Using IMAQ Vision Morphology Functions

Objectives:

- To apply a threshold and various morphology techniques in IMAQ Vision Builder.
- To apply particle analysis techniques in IMAQ Vision Builder and use IMAQ Vision Builder's Create LabVIEW VI feature.
- To learn the use of the primary binary morphology functions in IMAQ Vision.
- To learn how pixels are related to each other in an image.
- To learn how pixel connectivity affects your images.

Procedure A: Morphology in IMAQ Vision Builder. [6.1][1]

1. Launch IMAQ Vision Builder.

2. Select **Open Image**.

    a) Browse to **IMAQ Vision Builder 6 >> Examples >> Bracket**.

    b) Mark the checkbox labeled **Select all files** and click **OK**. All of the bracket images appear in your Image Browser. If IMAQ Vision Builder asks if you want to remove previously acquired images, choose **Yes**. If it asks you if you want to save changes to the current script, choose **No**.

3. Double-click on the first image.

4. Threshold this image to get a binary image.

    a) Go to the **Grayscale** menu and select **Threshold**.

    b) Set your threshold lower limit to 0 and the upper limit to 169.

5. Click **OK**.

6. Experiment with applying various morphological operations. Try to extract only the two holes from the bracket.

7. Select **Adv. Morphology** from the **Binary** menu.

8. Remove any particles that are touching the edges of the image by selecting **Remove border objects** and clicking **Apply**. Removing these particles cleans up the image and allows you to focus more on the two holes in the bracket. Notice

[1] Numbers in square brackets such as [6-1] refer to exercises in the LabVIEW™ Machine Vision and Image Processing Course Manual by National Instruments.

that because most of the red area in the image belonged to one large blob, a significant portion of the image has been cleaned up.

9. Fill in the holes in the two large blobs at the centre of the image.

    a) Select **Fill holes** from the list box at the bottom of the screen.

    b) When you are finished, click **Apply** and **Close**. Notice the noise caused by small particles in the area surrounding the two large circular blobs in the middle of the image. The Erode function is useful for cleaning up noise.

10. Apply an Erode operation to this image .

    a) Go to the **Binary** menu and select **Basic Morphology**.
    b) Select **Erode objects** from the drop-down list at the bottom of the screen. You may need to increase the number of iterations in order to completely remove all of the noise from the image. If any noise still remains, consider applying stronger erosion. The structuring element defines how many layers of pixels we erode from around each blob in the image.

11. Change the size parameter from 3x3 to 7x7, which will increase the size of the structuring element. Notice that a 7x7 structuring element makes the circles appear smaller than in the case of a 3X3 structuring element.

12. Click **Apply**.

13. Select **Dilate objects** and set the structuring element size to 7×7. The dilation will make the blobs appear to be approximately the same size as they were in the original image.

14. Click **Apply** and **Close**.

15. What single step could you have used in place of this Erosion followed by Dilation?

16. Now create a LabVIEW VI based on your work in IMAQ Vision Builder. Select **Script >> Create LabVIEW VI** to create a LabVIEW VI based on your IMAQ Vision Builder script. LabVIEW launches and displays a block diagram.

17. Save the VI as `Morphology in LabVIEW.vi`.

18. Run the VI. At the prompt, select an image file. Select any of the bracket images from the following path: IMAQ Vision Builder 6 >> Examples >> Bracket. A binary image of the bracket holes opens. Familiarize yourself with the Vision VIs

you used to perform this image analysis. Use Help to get more information on each specific VI.

19. When you are finished, close the VI. However, do not close IMAQ Vision Builder. You will use this script again in Procedure B.

Procedure B: Particle Analysis in IMAQ Vision builder [6.2]

1. Select **Binary >> Particle Analysis** to analyze the remaining particles in this image. The table shows a large array of values that describe various features of the particles in the image. For this exercise, consider the particles' area and centre of mass.

2. Click on the **Choose Measurements** button at the bottom of your window to display only these qualities.

3. Uncheck all measurements except for **Pixels** , **Centre of Mass X** and **Centre of Mass Y**. The table now displays only the three values of interest. If you are interested in importing this data into a spreadsheet, click on the **Save Results** button on the right-hand side and IMAQ Vision Builder will format the table as a tab-delimited text file.

4. Click **Save Results** to save the data to a file named `results.txt` on your desktop. If Microsoft Excel is installed on your machine, you can send data to that program by clicking **Send Data to Excel**, which opens an Excel spreadsheet containing this data.

5. Click **Apply** and **Close**. Go to the **Script** menu and save this script as `Particle Analysis in IMAQ Vision Builder .scr`. Now use IMAQ Vision Builder's builder file to manually create a LabVIEW VI based on this script.

6. Select **Script >> Builder File…** A text file opens listing the steps you used in IMAQ Vision Builder and the IMAQ Vision VIs you should use in LabVIEW to implement the script. The builder file also gives you the parameters of the VIs so that you can recreate your prototyped application in LabVIEW.

7. Examine the builder file.

8. Open LabVIEW and select **New VI**.

9. Using the VIs described in the builder file, create the LabVIEW VI.

10. Save the VI as `Particle Analysis in LabVIEW . vi`.

11. Run the VI and open one of the bracket images from **IMAQ Vision Builder 6** >> **Examples** >> **Bracket**. The results are displayed in a 2-D array on the front panel. Expand the array to view all of the results. The first column represents the area in pixels and the second and third columns represent the X and Y coordinate positions, respectively. Examine the block diagram and familiarize yourself with the particle analysis VIs.

12. Close the VI when you are finished.
