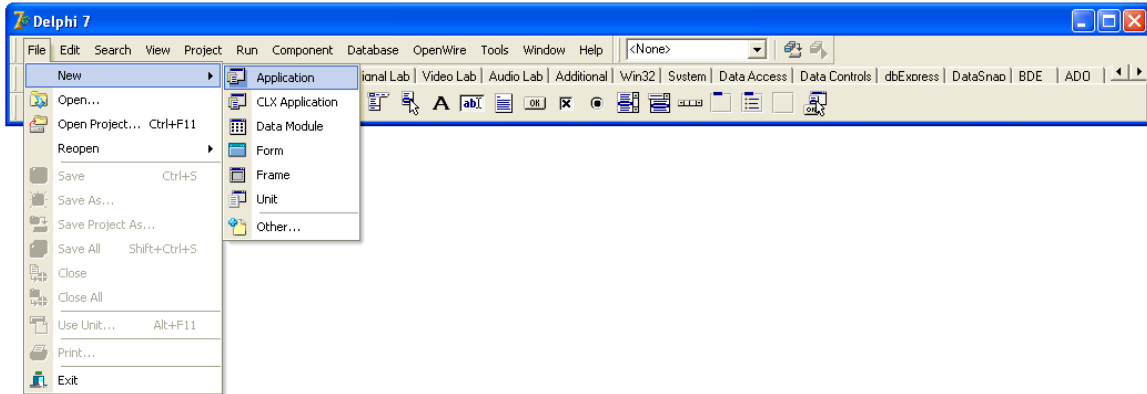


Now you have all the necessary knowledge to build complex video filtering and geometric transformation applications.

Creating a simple video capture application using DirectShow

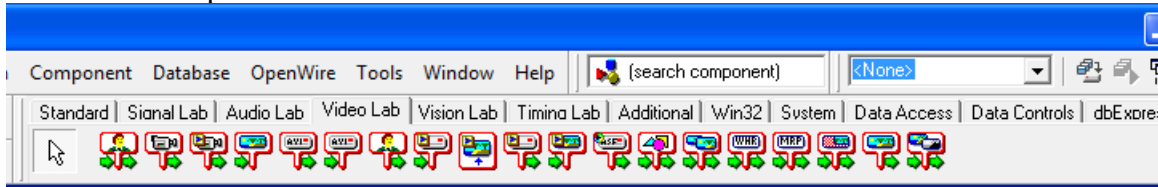
WARNING: In order to run the application in this example you must have DirectX 9.0 or higher installed!

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






An empty form will appear on the screen.

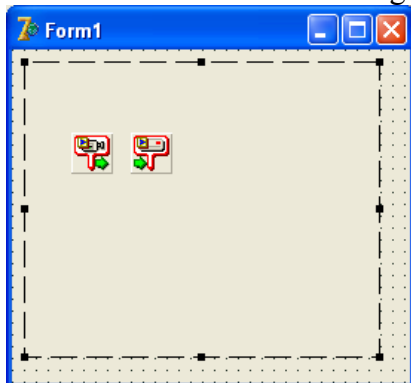
From the “Component Palette” select the “Video Lab” tab:



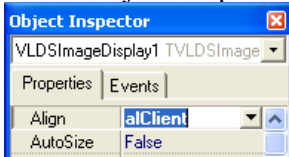
From the tab select and drop on the form the following three components:

- One  - TVLDS Capture
- One  - TVLDS Image Display
- One  - TVLDS Video Logger

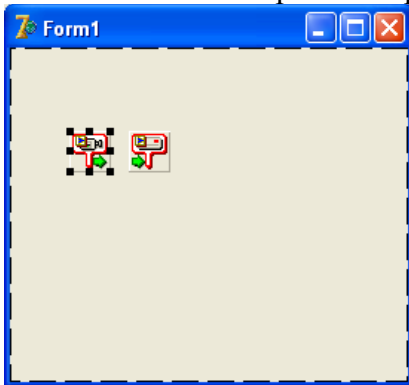
On the form select the TVLDS Image Display component.
Your form will look something like this:




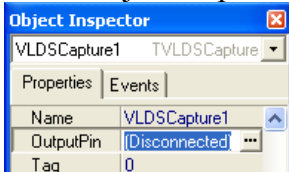
In the Object Inspector set the Align property to alClient:



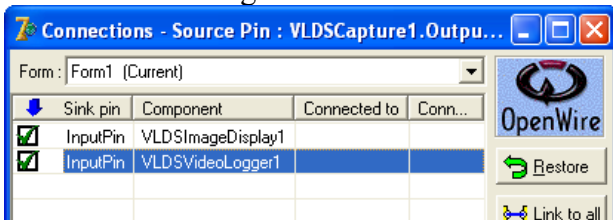
Select the TVLDSCapture component:



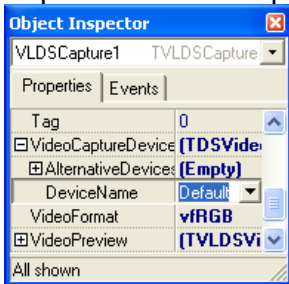
In the Object Inspector select the OutputPin property and click the  button.



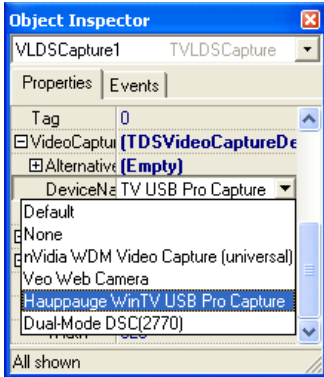
Make the following selection in the Pin Editor and click OK:



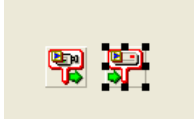
Expand the VideoCaptureDevice property:



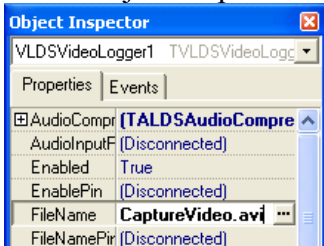
Click on the arrow and select a video capture device from the list:



Select the VLADSVideoLogger1:



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



Compile and run the application.

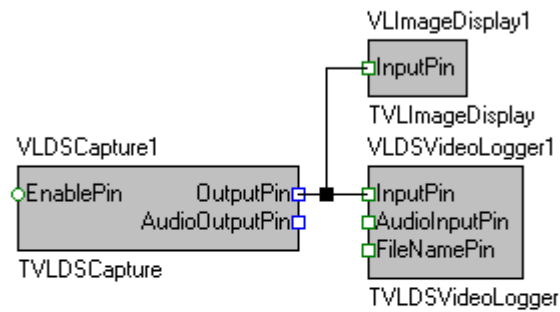
You should see the captured video.

Here is an example of captured video from a TV Tuner:



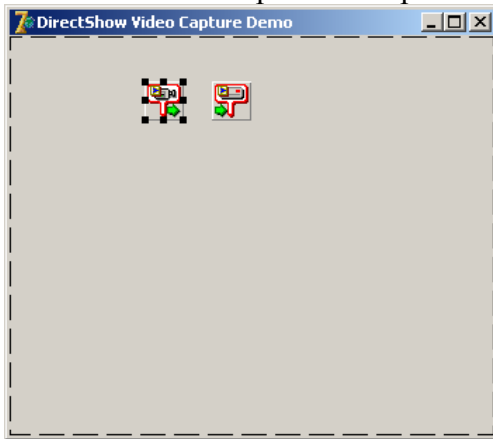
Congratulations! You have created your first DirectShow video capture application with VideoLab.

Here are the OpenWire connections in the application:

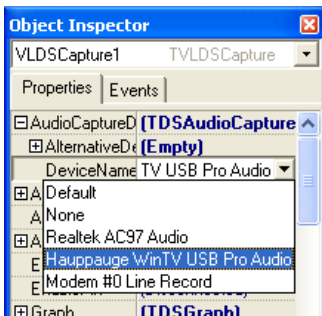


You probably have noticed that the application logs only the video, but not the audio. It would be even better if we can hear the audio as it is captured. We can easily do that. Stop the running application.

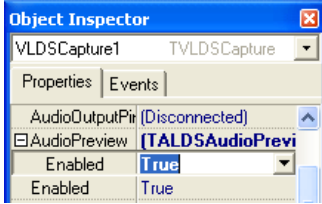
Select the VLDSCapture1 component:



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

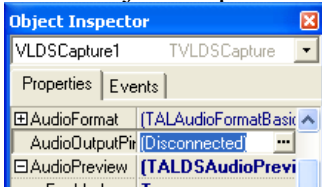


If you want to hear the captured audio, expand the AudioPreview property and set Enabled sub property to True:

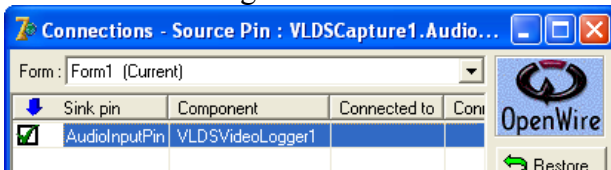


WARNING: Setting the Enable to true if you are capturing from a microphone is not advised, as you may experience a feedback from the speakers!

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

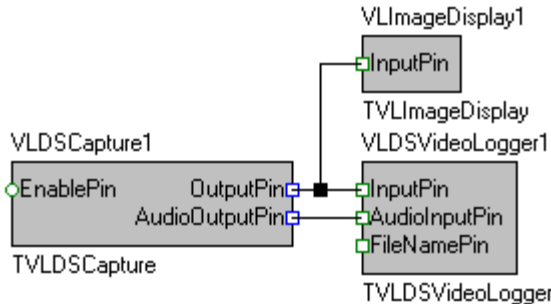


Make the following selection in the Pin Editor and click OK:



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.

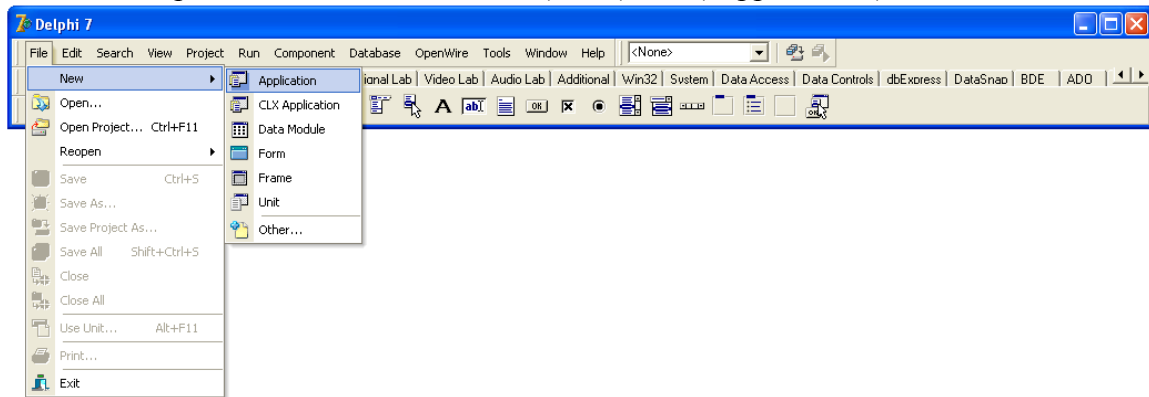
Here are the OpenWire connections in the application:



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

Creating a simple video capture application using Win32API

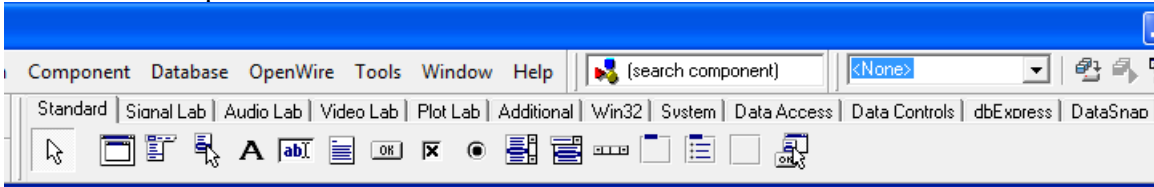
From the Delphi/C++Builder menu select | File | New | Application |.



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:

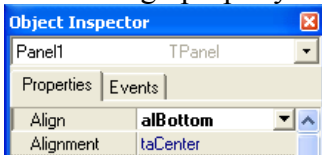


select and drop on the form a TPanel.

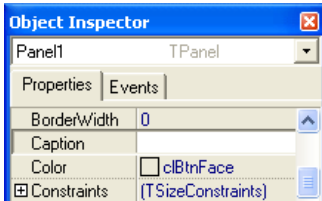


- TPanel

Set the Align property of the Panel1 to alBottom:



Remove the text of the Caption of the Panel1.

