MICROSCAN®

Getting Started with the VS-1 Smart Camera

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PREFACE

Welcome!

Purpose of This Manual

This manual is designed to get you up and running with your VS-1 Smart Camera quickly and confidently.

Please don’t be intimidated by the size of this Getting Started manual. It contains a large number of images that will help you as you create new Jobs using the tutorials.

Manual Conventions

The following typographical conventions are used throughout this manual.

- Items emphasizing important information are **bolded**.
- Menu selections, menu items and entries in screen images are indicated as: Run (triggered), Modify..., etc.

CHAPTER 1

Using a VS-1 Smart Camera for the First Time

Before proceeding with this chapter, you should have:

- Completed installation of Visionscape® software;
- Suitably mounted and wired the VS-1 Smart Camera (see Chapter 2 of Visionscape® Smart Camera Guide)

Establishing a Network Connection and Making a FrontRunner™ Device Button for Your Camera

This section assumes familiarity with basic wired networking concepts such as IP addresses and DHCP servers. If these terms are not familiar, please talk to your IT department and see “Setting Up Network Communications” in the Visionscape® Smart Camera Guide.

A network connection is required to communicate with the VS-1 Smart Camera. In order that the VS-1 Smart Camera be recognized, it must have a valid IP address. As shipped, the VS-1 Smart Camera will try to obtain an IP address from a DHCP server so, if your network is configured for DHCP, you will be able to connect to your camera without changing any settings. However, if your network requires a static IP address to be assigned, or if you would like to use a cross-link cable,

please see “Setting Up Network Communications” in the Visionscape® Smart Camera Guide.

Note: When using a VS-1 Smart Camera in a production environment, it **MUST** be programmed to use a static IP address instead of DHCP. This is to prevent loss of communications due to IP lease renewal by the DHCP server.

Follow these steps when connecting the VS-1 Smart Camera for the first time:

1. Connect the VS-1 Smart Camera to the same network as the PC that will be running the FrontRunner™ software.
2. Apply power to the VS-1 Smart Camera; be sure to do this AFTER making the physical connection to the network.
3. Start the FrontRunner™ application by selecting Start > Visionscape > Visionscape FrontRunner. The main FrontRunner™ screen is displayed, as shown in Figure 1–1.

FIGURE 1–1. FrontRunner™ Main Screen

4. Select View > Network Overview to display the Network Overview window, as shown in Figure 1–2.

FIGURE 1–2. Network Overview Screen — No Camera Selected

Your camera should appear in the network overview list. The camera name will be of the form HawkeyeXXXXXX, where the X's represent the last part of the camera's MAC address.

5. Click on the row that lists your camera. The network information area should update and display the Change Network Settings … button, as shown in Figure 1–3.

FIGURE 1–3. Network Overview Screen — Camera Selected

6. If the info area displays a red background identifying a camera communication problem, it means that the camera and the PC, even though connected to the same network, are not using the same logical IP addressing. See "Setting Up Network Communications" in the Visionscape® Smart Camera Guide to correct the communication problem.

7. Click the Change Network Settings button, which displays the login screen. Enter the default user name (hawkeye) and password ("vision") and click OK. You will see the Change HawkEye Network Settings dialog box (Figure 1–4), which allows you to change the name of your camera.

FIGURE 1–4. Change Network Settings Dialog Box

8. Highlight the existing camera name, type in a new name (no spaces are allowed), and click OK. You will see the name of your camera change in the network overview. You can close the Network Overview Window.

9. From FrontRunner™, click

to display the Select Device dialog box.

10. Click on the camera name you just assigned and click OK. You will see a new device button appear for your camera, as shown in Figure 1–5.

FIGURE 1–5. VS-1 Device Button Added

Note: The green triangle symbol indicates that the camera is currently running a job.

11. From this point on, you can simply click on the device button for your camera to establish a connection.

Creating a New Job to Acquire Images

The instructions that the VS-1 Smart Camera performs in a particular application are called “Steps”, and the complete collection of steps is called a “Job”. To do anything, even to take a picture, the VS-1 Smart Camera requires a Job. Use the following procedure to create a new Job:

1. Click the device button for your camera.
2. Take control of the camera by clicking .

   This will display the Login to Device dialog box, where you should enter the username (hawkeye) and password (“vision”) and then click OK.
3. To begin creating a new Job, select File > New Job (or click).

   FrontRunner™ displays the screen shown in Figure 1–6.

FIGURE 1–6. FrontRunner Main Screen After Clicking New Job

4. To acquire a new image, click . You should see an image appear in the display area.

5. To display a “live” image, click . (Click it again to exit live video.)

6. To bring up the step editing environment, click .

   You will see a hierarchy of steps on the left hand side of the editor, as shown in Figure 1–7.

FIGURE 1–7. Hierarchy of Steps

7. Select the step named “Acquire”. After you select the Acquire step, the right hand side of the editor will display the various parameters and settings that can be modified. Of immediate interest is Exposure Time. You can click on the spreadsheet cell with the current Exposure Time value to change it. Reducing the exposure time will darken the image, while increasing it will make the image brighter.

   So far, the Job you are manipulating exists only on the PC. You are using the Job in “Setup Mode”, which allows you to create, edit, and debug Jobs on the PC.

