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Lab Exercise 1.1 – Getting Connected & Image Acquisition

At the end of this lab exercise, Participants will be able to:

- Confirm the camera has power and is properly connected to IO and the Network
- Launch the Cognex GigE Configuration Tool
- Configure the GigE camera for use in Cognex Designer applications
- Launch the Cognex Designer software and create a new project

The Participant will utilize the following functions to successfully complete this exercise:

Cognex GigE Configuration Tool

NOTE: The first section of this lab requires a physical camera. All other exercises can be completed using saved images.

Follow the steps below to complete the lab exercise:

- 1. Confirm your camera has the proper connections to the following:
 - Power
 - □ I/O (not connected)
 - Network
- 2. Search for the **Cognex GigE Configuration** tool using the Windows Search box. Select the **Cognex GigE Vision Configurator** from the displayed selections.



The Cognex GigE Vision Configuration Tool displays.

Cognex GigE Vision Configuration Tool		– 🗆 X
File View Help		
i 🞓 📑 📲 📲 🛅		
Network Connections	Network Connection Information Name: Bluetooth Network Connection Working	vith GigE Vision Network Connections
Ethemet 2	Device: Bluetooth Device (Personal Area @ How on the twork?	do I use this utility to create my GigE Vision
Wi-Fi	Status: Down Connectio	do I know which Network Connections are GigE .ns?
	Speed: 3 Mbps @ How G a GigE Vis a GigE Vis	do I choose an IP address and a Subnet mask for ion network connection?
	DHCP status: Enabled @ Are the cannot us	nere reserved IP addresses and Subnet Masks I se?
	IP address: 169.254.81.163 @ Why i GigE Visio	is there a red warning symbol on my camera or n network connection?
	Subnet: 255.255.0.0 @ Why in etwork of network of the state of the sta	is there a red warning symbol on two GigE Vision connections?
	Update Network Connection @ What best perfe	advanced connection properties should I set for ormance?
	Properties Why i	is there a yellow warning icon under Properties?
	Set maximum Jumbo Frame for the best performance.	irewall status is On. What should I do?
	MTU: 1500 @ When Press F5 to update the value. checkbox	n do I check the eBus Universal Pro Driver ?
	Firewall	does enabling the eBus Universal Pro Driver Hardware Installation warning?
	Press F5 to update the status.	nected a camera. Why doesn't it show up?
	Driver Status Why	did my camera disappear?
	Performance driver: Not Installed Can I	save the current configuration?
	Driver version:	this utility provide tooltips to display additional
	eBus Universal Pro Driver	In about any individual property?



- 3. Record the following information about your camera and PC configuration:
 - a. Camera
 - a. Serial Number: _____
 - b. IP Address: _____
 - b. PC
 - a. IP Address: _____
- 4. Confirm your camera is listed without warnings. **NOTE**: *If your camera is on a different IP Address/Subnet Mask there will be a red guestion mark showing.*
- 5. If the network connection is to be used for image acquisitions check the **eBus Universal Pro Driver** checkbox, otherwise uncheck it.

Driver Status	
Performance driver:	Not Installed
Driver version:	
eBus Universal Pr	o Driver



Launch Cognex Designer

Follow the steps below to launch Cognex Designer and acquire an image:

1. Double click the **Designer** icon on your desktop.



The **Cognex Designer** launch page displays.

Cognex Designer		- D X
	Version 4.1 PR2 Cognex Designer is a trademark of Cognex Corporation.	@
	New Project Open Project.	
Recent Projects	Sample Projects	More samples on the Cognex website
ProjectOne	5/3/2019 10:02:38 AM Cognex Designer 4.1 PR2 Basics Localization	2/13/2019 4:15:06 PM
MyProject	7/21/2016 4:31:14 PM DatabaseSample	2/13/2019 4:15:06 PM
Pattern Iraining	7/6/2016 1:47:12 AM FunctionSample	2/13/2019 4:15:06 PM
	Utilities	¢

2. Click the **New Project** button.





The **New Project** dialog displays.

🥯 New Project	×
Project Name:	MyProject
Project Path:	C:\Users\jmacdona\Documents\Cogn
Project Type:	Single Camera 🔹
	Accept Cancel

3. Enter *MyProject* in the **Project Name** field, Create a new folder on the desktop named *Designer_Class_XX_XX_XX* (where the X's are the class start date) as the **Project Path**, and select *Single Camera* as the **Project Type**.



4. Click the **Accept** button. The **Cognex Designer** application launches.

S MyProject - Cognex Designer	-	0 X
File View Project Tools Help		
Explorer * 0. Properties Task X	Toolbox	- ù
Ceptorer Proprieties Set X Image: Set X Image: Set X Atoms Image: Set X Image: Set X	Ootbox • Communication • COM and TC/PP • Discrete IO • Deter Handling • Eactory Protocol • Data Manipulation • Oate Manipulation • Database Witter Image Recorder • Math and Logic • Comparison • Script Biock • Script Biock • Structure • Group Note • Vision Merge Graphics • Vision/Hro® Tool Block	~ 0.
	L	
Output Frees		
Control and the second se	<u> </u>	
U start up completed in 25-35		•



Follow the steps below if you are using an Image Database for your images:

NOTE: If you are using a Cognex Industrial Camera (CIC) to capture your images skip to **step #14**.

5. Right click the **Cameras** link under **Devices** in the Cognex Designer Explorer window.

The **Add** Menu displays.



6. Hover your mouse over the word **Add** and select '**Image File**' **Device** from the fly out.

4		5		
	P Corr	Add	•	'Camera' Device
	🗊 Databa	ises		'Image File' Device
•				'A5000' Device

The Parameter Configuration window displays.

		🥯 Parameter	Configuration	×	
		Name			
			Accept	Cancel	
7.	Enter CognexBlo	ck in the Na	ame field and cl	ick the Accept	Accept button.
		🥯 Parameter	Configuration	X	
		Name	Cogne	xBlock	
			Accept	Cancel	
	CognovBlock	addad und	or Comorae		

CognexBlock is added under Cameras.





8. Right click on CognexBlock and choose Select Image Source from the fly-out.



The Image Source Selection dialog displays.

Image Source Selection	×
Please select the file or folder to be used as the Image Source:	
Choose File	
Choose Directory	
	_
Accept Cancel]

9. Click the **Choose Directory** Choose Directory button and navigate to the location of your image database.

NOTE: The images can be found in the Student Folder on the desktop.

10. Click the **Accept** button.

CognexBlock has been added under Cameras in the Cognex Designer toolbox.



11. Drag and drop the CognexBlock into the Cognex Designer Task.





12. Click the **Run All** Land Button to bring the image into the Task.

Notice the green dot in the lower left and the time noted on the lower right of the CognexBlock. If you hover your mouse over the output the image flyout will display.



NOTE: Cognex Designer does not have an auto-save feature so make sure that you are saving your work often.

13. Click the **Save** button in the Designer toolbar to save your job.





Follow the steps below if you are using a **Cognex Industrial Camera (CIC)** to capture your images:

14. Right click the **Camera** listed under the Devices → Cameras section of the Cognex Designer Explorer.

The Add Menu displays.



15. Click Add.

The **Parameter Configuration** window displays.

Name	
Camera CIC_10MR - 21839747 🔻	
Video Format Generic GigEVision (M 💌	
Accept Cancel	

16. Enter *MyCamera* in the Name field and click the **Accept** button. *MyCamera* has been added under Cameras in the Cognex Designer toolbox.



17. Drag and drop **MyCamera** into the Cognex Designer Task.





18. Double-click the **MyCamera_Acquire** ToolBlock to access the camera settings. The **MyCamera Settings** display.

tings	Strobe & Trigger Imag	je Properties Gigl	E Custom Pr	operties
Image	Acquisition Device/Fram	ne Grabber:		
GigE \	sion: COGNEX: CIC-10N	IR : 21839747		~
Video	Formats:			
Gener	: GigEVision (Mono)			~

19. Select Generic GigEVision \rightarrow Mono as the camera's Video Format.

Video Formats:		
Generic GigEVision (Mono)	Generic GigEVision	Mono
Initialize Acquisition		Mono12 Mono12 Packed

20. Click the **Initialize Acquisition** Initialize Acquisition button. The **camera settings** display.

Exposure:	35 🖨 ms	
Brightness:	0.0196 🖨	
Contrast:	0	
✓ Timeout	10000 🚔 ms	
Serial Number:	21839747	Flush Fifo

- 21. Configure the camera settings so that you can acquire an image from the camera at your workstation.
- 22. Click the **Run** button. The **image** is captured.





23. Return to the **Task** Tab and click the **Run All transmitted** button.



Notice the green dot in the lower left and the time noted on the lower right of the CognexBlock. If you hover your mouse over the output the image flyout will display.



NOTE: Cognex Designer does not have an auto-save feature so make sure that you are saving your work often.

24. Click the **Save** button in the Designer toolbar to save your job.





Lab Exercise 2.1 – Tasks and PatMax[®] RedLine

At the end of this lab exercise, Participants will be able to:

- Configure a PatMax RedLine tool to find a pattern under various run-time conditions
- Train a pattern and determine if the automatically extracted features are valid for the application
- Determine if the PatMax RedLine score is valid

The Participant will utilize the following Cognex Designer functions to successfully complete this exercise:

- Toolbox
 - CogPMRedLine Tool
 - Script Block

Follow the steps below to complete the lab exercise:

1. Open the **MyProject** Application from the previous lab exercise.

The Task opens.

