

Machine Vision



- The process of extracting, characterizing, and interpreting information from images

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1

Six steps

- Sensing
 - Process that yields a
- Preprocessing
 - Noise reduction, enh
- Segmentation
 - Partitions an image into objects of interest

Low Level
Vision

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2

Six steps ...

- Description
 - Computation of features of objects
- Recognition
 - Process to identify objects
- Interpretation
 - Assigning meaning to group of objects

High Level
Vision

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3

Common industrial applications

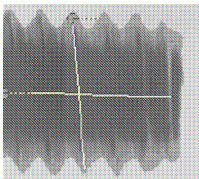
- Gauging
- Presence Verification
- Identification
- Character Recognition
- Print Quality Inspection

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4

Thread Pitch



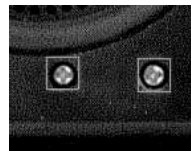
- backlighting gives clear contour image
- screw separated
- corresponding points on teeth located and distance calculated

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5

Presence of screws



Both screws present

- Position of object is fixed
- Identify two regions of interest
- Check brightness to verify screw
- Unfastened screw is very bright

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6

Defective assemblies



One screw missing



One screw unfastened

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7

Recognize codes on film

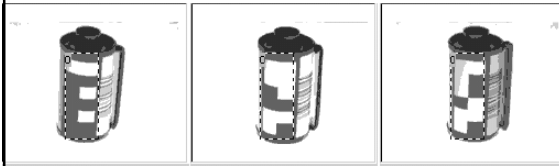
- Neural networks used to recognize block codes
- Non-optical methods possible
- Challenge: Inspect 20 rolls per second
- Asynchronous reset camera

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Three different rolls correctly identified



No.	Class	Certainty	No.	Class	Certainty	No.	Class	Certainty
✓ 0	100 ASA	0.94	✓ 0	200 ASA	0.9	✓ 0	400 ASA	0.931

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9

IC inscription reading

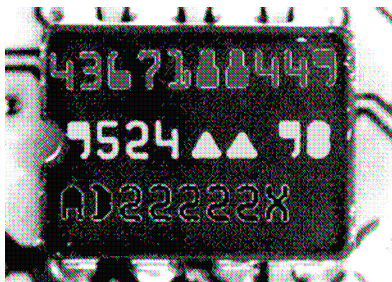
- IC used in air bag controllers
- 100% inspection necessary to verify correct IC used
- circular illumination using polarized light
- preprocessing enhancement to compensate for print quality variation

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10

View after segmentation



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11

Print Quality



Image of defective scale

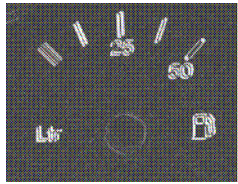
- Procedure: Create difference image, with respect to a reference image

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12

Simple difference image



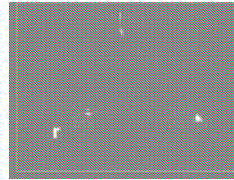
- Pseudo errors because of misalignment

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13

After 3 stage positioning



- Defects detected

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14

Text Book



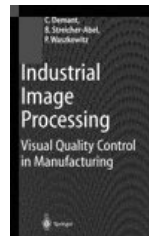
- K.S.Fu
- R.C.Gonzalez
- C.S.G.Lee
- Robotics: Control, Sensing, Vision, and Intelligence
- chapters 7,8
- pages 296-449

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15

Reference 1



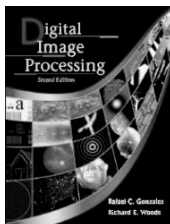
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- Industrial Image Processing
- Springer
- www.neurocheck.com

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16

Reference 2



- Rafael C. Gonzalez
- Richard E. Woods
- Digital Image Processing 2ed.
- Pearson Rs 395/-
- Website:
- www.imageprocessingplace.com

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17

Reference 3



- Bernd Jähne
- Digital Image Processing
- 5th ed
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- <http://klimt.iwr.uni-heidelberg.de>

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18