

Edge Detection and Applications

Objectives:

- To perform edge detection operations.
- To use the caliper function for gauging jumper switches without any programming.
- To measure circularity.
- To measure the distance between the centers of two holes.
- To measure the distance between two vertical edges.

Procedure A: Edge Detection and Gauging [8.1]¹

1. Launch IMAQ Vision Builder.
2. Click **Open Image**.
3. In the **Look In** area, navigate to the **IMAQ Vision Builder >> Examples >> Jumper** folder. Click on **Select All Files** to select all images. Click **OK**.
4. The browser window opens. Double-click the first image.
5. Select **Machine Vision >> Edge Detector**.
6. Draw a straight line across the top part of the jumper.
7. Select **Simple Edge Tool** as the edge detector. The grayscale variation along the line drawn is shown, and all the edges found are numbered and highlighted in green. In your opinion, what was the dimensionality of the edge-detector filter used? Was it a high-pass, band-pass or low-pass filter? **Answer In Lab Book**
8. Click **Apply**. Clicking **Apply** saves the step in a script as shown on the left-hand side of the window.
9. Click **Close** and select **Machine Vision >> Caliper**. The caliper tool measures quantities such as distances and angles and numbers the edges found during the edge detection process.
10. Click in the image on points 2 and 3. The points are automatically selected and indicated in the bottom area, which lists all the points.
11. Select **Type of Measure >> Distance**.

¹ Numbers in square brackets such as [8-1] refer to exercises in the LabVIEW™ Machine Vision and Image Processing Course Manual by National Instruments.

12. Click **Measure**.
13. Select **Script >> Batch Processing**.
14. Select **Image Source >> Hard Disk**.
15. Specify **Folder Path >> Browse to IMAQ Vision Builder 6 >> Examples >> Jumper**. Click **Select Cur Dir** to select the whole folder.
16. Click **Caliper**. Select **Analysis Mode >> Save Results**. Click **Setup** and browse to the IMAQ Vision Builder 6 folder. Click **Select Cur Dir** and then click **OK**.
17. Click **Run**. The script runs on all the images in the Examples\Jumper folder and the results are logged to the file named `distance.txt` in the IMAQ Vision Builder 6 folder.
18. Click **Return** to exit Batch Processing. Open the specified file in any text editor to look at the output.
19. Create a LabVIEW VI using either the Builder File or **Script >> Create LabVIEW VI**. Examine the VI. Use the Online Help tool to get more information on edge detection VIs. Write a paragraph in your lab book, describing what you found in Online Help.
20. Save the VI as `Edge Detection and Gauging in LabVIEW.vi`.
21. Run the VI. In the file prompt, choose one of the jumper images. Examine the results on the front panel. You will need to expand the array to view more than one result at a time.
22. Close the VI.

Procedure B: Measure Circularity and Distance Between Features [8.2]

1. Open IMAQ Vision Builder 6 and click **Open Image**.
2. Browse to LabVIEW's examples and select `Holes.tif`. Click OK to load the image in IMAQ Vision Builder.

3. Select **Machine Vision >> Find Circular Edge**. Draw a circular region of interest around the right top hole. Notice that you can maneuver the ROI once it has been placed. You can also expand or contract either the inner or outer circle of the ROI. Experiment with moving the ROI around and changing the size of both the inner and outer circle.
4. Click the **Options** tab to determine which result lines will show up. Explore the settings and experiment with each of the parameters. Describe your observations in a paragraph in your lab book.
5. After you find the center of the hole, click **OK**. Follow the same steps for the top left hole. You should now see two **Find Circular Edge** steps in your script.
6. You will now determine the distance between the vertical edges. Select **Clamp** from the Machine Vision menu.
7. Draw a square region of interest encompassing the bottom half of the object. Once the ROI has been set, a rake of lines appears. You can adjust whether these lines are horizontal or vertical by selecting one of the **Direction** radio buttons in the **Function** tab. You can also determine whether to use a minimum or maximum clamp. Experiment with each parameter. Notice that the settings and options are nearly identical to those in the **Find Circular Edge** step. Examine these settings and determine the correct values for the application. Notice that the distance (in pixels) is displayed in the lower right corner.
8. Click **OK**.
9. The last step in the script is to measure the distance between the centers of the two holes.
 - a. Select **Caliper** from the Machine Vision menu and choose points 1 and 2. The squares under the numbers disappear and the selected points are checked in the selection box at the bottom.
 - b. Select **Distance** under **Type of Measurement** and click **Measure**. The distance is then calculated. Note the results of the measurement.
 - c. Click **OK**.
10. Create a LabVIEW VI using the builder file or **Script >> Create LabVIEW VI**.
11. Run the VI. Did you receive the same results as you did in IMAQ Vision Builder?