Properties Tas	k ×			
🛃 Run All	▶ E Run Selected	Fi Run From → End	ÞΞ Run From → To	÷
Device				
		-0		
0	<u> </u>			
Cogne	Block_Acquire			

2. Drag a **VisionPro Tool Block** from the Toolbox and drop it to the right of the *Device* block on the Task.

	Properties Task	k X		
	E Run All	▶ ERun Selected	▶ ∃ Run From → End	▶ = Run From → To
	Device			VisionPro® Tool Block
			-0 0-	
 Vision Merge Graphics 	0			o
VisionPro® Tool Block	Cognex	Block_Acquire		VisionProToolBlock



3. Right click on the VisionPro ToolBlock and select Rename from the fly-out box.



The Name field becomes editable.



4. Rename the ToolBlock to *Pattern_Tool* and press the **<Enter>** key. The ToolBlock name changes.



5. Connect the *Output* pin of the Device block to the *Input* pin of the Pattern_Tool block and click the **Run All** button.



The blocks are linked and an image has been acquired.

Properties Task ×		
Run All 🖻 Run Selected	▶ Ŧ Run From → End	▶ Ξ Run From → To
Device		VisionPro® Tool Block
		<u>c</u>
	00	
CognovPlock Acquire		O 13.60 ms
CognexBlock_Acquire		Pattern_1001

6. Double-click on the Pattern_Tool ToolBlock. The *Task.Pattern_Tool* tab opens.



7. Drag a CogPMRedLineTool from the toolbox and drop it in the Task.Pattern_Tool.





Connect the InputImage of the CogPMRedLineTool to the [Inputs] Image.
 NOTE: This can also be done by right-clicking on the CogPMRedLineTool InputImage → Link From → [Inputs].Image.

Tools	Inputs/Outputs	Graphics				LastR
🖃 🗲 [Inputs]						
÷	CogPMRedLineT	ool1				
	→ Resu	nk from	>	[Inputs].Image		
	🔶 Resul 🛛 🕖	nlink		onX		

9. Click the **Run Tools** button. An **image** is captured.



10. Double-click the **CogPMRedLineTool** to open the tool control for the PatMax RedLine tool.

The PatMax RedLine tool controls open.

CogPMRedLineTool1		– 🗆 X
🕨 🖉 🔤 😼 🖉 🔛 🖉	123 🤽 💡	
Train Params Train Region & Origin Ru	n Params Search Region Graphics Results	Current.InputImage <
Pattern:	Grain Limits ☑ Auto Coarse Grain Limit: 2 ♀ ☑ Auto Fine Grain Limit: 1 ♀	^
Load Pattern Save Pattern	Feature Threshold: 0.2 € Train Timeout: 5000 € ms Train Grab Train Image	
No Train Image		<pre></pre>
4.5911ms 4.6635ms 0x80131600	Not Trained.	

- 11. Click the **Grab Train Image** button on the Train Params tab.
- 12. Change the Image Buffer to **Current.TrainImage**.



The Region and Origin appear on the Current. TrainImage.



13. Set the Region around the word COGNEX.

14. Click the Train Region & Origin tab and click the Center Origin button.





- 15. Click the **Train** button.
- 16. Return to the **Train Params** tab and notice the image of the model appears in the **Pattern:** window.



17. Click the **Run Params** tab and add an *Angle* range.

NOTE: The arrow for the Angle is facing the Low and High fields.

Train Para	ams Train Region & Origir	Run Params	Search Region	Graphics	Results		
Numbe	Number To Find:						
Accept	Accept Threshold: 0.5 🖨 🗌 Ignore Polarity						
Contra	Contrast Fraction Threshold: 0 🖨 🗌 Score Using Clutter						
Accura	Accuracy Mode: Timeout: 5000 🖨 ms						
Standa	rd 🗸	/					
Coa	Coarse Accept Threshold Fraction: 0.66						
Zone	Nominal	Low	High		Overlap		
Angle	0 ≑ deg	-45 🖨 (deg 45	🗧 deg	360 ≑ deg		
Scale	1 🗧 📕	0.8	* •	1.2 🜩	1.4 🔹		

18. Click the **Search Region** tab and select *<None – Use Entire Image>* as the **Region Shape**.

Т	rain Params Train Region & Origin	Run Params	Search Region	Graphics	Results	
	Region Mode:					
	Pixel Aligned Bounding Box Adjust	Mask 🗸 🗸				
	Region Shape:					
	<none -="" entire="" image="" use=""></none>	\sim				

19. Click the **Run** button to run the tool once.



20. Click the **Results** tab and change the **Image Buffer** to *LastRun.InputImage* to review the results.



21. Close the tool control by clicking the **X** in the upper-right hand corner.

Add an Output for Score and Count

Follow the steps below to add an output to the ToolBlock:

1. Drag the **Results.Item[0].Score** and drop it at **[Outputs]**. This creates a new output terminal from the ToolBlock.



The Results Output pin is added to the Pattern_Tool ToolBlock on the Task.





2. Right click on the CogPMRedLineTool and select Add Terminals.

Tools	Inputs/Outputs	Graphics					
—	□ 🗲 [Inputs]						
	→ Image						
	CogPMRedL	Edit					
	 Results.lt 	Run					
	→ Results.lt	Delete					
	Results.lt	Rename					
	 Results.lt Results.lt 	Enabled					
	[Outputs]	Add Terminals					
	- itesuits_i	Collapse all					

The Member Browser displays.

Member Browser x
Browse: Typical - Auto Expand: Common Member: -
Displayed Name:
Path to Property
□ CogPMRedLine Tool □ □ <
Add Input Add Output Close



3. Open the *Results* branch, select *Count* and click the **Add Output** button.

Membe	r Browser				x
Browse:	Typical	- Auto Expand:	Common Member:	•	
Displaye	d Name:				
Results.(Count				
Path to P	roperty CogPMRedLine Tool Part InputImage <icogi Results <cogpmr Count <int32> Count <int32< td=""><td>mage> edLineResults> = 1 MRedLineResult> <cogtransfom2dl vuble> = 0.9873754 PMRedLineRunPara tunStatus> ogRegion> = null</cogtransfom2dl </td><td>inear> 38213348 ams></td><th></th><th></th></int32<></int32></int32></int32></int32></int32></int32></int32></int32></int32></int32></int32></int32></int32></int32></int32></int32></int32></int32></int32></int32></int32></int32></int32></int32></int32></int32></int32></int32></int32></int32></int32></int32></int32></int32></int32></int32></int32></int32></int32></int32></int32></int32></int32></int32></int32></int32></int32></int32></int32></int32></int32></int32></int32></int32></int32></int32></int32></int32></int32></int32></int32></int32></int32></int32></int32></int32></int32></int32></int32></int32></int32></int32></int32></int32></int32></int32></int32></int32></int32></int32></int32></int32></int32></int32></int32></int32></int32></int32></int32></int32></int32></int32></int32></int32></int32></int32></int32></int32></int32></int32></int32></int32></int32></int32></int32></int32></int32></int32></int32></int32></int32></int32></int32></int32></int32></int32></int32></int32></int32></int32></int32></int32></int32></int32></int32></int32></int32></int32></int32></int32></int32></cogpmr </icogi 	mage> edLineResults> = 1 MRedLineResult> <cogtransfom2dl vuble> = 0.9873754 PMRedLineRunPara tunStatus> ogRegion> = null</cogtransfom2dl 	inear> 38213348 ams>		
		Add Input	Add Output	Close	

4. Click the **Close** button.

Results.Count has been added to the CogPMRedLineTool.



5. Drag the **Results.Count** and drop it at [Outputs]. This creates a new output terminal from the ToolBlock.



The *Count* Output pin is added to the Pattern_Tool ToolBlock on the Task. Note that the Pattern_Tool ToolBlock now has two output pins.



- 6. Click the **Run All** Land button.
- 7. Record the Output results:
 - a. Score:
 - b. Count:

Create a Script Block

Add a Script Block to the Task.
 Note: The Script Block is found in the Toolbox under Scripts.



COGNEX

2. Double-click the ScriptBlock to open and rename it to CheckPatternScore.



- 3. Click the green plus sign 🛨 button to add an argument.
- 4. Rename the argument *Score* and set it to Double.

Arguments		
Score	Double	-

5. Add a second argument named *Count* and set it to Integer.

Arguments		
Score	Double	•
Count	Integer	•

6. Check the Return Type checkbox and set to Boolean.

Return Type:	Boolean	•
	Accept	Cancel

7. Click the Accept button.

The CheckPatternScore.Execute tab opens.



8. Enter the following script in the script window.



- 9. Click the **green check** substantial button to compile the current script. The script is a success.
 - Success
- Click the X in the upper right hand corner of the script tab to close. You are returned to the Task.



11. Connect the Output pins of the Pattern_Tool block to the corresponding Input pins of the CheckPatternScore script block.



12. Click the **Run All** Land Button to run execute the task.



13. Run the task with the bad part and review the results.

ዕ 🧯



5 × +

۵.