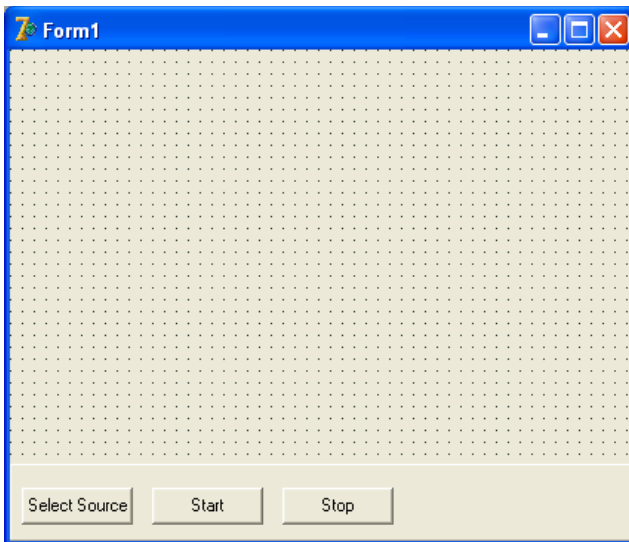


Place 3 TButton components on the TPanel.

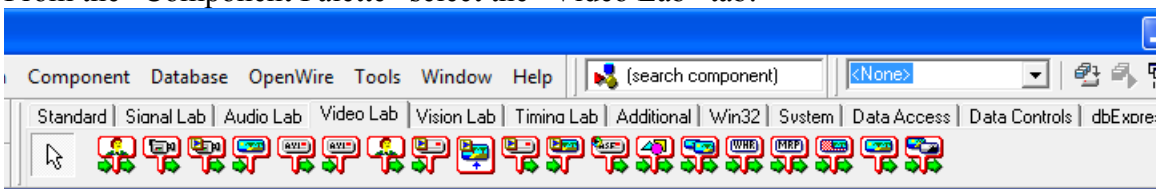


Rename the buttons to “SourceButton”, “StartButton”, and “StopButton”.
Set the button captions to “Select Source”, “Start”, and “Stop”.

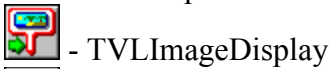
The form should look like this one:



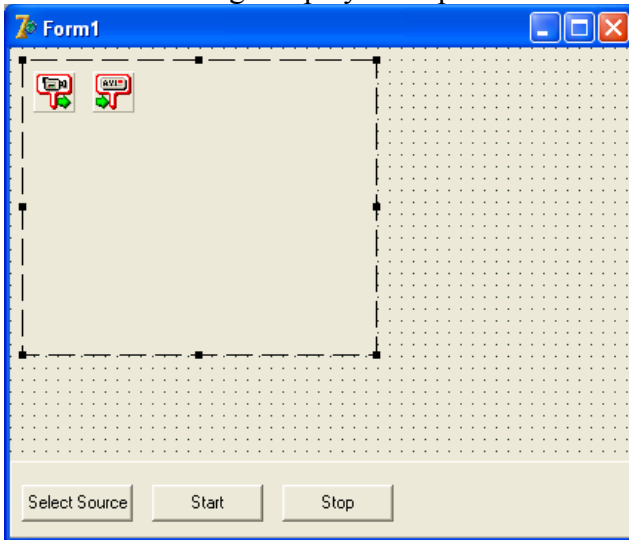
From the “Component Palette” select the “Video Lab” tab:



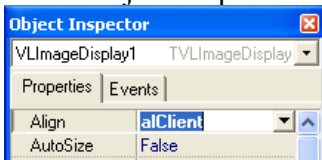
select and drop on the form the following three components:



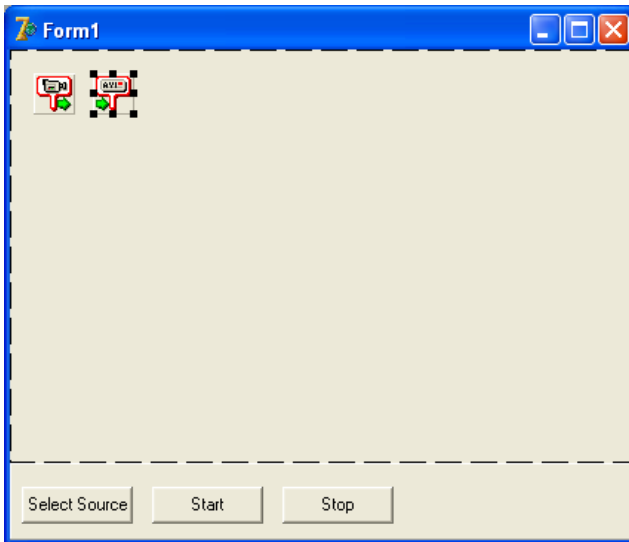
Select the VImageDisplay1 component on the form.



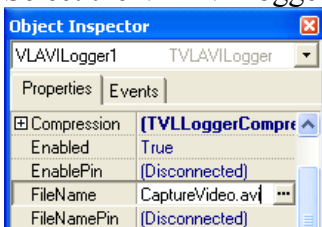
In the Object Inspector set the Align property to alClient:



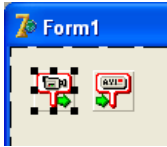
The form should look similar to this one:



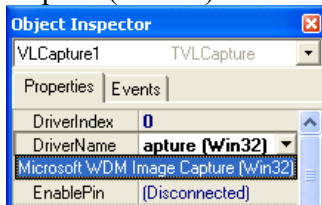
Select the VLAVIDLogger1 and set its "FileName" property to "CaptureVideo.avi" :




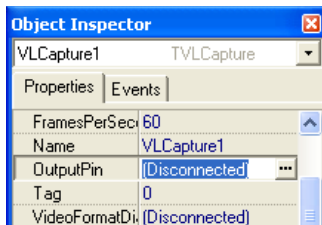
Select the VLCapture1 component on the form.



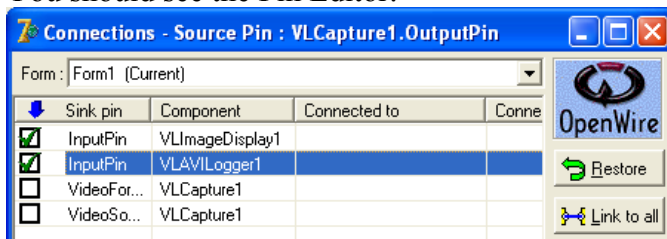
In the Object Inspector set the DriverName property to “Microsoft WDM Image Capture(Win32)”:



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



You should see the Pin Editor:



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 VImageDisplay1 and VLAVIDLogger1.

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:

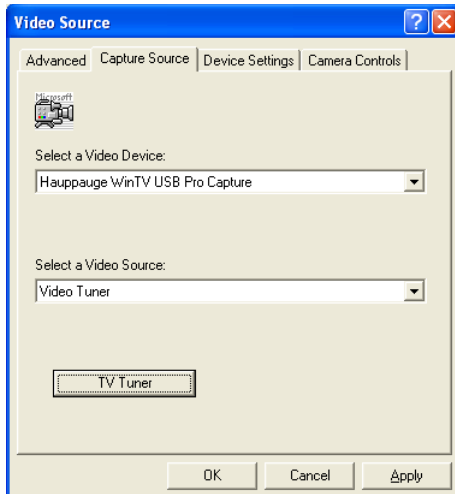
```
void __fastcall TForm1::StartButtonClick(TObject *Sender)
{
    VLCapture1->Enabled = true;
}
```

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

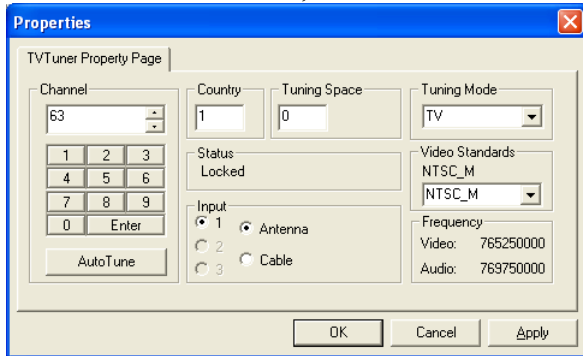
```
void __fastcall TForm1::StopButtonClick(TObject *Sender)
{
    VLCapture1->Enabled = false;
}
```

Compile and run the application.

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



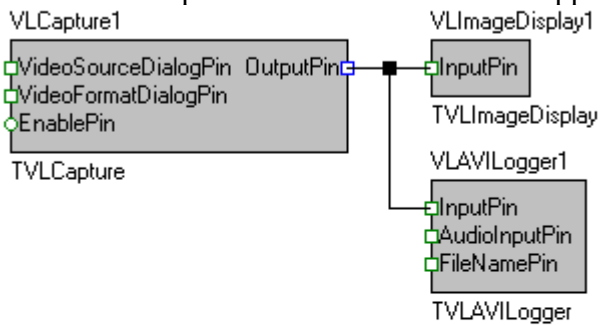
In this dialog you can select your video source, such as TV Tuner or video camera, as well as the TV channel, etc:



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:

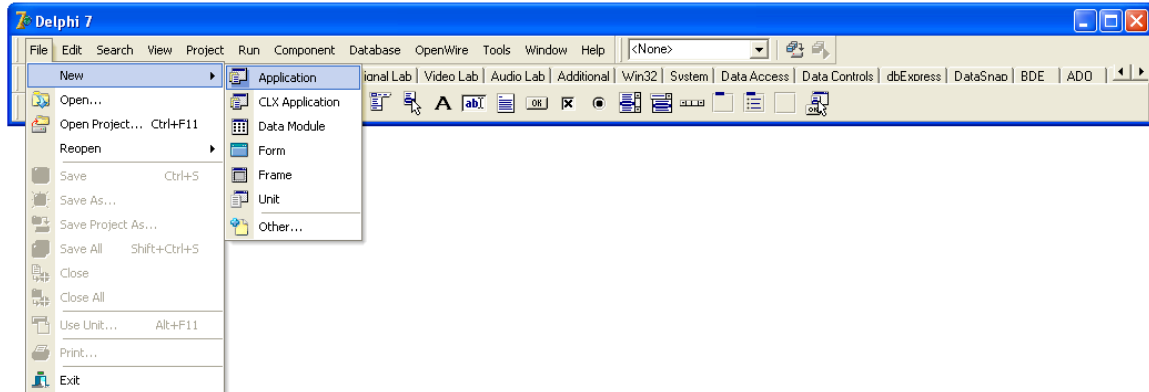


Congratulations! You have created your first video capture application with VideoLab. Here are the OpenWire connections in the application:



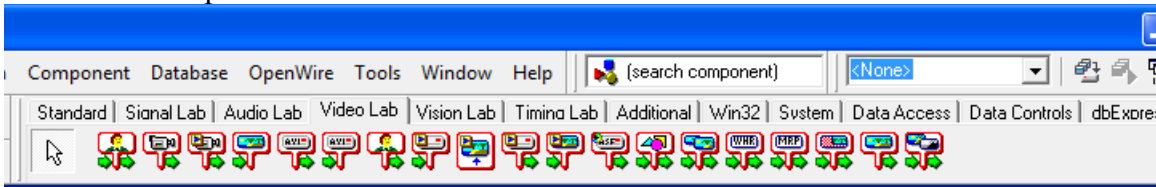
Capturing a frame into a TBitmap

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



An empty form will appear on the screen.