8. To transfer the Job to the camera, click

   If you want the Job to be non-volatile (still be loaded on the camera when it is rebooted), then click

9. Now that there is a Job loaded onto the camera, start it by clicking

   This will switch FrontRunner™ to a runtime display which, in the case of this example, will simply display the image, as shown in Figure 1–8.

FIGURE 1–8. Image Displayed by Your New Job

Note: Notice the statistics at the bottom of the display.

CHAPTER 2

The VS-1 Smart Camera in Action - Simple Examples

This chapter contains simple tutorial examples to help you become familiar with various FrontRunner™ tools:

- “Simple Blob Tool” on page 2-3
- “Simple Flaw Tool” on page 2-12
- “Simple Fast Edge Tool” on page 2-19
- “Simple Data Matrix Tool” on page 2-36

Notice that each sections lists the complete Job (xxxxx.AVP) that corresponds to the Job you will create.

Icons

Table 2–1 describes the icon used in this chapter:

TABLE 2–1. Icons and What They Mean

Icon	What It Means
	This is step #1 of a procedure. Click the left mouse button.
	This is step #2 of a procedure. Click the left mouse button.

Simple Blob Tool

FrontRunner™ Job:
Start > Visionscape > Visionscape Tutorials & Samples > Tutorials > HawkEye 1600T > Simple Blob Tool > tutorial_blob.avp

The Blob Tool performs connectivity analysis on an image, finding groups of connected pixels with gray levels above or below a threshold. Each group is called a blob. The Blob Tool records all the detected blobs into a blob tree. For each blob, the tool calculates many geometric features including the length, width, area, etc. In addition, the number of blobs and number of parts in the region of interest (ROI) are calculated. A part is a blob that has the opposite color of the background. A hole is a blob with the same color as the background.

This example counts the number of pips on a die.

1. Start FrontRunner™ by selecting Start > Visionscape > Visionscape FrontRunner. FrontRunner™ displays its main window.

2. Do either of the following:

   a. For a camera already added to FrontRunner™, simply click the camera button.

   b. For a camera that has not been added to FrontRunner™, click

   FrontRunner™ displays the Select Device dialog box. Select a camera and click OK.

3. Take control of the camera by clicking .

   FrontRunner™ displays the Login to Device dialog box.

   Note: You will not see this screen if no login parameters are set.

4. Enter your username (default is “hawkeye”) and password (default is “vision”), and click OK.

5. If the camera is running, stop it by clicking . FrontRunner™ displays the Device State Changed dialog box. Because we’re creating a new Job, click No.

6. Start creating a new Job by clicking Create New Program, and then Editor, as shown in Figure 2–1.

FIGURE 2–1. Start Creating New Job

The camera will change to Edit Mode (indicated by the pencil next to the camera icon).

Note: Maximize or minimize the Editor as needed.

7. In the left pane of the Step Tree Editor window, click on the Step named “Acquire”.

FIGURE 2–2. Acquire Step

Note: You may have to click the Acquire tab in the properties window.

FrontRunner™ displays the Acquire properties page.

8. Adjust the following Acquire properties:

   – Picture Mode — Set to Load Images from File.

– File List — Click <empty>, and then Add... to display the Open dialog box. Browse for the file die1pip.tif from Windows. It's located at:

  C:\Vscape\Tutorials & Samples\Tutorials\HawkEye 1600T\Simple Blob Tool

  Select die1pip.tif and click Open.

  Note: These files were installed from the installation CD onto your hard drive when you installed Visionscape. If you installed Visionscape to a location other than C:\vscape, replace it with the appropriate drive and directory designation.

9. Highlight Snapshot in the Step Tree. Right click Snapshot and click Insert Into. FrontRunner™ displays the Insert Step window. Double click on Blob Tool to insert it into the Snapshot.

10. In the left pane, highlight Blob Filter in the Step Tree. Right click Blob Filter and click Delete. FrontRunner™ displays the Are you sure you want to delete this step? screen. Click Yes.

Note: Normally, you wouldn't delete Blob Filter from your Job. But, since we're simply counting pips on a die, you can delete it in this Job.

---

11. Click Blob Tool in the Step Tree to display the Blob Tool properties page.

12. Adjust the following Blob Tool properties:

  – Use Autothreshold — Uncheck it.

  – High Threshold — Set to 64.

  – Maximum Blob size — Set to 10000.

  – Min Number of Blobs — Set to 1.

  – Max Number of Blobs — Set to 6.

13. To display die1pip.tif, click .

FrontRunner™ displays the image and a box (the Blob Tool ROI), as shown in Figure 2–3.

FIGURE 2–3. die1pip.tif and Blob Tool ROI

14. Click on the box. Move and size the box so that it surrounds the die, as shown in Figure 2–4.

FIGURE 2–4. Blob Tool ROI Moved and Sized

15. To run the job once and then stop, click .

    The Job passes.

16. In the left pane of the Editor, highlight Acquire.

    FrontRunner™ displays the Acquire properties page.

17. Adjust the following Acquire properties:

    – File List — Click to the right of File List, and then click Add.... Browse for the files die2pip.tif, die3pip.tif, die4pip.tif, die5pip.tif, and die6pip.tif from Windows. They are located at:

      C:\Vscape\Tutorials & Samples\Tutorials\HawkEye 1600T\Simple Blob Tool

18. Select die2pip.tif through die6pip.tif and click Open.

19. Minimize the Editor.

20. To run the job once and then stop, click .

21. Notice that NumBlobs matches the number of pips on the die, as shown in Figure 2–5.

FIGURE 2–5. NumBlobs Displays Number of Pips on the Die

22. Continue clicking to display the remaining images.

    Notice that the value for NumBlobs changes as the image changes.