Expected Results:

Images:



CIC Camera:









Lab Exercise 3.1 – Histogram and Fixturing Tools

At the end of this lab exercise, Participants will be able to:

- Configure a Fixture tool
- Configure a Histogram tool to analyze the image for the presence/absence of a part
- Determine if the gouge is found

The Participant will utilize the following Cognex Designer functions to successfully complete this exercise:

- Toolbox
 - CogFixture Tool
 - CogHistogram Tool
 - Script Block

Follow the steps below to complete the lab exercise:

- 1. Open the **MyProject** Application from the previous lab exercise.
- Click the Run All Land button to bring the image into the tool.
 Note: If the job was open from the previous lab, this step is not required.



 Double click the Pattern_Tool ToolBlock to access the tool settings. The Task.Pattern_Tool opens.



4. Add a **CogFixtureTool** under the CogPMRedLineTool.



NOTE: The CogFixture tool is found in the Calibration & Fixturing folder.



The CogFixtureTool is added.

<u> </u>	CogFixtureTool1	
	OutputImage	
÷	➤ [Outputs]	

- 5. Connect the **[Inputs].Image** to the InputImage of the CogFixture tool. **NOTE**: To do this you can either drag and drop the connection, or right click on the InputImage \rightarrow Link from \rightarrow [Inputs].Image.
- 6. Connect the **Pose** result of the PMRedLine tool to the **Transform** result of the Fixture tool.

The image is now connected to the CogFixture tool.



7. Return to the **Task** tab and click the **Run All** button to bring the image into the tool.





- 8. Return to the **Task.Pattern_Tool** tab and double-click the CogFixture tool to access the tool settings.
- 9. On the Settings tab change the **Name** of the Fixtured Space to *Cognex Logo*.

Settings	Graphics	
		Fixtured Space
Ac	ction:	Name:
E	StablishNewFixture \vee	Cognex Logo

- 10. Click the **Run** button.
- 11. Close the Fixture tool.
- 12. Drag the **OutputImage** from the Fixture Tool to the **[Outputs]** section of the ToolBlock.



- 13. Add a new VisionPro Tool Block to the right of the Pattern_Tool block.
- 14. Rename the Toolblock to *Inspection* and connect the Output image from the Pattern_Tool block to the Input pin of this tool block.
- 15. Click the **Run All** button to bring the image into the new tool block.



16. Open the Inspection tool block and add a CogHistogram tool.Note: The CogHistogram tool is in the Image Processing folder.





The **CogHistogram** tool is added.



- 17. Connect the InputImage of the CogHistogram tool to the [Inputs] Image.
 NOTE: To do this you can either drag and drop the connection, or right click on the CogHistogramTool InputImage → Link from → [Inputs].Image.
- 18. Click the **Run** button to bring the image into the tool.



19. Double-click the **CogHistogram** tool to access the tool settings.

🔟 CogHistogramToo	11			
) 🖉 💷 🖥 🖻	🔲 🖏 📩	123	<u>à.</u> 9	?
Settings / Region Graph	hics Results			
Region Shape:				Region Mode
<none -="" entire="" im<="" th="" use=""><th>age></th><th>\sim</th><th></th><th>Masked Region</th></none>	age>	\sim		Masked Region
				O Bounding Box

20. On the Settings / Region tab select CogRectangleAffine as the Region Shape.

🔟 CogHistogramTool1	
🕨 🖉 🔤 😼 📴 🔁 🚾	<u>k</u> ?
Settings / Region Graphics Results	
Region Shape:	Region Mode
CogRectangleAffine \checkmark	Masked Region
Selected Space Name:	Bounding Box
. = Use Input Image Space 🗸 🗸	J

21. Position the Region between the Cognex logo and the number/letter string.







22. Click the **Graphics** tab and check the **Show Region** checkbox.

Diagnostics (re-run the tool to see the effect)			
Show Input Image:	Without Copy	◯ With Copy	◯ None
Show Region	ut Image Mask		

- 23. Click the **Run** button.
- 24. Close the Histogram tool.
- 25. Change the Image Buffer to LastRun.CogHistogramTool1.InputImage.



- 26. Run the Task with both the good part and the bad part. Confirm the Histogram tool's region moves with the part.
- 27. Click the **Results** tab and review the following values:

	Good Part	Bad Part
Standard Deviation		
Minimum		
Maximum		



28. Drag the **Results.StandardDeviation** from the Fixture Tool to the **[Outputs]** section of the ToolBlock.



Create a Script Block

1. Add a Script Block to the Task.



- 2. Double-click the Script Block to open and rename it to CheckInspection.
- 3. Add an argument named *StdDev* and set it to **Double**.
- 4. Check the Return Type checkbox and set it to **Boolean**.

Script Definition Editor		_		×
Name: CreateInsp	ection			
Arguments				
StdDev	Double		-	
•			+	X
🖌 Return Type: 🛛 Bo	olean			·
	Accept		Cance	2

5. Click the **Accept** button.



The CheckInspection.Execute tab opens.



6. Enter the following script in the script window.



7. Click the **green check** button to compile the current script. The script is a success.

\bigcirc	Success	

8. Click the **X** in the upper right hand corner of the script tab to close. You are returned to the Task.



9. Connect the Output pin of the Inspection block to the Input pin of the CheckInspection Script Block.



10. Click the **Run All** Land Button to run execute the task.





11. Run the Task with the bad part and review the results.

VisionPro* Tool Black	Script Block	
Inspection	CheckInspection	0.28 ms Result (Boolean) False
12. Click the Save] button in the Designer toolbar t	o save your job.
	🗅 🚄 🔛 🖉 📜 🛤 📜 🛤 🗶 🛨 📜 🕨	L 🐃 🚊



Expected Results:



Task.Pattern_Tool:





Task.Inspection:

Task	Task.Pattern_Tool Task.Inspection ×
Tools	5 Inputs/Outputs Graphics
	 [Inputs] Image CogHistogramTool1 InputImage Result.Mean Result.StandardDeviation [Outputs] Result_StandardDeviation


Lab Exercise 4.1 – Blob Tool

At the end of this lab exercise, Participants will be able to:

- Configure a Blob tool that will find blobs in a designated grey level range
- Filter blobs based on a given criteria

The Participant will utilize the following Cognex Designer functions to successfully complete this exercise:

- Toolbox
 - CogBlob Tool

Follow the steps below to complete the lab exercise:

1. Open the MyProject Application from the previous lab exercise.



- 2. Double click the **Inspection** ToolBlock to access the tool settings or click the Task.Inspection tab if it is open (as shown above).
- 3. Add a CogBlobTool under the CogHistogramTool.

The **CogBlob** tool is added.





4. Connect the InputImage of the CogBlobTool to the [Inputs].Image.



5. Click the **Run Tools** button to bring the image into the tool.



- 6. Double-click the **Blob** tool to access the tool.
- 7. You are looking for the 3 blobs (holes) on the part. On the *Settings* tab allow the default settings to remain.

Settings	Region Measurements	Graphics	Results
Segmentation Mode: Hard Threshold (Dynamic)		~	Connectivity Mode: Grey Scale
Polari Dark	ty: blobs, Light background	~	Cleanup: Fill V

NOTE: The Mode is Hard Dynamic Thresholding – a process that automatically computes an appropriate threshold on the input image histogram, and since we are searching for 3 dark holes on a slightly lighter background, we select Dark blobs, Light background for Polarity.

8. On the *Region* tab, select **CogRectangleAffine** as the Region Shape. Move the region to encompass the 3 blobs.

Settings	Region	Measurements	Graphics	Results		
Region CogRe	Shape: ectangleA	ffine	~		Region Mode Masked Region	
Selecte . = Use	d Space Input Im	Name: age Space	~		O Bounding Box	



9. On the *Measurement* tab allow the default settings to remain.



10. On the *Graphics* tab, check the **Show Unfiltered Blobs** checkbox and the **Show Region** checkbox.

Settings	Region	Measurements	Graphics	Results		
Inputs	how Input	Image Mask				
Results Show Bounding Box Show Median Show Image Bounding Box Show Image Median Show Principal Bounding Box Show Principal Median Show Boundary Show Unfiltered Blobs Show Center of Mass Show Blob Overlay Graphic Show Blob Image Show Blob Image Unfiltered					dian Median Blobs Tay Graphic e Unfiltered	
Diagno	stics (re-n	un the tool to se	e the effect)			
Show Input Image: Without Copy Show Input Image Histogram Show Diagnostic Input Image Mask Show Segmented Image before Masking Show Segmented Image before Morphology Show Segmented Image				py I g logy	O With Copy Show Region	() None

- 11. Click the **Run** button to bring the image into the tool.
- 12. On the *Results* tab review the results.
 - a. How many results display?
- 13. Change to the bad part and click the **Run** button.
 - a. How many results display now?
- 14. Run the Task with both the good part and the bad part. Confirm the Blob tool's region moves with the part.
- 15. Drag the **Results.GetBlobs().Count** and drop it at **[Outputs]**. This creates a new output terminal from the ToolBlock.



16. Click the **Save** button in the Designer toolbar to save your job.



Expected Results:

Task:



Task.Inspection:





Lab Exercise 5.1 – Caliper and Geometry Tools

At the end of this lab exercise, Participants will be able to:

- Configure a Caliper tool to detect edges under various run-time conditions
- Configure Geometry tools

The Participant will utilize the following Cognex Designer functions to successfully complete this exercise:

- Toolbox
 - CogCaliper Tool
 - CogFindLine Tool
 - CogAngleLineLine Tool

Follow the steps below to complete the lab exercise:

1. Open the **MyProject** Application from the previous lab exercise.



- 2. Double click the **Inspection** ToolBlock to access the tool settings or click the Task.Inspection tab if it is open (as shown above).
- 3. Add a CogCaliperTool under the CogBlobTool.

