

Vision Guided Robots

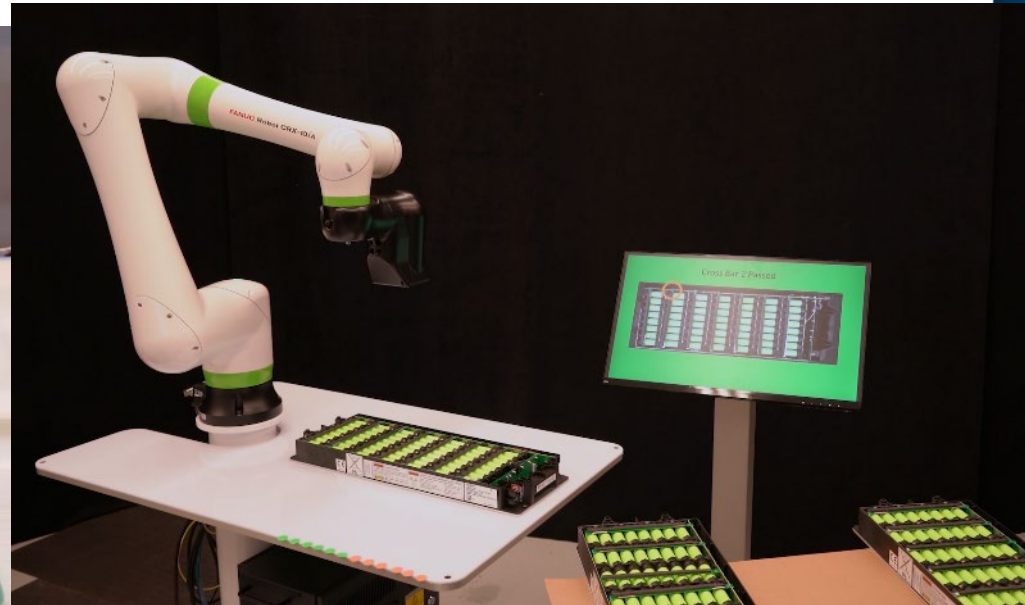
- What is Vision Guided Robot?
- Why/When should you guide your robot with vision?
- Developing an Application
- Guide in 2D or 3D?
- Types of vision applications
- Lighting, Lighting, Lighting