23. Now, let's display output information.

24. Maximize the Editor.

25. In the left pane of the Editor, highlight Blob Tool.

26. In the right pane of the Editor, click the Show Output Datums button, as shown in Figure 2–6.

FIGURE 2–6. Show Output Datums Button

27. Click to the left of all the output datums (5 of the 6 output datums have already been selected in Figure 2–6).

28. Close or minimize the Editor.

29. Click the Download Program from PC to Device (Figure 2–7) to download your Job to the Smart Camera.

FIGURE 2–7. Download Program from PC to Device Button

30. Click the Start Program on Device (Figure 2–8) to start your Job on the Smart Camera.

FIGURE 2–8. Start Program on Device Button

31. To display the output datums you specified earlier, click the button shown in Figure 2–9.

FIGURE 2–9. Show Output Datums Button

You will see output similar to that shown in Figure 2–10.

FIGURE 2–10. Output From Your Job

⊟ Hawkeye1000E

Insp1	Inspect: 1334	Pass: 1334	Fail: 0

Blob Tool.Status		True
Blob Tool.Blob Tree	⊞	...
Blob Tool.Number of blobs		4
Blob Tool.Number of parts		4
Blob Tool.Total Area		2052.000

Congratulations! You've just created a Visionscape Job that counts the pips on a die and displays output information.

Simple Flaw Tool

FrontRunner™ Job:
Start > Visionscape > Visionscape Tutorials & Samples > Tutorials > HawkEye 1600T > Simple Flaw Tool > tutorial_flaw.avp

The Flaw Tool detects the presence or absence of a feature. For example, it can determine whether a package has any defects in appearance, such as cracks or scratches. The input to the Flaw Tool is an image buffer on which to process. The output of the step at runtime is the pass/fail status of the inspection. An output containing the resulting sum or count is also available.

This example determines the presence or absence of a paper clip.

1. Start FrontRunner™ by selecting Start > Visionscape > Visionscape FrontRunner. FrontRunner™ displays its main window.

2. Do either of the following:

   a. For a camera already added to FrontRunner™, simply click the camera button.

   b. For a camera that has not been added to FrontRunner™, click

   FrontRunner™ displays the Select Device dialog box. Select a camera and click OK.

3. Take control by clicking . FrontRunner™ displays the Login to Device dialog box.

   Note: You will not see this screen if no login parameters are set.

4. Enter your username and password (the defaults are “hawkeye” and “vision”).

5. Click OK.

6. If the camera is running, stop it by clicking .

   FrontRunner™ displays the Device State Changed dialog box.

7. Because we’re creating a new Job, click No.

8. Start creating a new Job by clicking Create New Program, and then Editor, as shown in Figure 2–11.

FIGURE 2–11. Start Creating New Job

The camera will change to Edit Mode (indicated by the pencil next to the camera icon).

9. To display the Step Tree and Editor, click

.

This allows you to view your Job as you create it.

Note: Maximize or minimize the Editor as needed to accomplish the steps in this procedure.

10. Highlight Acquire in the Step Tree (left pane).

FIGURE 2–12. Acquire Step

Note: You may have to click the Acquire tab in the properties window.

FrontRunner™ displays the Acquire properties page.

11. Adjust the following Acquire properties:

    – Picture Mode — Set to Load Images from File.

    – File List — Click <empty>, and then Add... to display the Open dialog box. Browse for the files Paperclip01.tif, Paperclip02.tif and Paperclip03.tif from Windows. They are located at:

      C:\Vscape\Tutorials & Samples\Tutorials\HawkEye 1600T\Simple Flaw Tool

      Select Paperclip01.tif, Paperclip02.tif, and Paperclip03.tif. Click Open.

      Note: These files were installed from the installation CD onto your hard drive when you installed Visionscape. If you installed Visionscape to a location other than C:\vscape, replace it with the appropriate drive and directory designation.

12. Highlight Snapshot in the Step Tree (left pane). Right click Snapshot and click Insert Into. FrontRunner™ displays the Insert Step window. Click on the Analysis Tools tab. Double click on Flaw Tool to insert it into the Snapshot.

13. Highlight Flaw Tool in the Step Tree (left pane) to display the Flaw Tool properties page.

14. Adjust the following Flaw Tool properties:

    – Tool Method — Count Edge Pixels

    – Min Allowed Edge Count — 100

    – Max Allowed Edge Count — 5000

    – Graphics Level — Show Details

15. In the Setup window, to view Paperclip01.tif, click .

    FrontRunner™ displays the image Paperclip01.tif and a box, as shown in Figure 2–13.

FIGURE 2–13. Paperclip01.tif and Flaw Tool Displayed

16. Click on the box; re-size it so that it is just slightly smaller than the entire display area (see Figure 2–14).

17. To run the Job once and then stop, click .

    FrontRunner™ displays Paperclip02 and the information that the Flaw Tool passed, as shown in Figure 2–14.

FIGURE 2–14. Paperclip 02 Passes Inspection

Notice the following properties and their values:

– Edge Count — 1672

– Min Allowed — 100

– Max Allowed — 5000

The inspection passed because the Edge Count was between the minimum and maximum allowed.