The **CogCaliper** tool is added.



4. Connect the InputImage of the CogCaliperTool to the [Inputs].Image.



- 5. Click the **Run Tools** button to bring the image into the tool.
- 6. Double click the **Caliper** tool to access the tool.
- 7. On the Settings tab, select the following:
 - Edge Mode = Edge Pair
 - Edge 0 Polarity = *Dark to Light*
 - Edge 1 Polarity = *Light to Dark*
 - Maximum Results = 1

f CogCaliperTool1						
) / 💷 🖥 🗳 🖬 🛍	🕨 🖉 🚥 😼 🖨 📲 🏜 💶 🔤 🏊 💡					
Settings Region Scoring Grap	phics Results					
Edge Mode						
O Single I	Edge (
Edge 0 Polarity	Edge 1 Polarity					
O Light to Dark	Dark to Light Induction Dark					
O Any Polarity	O Any Polarity					
Edge	e Pair Width: 10 🗮					
Contrast Threshold:	5 👤					
Filter Half Size Pixels:	2 🗢					
Maximum Results:	1 🛋					

8. On the *Region* tab select **CogRectangleAffine** as the Region Shape. Position the Region as shown below.

NOTE: Do not position the region exactly to the edges, you want the region to overlap the part. This will ensure that the edges are found.





- 9. On the *Scoring* tab, do not make any changes.
- 10. On the *Graphics* tab, check the **Show Region** checkbox.



- 11. Click the **Run** button.
- 12. Click the *Results* tab to see the edges found.
 - How many edges were found?
 - Are the edges found the edges you expected?
 - How do you find the correct edges?
- 13. Click the **Floating Display** button. The **CogCaliperTool1Display** opens.

CogCaliperTool1 Display		×
Surrent.InputImage		~
		^
		>

14. Hover your mouse over the left and right edges and record the X values:

Left Edge	_
Right Edge	_
Difference	

NOTE: In this example, the left X value is 356 and the right X value is 939 – the difference is 583.

- 15. Close the **Floating Display**.
- 16. Return to the Settings tab and enter the difference in the Edge Pair Width field.



17. Click the **Run** button.



18. Click the *Results* tab and review the following to confirm the correct edges were found:

Score

Measured Width

19. Change the Image Buffer to LastRun.RegionData and review the edges found.



- 20. Close the Caliper tool.
- 21. Right-click on the Caliper tool and select Add Terminals from the fly out.

🗄 🗗 CogBlobTool1 🐫		
	Edit	
Results Cou	Run	
Results.lten	Delete	
> Results.Iten	Rename	
Results.Iten	Enabled	
□ 🔶 [Outputs]	Add Terminals	
Result_Stan	Collapse all	
	Expand all	

22. Open the *Results* path and select **Width**, click the **Add Output** button and **Close** the Member Browser.

Path to Property	
i	~
ia∰ Results <cogcaliperresults></cogcaliperresults>	
ianter la	
Edge0 <cogcaliperedge></cogcaliperedge>	
ia.⊢∰ Edge1 <cogcaliperedge></cogcaliperedge>	
Score - Doubles - 0.992292501710715	
	~
Add Input Add Output Close	



23. Drag the **Results.Item[0].Width** and drop it at **[Outputs]**. This creates a new output terminal from the ToolBlock.



24. Click the **Save** button in the Designer toolbar to save your job.

i n 🛋 🔛 😡 🚽 🖁 🖛 🗡	< ┾┊┊▶│♨┊
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Geometry Tools

Continue with the MyProject job.

1. Open the Inspection Toolblock and add a **CogFindLineTool** under the CogCaliperTool.

NOTE: The CogFindLineTool is in the Geometry – Finding & Fitting folder.



- 2. Connect the InputImage of the CogFindLineTool to the [Inputs].Image.
- 3. Click the **Run** button to bring the image into the tool.





- 4. Double-click the Find Line tool to access the tool settings.
- 5. On the Settings tab, position the Find Line tool on the left edge of the block.
- 6. Increase the **Number of Calipers** to *10*, leave all other settings as the defaults.





- 7. On the Caliper Settings tab:
 - Edge Mode = Single Edge
 - Edge 0 Polarity = *Light to Dark*

Edge Mode	Single Edge	◯ Edge Pair	
Edge 0	Polarity	Edge 1 Polarity	
0 L	ight to Dark	C Light to Dark	
	ny Polarity	Any Polarity	

- 8. Click the **Run** button.
- 9. Review the results on the *Point Results* tab.

NOTE: The number of results matches the number of calipers selected in the Settings tab. Since we increased the number of calipers to 10 there are 10 results, if you left the default of 6 there are 6 results.

10. Add a second **CogFindLineTool** to the job and position it as shown below.



Link Image From:		
Number of Calipers	•	
Edge Mode:		
Edge 0 Polarity:		
Edge 1 Polarity:		
• •		



- 11. Click the **Run** button.
- 12. Run the job with both the good and the bad part. Confirm the Cog Line tools move with the part.
- 13. Add a **CogAngleLineLineTool** under the second Find Line tool in the job. **Note**: *The CogAngleLineLineTool is in the Geometry – Measurement folder.*
- 14. Connect the **InputImage** of the CogAngleLineLineTool to the **[Inputs].Image**.
- 15. Click the **Run** button to bring the image into the tool.





16. Connect Line A to the CogFindLineTool1.Results.GetLine0 and connect Line B to the CogFindLineTool2.Results.GetLine0.

CogAnglel	LineLineTool1 * nage (
	Link from	>	CogFindLineTool1.Results.GetLine()
Ang	Unlink		CogFindLineTool2.Results.GetLine()
CogAngle	eLineLineTool1 * mage <		
	Link from	>	CogFindLineTool1.Results.GetLine()
⊡ → [Outp	Unlink		CogFindLineTool2.Results.GetLine()

17. Click the **Run** button.



18. Double-click the **Find Angle** tool to access the tool settings.

🌄 CogAngleL	ineLineTool1					_	×
Settings Graphi	ics Results	<u>a</u> ?				Current.InputImage	~
LineA Selected Space @\Cognex Log	e Name:	~	LineB Selected Space @\Cognex Lo	e Name: go	~		^
X: Y: Rotation:	286.896 -13.4898 -92.6921	dea	X: Y: Rotation:	6.6746 202.758 -1.88544	dea	COGNEX	
	Fit In Image	ucy		Fit In Image	log	ABC123	
 0.092ms 	0.11ms					<	>

- 19. Click the *Results* tab and make note of the Angle result.
- 20. Change the Image Buffer to LastRun.InputImage and review the results.

CogAngleLi	ineLineTool1					_		×
Settings Graphi	cs Results	78	LineP			LastRun.InputImage		×
Selected Space	e Name:		Selected Space	e Name:				
@\Cognex Log	go	~	@\Cognex Lo	go	\sim			
X:	286.896		X:	6.6746				
Y:	-13.4898		Y:	202.758			-	
Rotation:	-92.6921	deg	Rotation:	-1.88544	deg	COGNEX		
	Fit In Image			Fit In Image		ABC123		ļ
								~
						<	2	+
0.092ms	0.11ms							

- 21. Run the job with both the good part and the bad part. Confirm the tools move with the part.
- 22. Click the **Save** button in the Designer toolbar to save your job.



Expected Results:



Task.Inspection:









Lab Exercise 6.1 – Calibration

At the end of this lab exercise, Participants will be able to:

- Add a non-linear calibration to the task
- Convert the width measurement from pixels to a real-world measurement
- Add the Blob and Caliper results to the CheckInspection ScriptBlock

The Participant will utilize the following Cognex Designer functions to successfully complete this exercise:

- CogCalibCheckerboardTool
- ScriptBlock

Follow the steps below to complete the lab exercise:

1. Open the MyProject Application from the previous lab exercise.



2. Double-click the Inspection ToolBlock and add a **CogCalibCheckerboardTool** above the Histogram tool.

NOTE: The CogCalibCheckerboardTool is found in the Calibration & Fixturing folder.

The **CogCalibCheckerboard** tool is added.



3. Connect the InputImage of the CogCalibCheckerboardTool to the [Inputs].Image.

🚊 🇱 CogCalibChecl	kerboardTool1		
	Link from	>	[Inputs].Image
	11.12.1		





4. Return to the Task and acquire an image of the Checkerboard calibration plate.

- 5. Hover your mouse over the Pattern_Tool output image notice that it is now broken.
- 6. Redirect the input image of the Inspection ToolBlock directly to the camera and click the **Run All** button.