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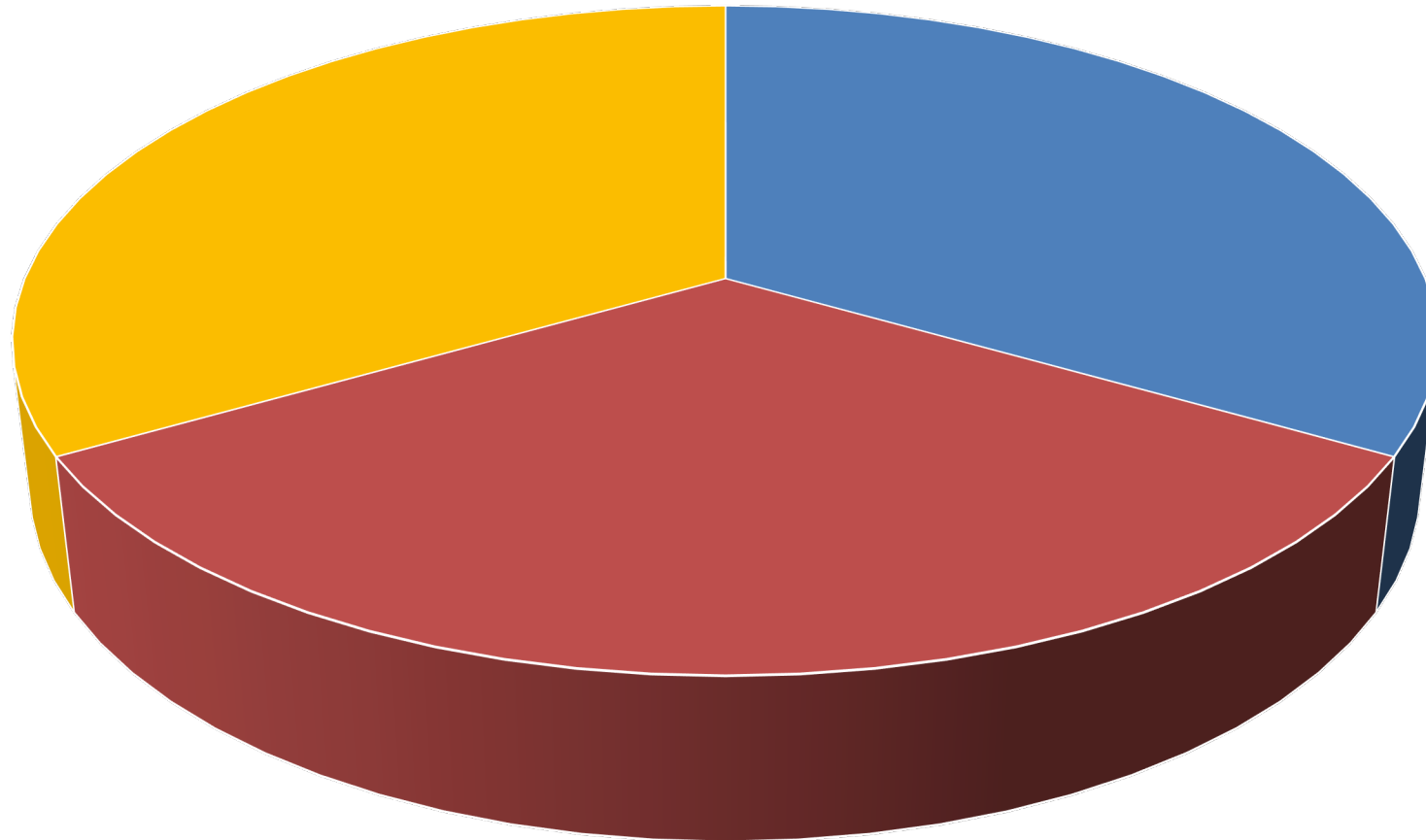
Vision Guided Robotics

- Guide the robot using 2D or 3D camera(s) or vision sensors
- Guide the robot with locational information or with process information
 1. 2D
 2. 3D
 3. Error Proofing/Classification



Why Machine Vision in Your Application

Why use Vision?