18. Click again.

FrontRunner™ displays the empty window and the information that the Flaw Tool failed, as shown in Figure 2–15.

FIGURE 2–15. Paperclip 03 Fails Inspection

Notice the following properties and their values:

– Edge Count — 7

– Min Allowed — 100

– Max Allowed — 5000

The inspection failed because the Edge Count was not within the minimum and maximum allowed.

19. Click again.

FrontRunner™ displays Paperclip01 and the information that the Flaw Tool passed, as shown in Figure 2–16.

FIGURE 2–16. Paperclip 01 Passes Inspection

Notice the following properties and their values:

– Edge Count — 2262

– Min Allowed — 100

– Max Allowed — 5000

The inspection passed because the Edge Count was between the minimum and maximum allowed.

Simple Fast Edge Tool

FrontRunner™ Job:
Start > Visionscape > Visionscape Tutorials & Samples > Tutorials > HawkEye 1600T > Simple Fast Edge Tool > tutorial_fastedge.avp

The Fast Edge Tool finds straight edges or line segments in the ROI. The step calculates a line equation, a midpoint of the line and angle, as well as statistics for the edges found as they relate to the line that is fit.

The Fast Edge Tool searches the ROI for places where gray level changes occur and uses these places to compute a line based on one of three types of line fit algorithms. These transitions are found using a threshold or gradient analysis.

This example finds the four edges and two top corners of one image.

1. Start FrontRunner™ by selecting Start > Visionscape > Visionscape FrontRunner. FrontRunner™ displays its main window.

2. Do either of the following:

   a. For a camera already added to FrontRunner™, simply click the camera button.

   b. For a camera that has not been added to FrontRunner™, click

.

      FrontRunner™ displays the Select Device dialog box. Select a camera and click OK.

3. Take control by clicking . FrontRunner™ displays the Login to Device dialog box.

   Note: You will not see this screen if no login parameters are set.

4. Enter your username and password (the defaults are “hawkeye” and “vision”).

5. Click OK.

6. If the camera is running, stop it by clicking .

   FrontRunner™ displays the Device State Changed dialog box.

7. Because we're creating a new Job, click No.

8. Start creating a new Job by clicking Create New Program, and then Editor, as shown in Figure 2–17.

FIGURE 2–17. Start Creating New Job

The camera will change to Edit Mode (indicated by the pencil next to the camera icon).

9. To display the Step Tree, click

.

This allows you to view your Job as you create it.

Note: Maximize or minimize the Editor as needed to accomplish the steps in this procedure.

10. Highlight Acquire in the Step Tree (left pane). FrontRunner™ displays the Acquire properties page.

FIGURE 2–18. Acquire Step

Note: You may have to click the Acquire tab in the properties window.

11. Adjust the following Acquire properties:

    – Picture Mode — Set to Load Images from File.

    – File List — Click <empty>, and then Add... to display the Open dialog box. Browse for the file Chip01.tif from Windows. It is located at:

      C:\Vscape\Tutorials & Samples\Tutorials\HawkEye 1600T\Simple Fast Edge Tool

      Select Chip01.tif. Click Open.

      Note: This file was installed from the installation CD onto your hard drive when you installed Visionscape. If you installed Visionscape to a location other than C:\vscape, replace it with the appropriate drive and directory designation.

12. Highlight Snapshot in the Step Tree (left pane). Right click Snapshot and click Insert Into. FrontRunner™ displays the Insert Step window. Click on the Analysis Tools tab. Double click on Fast Edge Tool to insert it into the Snapshot.

13. Highlight Fast Edge in the Step Tree (left pane), right click, and then click Rename. Rename it to Top Fast Edge.

14. In the Setup window, to view Chip01.tif, click . FrontRunner™ displays Chip01.tif, as shown in Figure 2–19.

FIGURE 2–19. Chip01.tif with One Fast Edge Tool Inserted

15. Adjust the ROI for Top Fast Edge so that it looks like the image in Figure 2–20.

FIGURE 2–20. Chip01.tif with One Fast Edge Tool Adjusted

16. Highlight Top Fast Edge in the Step Tree (left pane).

17. Adjust the following Top Fast Edge properties:

    – Scan Direction — Set to Top to Bottom

    – Transition color — Set to Light to Dark

    – Gradient Threshold — Set to 50

18. Highlight Snapshot in the Step Tree (left pane). Right click Snapshot and click Insert Into. FrontRunner™ displays the Insert Step window. Double click on Fast Edge Tool to insert a second one into the Snapshot.

19. Highlight the second Fast Edge in the Step Tree (left pane), right click, and then click Rename. Rename it to Left Fast Edge.

20. Adjust the ROI for Left Fast Edge so that it looks like the image in Figure 2–21.

FIGURE 2–21. Chip01.tif with Two Fast Edge Tool Adjusted

21. Highlight Left Fast Edge in the Step Tree (left pane).

22. Adjust the following Left Fast Edge properties:

    – Scan Direction — Set to Left to Right

    – Transition color — Set to Light to Dark

    – Gradient Threshold — Set to 50

23. Highlight Snapshot in the Step Tree (left pane). Right click Snapshot and click Insert Into. FrontRunner™ displays the Insert Step window. Double click on Fast Edge Tool to insert a third one into the Snapshot.

