Choosing the Right Machine Vision Applications

Part 2 of a 3-part webinar series: *Introduction to Machine Vision*

About your Instructors

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Today's Objectives

By the end of this webinar, you will know:

➢ How to identify a good Machine Vision application and which applications to avoid

➢ Machine Vision hardware platforms and what to consider when choosing one for an application

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Today's Topics

Today we will discuss:

➢ Successful Machine Vision Applications

➢ Challenging Machine Vision Applications

➢ Application Examples

➢ Machine Vision Hardware Platforms

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Successful Machine Vision Applications

As a new user, you should choose an application that will not be overly complex.

Successful applications have the following attributes:

1. Looking for a single decision point
2. Clear application requirements
3. Application is consistent
4. Parts are high value or critical
5. Some false rejects are OK

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1. Looking For Single Decision Point

The inspection will look for good and bad, rather than sorting through parts.

- Good vs. bad applications have a single decision point
- Failures should be clearly visible
- Some sorting is OK –(but not much)

GOOD vs. BAD: Reject defective product

SORTING: Identifying each battery type and vendor by shape, color, and text

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2. Clear Application Requirements

The application requirements have been clearly defined.

- The list of requirements is small, such as fitting on a single page
- Samples of good and bad parts are available
- The part to be inspected has a beginning and end, rather than continuous

Samples of good and bad parts should be available

Avoid continuous web inspection
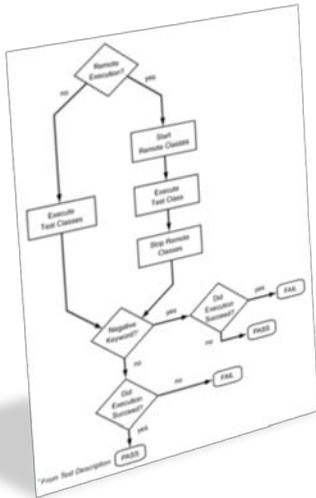
Inspection requirements should be one page

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3. Application is Consistent

The parts are always positioned the same way, at the same distance from the camera, with consistent lighting.

Organic items are inconsistent in size and shape; items randomly placed are difficult to locate.
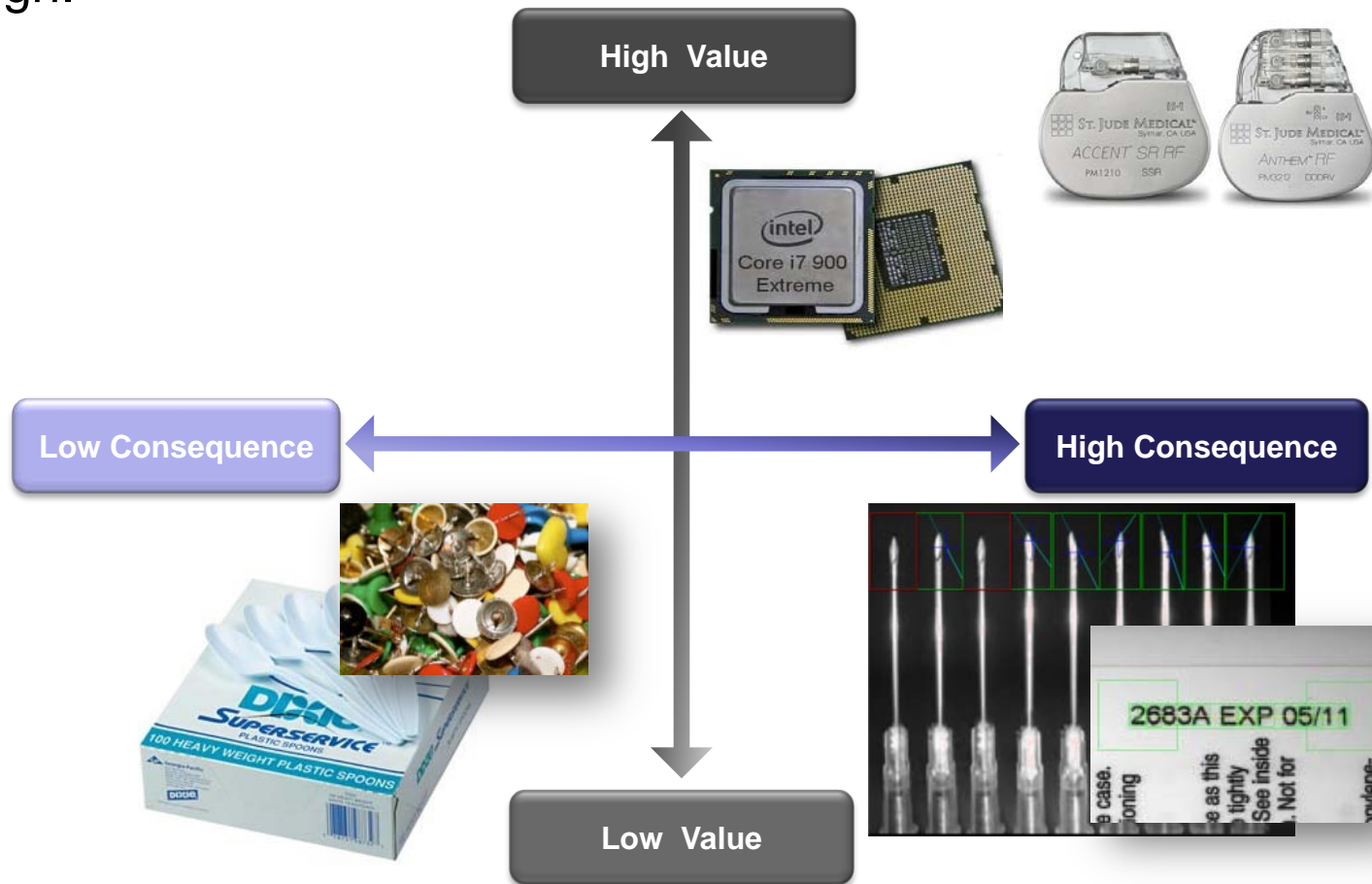

