

Exercise 2: Introduction to Vision Assistant

By: HKinkade

Note: this is the vision assistant for the FRC season 2009, the 2010 season uses Vision Assistant 2009. Buttons and wording will be different but with some playing, you should be able to figure it out.

Introduction:

This tutorial demonstrates how to use the Vision Assistant to quickly and efficiently prototype image processing algorithms. It walks through using the Vision Assistant to acquire images with the AXIS camera, creating an algorithm to process these images, and finally how to use the algorithm that you have created in LabVIEW FRC.

Goal:

In the following exercise, you will take an image with the AXIS camera, analyze that image, and then build a Vision Assistant script that will recognize a specific color in an image. Finally, you will create LabVIEW code based on the Vision Assistant script. This exercise requires the following hardware:

FRC cRIO

Driver Station

Two Ethernet Cables

AXIS Camera

Crossover Ethernet Cable (Orange in KOP)

Implementation:

- 1) Launch Vision Assistant
 - Go to **Start»Programs»National Instruments» Vision Assistant»Vision Assistant 8.6**
- 2) Acquire an Image from the Axis Camera
 - In the **Welcome Window**, select **Acquire Image**.
 - Select the **Acquire Image (Axis IP)** step and make sure the IP address is set to 192.168.0.90 (default IP of the camera).



- Click the **Grab** button and make sure that you can acquire images.

- Once you are satisfied with the camera settings and operation, click the **Grab** button again to stop acquisition.

Now click the **Snap** button to acquire a single frame. Point the camera at an object of interest and snap a few photos from different angles and distances. After each Snap, save the frame to the browser by



pressing the **Store Acquired Image in Browser** button.

- When you have three or four different frames saved, close the **Acquire Image (Axis IP) Setup** step.
- From the top right corner of Vision Assistant, click on **Process Images**. This will open the main interface in Vision Assistant where you will create your image processing algorithm.



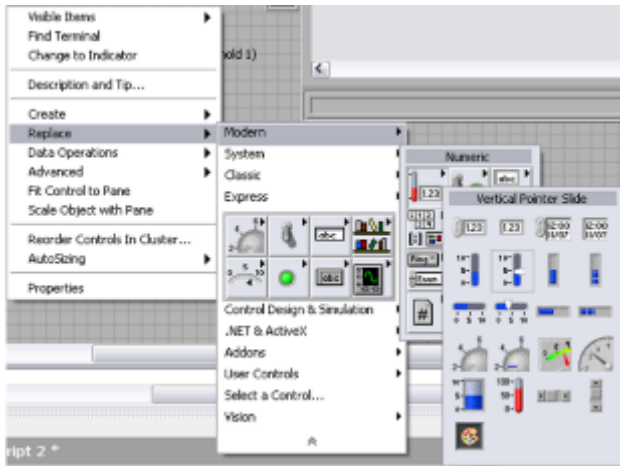
- 10) Explore the tools available to analyze the image
- Explore the image by selecting the **Histogram** step. Select different color spaces and observe the differences (HSL, RGB). Press **Cancel** when you are done because we don't want to add this step to our script.
 - Select the **Line Profile** step and select a few different lines on the image with the mouse to see the difference between line profiles in the image. Try to select a line across an area of high contrast vs. low contrast and see the difference. Press **Cancel** when finished.

Click on the **Color** processing functions palette and select the **Color Threshold** step.



- Use the Color Threshold step to look for a specific color in your sample images. (Can you get better results by using a different color model?). Note that areas of the image represented in RED are kept as pixels that meet the criteria you specified in the threshold, and all other pixels will be set to 0 to create a binary image (pixel values of 0 and 1). When you have played around with adjusting the thresholds, click **OK** to add the step to your script.
- 11) Convert your Vision Acquisition code to LabVIEW
 - Go to **Tools>>Create LabVIEW VI**.
 - Select a file location to save the resulting VI and click **Next**
 - Leave **Current Script** selected and click **Next**.
 - Select **Image Control** (since you will add code to acquire from the AXIS camera to your VI) and click **Next**.
 - Check all the boxes under *Color Threshold 1* and click **Finish**. LabVIEW will launch and a VI will be generated. You will use the generated code to modify the Main VI of a basic robot project so that this code can be deployed and run on the cRIO.
- 12) Now that the code is generated, modify the code so it can be used as a subVI.