24. Highlight Fast Edge in the Step Tree (left pane), right click, and then click Rename. Rename it to Right Fast Edge.

25. Adjust the ROI for Right Fast Edge so that it looks like the image in Figure 2–22.

FIGURE 2–22. Chip01.tif with Three Fast Edge Tool Adjusted

26. Highlight Right Fast Edge in the Step Tree (left pane).

27. Adjust the following Right Fast Edge properties:

    – Scan Direction — Set to Right to Left

    – Transition color — Set to Light to Dark

    – Gradient Threshold — Set to 50

28. Highlight Snapshot in the Step Tree (left pane). Right click Snapshot and click Insert Into. FrontRunner™ displays the Insert Step window. Double click on Fast Edge Tool to insert a fourth one into the Snapshot.

29. Highlight Fast Edge in the Step Tree (left pane), right click, and then click Rename. Rename it to Bottom Fast Edge.

30. Adjust the ROI for Bottom Fast Edge so that it looks like the image in Figure 2–23.

FIGURE 2–23. Chip01.tif with Four Fast Edge Tool Adjusted

31. Highlight Bottom Fast Edge in the Step Tree (left pane).

32. Adjust the following Bottom Fast Edge properties:

    – Scan Direction — Set to Bottom to Top

    – Transition color — Set to Light to Dark

    – Gradient Threshold — Set to 50

33. Highlight Snapshot in the Step Tree (left pane). Right click Snapshot and click Insert Into. FrontRunner™ displays the Insert Step window. Click the Measurements tab. Double click on IntersectLines Meas to insert it into the Snapshot.

34. Repeat the previous step one more time to add another IntersectLines Meas to the Job.

35. Rename the two IntersectLines Meas tools:

a. Highlight the first IntersectLines Meas, right click, and then click Rename. Rename the first IntersectLines Meas to Left Top IntersectLines Meas.

b. Highlight the second IntersectLines Meas, right click, and then click Rename. Rename the second IntersectLines Meas to Right Top IntersectLines Meas.

36. Highlight Snapshot in the Step Tree (left pane). Right click Snapshot and click Insert Into. FrontRunner™ displays the Insert Step window. Click the Analysis Tools tab. Double click on TwoPt Locator to insert it into the Snapshot.

When you are finished, the Job should look like the Job in Figure 2–24.

FIGURE 2–24. Step Tree

37. Highlight Left Top IntersectLines Meas in the Step Tree (left pane).

38. To select the reference for First Line, click in the area to the right of the blue arrow (Figure 2–25), and click on the three dots, which displays the Select Reference window, as shown in Figure 2–26.

FIGURE 2–25. Selecting Reference for First Line

FIGURE 2–26. Select Reference Window

39. Select Edge Line:EdgeLine from Left Fast Edge.

40. Click OK.

41. To select the reference for Second Line, click in the area to the right of the blue arrow (Figure 2–27), and click on the three dots, which displays the Select Reference window, as shown in Figure 2–28.

FIGURE 2–27. Selecting Reference for Second Line

FIGURE 2–28. Select Reference Window

42. Select Edge Line:EdgeLine from Top Fast Edge.

43. Click OK.

44. Highlight Right Top IntersectLines Meas in the Step Tree (left pane).

45. To select the reference for First Line, click in the area to the right of the blue arrow (Figure 2–29), and click on the three dots, which displays the Select Reference window, as shown in Figure 2–30.

FIGURE 2–29. Selecting Reference for First Line

FIGURE 2–30. Select Reference Window

46. Select Edge Line:EdgeLine from Right Fast Edge.

47. Click OK.

48. To select the reference for Second Line, click in the area to the right of the blue arrow (Figure 2–31), and click on the three dots, which displays the Select Reference window, as shown in Figure 2–32.

FIGURE 2–31. Selecting Reference for Second Line

FIGURE 2–32. Select Reference Window

49. Select Edge Line:EdgeLine from Top Fast Edge.

50. Click OK.

51. Highlight TwoPt Locator in the Step Tree (left pane).

52. To select the reference for Pin 1 Point, click in the area to the right of the blue arrow (Figure 2–33), and click on the three dots, which displays the Select Reference window, as shown in Figure 2–34.

FIGURE 2–33. Selecting Reference for Pin 1 Point

FIGURE 2–34. Select Reference Window

53. Select Point:Pt from Left Top IntersectLines Meas.

54. Click OK.

55. To select the reference for Pin 2 Point, click in the area to the right of the blue arrow (Figure 2–35), and click on the three dots, which displays the Select Reference window, as shown in Figure 2–36.

FIGURE 2–35. Selecting Reference for Pin 2 Point

FIGURE 2–36. Select Reference Window

56. Select Point:Pt from Right Top IntersectLines Meas.

57. Click OK.

58. Your setup for TwoPt Locator should appear as shown in Figure 2–37.

FIGURE 2–37. TwoPt Locator Adjusted

TwoPt Locator and the Train button will display a red box until you have trained the tool. Also, the boxes around the untrained tool will remain dotted lines until trained.

59. To train the tool, click .

60. Highlight Acquire in the Step Tree (left pane).

Note: You may have to click the Acquire tab in the properties window.

61. To run the Job once and then stop, click .

Notice that the Job runs successfully, as shown in Figure 2–38.

FIGURE 2–38. Job Runs Successfully

Note: Any tool inserted into the 2PtLocator adjusts as the symbol moves.