■ Reduce Cost ■ Increase Flexibility ■ Increase Quality

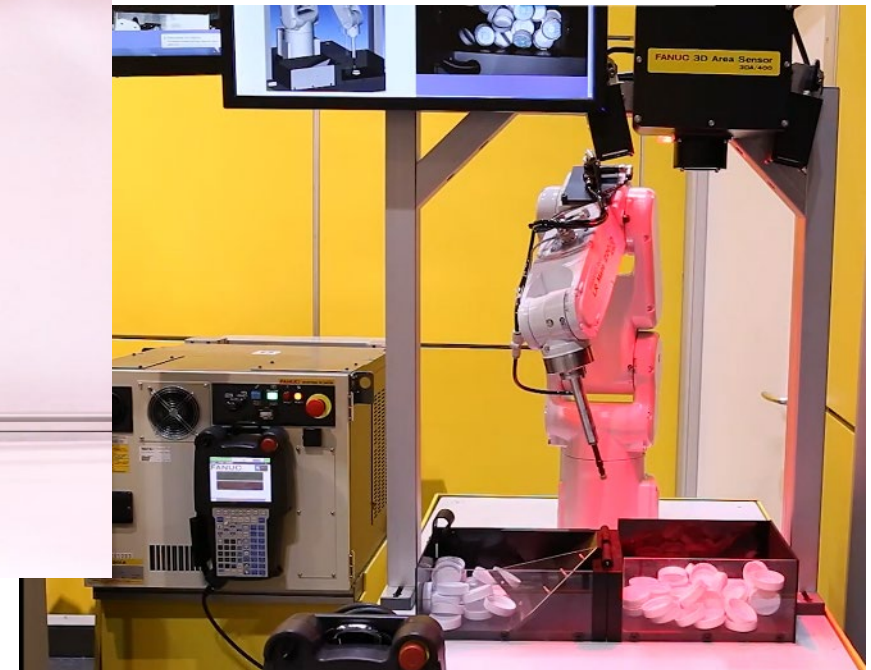
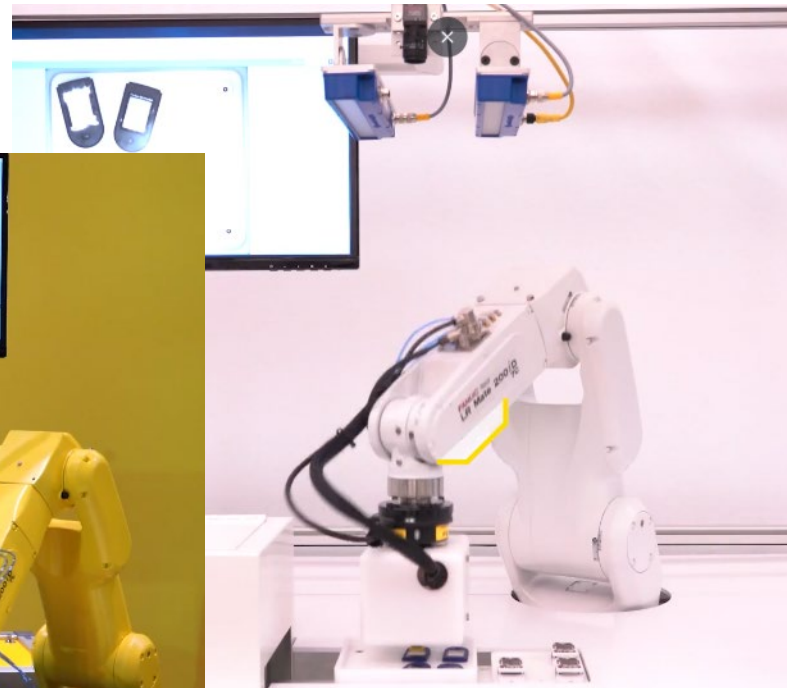
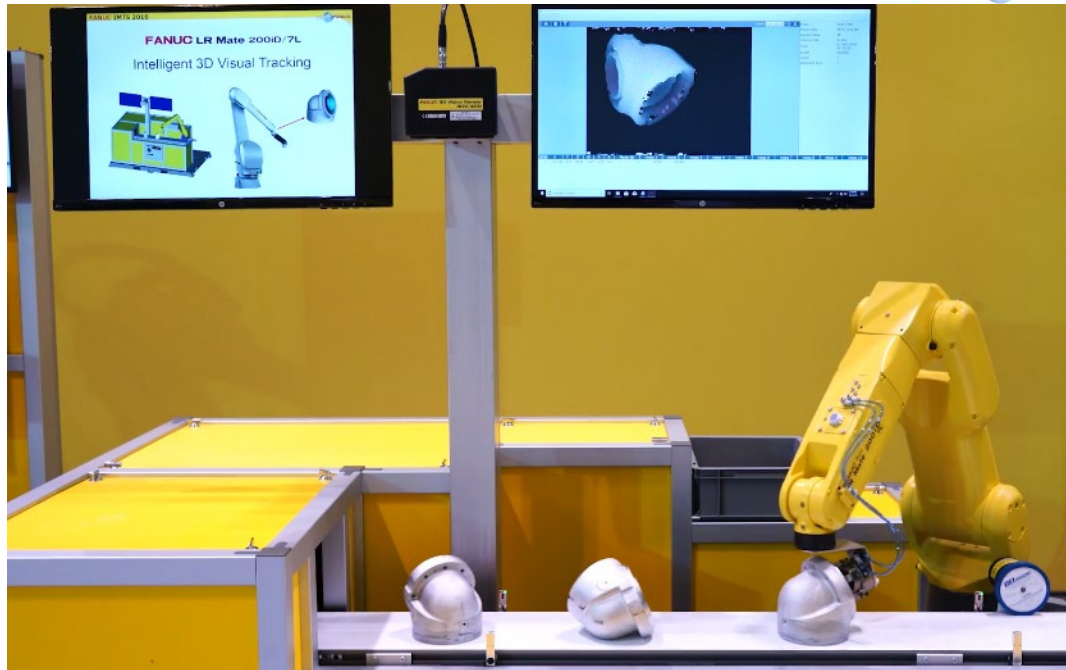
Developing an Application