From the “Component Palette” select the “Video Lab” tab:



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

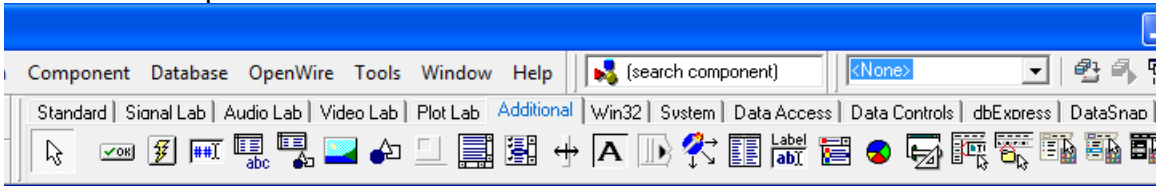


- TVLAVIPlayer

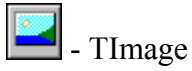


- TVLGenericFilter

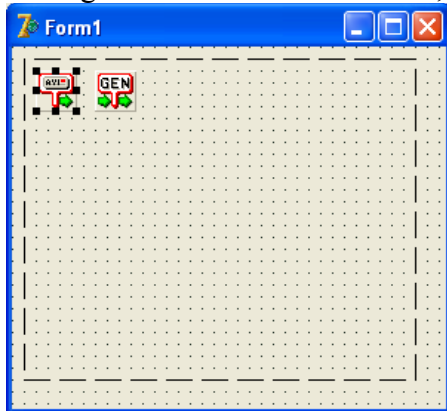
From the “Component Palette” select the “Additional” tab:



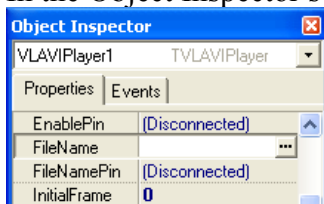
select and drop on the form a TImage:



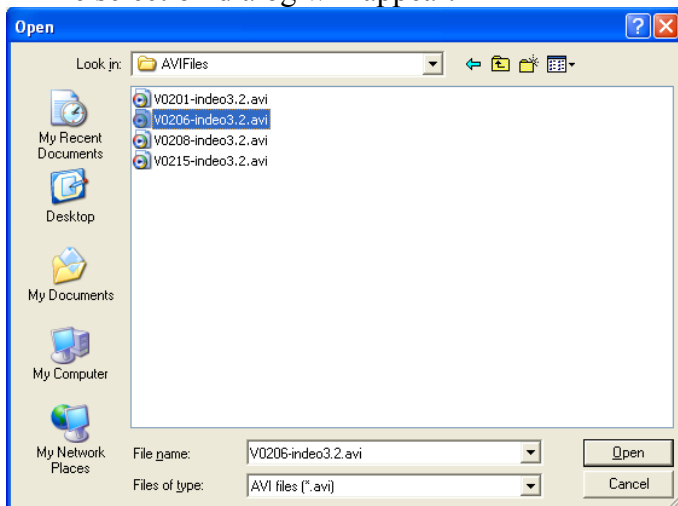
Arrange the form to look like this, and select the VLAVIPlayer1 on the form:




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



A File selection dialog will appear:

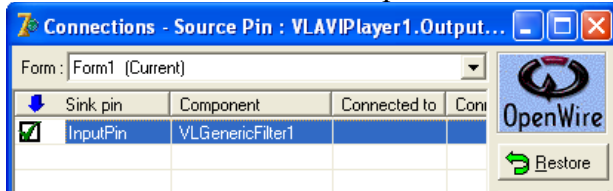


Select a file to play and click “Open”.

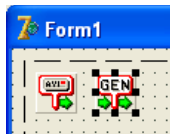
In the Object Inspector select the OutputPin property and click the  button.



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



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 );