Simple Data Matrix Tool

FrontRunner™ Job:
Start > Visionscape > Visionscape Tutorials & Samples > Tutorials > HawkEye 1600T > Simple Data Matrix Tool > tutorial_datamatrix.avp

The Data Matrix Tool reads a Data Matrix symbol and converts the data to a string that can be compared to a known string, or exported. The input to DataMatrixTool consists of a matrix description, and search criteria. The output of DataMatrixTool will be the decoded string and status indicating a match with the known string.

This example reads six Data Matrices using the DataMatrix Tool.

1. Start FrontRunner™ by selecting Start > Visionscape > Visionscape FrontRunner. FrontRunner™ displays its main window.

2. Do either of the following:

   a. For a camera already added to FrontRunner™, simply click the camera button.

   b. For a camera that has not been added to FrontRunner™, click

.
   FrontRunner™ displays the Select Device dialog box. Select a camera and click OK.

3. Take control by clicking . FrontRunner™ displays the Login to Device dialog box.

   Note: You will not see this screen if no login parameters are set.

4. Enter your username and password (the defaults are “hawkeye” and “vision”).

5. Click OK.

6. If the camera is running, stop it by clicking .

   FrontRunner™ displays the Device State Changed dialog box.

7. Because we’re creating a new Job, click No.

8. Start creating a new Job by clicking Create New Program, and then Editor, as shown in Figure 2–39.

FIGURE 2–39. Start Creating New Job

The camera will change to Edit Mode (indicated by the pencil next to the camera icon).

9. To display the Step Tree and Editor, click

.

This allows you to view your Job as you create it.

Note: Maximize or minimize the Editor as needed to accomplish the steps in this procedure.

10. Highlight Acquire in the Step Tree (left pane). FrontRunner™ displays the Acquire properties page.

FIGURE 2–40. Acquire Step

Note: You may have to click the Acquire tab in the properties window.

11. Adjust the following Acquire properties:

    – Picture Mode — Set to Load Images from File.

    – File List — Click <empty>, and then Add... to display the Open dialog box. Browse for the file DMs.tif from Windows. It is located at:

      C:\Vscape\Tutorials & Samples\Tutorials\HawkEye 1600T\Simple Data Matrix Tool

      Select DMs.tif. Click Open.

      Note: This file was installed from the installation CD onto your hard drive when you installed Visionscape. If you installed Visionscape to a location other than C:\vscape, replace it with the appropriate drive and directory designation.

12. In the Setup window, to view DMs.tif, click . FrontRunner™ displays DMs.tif, as shown in Figure 2–41.

FIGURE 2–41. DMs.tif

13. Highlight Snapshot in the Step Tree (left pane). Right click Snapshot and click Insert Into. FrontRunner™ displays the Insert Step window.

Click on the Analysis Tools tab. Double click on DataMatrix Tool to insert it into the Snapshot.

14. Adjust the ROI so that there is a generous amount of space around the Data Matrix, as shown in Figure 2–42.

FIGURE 2–42. Data Matrix with ROI

15. Repeat steps 13 and 14 to add the remaining Data Matrix Tools.

After you have added all six Data Matrix Tools, you should see a screen similar to the one shown in Figure 2–43.

FIGURE 2–43. All Six Data Matrix Tools Positioned

16. To run the Job once and then stop, click .

You should see a screen similar to the one shown in Figure 2–44.

FIGURE 2–44. All Trained and Inspection Run Once

Training Tools

Some FrontRunner™ tools, such as the Data Matrix tool, can be trained, that is, told what to expect when reading. For example, if you train a Data Matrix tool to read a Data Matrix with 8 rows and 32 columns, the Data Matrix tool will fail when it tries to read something other than a Data Matrix with 8 rows and 32 columns. Training the Data Matrix tool sets the parameters of the tool to specific values. This generally enables the tool to read a larger portion of a given population of a single type of Data Matrix symbol more quickly and robustly by concentrating on symbols that have specific parameter values. However, if the application requires reading a wide variety of symbologies, it is necessary to run without training.

For this tutorial, you saw a red Train button and red boxes in front of each Data Matrix tool. Even though we didn't train the six Data Matrix tools, they each read their respective Data Matrices without problems.

Where To Now?

Chapter 3 of this Getting Started contains a tutorial example that is more advanced than the ones you just finished.

CHAPTER 3

The VS-1 Smart Camera in Action - Advanced Example

This chapter contains an advanced tutorial example to help you become familiar with the use of various FrontRunner™ tools in one Job.

Notice that we list the complete Job (xxxxx.AVP) that corresponds to the Job you will create.

Advanced Example Using Multiple Tools

FrontRunner™ Job:
Start > Visionscape > Visionscape Tutorials & Samples > Tutorials > HawkEye 1600T > Advanced Example Using Multiple Tools > tutorial_opto.avp

This example finds the sides of an optical isolator module, locates the switch on top of the optical isolator module, and determines the switch's position.

Input Datums

Input datums get their values from another datum from another step. Whenever you see the icon shown in Figure 3–1, you will use the Select Reference editor to select another step in your Job that will supply the datum value for this datum.

FIGURE 3–1. Input Datum Icon

Procedure

Use the following procedure to find the sides of an opto, locate the switch on top of the opto, and determine the switch's position:

1. Start FrontRunner™ by selecting Start > Visionscape > Visionscape FrontRunner. FrontRunner™ displays its main window.
2. Do either of the following:
   a. For a camera already added to FrontRunner™, simply click the camera button.
   b. For a camera that has not been added to FrontRunner™, click

   .
   FrontRunner™ displays the Select Device dialog box. Select a camera and click OK.
3. Take control by clicking . FrontRunner™ displays the Login to Device dialog box.