- What is the process that requires vision?
- How many cameras are required?
- Is 2D or 3D required?
- What is the cell cycle time and how does vision impact the cycle time?
- Fixed or Robot Mount Camera?
- Typically it is recommended to test the workpiece under the camera early in the engineering phase



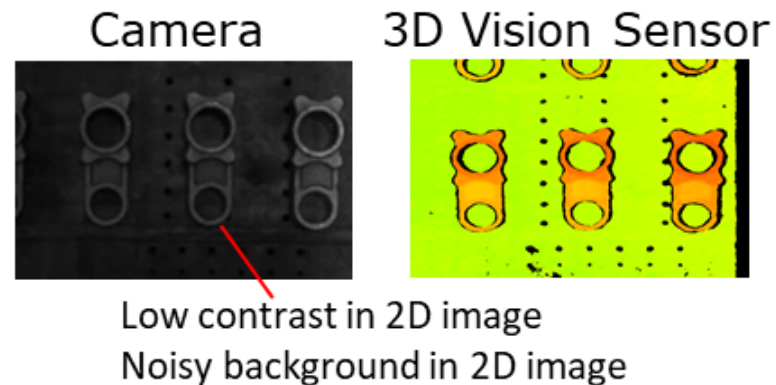
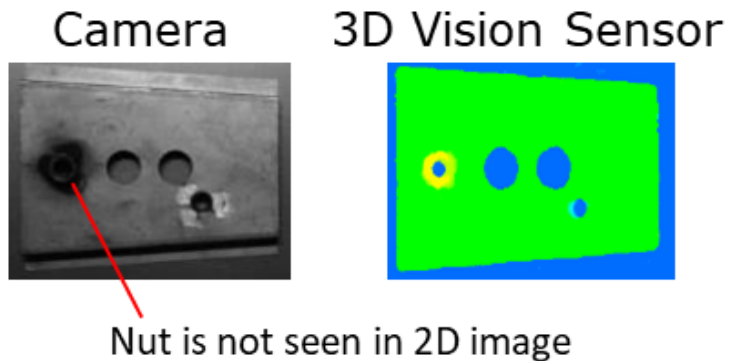
Providing position guidance to robot

- 2D – Provides the part location based on a flat plane (X,Y,R)
- 3D – Provides the part location in 3D space (X,Y,Z,W,P,R)
- Visual Tracking – Provides the location of the part on a moving conveyor
- Bin picking – Provides the location of parts inside a bin or tote.



3D - The new 2D

- Many 2D applications can benefit from use of a 3D camera
- 2D Grayscale vision algorithms use the difference in grayscale pixel “color” to differentiate between the workpiece and the background. Requires the workpiece to be darker or lighter than the background.
- With a 3D point cloud, the depth image can be used to create a pseudo contrast image.
- 3D Depth Image uses differences in height to differentiate between the workpiece and the background. Requires the workpiece to be higher than the background