7. Open the Inspection ToolBlock and click the **Run** button to bring the checkerboard image into the InputImage.





Set-up Calibration

8. Open the Calibration tool and click the Grab Calibration Image button.

CogCalibCheckerboardTool1				_	
) 🖉 💷 😼 🚔 🔛 🖼 🖾	<u>}</u>				
Calibrate Origin Warping Run Params	Graphics Point Results	Transform Results	Current.InputImage		
Calibration Mode					
Linear			~		
Degrees of Freedom to Compute:					
Scaling, Aspect, Rotation, Skew And Tra	anslation		×		000
Calibration Plate					88 I
Feature Finder:	Tile Size	X: 1	- 1 900000		886_
CheckerboardExhaustive	~		- 1300000		888 I
Fiducial Mark:	Tile Size	Y: 1	- 9000000		888
StandardRectangles	\sim				
			200000		888 I
			5000000		888
Grab Calibration Image	Com	oute Calibration			
libration Info:					
Not Calibrated			4		
0.5258ms 0.5662ms 0x80131600	The tool did not run bec	ause the calibration v	vas not computed. Please ensu	ure the tool is ca	alibrated befo

- 9. Set the Tile Size X and Tile Size Y to 3.175 (or the size shared by the Instructor) and click the **Compute Calibration** button.
- 10. Click the **Run** button and review the Transform Result to make sure the RMS Error is relatively low.
- 11. Close the Calibration tool.
- 12. Return to the Task and disconnect the input image from the camera and reconnect it to the Fixture output image from the Pattern_Tool block.



13. Open the Inspection ToolBlock and unlink the Blob tool's and the Caliper tool's InputImage from the [Inputs].Image.





14. Link the InputImage of the Blob Tool to the OutputImage from the Calibration ToolBlock.

	11			
Inputima	ige			
> Result:	Link from	\rightarrow	[Inputs].Image	
> Result:	Unlink		CogCalibCheckerboardTool1.OutputImage	
Result		L	1910331	

15. Repeat for the Caliper tool.

	11 *					
Results.C	Link from	>	[Inputs].Image			
> Results.lt	Unlink		CogCalibCheckerboardTool1.OutputImage			
N. Describe It						

16. Run the ToolBlock once with the Good Part and look at the results from both tools. Tweak your settings to make them work with real world units.

Add Blob and Caliper Results to the CheckInspection ScriptBlock

1. Right-click the CheckInspection ScriptBlock and select Reconfigure Script I/O.



The Script Definition Editor displays.

Script Definition	Editor	-		×
Name: CheckInspec	tion			
Arguments				
StdDev	Double		*	
↑			÷	\times
Return Type: Boo	lean			•
	Accept		Can	cel



- 2. Add two arguments to the Editor:
 - 1. *Count* and set it to **Integer**
 - 2. *Width* and set it to **Double**

Script Definition	Editor -	- 1		Х				
Name: CheckInspection								
Arguments								
StdDev	Double	*		•				
Count	Integer	*						
Width	Double	•		-				
↑ · + ×								
Return Type: Boolean								
	Accept							

3. Click the Accept button.

The **CheckInspection.Execute** tab opens.

Task	Task.Pattern_Tool	Task.Inspection	CheckInspection.Execute	х					
0	X public double	Execute(double Sto	IDev)						
1 if	1 if (StdDev < 10)								
2 return true;									
3 else									
4 ret	urn false;								

4. Update the code on the **CheckInspection.Execute** tab.



5. Click the **green check** button to compile the current script. The script is a success.

Success

6. Click the **X** in the upper right hand corner of the script tab to close.

You are returned to the Task.



7. Connect the Output pins on the Inspection block to the corresponding Input Pins on the CheckInspection ScriptBlock



8. Click the **Run All** button to run execute the task with both the good and the bad parts.



Expected Results:



Task.Inspection:







Lab Exercise 7.1 – Identification Tools

At the end of this lab exercise, Participants will be able to:

- Configure an OCRMax tool to read text
- Configure an ID tool to read a Data Matrix code

The Participant will utilize the following Cognex Designer functions to successfully complete this exercise:

- Toolbox
 - CogOCRMaxTool

Follow the steps below to complete the lab exercise:

1. Open the **MyProject** Application from the previous lab exercise.



- 2. Add a new VisionPro Tool Block below the Inspection Block.
- 3. Rename the Toolblock *Identification* and connect the Output Image from the Pattern_Tool block to the Input pin of this tool block.
- 4. Click the **Run All** button to bring the image into the new tool block.



- 5. Double-click the Identification Tool block to open.
- 6. Add a CogOCRMaxTool.

NOTE: The CogOCRMax tool is found in the ID & Metrics folder.





7. Connect the InputImage of the CogOCRMaxTool to the [Inputs].Image.



- 8. Click the **Run** button to bring the image into the tool.
- 9. Double-click the OCRMax Tool to access the tool settings.

123 Cog	jOCRMax	Tool1								-	×
) 🗸		F		••	123 🛓	?					
Tune	Segment	Font	Run	Params	Region	Fielding	Graphics	Results	Current.InputImage		~
Extr	act Line		🖂 Ext	act On F	Run						1
Expected	d Text:							Auto-Segment			
Results				<	0 of	0	>	Add & Tune			
									COG	NEX	
									ABC123	國	
T 0											
Tune Da	ata										
									C. S.		
Remov	re Selecte	d						un Selected			
Themev		~									
Untu	ined, l	VO C	hara	cters	in Fo	nt			<		>
50.4	64ms 50	.572m	s		Seg	mentation	Step Found	Zero Characters			

- 10. Position the Region around the *ABC123* string as shown below.
- 11. Click the **Run** button.



12. Click the **Extract Line** button and confirm that all characters are detected.





13. Enter the label for each character in the string in the **Expected Text** field and click the **Auto-Segment** button.



The characters are assigned labels. Confirm that the labels are correct.



14. Click the **Add & Tune** button. The characters have been trained and added to the Tune Data field.



- 15. Click the **Run** button.
- 16. Review the LastRun.InputImage buffer.



- 17. Allow the defaults to remain on the Settings tab.
- 18. On the Font tab click the Extract Characters

button.

Extract Characters



19. Click each character in the Font Chars window and confirm the Char. Image is correct.



- 20. Allow the defaults to remain on the *Run Params* and *Region* tabs.
- 21. On the *Fielding* tab, check the **Field String** box, enter *ABC123* in the newly open field, and click the **<Enter>** key.



22. On the *Graphics* tab check the Show Region checkbox.

Diagnostics (re-run the tool to see the effect)								
Show Input Image: (Without Copy	With Copy	○ None					
Show Region	Show Recti	fied Line Image						
Show Main Line	Show Norm	alized Rectified Line I	mage					
Show Main Line Expanded	Show Norm	alized Rectified Binari	zed Line Image					

22. Review the scores on the *Results* tab - notice the Confidence and Confusion Character fields.

ID	Char	Status	Score	Confidence	Confusion Character	Confusion Explanation
0	Α	Read	1.000	0.715	1	NotConfused
1	В	Read	1.000	0.430	C	NotConfused
2	С	Read	1.000	0.418	В	NotConfused
3	1	Read	1.000	0.617	В	NotConfused
4	2	Read	1.000	0.469	В	NotConfused
5	3	Read	1.000	0.438	В	NotConfused

NOTE: Entering the string in the Field String box on the Fielding tab allows the tool to be used as a verification tool instead of just reading the characters.

23. Run the job with both the good part and the bad part. The good part should pass and the bad part should fail. Confirm the results in the OCRMax tool Results tab.



Good Part: _____

Status:	Read								
Result String: 6 characters									
ABC12	3								
ID	Char	Status	Score	Confidence	Confusion Character	Confusion Explanation			
0	Α	Read	1.000	1.000	?	NotConfu			
1	В	Read	1.000	1.000	?	NotConfu			
2	С	Read	1.000	1.000	?	NotConfu			
3	1	Read	1.000	1.000	?	NotConfu			
4	2	Read	1.000	1.000	?	NotConfu			
5	3	Read	1.000	1.000	?	NotConfu			

Bad Part:

Status:	Status: Failed						
Result String: 6 characters							
AB??21	?						
ID	Char	Status	Score	Confidence	Confusion Character	Confusion Explanation	
0	Α	Read	0.984	0.984	?	NotConfi	
1	В	Read	0.977	0.977	?	NotConfi	
2	?	Failed	0.000	0.000	?	NotConfi	
3	?	Failed	0.000	0.000	?	NotConfi	
4	2	Read	0.973	0.973	?	NotConfu	
5	?	Failed	0.000	0.000	?	NotConfi	

24. Close the OCRMax Tool.

25. Click the **Save** button in the Designer toolbar to save your job.

ර 🚄 💾	🔀 🚽 🖗 🖬	× + ‡	🕴 🕨 🛓 👘
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Add an ID Tool to Read a Data Matrix code

1. Add a **CogIDTool** under the OCRMax tool in the Identification ToolBlock. **Note**: *The CogIDTool is found in the ID & Metrics folder.*





2. Connect the InputImage of the CogIDTool to the [Inputs].Image.



- 3. Click the **Run** button to bring the image into the tool.
- 4. Double-click the ID Tool to access the tool settings.

D CoglDTool1		– 🗆 X
Image: Settings Region Graphics Results	1 <u>4</u> ?	Current.InputImage ~
Processing Mode: IDMax Symbologies Data Matrix QR Code Code 128 UPC/EAN Code 39 Code 30 Code 30 Co	Number to Find: 1 Settings for Code 128 1 Minimum Length: 3 ÷ Maximum Length: 40 ÷ Image: Setting S	
Decoded String Code Page: 1252 - La	Timeout: 500 ♀	èr ms ✓
😑 51.849ms 51.902ms		

5. On the *Region* tab select **CogRectangleAffine** as the Region Shape. Position the Region as shown below.



On the Settings tab select Data Matrix under Symbologies.
 NOTE: This will require two clicks – the other symbologies will be deselected.