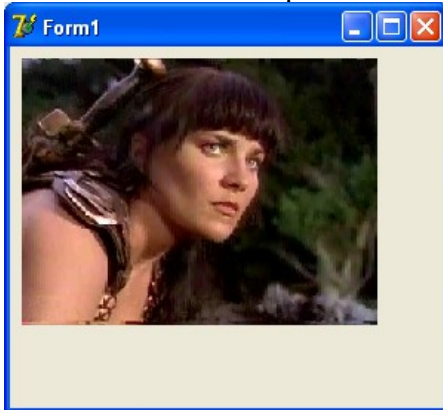
  // Update Screen.
  Image1.Refresh();
end;
```

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:

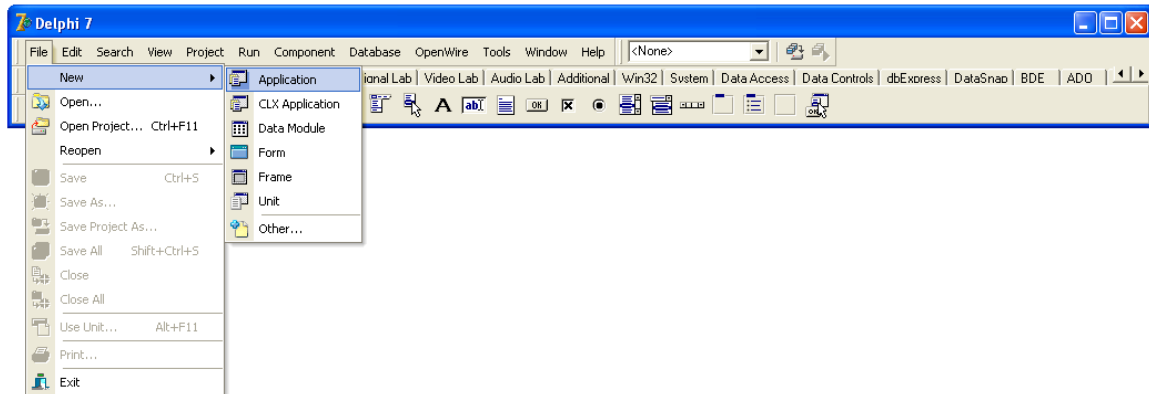


You have just learned how to capture bitmaps from the video stream.

Displaying a video histogram into a Scope component

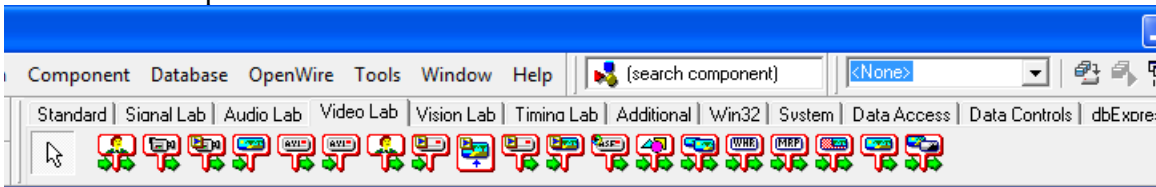
VideoLab includes a simple but useful Scope component. The component can be used to display video histogram data. The next chapter will show how you can use other Plot components to achieve the same.

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



An empty form will appear on the screen.

From the “Component Palette” select the “Video Lab” tab:



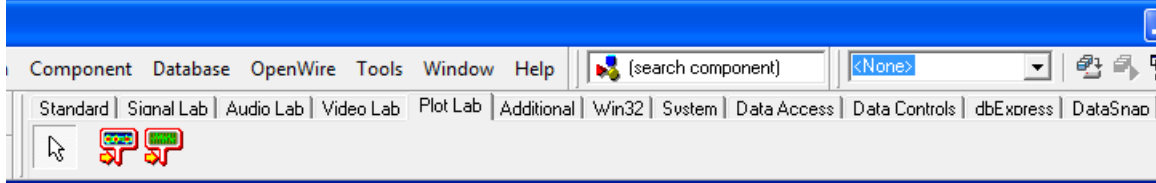
From the tab select and drop on the form the following components:

One  - TVLAVIPlayer

One  - TVLImageDisplay

One  - TVLHistogram

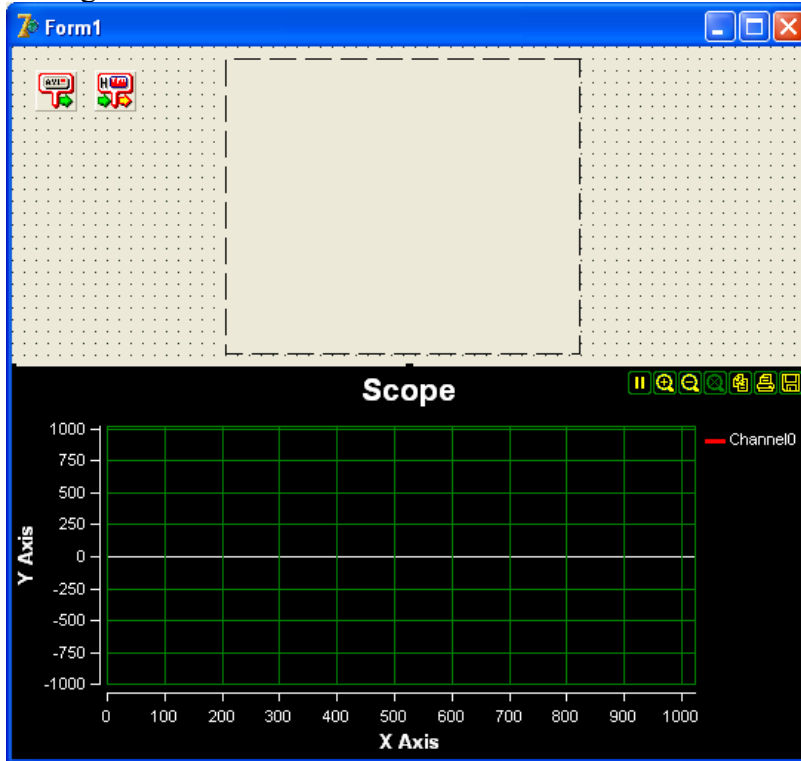
From the “Component Palette” select the “Plot Lab” tab:



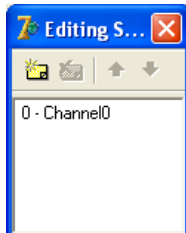
select and drop on the form the following component:

One  - TSLScope

Arrange the form to look like this:



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



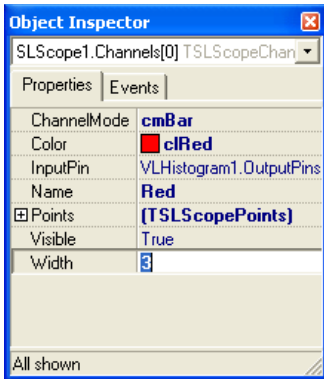
Click twice on the “Add New”  button to create two more channels:



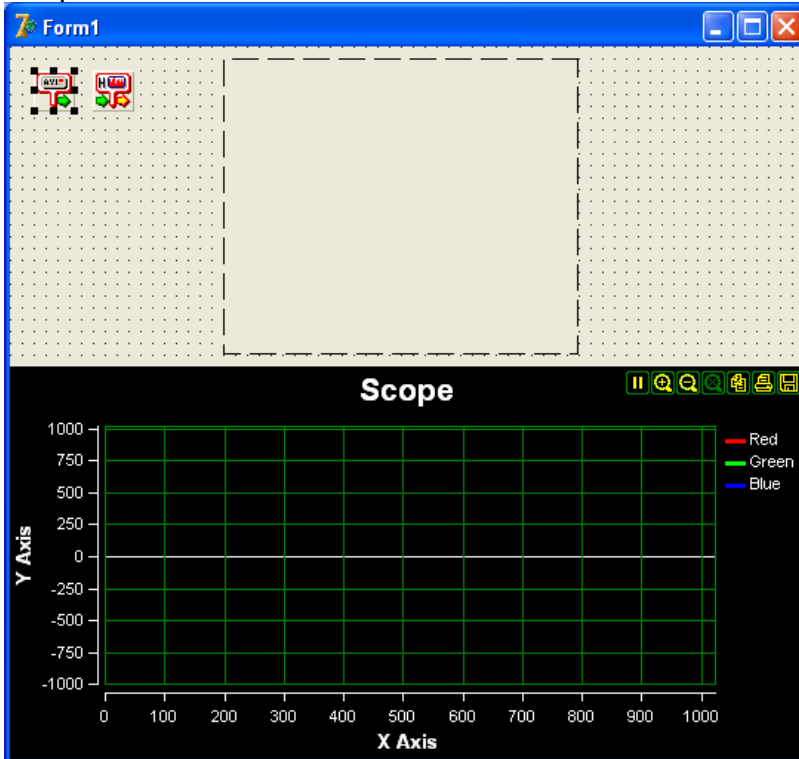
Rename the Channels to Red, Green and Blue:



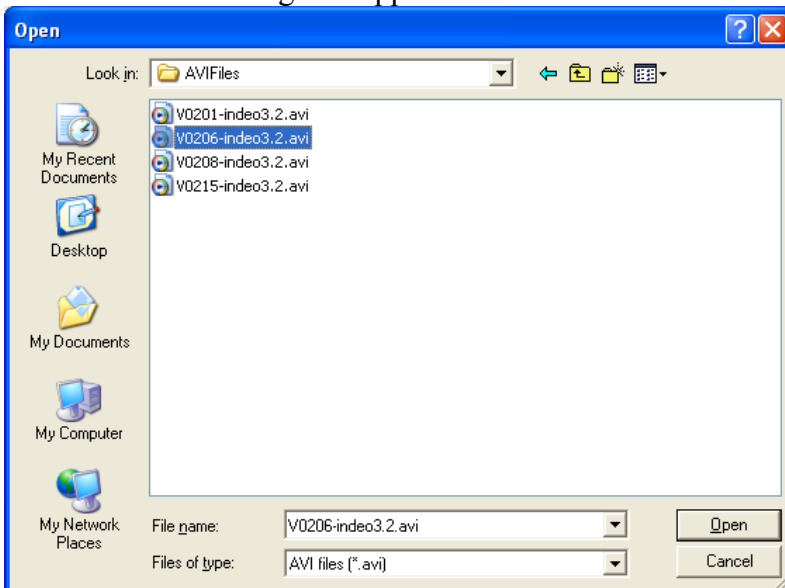
For each channel set the ChannelMode property to cmBar, and the Width to 3:




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



A File selection dialog will appear:

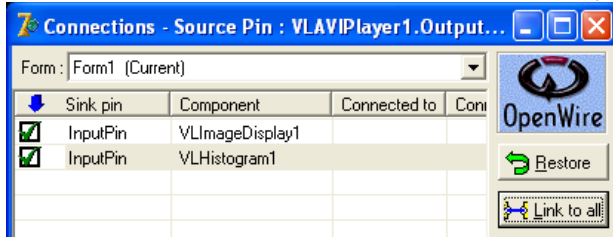


Select a file to play and click “Open”.

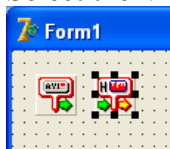
In the Object Inspector select the OutputPin property and click the  button.




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



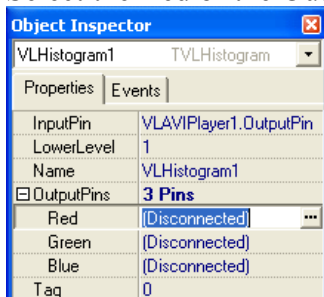
Select the VLHistogram1 component on the form:



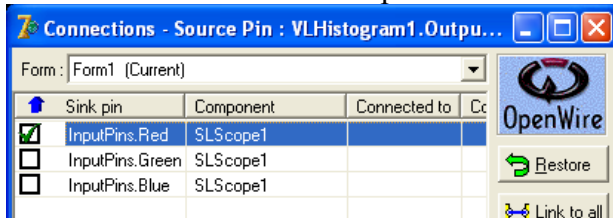
In the Object Inspector click on the  button to expand the OutputPins:



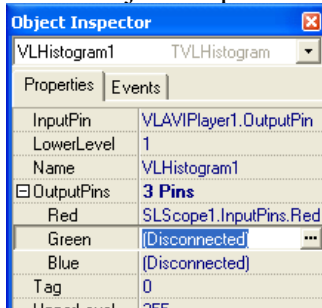
Select the Red of the OutputPins and click on the  button:



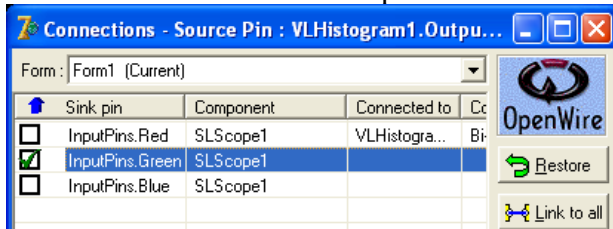
In the Pin Editor select the InputPins.Red of the SLScope1 and click OK:



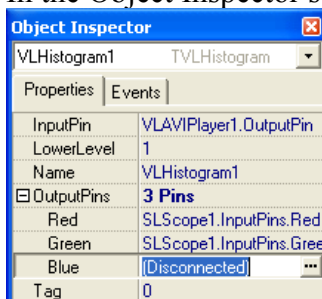
In the Object Inspector select the Green of the OutputPins and click on the button:



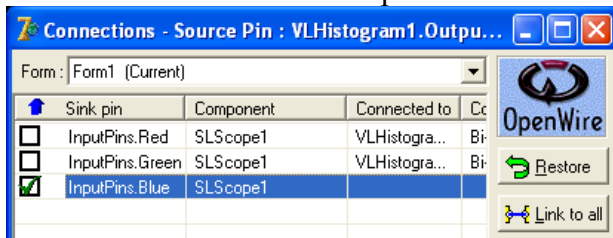
In the Pin Editor select the InputPins.Green of the SLScope1 and click OK:



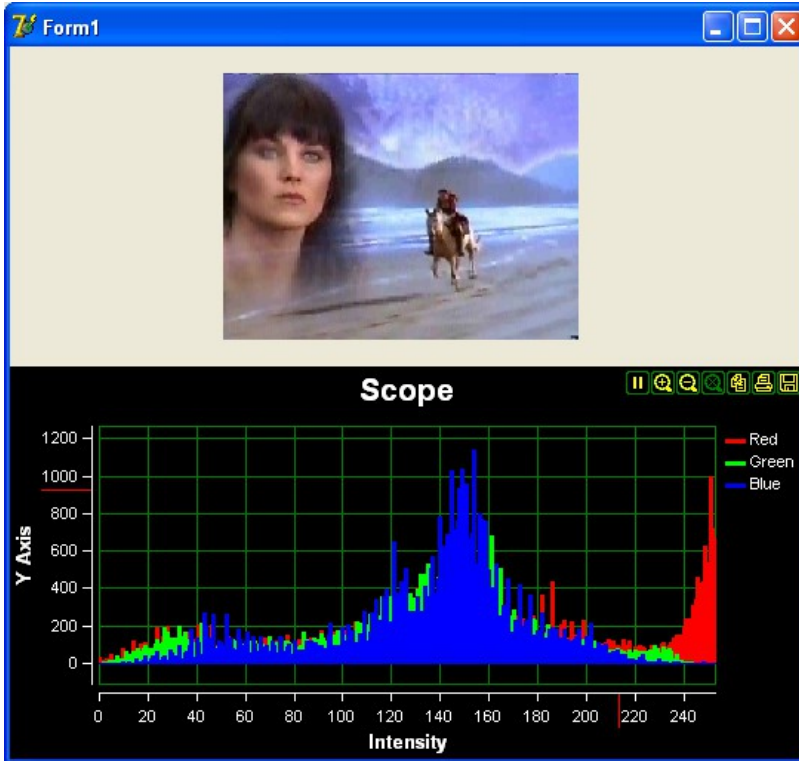
In the Object Inspector select the Blue of the OutputPins and click on the button:



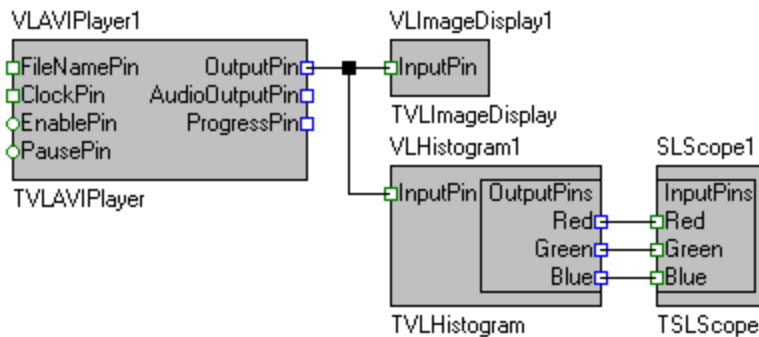
In the Pin Editor select the InputPins.Blue of the SLScope1 and click OK:



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



Here are the OpenWire connections in this application:



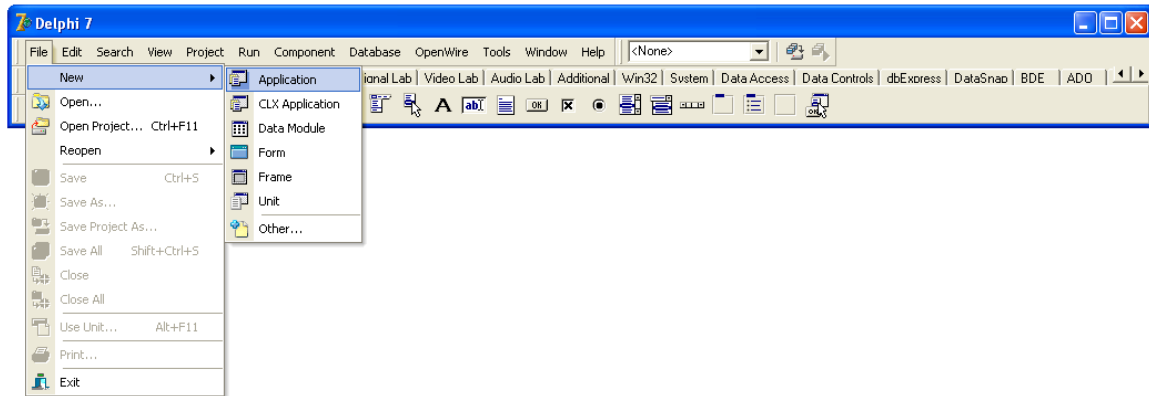