Note: You will not see this screen if no login parameters are set.

4. Enter your username and password (the defaults are “hawkeye” and “vision”).
5. Click OK.
6. If the camera is running, stop it by clicking .

   FrontRunner™ displays the Device State Changed dialog box.
7. Because we’re creating a new Job, click No.
8. Start creating a new Job by clicking Create New Program, and then Editor, as shown in Figure 3–2.

FIGURE 3–2. Start Creating New Job

The camera will change to Edit Mode (indicated by the pencil next to the camera icon).

9. To display the Step Tree and Editor, click

.

   This allows you to view your Job as you create it.

Note: Maximize or minimize the Editor as needed to accomplish the steps in this procedure.

10. Highlight Acquire in the Step Tree (left pane). FrontRunner™ displays the Acquire properties page.

FIGURE 3–3. Acquire Step

Note: You may have to click the Acquire tab in the properties window.

11. Adjust the following Acquire properties:

    – Picture Mode — Set to Load Images from File.

    – File List — Click <empty>, and then Add... to display the Open dialog box. Browse for the files opto01.tif and opto02.tif from Windows. They are located at:

      C:\Vscape\Tutorials & Samples\Tutorials\HawkEye 1600T\Advanced Example Using Multiple Tools

      Select opto01.tif and opto02.tif. Click Open.

      Note: These files were installed from the installation CD onto your hard drive when you installed Visionscape®. If you installed Visionscape® to a location other than C:\vscape, replace it with the appropriate drive and directory designation.

12. Highlight Snapshot in the Step Tree (left pane). Right click Snapshot and click Insert Into. FrontRunner™ displays the Insert Step window. Click on the Analysis Tools tab. Double click on Fast Edge to insert it into the Snapshot.

13. In the Setup window, to view opto01.tif, click .

14. FrontRunner™ displays Opto01.tif, as shown in Figure 3–4.

FIGURE 3–4. Opto01.tif

15. Highlight Snapshot in the Step Tree (left pane). Right click Snapshot and click Insert Into. FrontRunner™ displays the Insert Step window. Double click on Fast Edge to insert a **second** Fast Edge into the Snapshot.

16. Highlight Snapshot in the Step Tree (left pane). Right click Snapshot and click Insert Into. FrontRunner™ displays the Insert Step window. Double click on Fast Edge to insert a **third** Fast Edge into the Snapshot.

17. Rename the three Fast Edge tools:

    a. Highlight the first Fast Edge in the Step Tree (left pane), right click, and then click Rename. Rename the first Fast Edge to Left Fast Edge.

b. Highlight the second Fast Edge in the Step Tree (left pane), right click, and then click Rename. Rename the second Fast Edge to Top Fast Edge.

c. Highlight the third Fast Edge in the Step Tree (left pane), right click, and then click Rename. Rename the third Fast Edge to Right Fast Edge.

18. Adjust the three Fast Edge tools so that they look like the image in Figure 3–5.

FIGURE 3–5. Opto with Three Fast Edges Adjusted

19. Highlight Left Fast Edge in the Step Tree (left pane).

20. Adjust the following Left Fast Edge properties:

– Scan Direction — Set to Left to Right

– Transition color — Set to Dark to Light

– Sharpness — Set to Sharp

21. Highlight Top Fast Edge in the Step Tree (left pane). Adjust the following Top Fast Edge properties:

    – Scan Direction — Set to Top to Bottom

    – Transition color — Set to Dark to Light

    – Sharpness — Set to Sharp

22. Highlight Right Fast Edge in the Step Tree (left pane). Adjust the following Right Fast Edge properties:

    – Scan Direction — Set to Right to Left

    – Transition color — Set to Dark to Light

    – Sharpness — Set to Sharp

23. Highlight Snapshot in the Step Tree (left pane). Right click Snapshot and click Insert Into. FrontRunner™ displays the Insert Step window. Click the Measurements tab. Double click on IntersectLines Meas to insert it into the Snapshot.

24. Highlight Snapshot in the Step Tree (left pane). Right click Snapshot and click Insert Into. FrontRunner™ displays the Insert Step window. Double click on IntersectLines Meas to insert a second one into the Snapshot.

25. Rename the two IntersectLines Meas tools:

    a. Highlight the first IntersectLines Meas, right click, and then click Rename. Rename the first IntersectLines Meas to Left Top IntersectLines Meas.

    b. Highlight the second IntersectLines Meas, right click, and then click Rename. Rename the second IntersectLines Meas to Right Top IntersectLines Meas.

26. Highlight Snapshot in the Step Tree (left pane). Right click Snapshot and click Insert Into. FrontRunner™ displays the Insert Step window. Click the Analysis Tools tab. Double click on TwoPt Locator to insert it into the Snapshot.

27. Highlight TwoPt Locator in the Step Tree (left pane). Right click TwoPt Locator and click Insert Into. FrontRunner™ displays the Insert Step window. Double click on Blob Tool to insert it into the TwoPt Locator.

28. Right click on the Blob Filter and select Delete. Click yes to confirm the deletion of the Blob Filter.

    When you are finished, the Job should look like the Job in Figure 3–6.