Good applications include consistent part shape, positioning, and lighting.

Designing tight application parameters allows a simple Machine Vision system.

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4. Parts Are High Value or Critical

The value of the part is high, or the consequence of a flawed part is high.

High Value

Low Consequence

High Consequence

Low Value

intel
Core i7 900
Extreme

ST. JUDE MEDICAL
ACCENT SR RF

ST. JUDE MEDICAL
ANTHEM RF
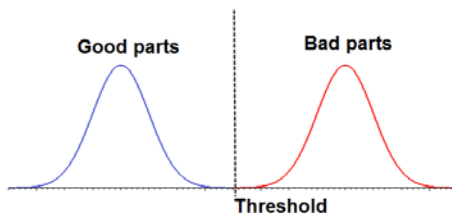
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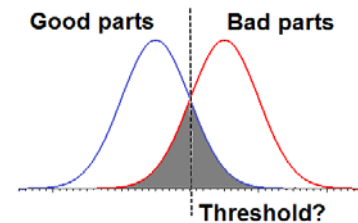
5. Some False Rejects Are OK

The price for catching all the defects may be some false rejects. The customer will need to make a decision on what will be the acceptable level of rejects.
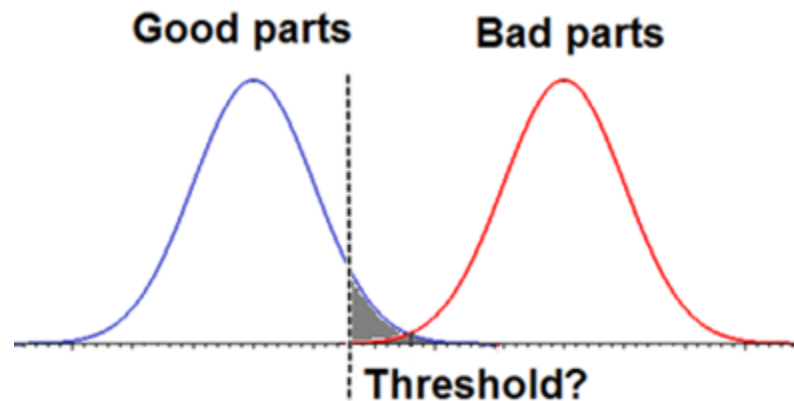
As good and bad parts appear to be similar, some false rejects must be acceptable to catch all the bad parts

Ideally, there is a large separation between good and bad parts.

As good and bad parts become more similar, the grey area becomes larger

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Challenging Machine Vision Applications

Applications that are not impossible, but are specialized and time consuming:

1. Non-industrial applications
2. Organic materials applications

ANYTHING IS PO$$IBLE!

➤ Time consuming projects cost money
➤ Consider the Return on Investment (ROI)

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1. Non-Industrial Vision Applications

Machine Vision is a specific branch of Vision that is specialized for <u>industrial</u> applications.