You have just learned how to process image histogram with VideoLab.

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

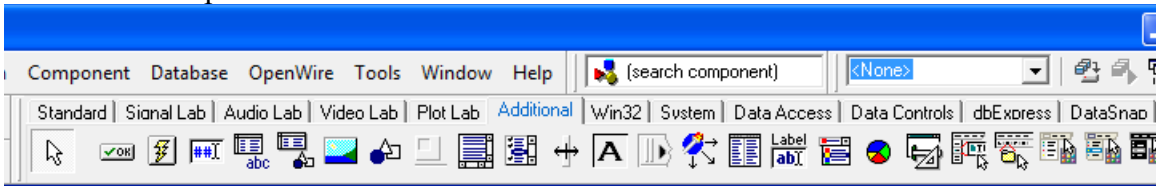
download a trial version of the component from <http://www.steema.com/> . You can also change the example a little bit and use a different chart or plot component.

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:

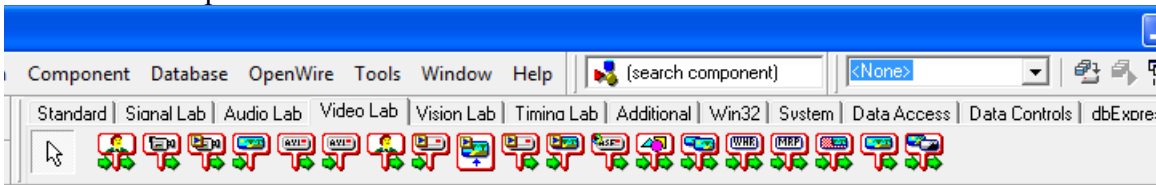


From the tab select and drop on the form a TChart component.






- TChart

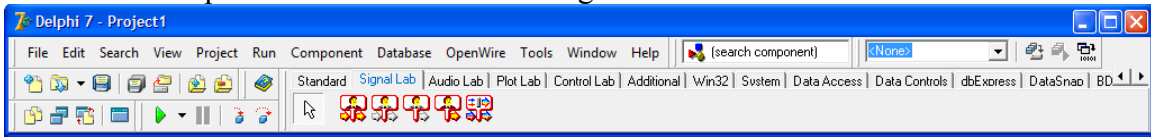
From the “Component Palette” select the “Video Lab” tab:



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

- One  - TVLAVIPlayer
- One  - TVLImageDisplay
- One  - TVLHistogram

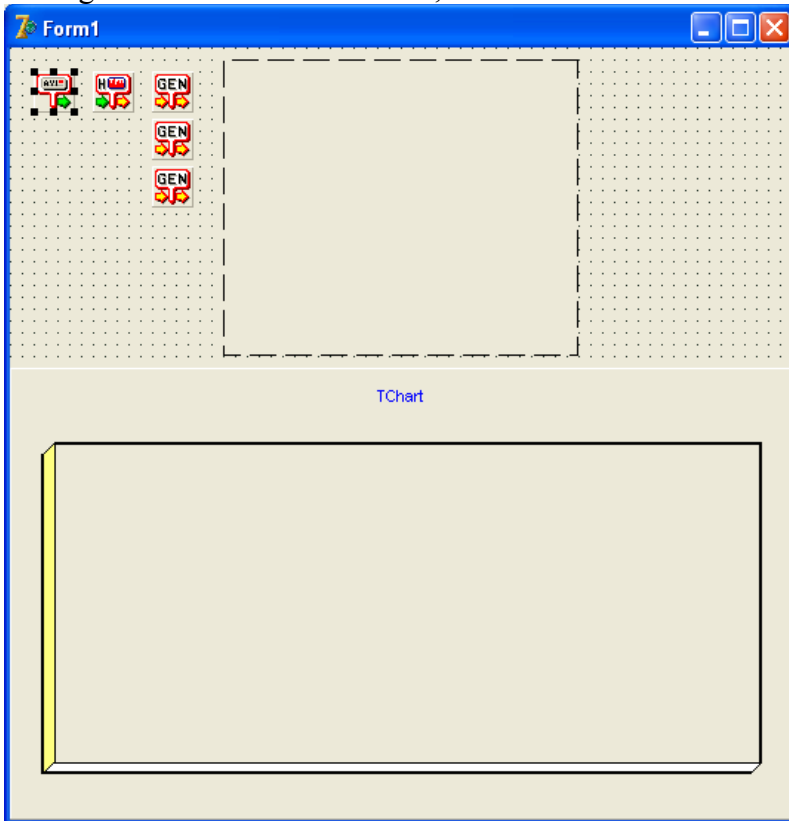
From the “Component Palette” select the “Signal Lab” tab:



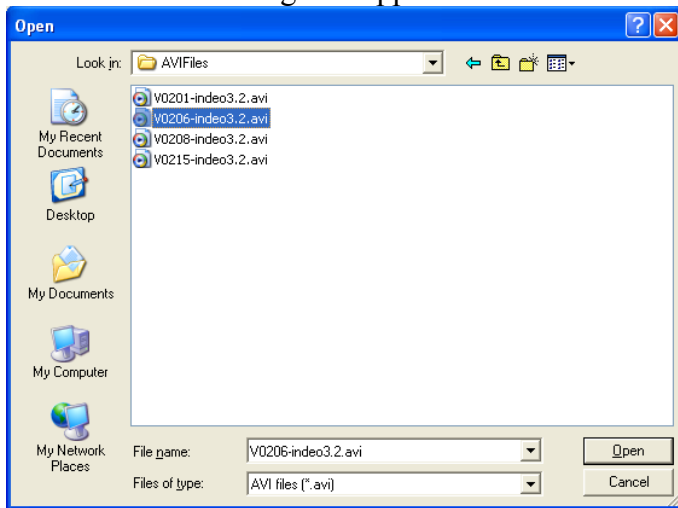
From the tab select and drop on the form the following components:

Three  - TSLGenericReal


Arrange the form to look like this, and double-click on the VLAVIDPlayer1 component:

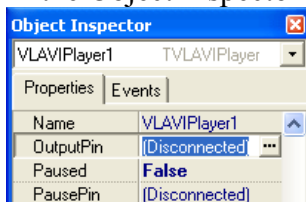


A File selection dialog will appear:

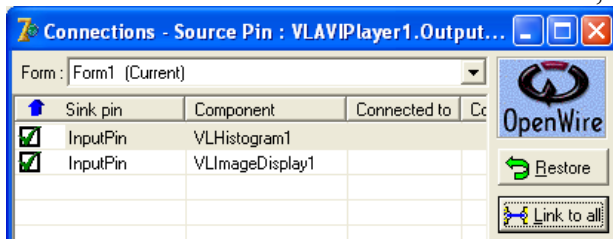


Select a file to play and click “Open”.

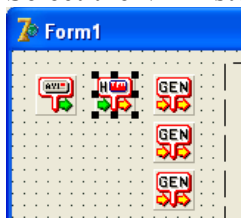
In the Object Inspector select the OutputPin property and click the  button.




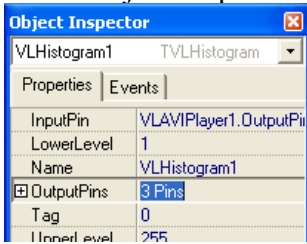
In the Pin Editor click the “Link to all” button, and then click OK.



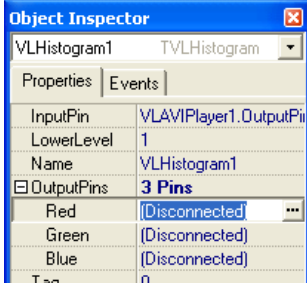
Select the VLHistogram1 component on the form:



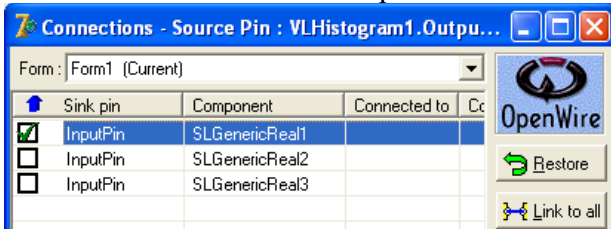
In the Object Inspector click on the  button to expand the OutputPins:




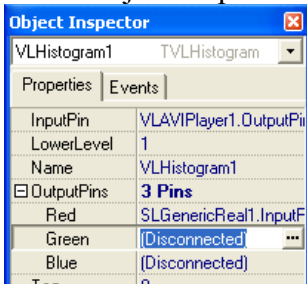
Select the Red of the OutputPins and click on the  button:



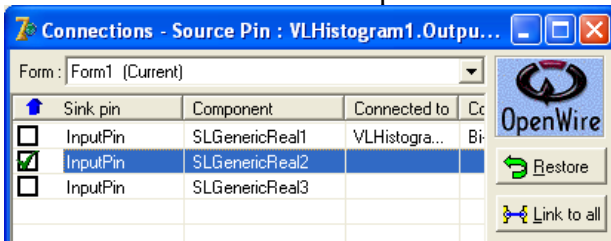
In the Pin Editor select the InputPin of the SLGenericReal1 and click OK:




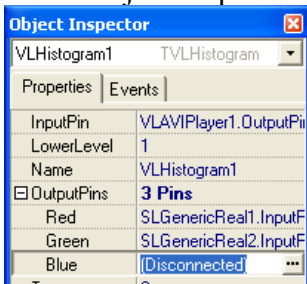
In the Object Inspector select the Green of the OutputPins and click on the  button:



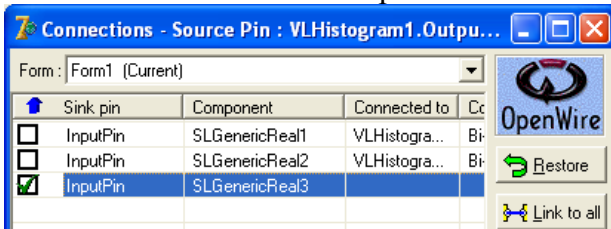
In the Pin Editor select the InputPin of the SLGenericReal2 and click OK:



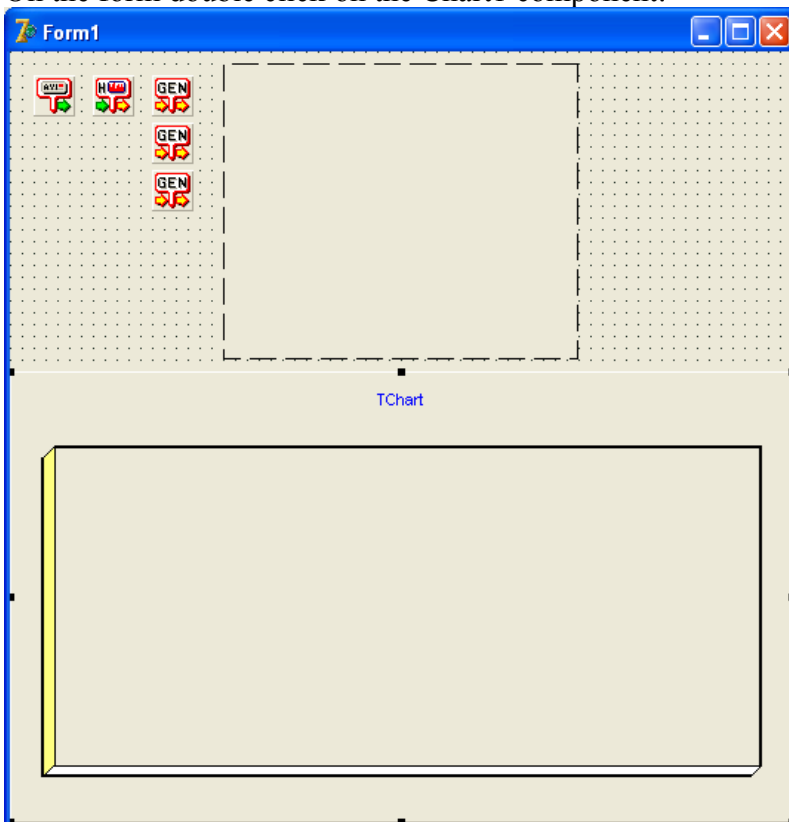
In the Object Inspector select the Blue of the OutputPins and click on the  button:



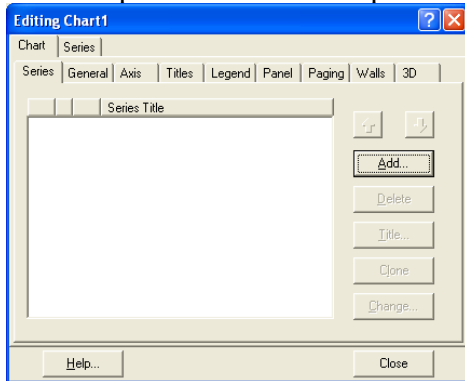
In the Pin Editor select the InputPin of the SLGenericReal3 and click OK:



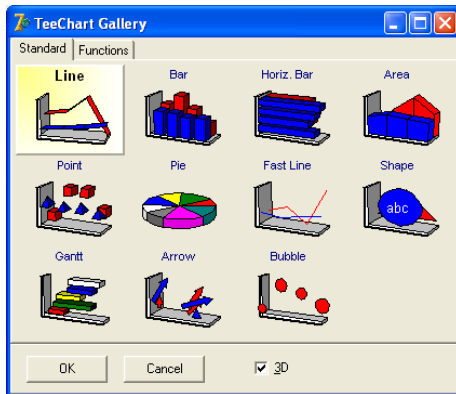
On the form double click on the Chart1 component:



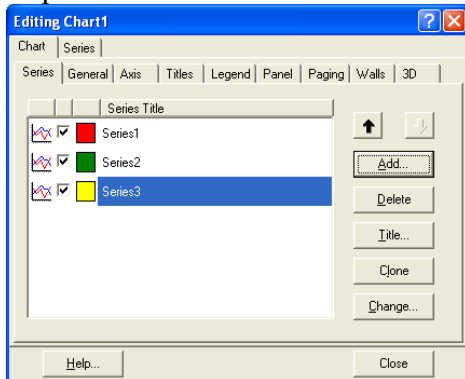
The component editor will open:



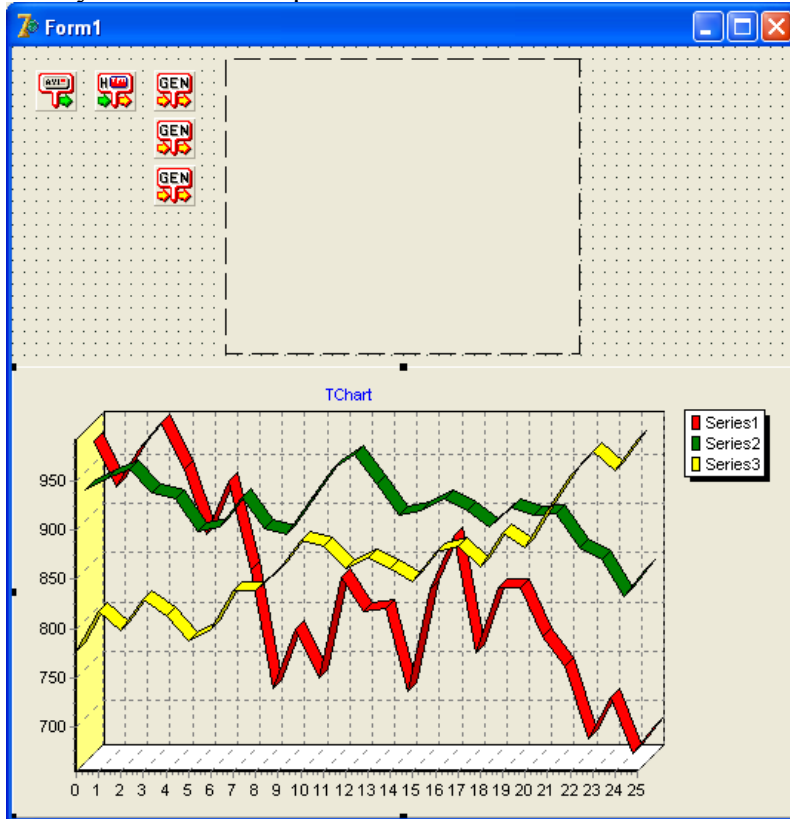
Click the “Add..” button to add new series, and select Line, then click OK:



Repeat this two more times and click Close:



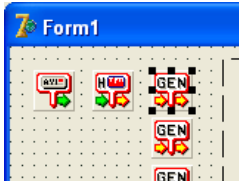
Now your Chart1 component should look like this:



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:



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 );
end;

