Smart Cameras in Robot Control Applications

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www.vision-comp.com
Introduction

- Cost, effectiveness, speed, size, reliability
- Miniature Smart camera architecture
- High end, high speed smart camera architecture
- Smart camera advantages in robot applications
- Application examples
Miniature smart camera

- Integrating
  - Image sensor
  - Processor
  - Lighting
  - Simple user interface
  - Lens and IP67 housing

- Significantly lower cost, higher performance
- Smaller size, less power consumption, less weight
- Setting new standard for performance and integration density
Miniature Smart Sensor architecture

- CCD Sensor
- DSP
- Controller
- Boot Memory
- Digital IO
- Opto
- Driver
- LEDs Switch
- CLK
- 12V
- TXD
- RXD
- 4 Outputs
- 2 Inputs
- 10
Low Cost Smart Camera

Able to read 7-10 ECC 200 codes/sec.
CCD sensor

- Sensor: Sony 1/4"
- Resolution: 640 x 480 pixels 8/10 bit
- Frame rate: 50-200 frames/sec with binning
- Shutter: 20 usec – 4 sec frame by frame
- Picture: full frame, trigger, async reset
- Sensor next to DSP processor
Hardware components

- 75 MHz DSP, 375 MIPS
- On-chip memory, DRAM for images
- Flash EPROM for program storage
- PLC compatible digital I/Os
- Simple operator interface
- JPEG image output
Integrated illumination and optics

- Built-in program controlled ring LEDs
- Strobe control
- Four LEDs for FOV and focus adjustment
- Simple setup and operation
- Vibration, shock resistant
- Waterproof, durable aluminum housing
Software components

- Real time operating system in the smart camera
- Flexible Cross development environment
- Image processing, machine vision library
- Emulator, simulator
- Application software – third party software
- Robot communication protocols
High performance 32 bit Smart Camera
High Performance Industrial Smart Camera

- Performance: up to 30-40 parts/sec
- Modular architecture
- Multitasking, parallel execution
- Exposure, read-out, UI in parallel
- Programmable gain and offset
- Crash proof file system
- Built-in Fast Ethernet/TCP/IP stack
High-performance intelligent camera

- 800x600 pixel-identical 8/10 bit A/D at the CCD
- 54 full frames/sec, dual channel 800x600
- 110 full frames/sec 640x480
- 32 bit DSP processor
- Up to 64 Mbytes SDRAM
- SVGA output with 8 bit color overlay
- Size 100x50x35 mm 300 gr
- Shutter 30 usec up-to 20 sec
Smart camera advantages

- Low power design: few watts; small size
- No moving parts, no fans, compact, higher integration, significantly less parts
- Reproduction for a long time
- Code transferability
- DSP processors designed for image processing
- One supplier - versus several
- Small embedded, modular fast image processing
Smart camera advantages

- Compact, self-contained units without a lot of baggage
- Simple maintenance, replace or repair of one part from one supplier
- Higher reliability
- Less parts, less cables
- Simpler
- Longer product life cycle
- Industrial design, easier to integrate
Diverse applications

- Metrology, gauging, 2D 3D and Color measurement
- Robot Guidance
- Surface analyses
- Identification, inspection
- Motion analyses
- Sorting, packaging
- Surveillance and security video systems
- Embedded systems
Part Inspection
Sorting, feeding parts with correct orientation
Robot Palletizer
Calibration of thermometers
Mounting of thermometer scales
Metal Inserts Inspection

Edge
.600 3mm brass
88441153

Courtesy of
Ross Microsystems Inc.
Robot Eye controls carburetor assembly
Measurement and assembly
Control and inspection example

Courtesy of AIT
Assembly line
Weld seam inspection
Welding robot
Filling control