✓ Pursue these applications: Industrial, Manufacturing

These types of applications typically follow the 5 guidelines we discussed earlier.

✗ Non-industrial applications include: Medical, Scientific, Security,

These applications have different requirements and use different tools.
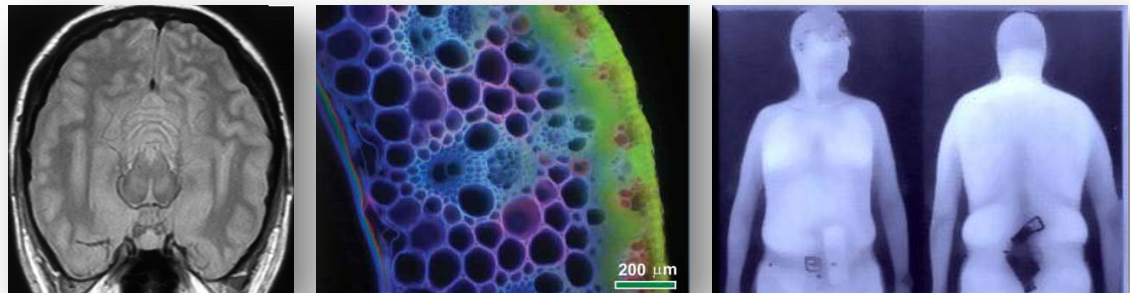
Security, Scientific and Medical applications have specific challenges that take a lot of time to overcome.

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2. Organic Materials Applications

Organic materials are inconsistent in size and shape - Difficult to identify and inspect.

- Avoid forest products, wood, vegetables, sorting trash

**Watching vegetation grow is not an ideal application**

Sorting trash is hard work!

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Application examples

> Ideal Machine Vision applications:
> - There is a part handling solution in place
> - Application can be replicated over 20 lines
> - You are inspecting/gauging expensive parts
> - There are good and bad parts available for evaluation
> - The inspection/gauging criteria can be expressed in numbers

Ideal Machine Vision applications have criteria expressed in numbers

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MAX FLAW < 0.020
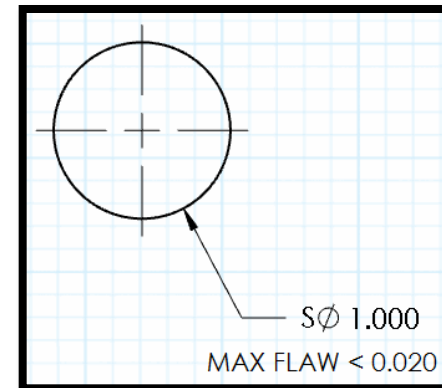
> Challenging Machine Vision Applications:
> - The application is inspecting plastic knives and forks
> - The "spec" is a book with fuzzy pictures of bad parts
> - The current process is manual

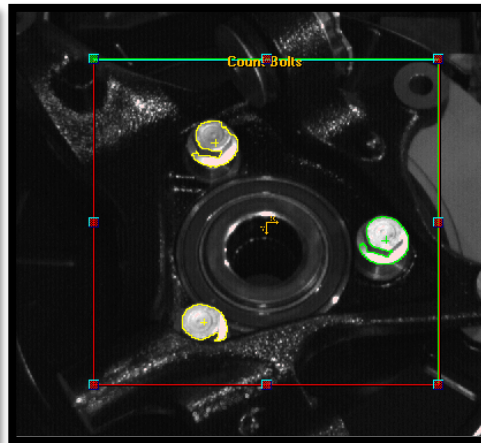**MICROSCAN.**

Ideal Machine Vision Applications

Here are a few examples of successful applications for new users.

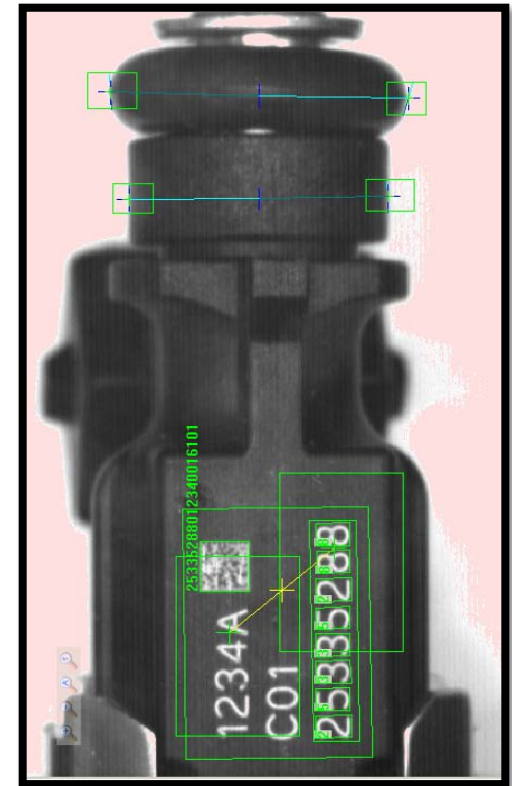These applications have the traits of a successful application:

1. Looking for a single decision point
2. Clear application requirements
3. Application is consistent
4. Parts are high value or critical

Read barcode and check label position

Count that 3 bolts installed

**Validate 2D and OCR data
Measure part to tolerance**

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Machine Vision Hardware Platforms

Hardware Platforms for Machine Vision Applications

Smart camera:
Integrated Machine Vision
solution

PC Based:
PC-based image processing
using cameras for acquisition

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Smart Cameras: Integrated Solution

Smart cameras can vary in processor power and capabilities. Be sure to match the smart camera with the application.

- Sometimes includes integral lighting and lens
- Vision processing is done in the camera
- Good for a single or few tasks with moderate processing speeds
- Single camera operation, no multiple camera operations
- Fewer I/O points, less sensor options

A computer is only required for programming. When programming is complete, the smart camera can run on its own.

Benefits of a Smart Camera:
- No PC on the floor
- Compact
- Low cost
- All-in-one

Smart Cameras:
Includes lighting, lens, sensor, Image processor, and I/O

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PC-Based Solutions

GigE Machine Vision uses a camera transporting the image over Gigabit Ethernet to a PC for vision processing.

- Fewer system components than frame grabbers
- More processor power than smart cameras
- Multiple cameras in a single inspection
- More I/O points than smart cameras
- PC required for operation

I/O Expansion:
PC-based Machine Vision like GigE and frame grabbers allow for more I/O

GigE:
Ethernet transports an image into a PC

Similar configurations: USB, IEEE1394, 10/100 Ethernet, Frame Grabbers
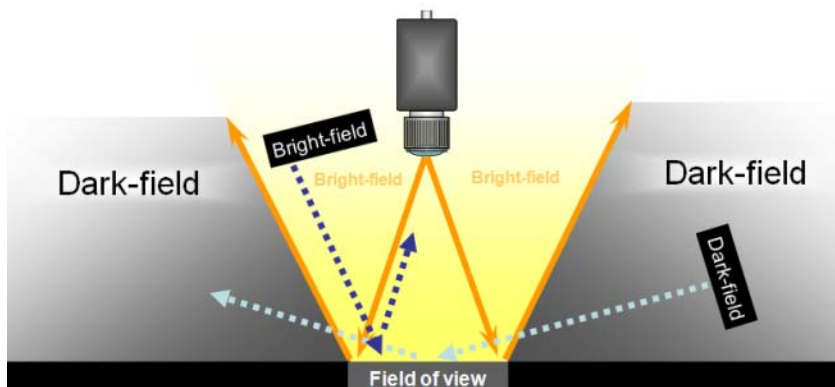
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LIGHTS!

The Machine Vision platforms discussed today did not include Machine Vision lighting.

To learn more about Machine Vision lighting, visit **www.microscan.com** and select *Training/Lighting*.

Learn about:

- Geometry
- Feature analysis
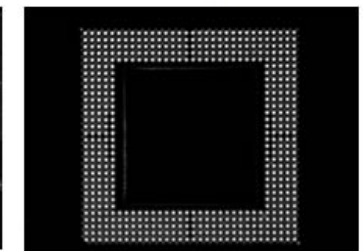- Lighting types
- Effect of lighting

Feature Analysis

Absorption

Shape

Texture

Elevation

Geometry

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Conclusion

➢ When entering the Machine Vision world, consider applications for: *Measuring, Decoding, Counting* and *Locating*.

➢ By following the guidelines discussed here, your first Machine Vision applications will result in success and low maintenance.

➢ Other types of applications are not impossible or unsuccessful, but they are highly specialized and sometimes require specific equipment or other tools.

➢ Selecting the right platform for an application is a balance between cost, performance and portability.

➢ Don't forget to visit www.microscan.com to view training courses about Machine Vision Lighting.

➢ Let us help you define an application and hardware platform!

Thank you!

For More information

Website: www.microscan.com

- – Online courses
- – Spec sheets
- – Technology Brochures
- – Support Self-help and support request form

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