```

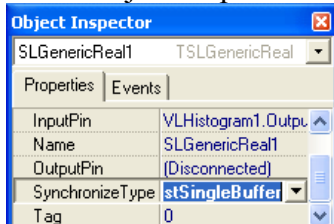
If you are using C++ Builder:

```

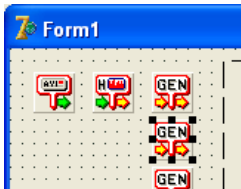
void __fastcall TForm1::SLGenericReal1ProcessData(TObject *Sender,
    TSLCRealBuffer InBuffer, TSLCRealBuffer &OutBuffer,
    bool &SendOutputData)
{
    Chart1->Series[ 0 ]->Clear();
    for( int i = 0; i < InBuffer.GetSize(); i ++ )
        Chart1->Series[ 0 ]->Add(InBuffer[ i ], "", clRed );
}

```

In the Object Inspector set the SynchronizeType property to stSingleBuffer:



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,

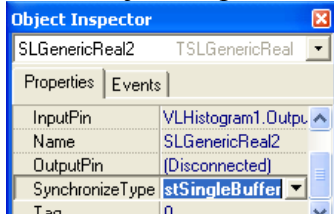
```

```

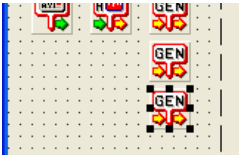
    bool &SendOutputData)
{
    Chart1->Series[ 1 ]->Clear();
    for( int i = 0; i < InBuffer.GetSize(); i ++ )
        Chart1->Series[ 1 ]->Add(InBuffer[ i ], "", clGreen );
}

```

In the Object Inspector set the SynchronizeType property to stSingleBuffer:



Switch to the form and double click the SLGenericReal3:



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;

```

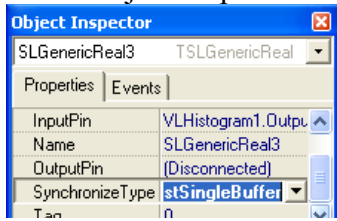
If you are using C++ Builder:

```

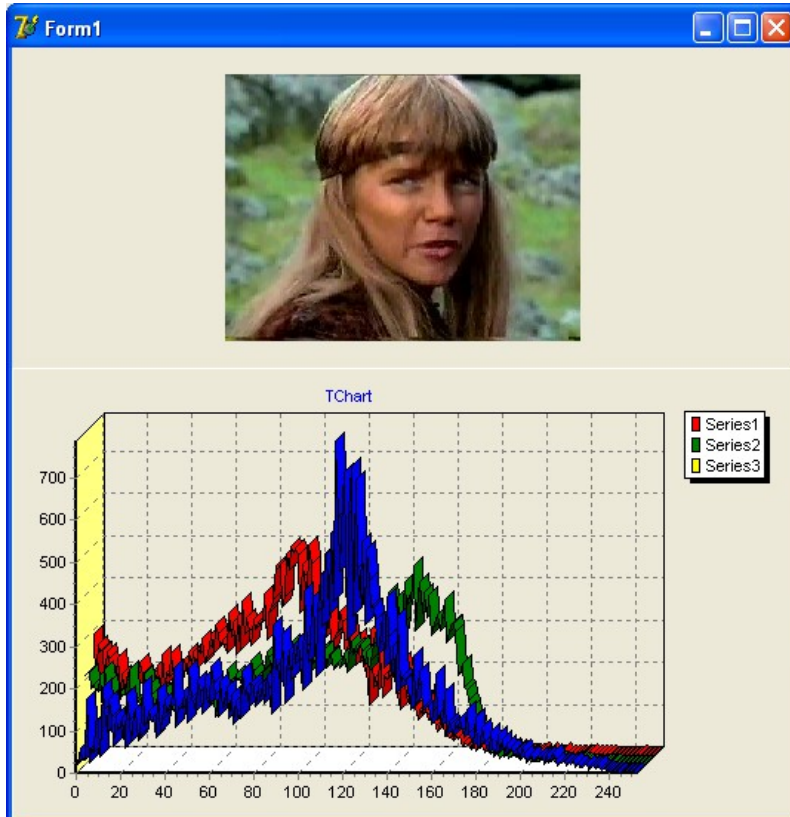
void __fastcall TForm1::SLGenericReal3ProcessData(TObject *Sender,
    TSLCRealBuffer InBuffer, TSLCRealBuffer &OutBuffer,
    bool &SendOutputData)
{
    Chart1->Series[ 2 ]->Clear();
    for( int i = 0; i < InBuffer.GetSize(); i ++ )
        Chart1->Series[ 2 ]->Add(InBuffer[ i ], "", clBlue );
}


```

In the Object Inspector set the SynchronizeType property to stSingleBuffer:



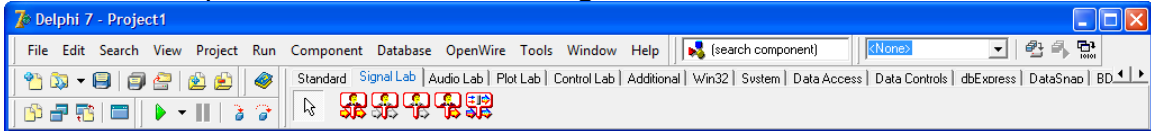
Compile and run the application.
You should see result similar to this one:



One  - TVLAVIPlayer

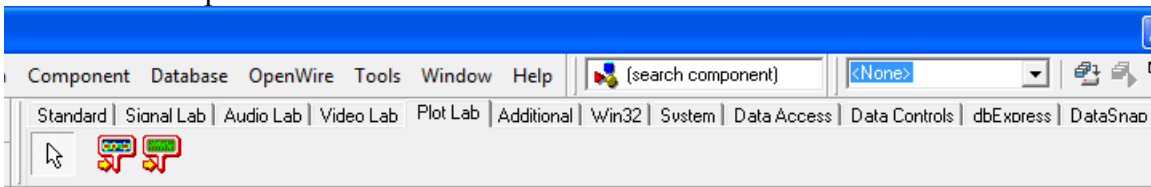
One  - TVLImageDisplay

From the “Component Palette” select the “Signal Lab” tab:



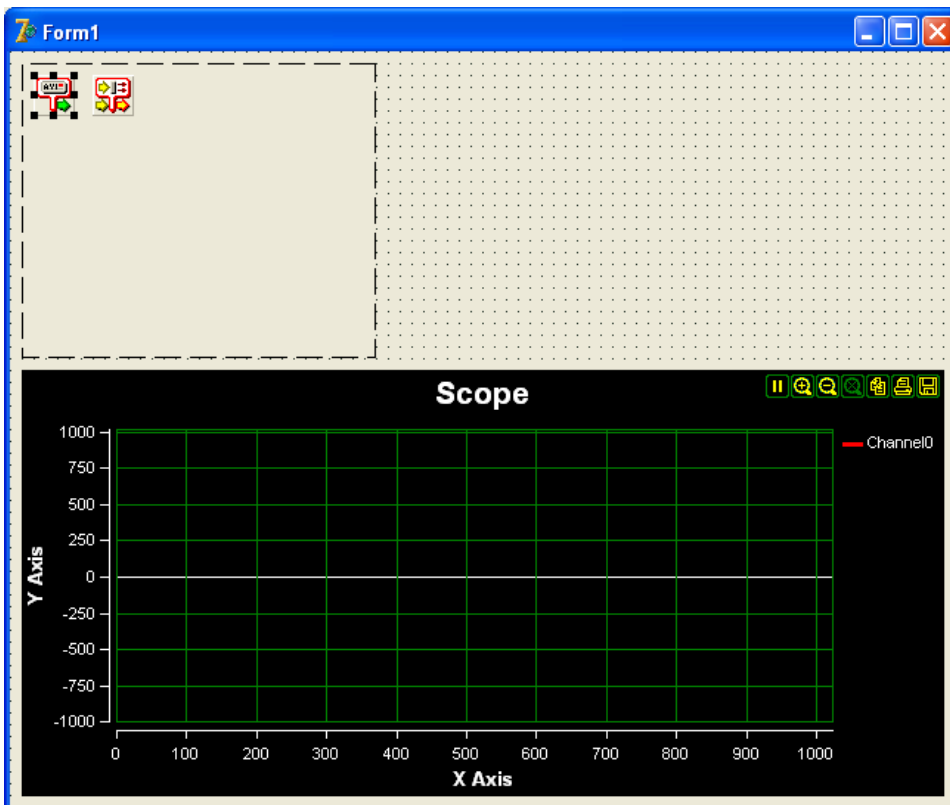
One  - TALAudioToReal

From the “Component Palette” select the “Plot Lab” tab:

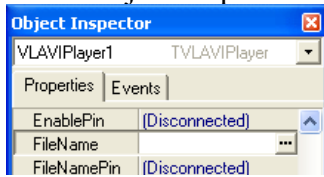


From the tab select and drop on the form the following component:

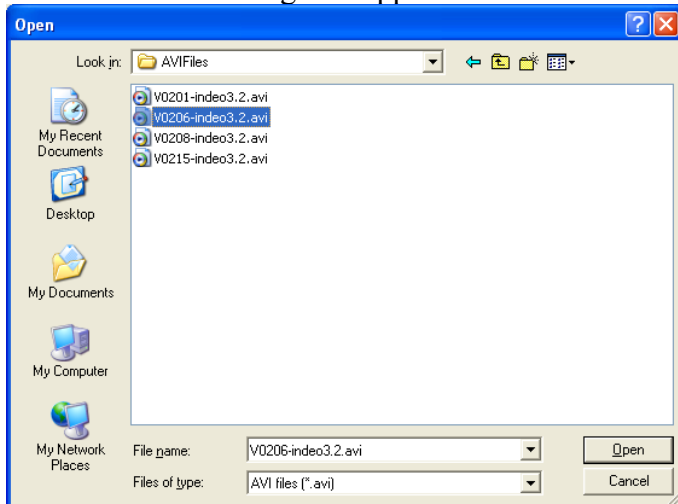
One  - TSLScope




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



A File selection dialog will appear:

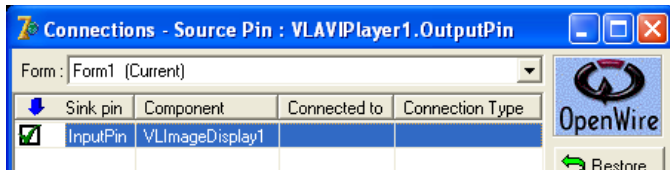


Select a file to play and click “Open”.

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

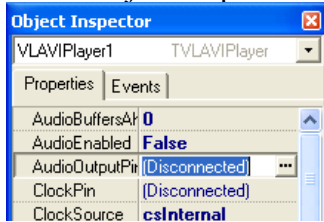


You should see the Pin Editor:

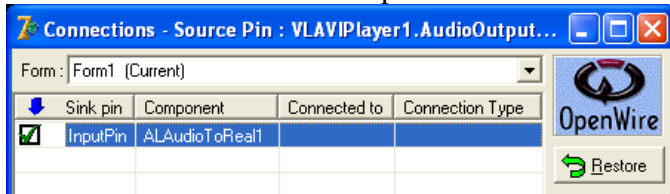


Click on the check box to make it look as in the picture, and then click OK.

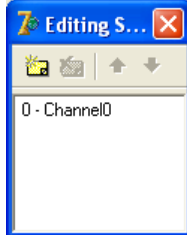
In the Object Inspector select the AudioOutputPin property and click the  button.




