Arquitectura de Computadores

Mestrado / Curso de Especialização em Informática

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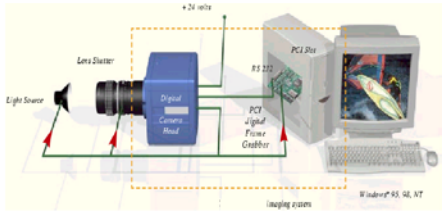
2002-2003

- Introduction
- Smart Cameras vs. Standard Smart Vision Systems
- Smart Camera Architecture
- Image Processing Algorithms
- Smart Camera System
- Looking Ahead…

- Introduction
  - What's a smart camera?
  - Where to use it?
  - Why use it?

- Smart Cameras vs. Standard Smart Vision Systems



Standard Smart Vision System

Smart Camera System
(120x50x35 mm)
(250g)

Smart Cameras as Embedded Systems

- Smart Cameras vs. Standard Smart Vision Systems
  - PC-Based Vision Systems Advantages:
    - Flexibility
    - Power
  - Smart Cameras Advantages:
    - Cost
    - Simplicity
    - Integration

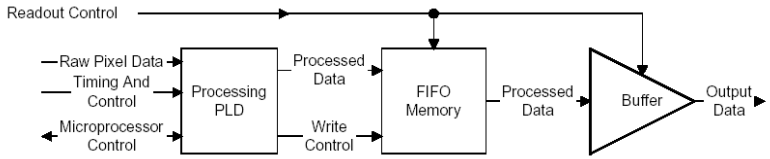
Smart Cameras as Embedded Systems

- Smart Camera Architecture - Block Diagram

- Analog to Digital Conversion Electronics
  - Sub-divides CCD analog output into 8 CH x 256 pixel each
  - ADC is performed at a 8 CH x 20 MHz

Smart Cameras as Embedded Systems

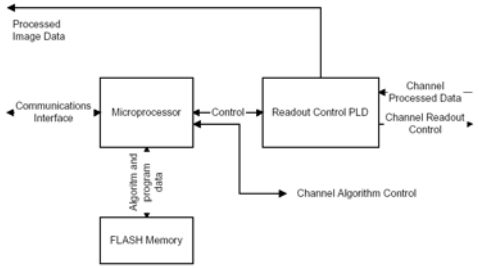
- Image Processing Architecture Block Diagram (Basic processing architecture for each channel)



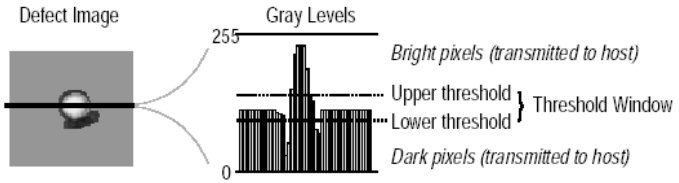
- The processing algorithm is embedded in the processing PLD

Smart Cameras as Embedded Systems

- Microprocessor/FIFO Readout Control Circuit Board Block Diagram



- Image Processing Algorithms
  - Example: Static Gray Scale Thresholding



- The static thresholding algorithm is expressed as follows:

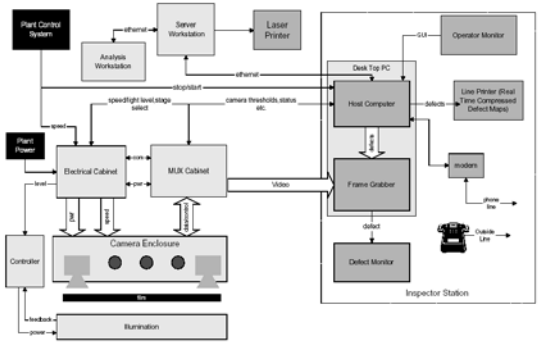
IF (PIXEL GRAY IS > (CENTER + UPPER)) OR (PIXEL GRAY IS < (CENTER – LOWER)) THEN

TRANSMIT PIXEL

ELSE

IGNORE PIXEL

- Smart Camera Vision System for web inspection with a maximum of twenty smart cameras



- Looking Ahead…
  - Real-time, pixel-data extraction and processing operations within the camera at extremely high speeds and at a low cost
  - Eventually, complete vision-processing-systems-on-a-sensor-chip will be available
  - Higher resolution, megapixel sensors
  - Standard CCD based camera - 480,000 pixels \\ New megapixel cameras 1 million pixels \\ Some manufacturers already offer cameras of 2 million pixels

- Future Applications…
  - Security and access control markets
  - Automotive industry, for collision avoidance
  - Even – one day – for the toy industry
  - For intelligent lifts

Smart Cameras as Embedded Systems

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