- Replace the threshold controls with sliders
 - i) From the VI front panel, right-click on the **Red or Hue Range** cluster control and select **Replace>>Modern>>Numeric>>Vertical Pointer Slide**

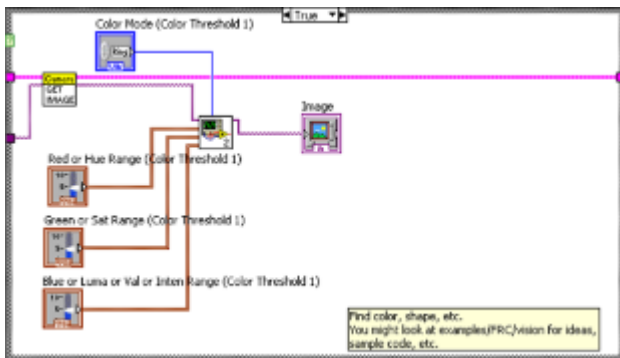


Right click on the slide and select **Add Slider**

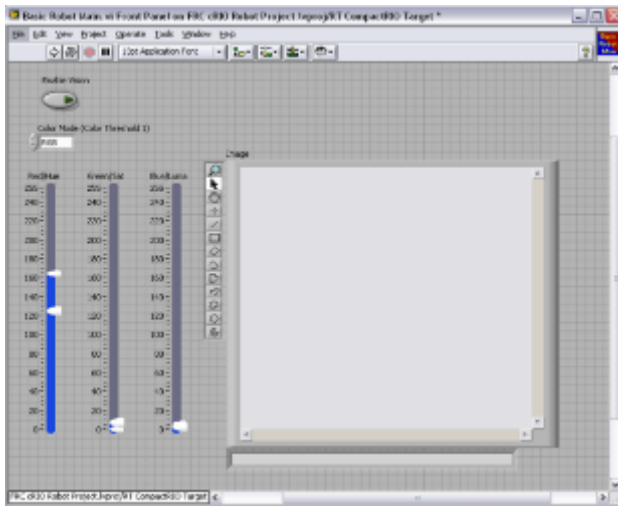
Repeat this process for the other 2 color threshold controls.

- 13) Create a **new FRC Robot Project** from the LabVIEW Getting Started Windows and select **Basic Framework**, as well as the correct IP settings for your cRIO.
- 14) Insert your Vision VI into the framework
 - From your FRC Robot Project, open **Main.vi**.
 - Right-click to bring up the functions palette and click **select a VI**, and navigate to the Vision VI you just created.
 - Wire your subVI as follows:
 - i) Wire the Image out of the **Get Image** VI to the Image input on your subVI.
 - ii) Switch to the front panel, right-click, and select **Vision>>Image Display**. Wire the Image out of your subVI to this display.

Right-click on all the other terminals and select **Create>>Control**.



Click on upper scale limit (10) of all the slider controls and change to 255. Expand the sliders and re-arrange the front panel as you see fit. It should look something like this when you are done:



- 15) Click the **Enable Vision** button and click the **Run** button to run the code on the cRIO and see how it works! Can you detect an object of a specific color against a contrasting background? Can you detect your skin tone or clothing alone?

Conclusion

Congratulations, you now know how to use Vision Assistant to rapidly prototype vision processing algorithms. Better yet, you know how to convert those algorithms to LabVIEW code to run on your cRIO from a LabVIEW FRC project using the AXIS camera!