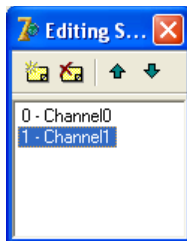
In the Pin Editor select the InputPin of the ALWaveToReal1 and click OK:



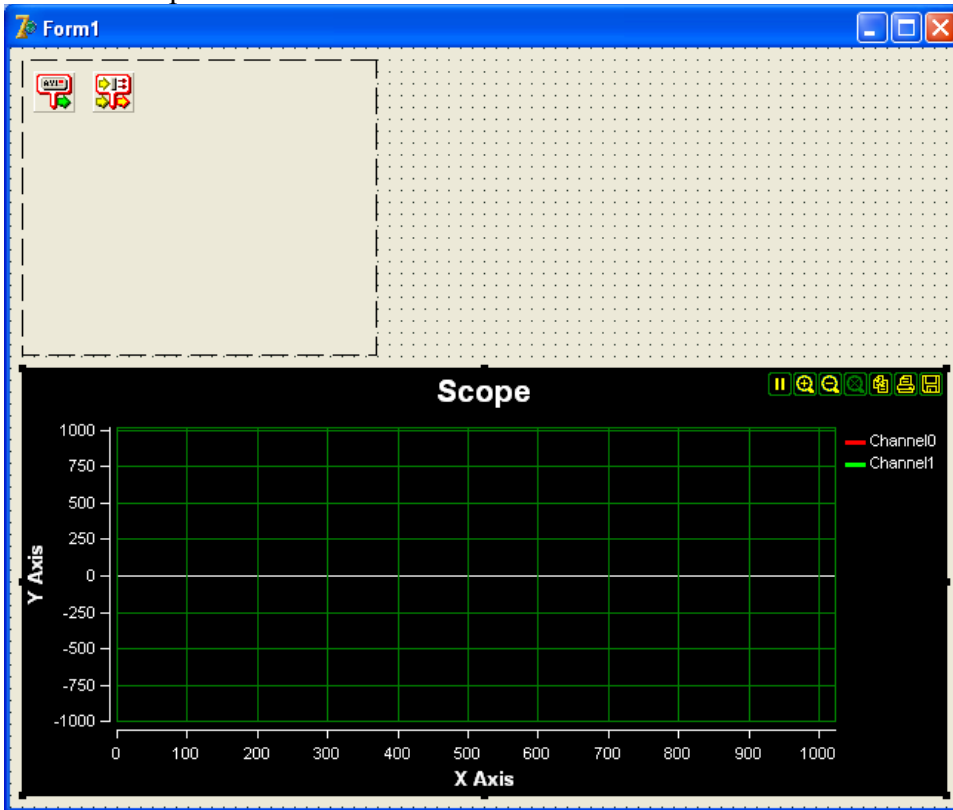
Double click on the Scope component, to open the Channels editor:



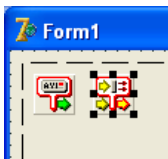
Click on the “Add New”  button to create one more channel:




Now the Scope should look like this:




On the form select the ALAudioToReal1 component:



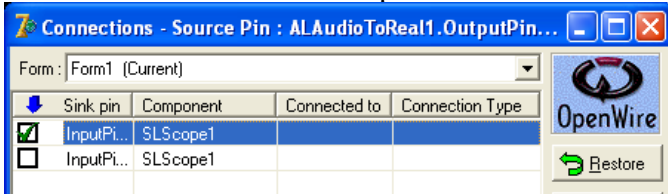
In the Object Inspector click on the  button to expand the OutputPins:



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



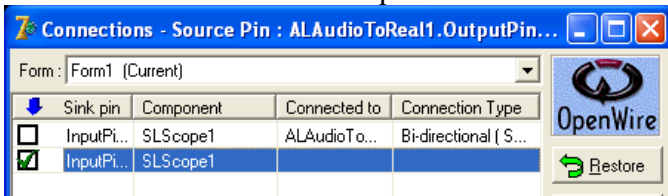
In the Pin Editor select the InputPins.Channel0 of the SLScope1 and click OK:



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



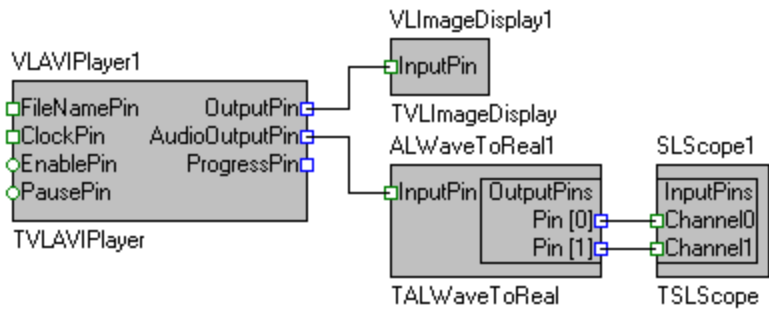
In the Pin Editor select the InputPins.Channel1 of the SLScope1 and click OK:



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



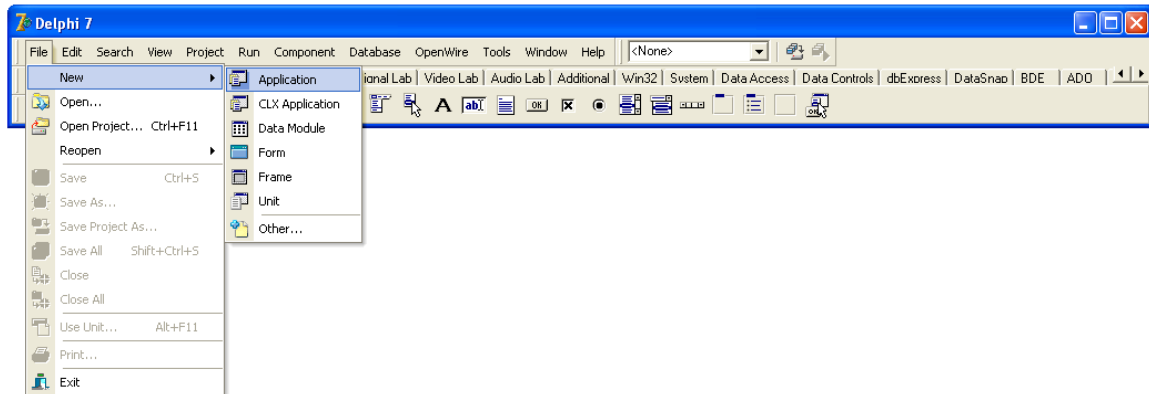
Here are the OpenWire connections in this application:



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

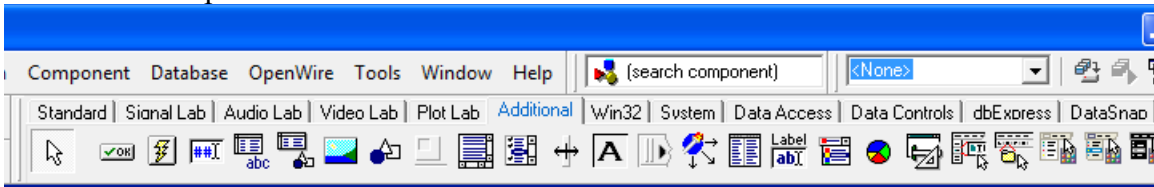
Performing filter or transformation over TBitmap

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



An empty form will appear on the screen.

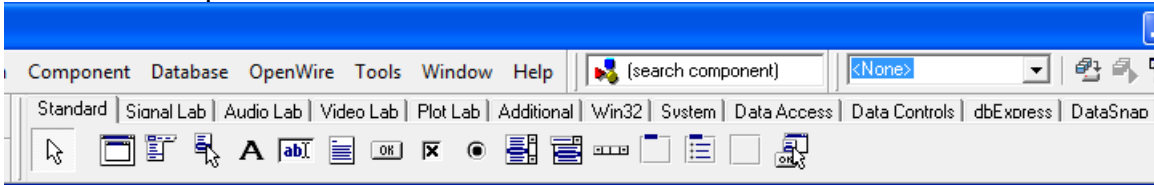
From the “Component Palette” select the “Additional” tab:




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

Two  - TImage

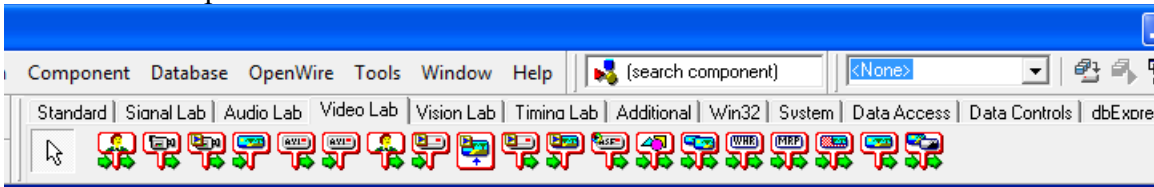
From the “Component Palette” select the “Standard” tab:



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

 - TButton

From the “Component Palette” select the “Video Lab” tab:



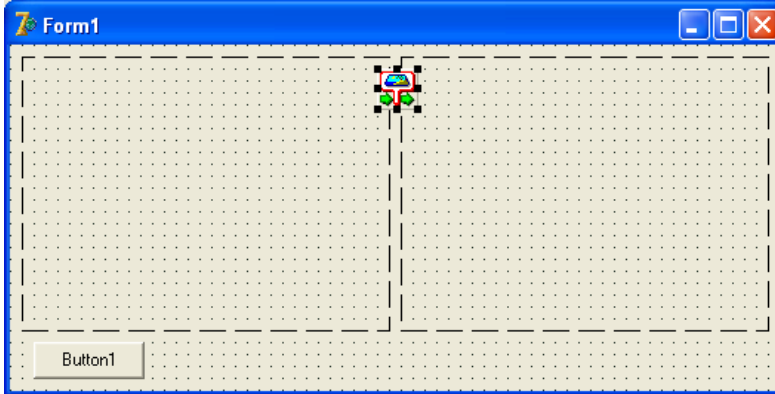
From the tab select and drop on the form the following component:



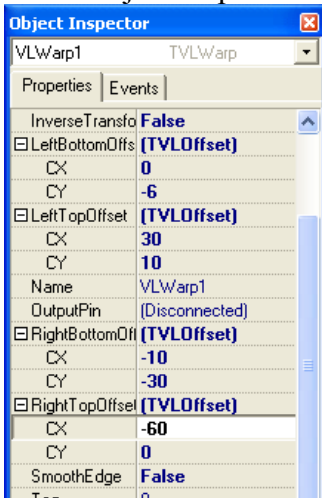
- TVLWarp

Change the Button1.Caption to “Process”.

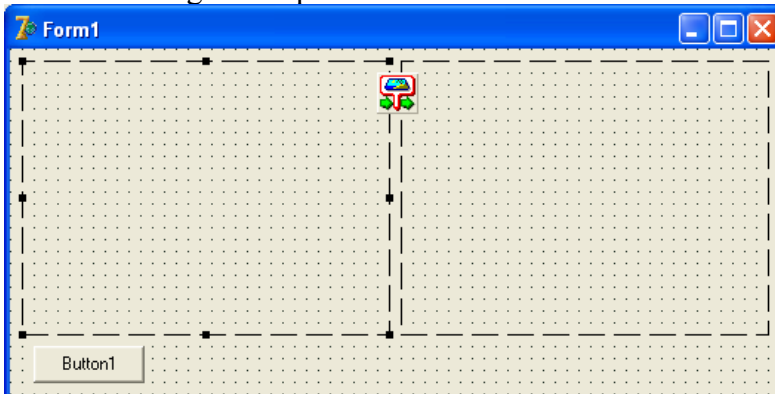
Arrange the form to look something like this, and select the VLWarp1 component:



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



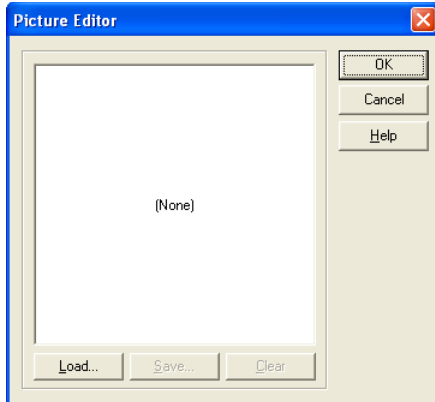
Select the Image1 component on the form:



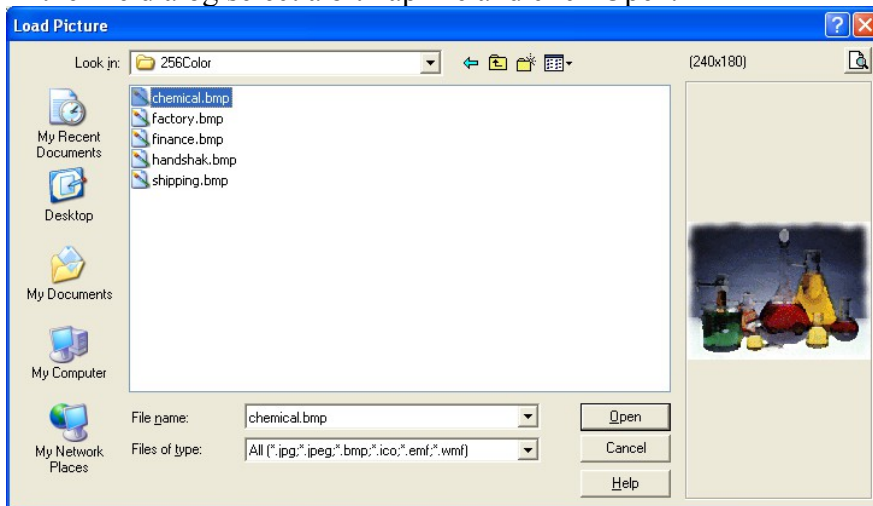
In the Object Inspector select the Picture property and click the  button.