Symbologies	٦
🗹 Data Matrix	
QR Code	
Code 128	



7. Click the **Run** button and review the results.

Settings	Region Graph	ics Results				
1 Resu	lt Status: Okay					
ID	Symbology	Decoded String	Center X	Center Y	Angle	PPN
0	Data Matrix	ABC123	430	274.8	-0.06	29.4

8. Close the ID Tool.

Compare the Results of the OCRMax and Data Matrix Tools

1. Move the CogOCRMax tool below the CogIDTool by dragging the tool down.

Tools	Inputs/Outputs Graphics
	Inputs/Outputs Graphics Inputs] Image CoglDTooll InputImage Results.Count Results.Item[0].DecodedData.DecodedString CoglDMarrTool1 InputImage
	InputImage LineResult.Status LineResult.ResultString Outputs]

2. Right-click on the OCRMax tool and select Add Terminals from the fly-out.

		Edit	1
> LineRe		Run	
		Delete	
[Outputs]		Rename	
	~	Enabled	
		Add Terminals	
		Collapse all	

3. Change the **Browse** field to **All (unfiltered).**

Membe	r Browser					x
Browse:	Typical	-	Auto Expand:	Common Member:	•	
Displaye	All (unfiltered)					
	Expanded Typical					



4. Expand the Fielding section and select FieldString <String> = "ABC123"

Displayed Name:	
Fielding.FieldString	
Path to Property	
i⊒tter Fielding <cogocrmaxfielding></cogocrmaxfielding>	~
🔤 AcceptedMetric <cogocrmaxfieldingacceptedmetricconstants> = PrimaryAndSecondaryMatches</cogocrmaxfieldingacceptedmetricconstants>	
FieldingDefinitions <cogocrmaxfieldingdefinitioncollection></cogocrmaxfieldingdefinitioncollection>	
iter in the string str	
PirstindexMax <int32> = 399</int32>	
	~

- 5. Click the **Add Input** button and close the Member Browser. A **Fielding.FieldString** Input is added to the OCRMax tool.
- 6. Connect the **DecodedString** terminal of the ID Tool to the **FieldString** terminal of the OCRMax Tool.

🖃 🗲 [Inputs]	
Image	1
🗄 📶 CoglDTool1 *	
📕 🔶 InputImage 🤇	
Results.ltem[0].DecodedData.DecodedString —	
E-123 CogOCRMaxTool1	
🛶 InputImage <	J
🛶 Fielding,FieldString 🧲	
-> LineResult.Status	
LineResult.ResultString	

- 7. Double-click the OCRMaxTool to access the tool settings.
- 8. On the *Fielding* tab note the string in the **Field String** section and check the **Field String** checkbox. Do not select any of the Field Definitions.

[Field S	String 3	6 characters
Fi	eld Defin	itions	
	20 ×		
	Enabled	Alias	Character Set
		•	{ any character or space }
		Ν	0123456789
		Α	ABCDEFGHIJKLMNOPQRSTUVWXYZabcdefghijklmnopqrstuvwxyz
l			



9. Drag the **LineResult.Status** output from the OCRMaxTool to the **[Outputs]** section of the ToolBlock.



An output pin is added to the Identification ToolBlock.



10. Click the **Save** button in the Designer toolbar to save your job.



Expected Results:

Task:



Task.Identification:





Lab Exercise 8.1 – Cognex Designer Components

At the end of this lab exercise, Participants will be able to:

- Create a Shift Register for images
- Add a ScriptBlock to save the image

The Participant will utilize the following Cognex Designer functions to successfully complete this exercise:

- Project Explorer
 - o Components
 - Shift Register
 - ScriptBlock

Follow the steps below to complete the lab exercise:

1. Open the MyProject Application from the previous lab exercise.



2. Right-click **Components** in the Project Explorer and select **New Component** from the fly-out.

		New Component	
		New Component	
▲ Thevices	*-	New Folder	Ľ
Cameras	_	NewTolder	Ľ

The Component Browser displays.

🥯 Component Browser	×
 Process Utilities 	Add
	Accept



3. Open Utilities select **Shift Register** and click the **Add** Button.

Component Browser	×
 Process Utilities Disk Monitor Inactivity Monitor Shift Register 	Shift Register Shift Register Add

The Parameter Configuration dialog box displays.

Parameter Configuration ×		
Name		
Data Type	String •	
Buffer Size	5 🗣	
Accept	t Cancel	

4. Enter *myFilmstrip* in the **Name** field, select VisionPro Record as the **Data Type** and leave the default **Buffer Size** of 5 to remain, click the **Accept** buttons to close the dialog boxes.

Parameter Configuration		
Name	myFilmstrip	
Data Type	VisionPro Recor 🔻	
Buffer Size	5 🖍	
Accept	Cancel	

myFilmstrip is added under Components in the Project Explorer.





5. Add a **Script Block** to the Task to the right of the Identification block.



6. Double-click the Script Block to open.

The Script Definition Editor displays.

7. Name the ToolBlock *CreateFilmstrip*, add an argument named *Image*, Type VisionPro Record, leave the Return Type blank and click the Accept Accept button.

Script Definition	Editor	_		×
Name: CreateFilmst	rip			
Arguments				
Image	VisionPro R	ecord	•	
↑			Ŧ	×
Return Type: Boo	lean			
	Accept		Cance	el

The Script Editor tab opens.

8. Drag the **Add** script from the Toolbox into the Script Editor.

Toolbox		
🛨 💻 Filter:		
Address	Туре	
 () Components () myFilmstrip 		
∫∝ Add	void	
<i>∫</i> ≭ Clear	void	

The Script is entered in the Editor.





9. Update the Script as shown below:

Task	Task.Pattern_Tool	Task.Inspection	Task.Identification	CreateFilmstrip.Execute	×	Ŧ
	🗙 public void Exe	ecute(Cognex.Visi	ionPro.ICogRecord Im	nage)		
1 \$Com	ponents.myFilmstri	<pre>ip.Add(Image);</pre>				*

10. Click the **green check** sutton to compile the current script.

The script is a success.

\circ	Success	

- 11. Click the \mathbf{X} in the upper right hand corner of the script tab to close.
- 12. Click the **Save** button in the Designer toolbar to save your job.



Add an Indication of Pass or Fail

1. Right-click the CreateFilmstrip Script Block and select **Reconfigure Script I/O** from the fly-out.



The Script Definition Editor displays.

2. Add a second argument named *Result* and set the Type to **Boolean**.

	🥯 Script Definition Editor 🛛 — 🔲 🗙
	Name: CreateFilmstrip
	Arguments
	Image VisionPro Record
	Result Boolean
	↑ ↓ + ×
	Return Type: Boolean
	Accept Cancel
3. Click the Accept	Accept button.


4. The CreateFilmstrip.Execute script tab opens. Leave this open we will be adding to the script later. Return to the Task.

A new input pin has been added to the CreateFilmstrip ScriptBlock.



5. Connect the *output* pin of the **CheckInspection** ScriptBlock to the *Result input* pin of the **CreateFilmstrip** ScriptBlock.



- 6. A new **input pin** has been added to the CreateFilmstrip ScriptBlock.
- 7. Right-click **Components** in the Project Explorer and select **New Component** from the fly-out.



8. Create a new ShiftRegister named *PassFailResults* with the Data Type of Boolean, and a Buffer Size of 5.

🥯 Parameter C	Configuration X
Name	PassFailResults
Data Type	Boolean 🔻
Buffer Size	5 🜩
[Accept Cancel
he Accept	button twice.



10. Return to the Script tab and enter the following line of script:



11. Click the **green check** button to compile the current script. The script is a success.



- 12. Click the \mathbf{X} in the upper right hand corner of the script tab to close.
- 13. Click the **Save** button in the Designer toolbar to save your job.

i n 🖬 🖬 🖉 🚦 🗶 🕇 🗍 🕷	Ŧ
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Expected Results:





Lab Exercise 10.1 – Building an HMI

At the end of this lab exercise, Participants will be able to:

• Create a custom Page accessible from other devices, including status indicators, results and controls to view and affect the vision application

The Participant will utilize the following Cognex Designer functions to successfully complete this exercise:

- Tag Manager
- Pages
- Controls
- Expression Builder
- Associations

Tag Manager

Follow the steps below to complete the lab exercise:

1. Open the **MyProject** Application from the previous lab exercise.



2. On the Task, right-click on the Image output pin of the Pattern_Tool ToolBlock and select **Assign to New Tag** from the fly-out.





The **Create New Tag** dialog box displays.

3. Name the Tag *Display.FixtureImage* and click the **Accept** button.



The **Display.FixtureImage** Tag is added to the ToolBlock.



4. Repeat steps 2 & 3 to create the following tags:

Pattern_Tool ToolBlock	
Score Output Pin	Result.PMScore
Inspection ToolBlock	
Standard Deviation Pin	Result.StdDev
Blob Count Pin	Result.NumHoles
Caliper Width Pin	Result.BlockWidth
Identification ToolBlock	
IDTool Pin	Result.IDMatch
CheckPatternScore ScriptBlock	
Result Output Pin	Check.PatternScore
CheckInspection ScriptBlock	
Result Output Pin	Check.Inspection

5. Connect the **Image** pin of the CreateFilmstrip ScriptBlock to the **InputImage** of the LastRun result of the PatMaxRedLine Tool.