FIGURE 3–6. Step Tree

29. Highlight Left Top IntersectLines Meas in the Step Tree (left pane).

30. To select the reference for First Line, click in the area to the right of the blue arrow (Figure 3–7), and click on the three dots, which displays the Select Reference window, as shown in Figure 3–8.

FIGURE 3–7. Selecting Reference for First Line

FIGURE 3–8. Select Reference Window

31. Select Edge Line:EdgeLine from Left Fast Edge.

32. Click OK.

33. To select the reference for Second Line, click in the area to the right of the blue arrow (Figure 3–9), and click on the three dots, which displays the Select Reference window, as shown in Figure 3–10.

FIGURE 3–9. Selecting Reference for Second Line

FIGURE 3–10. Select Reference Window

34. Select Edge Line:EdgeLine from Top Fast Edge.

35. Click OK.

36. Highlight Right Top IntersectLines Meas in the Step Tree (left pane).

37. To select the reference for First Line, click in the area to the right of the blue arrow (Figure 3–11), and click on the three dots, which displays the Select Reference window, as shown in Figure 3–12.

FIGURE 3–11. Selecting Reference for First Line

FIGURE 3–12. Select Reference Window

38. Select Edge Line:EdgeLine from Right Fast Edge.

39. Click OK.

40. To select the reference for Second Line, click in the area to the right of the blue arrow (Figure 3–13), and click on the three dots, which displays the Select Reference window, as shown in Figure 3–14.

FIGURE 3–13. Selecting Reference for Second Line

FIGURE 3–14. Select Reference Window

41. Select Edge Line:EdgeLine from Top Fast Edge.
42. Click OK.
43. Highlight TwoPt Locator in the Step Tree (left pane).
44. To select the reference for Pin 1 Point, click in the area to the right of the blue arrow (Figure 3–15), and click on the three dots, which displays the Select Reference window, as shown in Figure 3–16.

FIGURE 3–15. Selecting Reference for First Line

FIGURE 3–16. Select Reference Window

45. Select Point:PT from Left Top IntersectLines Meas.

46. Click OK.

47. To select the reference for Pin 2 Point, click in the area to the right of the blue arrow (Figure 3–17), and click on the three dots, which displays the Select Reference window, as shown in Figure 3–18.

FIGURE 3–17. Selecting Reference for Second Line

FIGURE 3–18. Select Reference Window

48. Select Point:Pt from Right Top IntersectLines Meas.

49. Click OK.

    In the FrontRunner™ Edit window, TwoPt Locator and the Train button will display a red box until you train the tool. Also, the boxes around the untrained tool will remain dotted lines until trained.

50. To train the Two Pt Locator tool, highlight it and then click .

    Your setup should appear as shown in Figure 3–19.

FIGURE 3–19. TwoPt Locator Adjusted

51. Highlight Blob Tool (left pane).

52. Adjust the following Blob Tool properties:

    – Use Autothreshold — Deselect it

    – Low Threshold — Set to 128

    – High Threshold — Set to 255

    – Blob Polarity — Set to Light Parts

53. In the Editor window, adjust the ROI so that it encloses the switch, as shown in Figure 3–20.

FIGURE 3–20. Blob Enclosing Opto Switch

54. To run the Job once and then stop, click .

    When the Opto switch is on the right, the Job passes.

55. Highlight Acquire in the Step Tree (left pane).

    Note: You may have to click the Acquire tab in the properties window.

56. Click again.

    When the Opto switch is on the left, as is the case with Opto02.tif, the Job fails, as shown in Figure 3–21.

FIGURE 3–21. Job Fails

57. Click again.

Because we used a TwoPt Locator in this Job, FrontRunner™ can find the switch even when the opto is rotated.

In Figure 3–22, even though the opto is rotated to the left a couple of degrees, the Job finds the switch. The Job passes, because the switch is in the correct position for a pass.

FIGURE 3–22. Opto Rotated Left - Job Passes

58. Click again.

In Figure 3–23, the Job fails, because the switch is in the incorrect position for a pass.

FIGURE 3–23. Opto Rotated Left - Job Fails

Figure 3–24 and Figure 3–25 show the same pass and fail results with the opto rotated to the right a couple of degrees.

FIGURE 3–24. Opto Rotated Right - Job Passes

FIGURE 3–25. Opto Rotated Right - Job Fails

Where To Now?

See the following manuals that make up the rest of the documentation set:

- Visionscape® GigE Camera Guide — Contains information about installing GigE Camera hardware.
- VS-1 Smart Camera Guide — Contains reference information about the VS-1 Smart Camera; specifically, system components, optics and lighting, connector pinouts, cable specifications, dimensions, and how to update the firmware on the Smart Camera.
- Perl Script Custom Tool Programmer's Manual — Contains an explanation of what Perl is, how to use variables, arrays, conditional and loop statements, explains the Perl script, and provides examples of Visionscape® tools using Perl script language to define their operation and results.

- Visionscape® AppRunner User Manual — Contains information about using AppRunner.
- Visionscape® FrontRunner User Manual — Contains information about using FrontRunner.
- Visionscape® Programmers Kit (VSKit) Manual — Contains information about using VSKIT, which is a collection of libraries that aid in the development of user interface applications for Visionscape® products.
- Visionscape® Tools Reference — Contains information about all the tools in Visionscape® including builtin Perl script based tools.
- Visionscape® Readme — Contain latest details of this software revision that did not make it into the listed manuals.

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