Advanced Defect Detection

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Agenda

Introduction to Vision Applications
Overview of Markets
Defect Detection Considerations
Cognex Tools
  • InspectEdge
  • Flexible Flaw Detect
  • Surface Flaw Tool
Application Examples
Summary
QA
High-Level Introduction
What Does Machine Vision Do?
Think: GIGI

Guide
Identify
Gauge
Inspect
Inspection

Completeness
- Fill Level
- Feature Presence
- Assembly Verification

Correct Location
- Orientation
- Skew

Quality
- Part Defects
- Surface Inspection
- Contaminants
Defect Detection Applications

Features
- Dent
- Blotch
- Scratch
- Bump
- Mousebite
- Large Bite

Change of existing features
- Missing
- Size
- Movement
Who Needs Defect Detection?

- Automotive
- Food & Beverage
- Consumer Electronics
- Plastics
- Printing
Common Defect Detection Challenges

1. **Looking for ‘Anything Anywhere’**

2. **Accounting for complex features**

3. **Process variation**
Managing The Challenges

Manage the Application

- Define defects & constrain problem
- What is ‘Anything’ and ‘Anywhere’?
- Understand the process variation

Choose the Right System

- Optimize lighting and optics
- Flexible platform
  - Resolution and color
  - Processing speeds
- Robust, flexible and fast algorithms
Cognex Defect Detection Tools
Cognex Tools

InspectEdge
- Min/max & gaps along a line path

SurfaceFlaw Detection
- Surface imperfections with intensity variation

Flexible Flaw Detect (FFD)
- Edge & area based inspection of shapes
InspectEdge

Advanced edge analysis to find features or defects

- Find Edges

- Reference “found” edges and inspect for:
  - Defects
  - Edge width
  - Position

- Train bead path to:
  - Account for variable positioning
InspectEdge accounts for:

- Complex shapes

- Process variation
Surface Flaw Tool

Advanced inspection which finds defects on surfaces with intensity variation

- Select area and choose defect types
- Ignore unwanted features (as desired) with mask
Surface Flaw Tool

**Surface Flaw Detection accounts for:**

- Complex features
- Process intensity variation
Flexible Flaw Detection (FFD)

Advanced inspection tool to inspect shapes and patterns

- Train “Golden Image”
- Apply ‘Flex’ to edges
- Detect flaws, appropriate flaws
- Ignore features with mask
Flexible Flaw Detection (FFD)

Flexible Flaw Detection accounts for:

- Complex features
- Process variation

Figure 1 – Before Flex

Figure 2 – After Flex
Application Examples
Medical Device Application

**Application**
- Part: Rubber Valve
- Detect Tears
- Detect Holes

**Challenge**
- Noisy features
- Complex Edge-based features
Medical Device Application

Application

- Part: Rubber Valve
- Detect Tears
- Detect Holes

Solution

- Surface Flaw Detect

Number of Flaws: 0

Number of Flaws: 1

Number of Flaws: 2

Number of Flaws: 1
Automotive Application

Application

- Part: Gas Cap
- Detect Flash
- Detect Short-Shot

Challenge

- Account for molding process variation
Automotive Application

Application

- Part: Gas Cap
- Detect Flash
- Detect Short-Shot

Solution

- Flexible Flaw Detect

Normal process variation causes false reject without Flex

With Flex Applied
Consumer Product Application

Application

 Part: Pad Printed Label
 Detect Gross Printing Defects

Challenge

 Print Positional Variation
Consumer Product Application

Application

- Part: Pad Printed Label
- Detect Gross Printing Defects

Solution

- Flexible Flaw Detect
Automotive Application

Application

- Part: Assembled Gasket
- Confirm Gasket path
- Find defects

Challenge

- Complex shape
- Reflective background
Automotive Application

Application

- Part: Assembled Gasket
- Find defects
- Confirm Gasket path

Solution

- InspectEdgeWidth
Consumer Product Application

**Application**
- Part: Blow molded plastic container
- Detect burn marks and other discoloration

**Challenge**
- Ignore surface noise
- Discoloration Faint
- Varied color backgrounds
Consumer Product Application

Application

- Part: Blow molded plastic container
- Detect burn marks and other discoloration

Solution

- Color In-Sight
- Surface Flaw
Consumer Packaging Application

Application
- Part: Label
- Detect defects and discoloration

Challenge
- Non-linear light intensity
- Color intensity variation slight
- Different defect colors
- Different background colors
Color Surface Flaw Demo
Automotive Application

Application

- Part: Engine Filter
- Find tears and damage

Solution

- Flexible Flaw Detect
Consumer Product Application

Application

- Part: Paper Cup
- Inspect defects along the wall and bottom
- Confirm lip of cup correctly formed

Solution

- InspectEdge
- Surface Flaw
Automotive Application

Application
- Part: Automotive keypad
- Confirm placement of buttons

Solution
- Flexible Flaw Detect

Auto Keypad Inspection
Solar Application

Application

- Inspect solar wafers for cracks, gaps and defects

Solution

- InspectEdge
Automotive Application

Application
- Part: Flexible Rubber Gasket
- Find defects
- Allow for variable path

Solution
- InspectEdgeTrainBeadPath
- InspectEdgeWidth
Summary

Defect Detection Considerations

- Manage the Application
  - Understand ‘anything’ and ‘anywhere’
  - Account for process variation

- Choose the *right* system
  - Optimized lighting and optics
  - Pixel resolution, color or grayscale
  - Powerful processing
  - Powerful, flexible and fast algorithms
Questions?
Thank You!