6. Open Tag Manager in the Project Explorer and review the Tags.

Explorer	▲ ù	Task Tag Manager 🗙						
🖌 📃 System	•	Filter:						
🐥 Alarms		Name	Comment	Data Type	Default Value	R/O	Selected Path	Persistent
XA Localization	- 11	Check.Inspection		Boolean	False			
Resources	- 11	Check.PatternScore		Boolean	False			
Continger	- 11	Display.FixtureImage		VisionPro Image				
L→ lag Manager	- 11	Result.BlockWidth		Double	0			
Ma Users	- 11	Result.IDMatch		CogOCRMaxLineResultStatusConstan	NoText			
- Recipes	- 11	Result.NumHoles		Integer	0			
▲ Lasks	- 11	Result.PMScore		Double	0			
Task	- 11	Result.StdDev		Double	0			

Create the HMI

1. Right-click **Page** in the Project Explorer and select **Edit** from the fly-out.



The **Page** tab is added to the project.

2. Right-click **Page** and select **Rename** from the fly-out. Rename the Page *MainPage* and press the **<Enter>** key.



The Page tab is renamed to MainPage.



3. Go to the *MainPage* tab and add a **VisionPro Display** in the upper left hand corner of the Page.





NOTE: The VisionPro Display is located under Vision in the Toolbox.

4. Click on the Display to show the **Properties**. The Properties are located on the right-hand side of the Development Environment.

Properties		•	ņ
VisionPro Display	VisionProDisplay		•
Frequently Used	1		
Source		¢	

5. Click the **double arrow** button to set the **Source** of the display. The **Expression Builder** dialog displays.



6. Click the **Tag Selector** Tag Selector button.



The Tag Selector dialog displays.

🥯 Tag Selector			_		×
Filter:					
Address	Туре	Value	R/O	Comme	nt
 ▷ () Check ▷ () Components ▷ () Devices ▷ () Display 	_				

7. Expand the **Display** list and select **FixtureImage**, as shown below.

() Display		
FixtureImage	vproimage	
▷ () Localization		

8. Click the **Accept** button.

The Expression has been built.

Expression Builder (Source, Object)	×
\$Display.FixtureImage	Help
	Validate
	Associations
	Tag Selector
	Insert
	Tag
	Constant
	Function
✓ Result: NULL	
ОК	Cancel

 9. Click the OK _____ button. The Source icon has changed color from black to green indicating that there is a reference enabled.

Properties		•	џ
VisionPro Display	VisionProDisplay		*
Frequently Used			
Source		4	

10. Add a Label to the Page under the display.NOTE: The Label is found in the Toolbox under Controls.



11. Under the Label Properties change the Text to PatternScore:.

Properties			•	Ţ
Label	Label			•
▲ Freque	ntly Used			
Text		PatternScore	4	

12. In the Label Appearance check the **Bold** checkbox and change the Font Size to **24**. **NOTE**: You may need to increase the size of the text box to see the complete name.

DattornScore	
Fatternscore:	

13. Copy the Label and Paste next to the PatternScore label.



14. Under the Properties click the **double arrow** button to set the **Text** of the label. The **Expression Builder** dialog displays.





16. Select **Result.PMScore** from the list of available Tags.

Result.BlockWidth	
Result.IDMatch	
Result.NumHoles	
Result.PMScore	
Result.StdDev	
System.Alarms.AnyActive	•

17. Press the **<Enter>** key.

The **Expression** has been built.

🥯 Expression Builder (Text, String)	×
\$Result.PMScore	Help
	Validate
	Associations
	Tag Selector
	Insert
	Tag
	Constant
	Function
Result: Double	
ОК	Cancel

18. Click the **OK** button.

The **Text** icon has changed color from black to green indicating that there is a reference enabled.

Properties	-	Ţ
Label	Label1	•
▲ Freque	ently Used	
Text	PatternScore: 🛹	

19. Copy and Paste the Labels under the original PatternScore labels.

PatternScore:	PatternScore:
PatternScore:	PatternScore:

- 20. Under the Label Properties of the first pasted label change the Text to Gouge:.
- 21. Under the Properties of the second pasted label click the **double arrow** button to set the **Text** of the label.



The **Expression Builder** dialog displays.

Expression Builder (Text, String)	×
	Help
	Validate
	Associations
	Tag Selector
	Insert
	Tag
	Constant
	Function
✓ No binding	
	Canad
OK	Cancel

- 22. Click the **Tag** button to select a tag.
- 23. Select **Result.StdDev** from the list of available Tags.

Result.NumHoles	
Result.PMScore	
Result.StdDev	
System.Alarms.AnyActive	•

24. Press the **<Enter>** key.

The **Expression** has been built.

		🥯 Expression Builder (Text, String)	×
		\$Result.StdDev	Help
			Validate
			Associations
			Tag Selector
			Insert
			Tag
			Constant
			Function
		✔ Result: Double	
		ОК	Cancel
25. Click	< the OK	ок button.	



The **Text** icon has changed color from black to green indicating that there is a reference enabled.



- 26. Add a **Button** to the Page under the display. **NOTE**: *The Button is found in the Toolbox under Controls.*
- 27. Under the Button Properties change the Text to *Run Once*.

Properties				•	Ļ
Button	Button				^
▲ Freque	ntly Used				
Click Com	mand		*		
Text		Run Once		\$	

28. In the Button Appearance check the **Bold** checkbox, change the Font Size to **24**, select **DropShadow** as the effect and set the Shadow Color to **Yellow**. **NOTE**: You may need to increase the size of the text box to see the complete name.



29. Under the Button Properties set the **Click Command** to **Tasks.Task.Run**.

System.Users.UserExists
Tasks.Task.Run
Tasks.Task.RunAsync

- 30. Click the **Run** button in the Task bar and click the **Run Mode** tab.
- 31. Click the **Run Once Run Once** button and review the results.

		Run Once
	Distance of	
Contraction of		
Contraction of the second second second	0.99390679597	
atternScore:		



- 32. Click the **Stop** button in the Task bar.
- 33. Click the **Save** button in the Designer toolbar to save your job.



Format and Control the Color of the Result Labels Using Associations

- Go to the Properties of the Label reporting the PatternScore result and click the double arrow button to open the Expression Builder.
- 2. Enter *FORMAT "F3"* after the referenced tag and click the **OK** button.

🥯 Expression Builder (Text, String)	×
\$Result.PMScore FORMAT "F3"	Help
	Validate
	Associations
	Tag Selector
	Insert
	Tag
	Constant
	Function
✓ Result: String	
ОК	Cancel

3. Under the Appearance Properties click the **double arrow** button to set the **Background Color** of the label.

Appearance	
Background	Solid Color 🔻
Color	😳 Trans 🗳

4. Type **\$** and select **Check.PatternScore** from the list of available tags and press the **<Enter>** key.

(😕 Expression Builder (Color, Color)		×
\$	Check.Inspection Check.PatternScore	•	Help Boolean e
	Components.myFilmstrip.ltem0		Associations



5. Click the **Associations** button.

Expression Builder (Color, Color)		×
<pre>\$Check.PatternScore</pre>		Help
		Validate
		Associations
		Tag Selector
		Insert
		Tag
		Constant
		Function
• Missing association		
	OK	Cancel

The **Binding Associations** dialog displays.

🥯 Binding Associatio	ons X
Add Association	
	#0000000 -
Current Associations	
	Accept Cancel

- 6. Click the **Checkbox** to turn it on, select a color (Green) from the drop down, and click the **Plus Sign** button to add the association for **True**.
- 7. Uncheck the Checkbox and select a second color (Red) from the drop down.
- 8. Click the **Plus Sign button** again to accept the color entry for **False**.

🥯 Binding Asso	×	
Add Association		
	Red	- +
Current Associati	ons	
True	Green	- X
False	E Red	- X
	Accept	Cancel



- 9. Click the **Accept** Accept button.
- 10. Click the **OK** button.
- 11. Go to the Properties of the Label reporting the **Gouge** result and click the **double arrow** button to open the Expression Builder.
- 12. Enter *FORMAT "F3"* after the referenced tag and click the **OK** button.

🥯 Expression Builder (Text, String)	×
\$Result.StdDev FORMAT "F3"	Help
	Validate
	Associations
	Tag Selector
	Insert
	Tag
	Constant
	Function
Result: String	
ОК	Cancel

13. Under the Appearance Properties click the **double arrow** button to set the **Background Color** of the label.

▲ Appearance	
Background	Solid Color 🔻
Color	😳 Trans 🖨

14. Type **\$R** and select **Result.StdDev** from the list of available tags and press the **<Enter>** key.

Expression Builder (Color, Color)	×
\$R	Help
Result.BlockWidth	Double
Result.IDMatch	Vendette
Result.NumHoles	Associations
Result.PMScore	Tag Selector
Result.StdDev	- ing selector

15. Enter the following expression.



Expression Builder (Color, Color)	×
<pre>\$Result.StdDev < 10 StdDev < 10 Missing association</pre>	Help Validate Associations Tag Selector Insert Tag Constant Function
OK	Cancel

NOTE: Select the Standard Deviation greater than number based on your results.