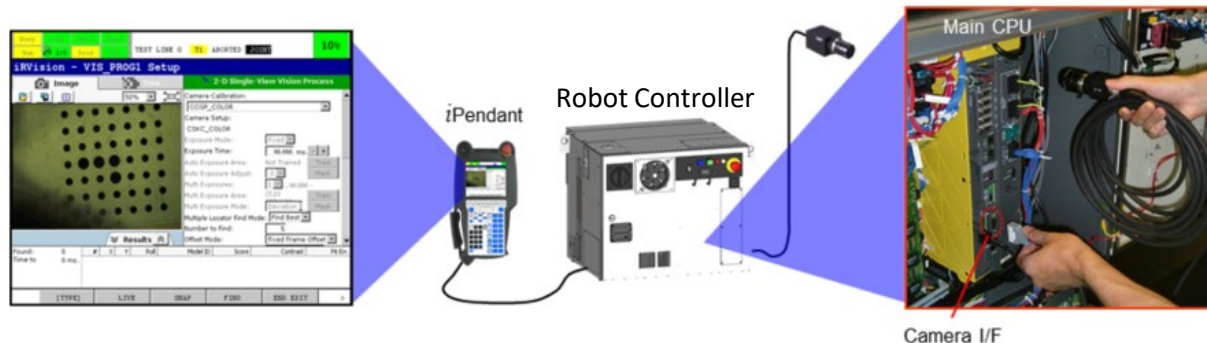


Polar Bear in a Snowstorm –
Low Contrast 2D mage



Integrated Vision vs 3rd Party Vision

- Some robot manufacturers provide integrated robotic solutions.
- 3rd party vision solutions can be implemented on all robots regardless of manufacture.
- Some robot manufacturers partner with 3rd party vision providers to provide a pseudo integrated solution.
- Make sure somebody understands how to calibrate the camera to the robot coordinates so the robot moves properly with the vision offset.



Integrated Robot Vision

Smart Cameras: All the image capture and vision algorithms are done on the camera. The smart camera communicates the data to the robot or PLC.

PC Based Vision: Cameras are plugged into a PC, where all the vision algorithms are done. The PC communicates the data to the robot or PLC

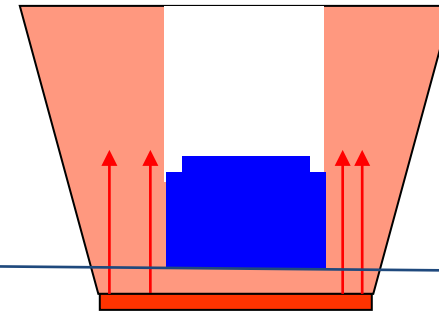
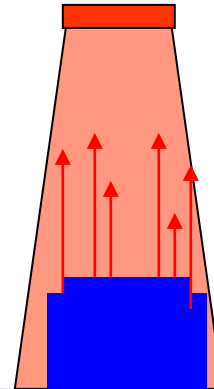
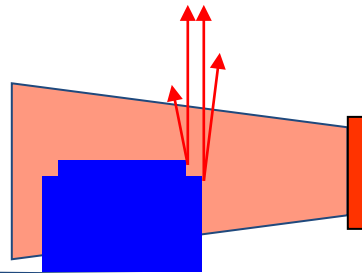
Lighting – Always important

Three BASIC Types of lighting are common in robotic vision

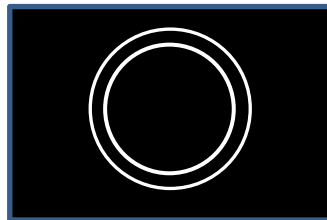
Camera



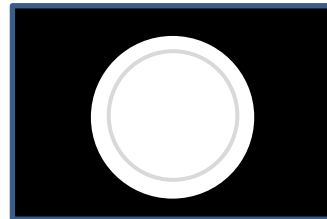
Workpiece



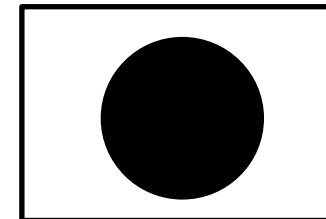
What the camera sees



Dark Field:
Good for finding
edges.



Front Illumination:
Good for finding
surfaces



Back Lighting:
Good for finding
Silhouette.

Expert Thoughts

- Automated manufacturing is becoming easier to justify and implement as the industry continues to focus on new technologies to increase functionality, ease of use, and cell reliability.
- Vision is a key piece technology that has increased the functionality, ease of use, and cell reliability.
- While vision opens the door to many applications that couldn't be successful without it, it is not always as easy as add a camera/vision and watch all the problems go away.
- No matter who manufactures, integrates, or installs your workcell, make sure the required engineering has been done for a successful outcome. Machine vision is no exception to this requirement.



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Test – Put your part under camera

Thank You