In the Picture Editor click the “Load...” button.



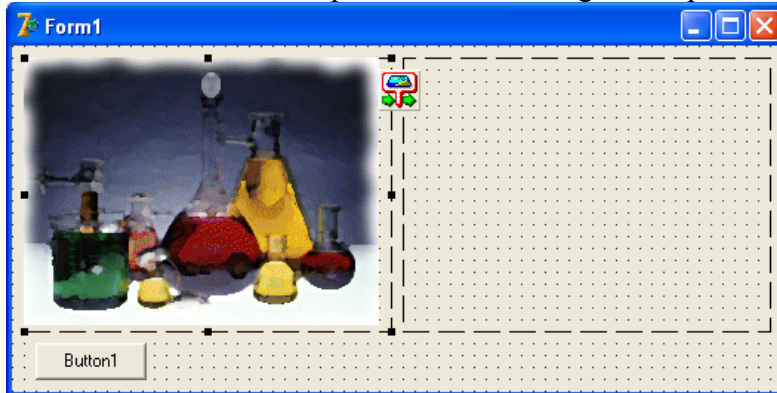
In the file dialog select a bitmap file and click Open.



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.

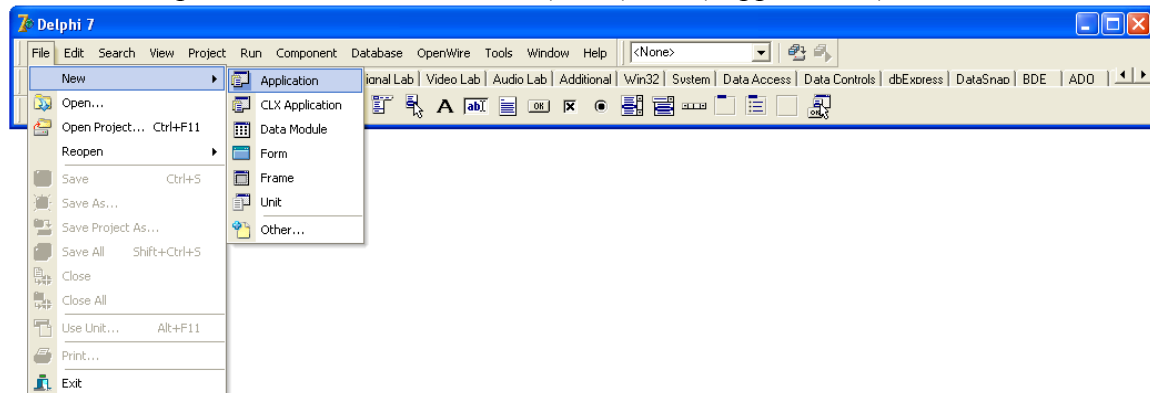
Press the “Process” button. The processed image should appear in Image2:



You just have created a bitmap processing application.

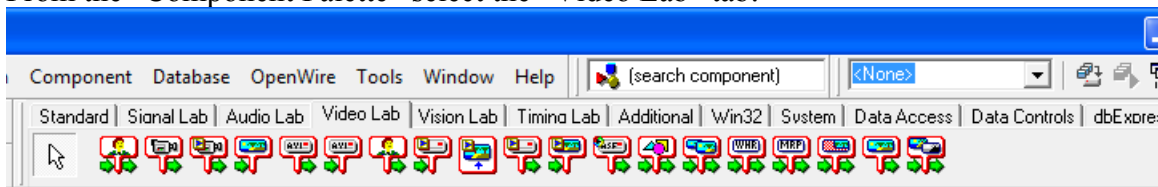
Creating your own filter

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






An empty form will appear on the screen.

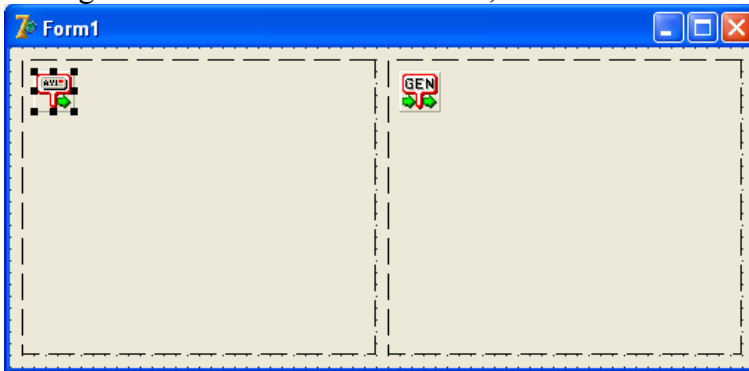
From the “Component Palette” select the “Video Lab” tab:



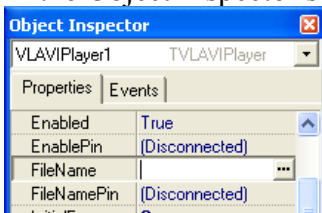
From the tab select and drop on the form the following components:

- One  - TVLAVIPlayer
- One  - TVLGenericFilter
- Two  - TVLImageDisplay

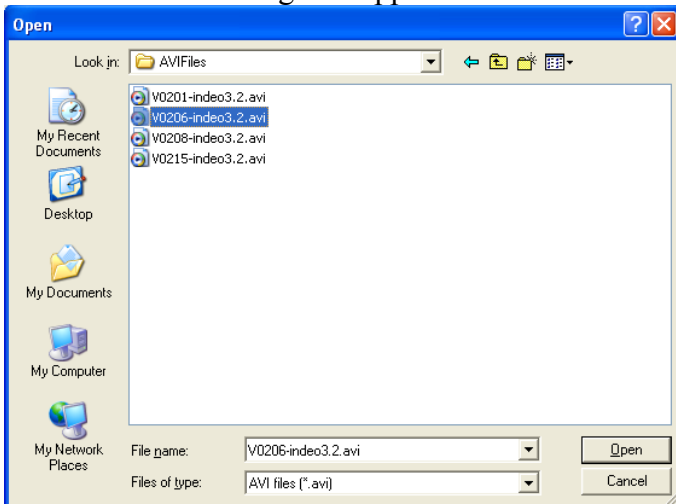
Arrange the form to look like this one, and select the VLAVIPlayer1 :




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

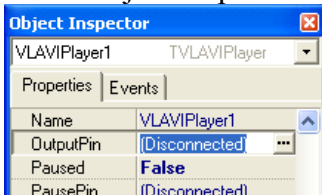


A File selection dialog will appear:

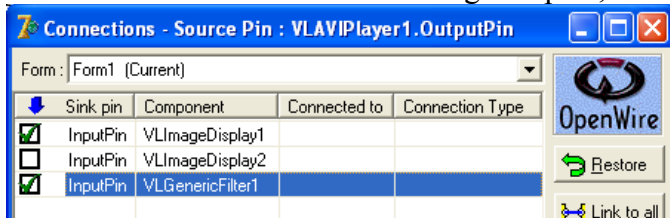


Select a file to play and click “Open”.

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



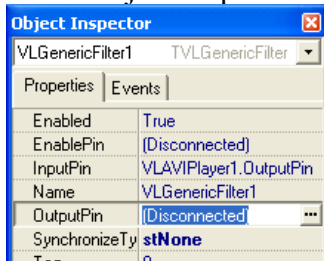
In the Pin Editor check the following two pins, then click OK.



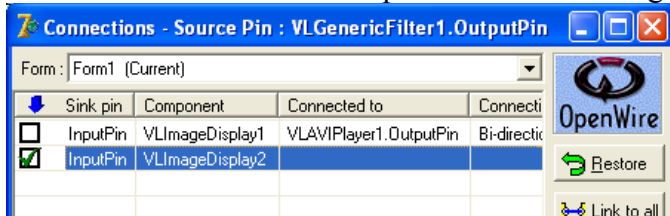
Select the VLGenericFilter1 on the form.



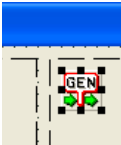
In the Object Inspector select the OutputPin property and click the button.



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



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;

```

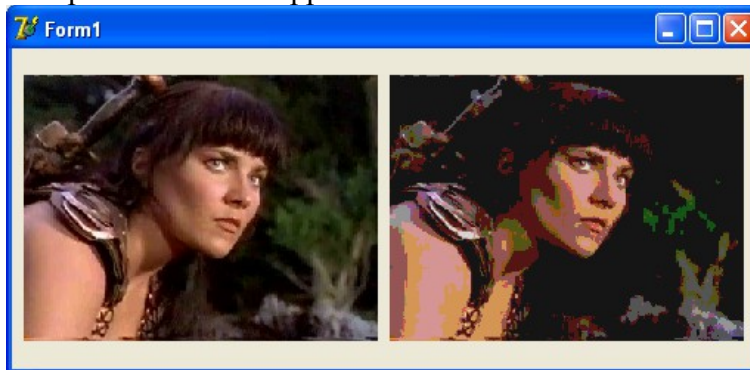
If you are using C++ Builder, write the following event handler:

```

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:

```

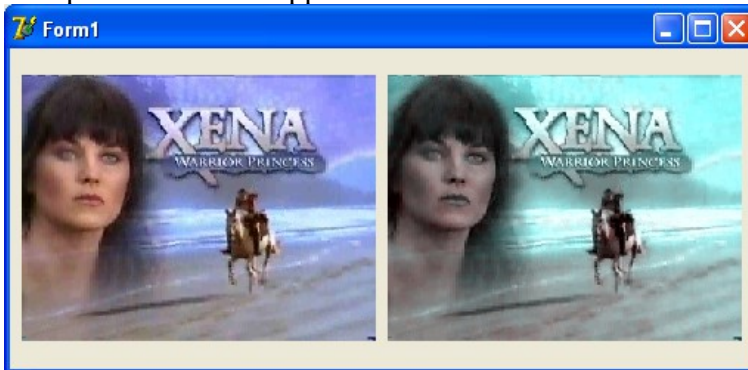
procedure TForm1.VLGenericFilter1ProcessData(Sender: TObject;
    InBuffer: IVLImageBuffer; var OutBuffer: IVLImageBuffer;
    var SendOutputData: Boolean);
var
    X, Y : Integer;
begin
    for X := 0 to OutBuffer.Width - 1 do
        for Y := 0 to OutBuffer.Height - 1 do
            begin
        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

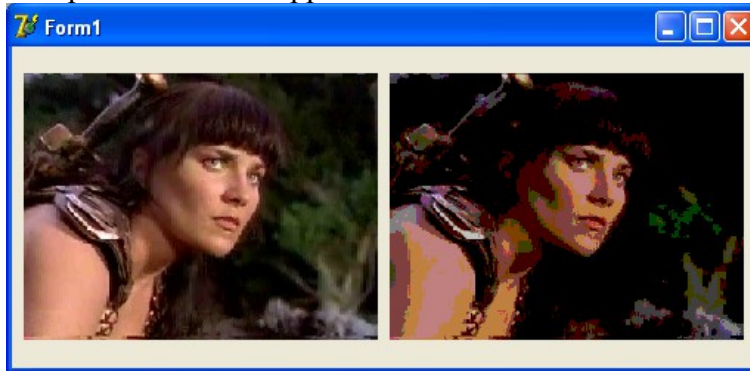
begin
    BytePtrIn := InBuffer.Read();
    BytePtrOut := OutBuffer.Write();

    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)
```

```

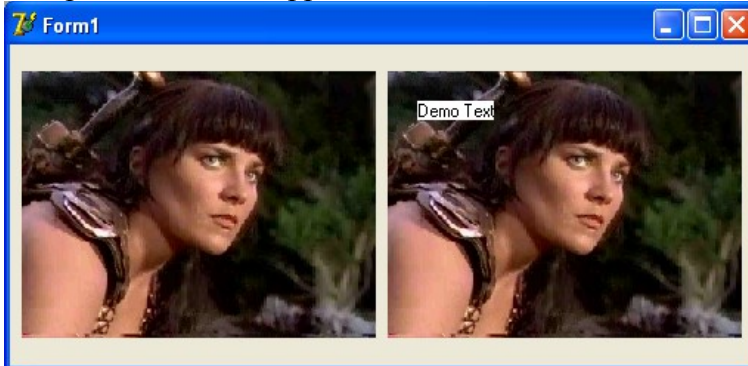
{
    Graphics::TBitmap *ABitmap = new Graphics::TBitmap;

    InBuffer.ToBitmap( ABitmap );
    ABitmap->Canvas->TextOut( 20, 20, "Demo Text" );
    OutBuffer.FromBitmap( ABitmap );

    delete ABitmap;
}

```

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 (through 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 element 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.