16. Click the **Associations** button and set the association as above.

		🥯 Binding Asso	ciations		×
		Add Association			
			Red	-	F
		Current Associat	ions		
		True	Green	- ×	
		False	Red	~ ×	
			Accept	Cancel	
17.	Click the Accept	Accept	outton.		
18.	Click the OK	ок butto	n.		
19.	Click the Run	button in the	e Task bar and	click the R	un Mode tab.
20.	Click the Run Or		button and rev	iew the resu	ults.
		CDGr ABC123		Run Once	
		PatternScore Gouge:	• 0.994 0.077		



21. Click the **Stop** button in the Task bar. 22. Repeat steps for the Blob and Caliper Tools. Blob: Label 1: # of Holes: Label 2: No Text \$Result.NumHoles Background Color (\$Results.NumHoles <> 3) Associations: (if bad part in FOV) True = RedFalse = Green Caliper: Label 1: Block Width Label 2: No Text ((\$Result.BlockWidth FORMAT "F3") + "mm") Background Color ((\$Result.BlockWidth FORMAT "F3") + "mm") Associations: (If good part in FOV) True = GreenFalse = Red ID Tools: Label 1: String Result Label 2: No Text Background Color \$Result.IDMatch Associations **Note**: You will get a Mismatch warning, click the Yes button to clear. If you copied and pasted your label, delete the current Associations and select new colors for each of the results that can occur. Confused = PaleVioletRed Failed = Red Mismatch = RedNo Text = Red NotRead = PaleVioletRed Read = Green 23. Click the **Save** button in the Designer toolbar to save your job. 🗎 🔛 🗋 🖉 🗶 🛨 🗋 🕨 **.** ዕ 🚄



Add a Filmstrip with Color to the HMI Page

1. Add 5 small VisionPro Displays to the bottom of the page.

NOTE: You may want to rearrange your page to make everything fit better.

2. Format the displays using the controls in the Taskbar.



3. Set the Source of the first VisionPro display to reference **Components** → **myFilmstrip** → **Item0**.

🥯 Tag Selector			_		×
🕂 💻 Filter:					
Address	Туре	Value	R/O	Comm	ent
 Check Components mvFilmstrip 					
♦ 🚯 Item0	vprorecord		\checkmark		
▷ 🖾 ltem1	vprorecord		\checkmark		
▷ 🖾 Item2	vprorecord		\checkmark		
▷ 🖾 Item3	vprorecord		\checkmark		
▷ 🖾 ltem4	vprorecord		\checkmark		
▷ 🖾 ItemCount	Integer	5	\checkmark		

- 4. Repeat Step 3 for the remaining 4 displays to create the filmstrip:
 - Display 2 = Item1
 - Display 3 = Item2
 - Display 4 = Item 3
 - Display 5 = Item 4
- 5. Add a Label above Display 1, enter *Recent Results* in the Text field, format **Bold**, Font Size **24**, and Horizontal Alignment **Left**.



- 6. Click the **Run** button in the Task bar and click the **Run Mode** tab.
- 7. Click the **Run Once** button to acquire a few images of both the good and bad parts and review the results.
- 8. Click the **Stop** button in the Task bar.

9. Add a **Rectangle** around each of the Filmstrip displays.



- 10. Select the first rectangle and click the **double arrow** button to set the color of the Border Brush.
- 11. Open the Tag Selector and check the **Show All Types** checkbox.

Show All Types

12. Set the Source of the first rectangle to reference **Components** → **myFilmstrip** → **PassFailResults** → **Item0**.

🥯 Tag Selector			_		×
Filter:					
Address	Туре	Value	R/O	Comme	ent
 ▷ () Check ▲ () Components ▷ () myFilmstrip ▲ () PassFailResults 					
▷ 🖾 Item0	Boolean	False	\checkmark		
▷ 🖾 Item1	Boolean	False	\checkmark		
▷ 🖾 Item2	Boolean	True	\checkmark		
▷ 🖾 Item3	Boolean		\checkmark		
▷ 🖾 Item4	Boolean		\checkmark		
▷ 🖾 ItemCount	Integer	5	\checkmark		

- 13. The **Type mismatch** dialog displays. Click the **Yes** button to continue.
- 14. Click the **Associations** Associations

	🥯 Binding Ass	ociations	×			
	Add Association	ı				
		Red	- +			
	Current Associations					
	True Green 👻 🕽					
	False	Red	- X			
		Accept	Cancel			
Click the Accept Accept button.						
Click the OK	ок butte	on.				



15. 16.

- 17. Repeat Steps 12 16 for the remaining 4 displays to create the filmstrip: Rectangle 2 = Item1 Rectangle 3 = Item2 Rectangle 4 = Item3 Rectangle 5 = Item4
- 18. Click the **Run** button in the Task bar and click the **Run Mode** tab.
- 19. Click the **Run Once** button to acquire a few images of both the good and bad parts and review the results.
- 20. Click the **Stop** button in the Task bar.

Expected Results:

Task:











Lab Exercise 11.1 – Deployment

At the end of this lab exercise, Participants will be able to:

• Employ utilities available to deploy the Cognex Designer application

The Participant will utilize the following Cognex Designer functions to successfully complete this exercise:

- VisionPro ToolBlock
- CogImageFileTool

Follow the steps below to complete the lab exercise:

- 1. Open the MyProject Application from the previous lab exercise.
- 2. Add a new VisionPro Tool Block to the Task.
- 3. Rename the Toolblock *SaveImages* and connect the output pin from the camera device to the input pin of this tool block.
- 4. Click the **Run All** button to bring the image into the new tool block.



- 5. Double click the SaveImages tool block to open.
- 6. Add a **CogImageFileTool**.



7. Connect the InputImage from the CogImageFileTool to the [Inputs].Image.

🖶 🚽 CoglmageFi	leTool1			
	Link from	>	[Inputs].Image	
	Unlink			



8. Double-click the Image File tool to access the tool settings.

🖳 CoglmageFileTool1		-	×
🕨 🖉 🔤 🔓 🔛 🍨 🗎 🖆 🔺 👔 🖆			
Filename (to specify a read-only file, type the name and press <enter>):</enter>	SelectedImage		~
0 image			^
-			
No Open Image File	<		~
□ 17.008ms 17.444ms 0x80131600			

- 9. Click the Create New ImageFile button.
 10. Save the file to your Desktop with a name like mySavedImages.idb and click the Save Save button.

NOTE: Make sure that you specify .idb, or it will save a bitmap .bmp file.

🚽 Create New Image	File						\times
← → * ↑ 🗖	 This PC 	> [Desktop	~ Ō	Search Desktop		9
Organize 👻 Ne	w folder						?
📌 Quick access		^	Name			Date modified	^
📃 Desktop	*						
👆 Downloads	*						
🔮 Documents	*						~
Pictures	*	×	<				>
File name:	mySavedIm	nage	es.idb				~
Save as type:	All Files(*.b	mp;	:*.cdb;*.idb;*.jpg;*.png;*.tif)				~
∧ Hide Folders					Save	Cancel	

11. Click the **Record** button to put the ImageFile tool into Record mode.

CoglmageFileTool1	_	×
▶ / 🖆 🛀 🔸 🔋 🖉		



12. Run the Task a few times to bring images into the Database.



- 13. Go to the Tag Manager and create a new Tag named *Global.SaveImage*, leave the Data Type as Boolean, and False as the Default Value.
- 14. Return to the Task, click the SaveImages Toolblock to display the Properties, click the ellipsis to open the **Condition** value. The Expression Builder will display.
- 15. Click the **Tag Selector** button and reference *\$Global.SaveImage* and click the **OK** button.

Properties *	- Ą
Name:	
Savelmages	
Comment:	
Ability to Save Images if Global Tag	
\$Global.Saveimage is set	
Condition:	
\$Global.SaveImage	

- 16. Add a **CheckBox** to the Main Page and enter Save Images in the Text field.
- 17. The **State** property should reference the \$Global.SaveImage tag.
- 18. Go into **Run Mode** and run the application a few times with the Save Images checkbox both checked and unchecked. Close Run Mode, open the SaveImages Toolblock and <u>open the ImageFileTool to review the images saved.</u>
- 19. Click the **Save** button in the Designer toolbar to save your job.





Deploy the Application

- 1. Add a **Button** to the MainPage next to the Run Once button. **NOTE**: *The Button is found in the Toolbox under Controls.*
- 2. Under the Button Properties change the Text to Shutdown.

Run Once	Shutdown

3. Set the Click Command to System.Shutdown.

System.Log.Write			
System.Log.WriteExcep	tion		
System.Shutdown			_
Click Command	-		
Text	Shutdown	₽	

- 4. Click the **Save** button in the Designer toolbar to save your job.
- 5. Select **Deploy** from the Project Menu.

Proje	ect	Tools	Help	ViDi	_
*	Ne	w Web	Page		
*3	Ne	w Page			
*	Ne	w Datał	oase		
Ľ	Ne	w Task			
	Ru	n		F5	
0	Ve	rify			
*	De	ploy]

The **Deployment** dialog displays.

Seployment		_		×
Project Name:	My_Project			
Project Version:	1.0.0.0			
Deployment Folder:	C:\Runtime\My_Project			
Scale Option:	None			*
Windowed Mode:				
Overwrite Folders:				
		Ac	cept	Cancel



6. Enter the Project Name and where you want the project to deploy and click the **Accept** Accept button.

The Deployment Successful dialog displays.



- 7. Click the **OK** button to close the dialog box.
- 8. Notice that a .exe of your file is now on the desktop.



9. Close Cognex Designer and run the .exe file.

