

Low-Cost Portable Edge Detection Device

Presented by:
Paul Grinberg & Mahmoud Yasir Imam

Special thanks to:
Professor Stephen Phillips,
Professor Frank Merat,
Professor Ken Loparo,
Mark Koob

Presentation Topics

- What is an Edge Detection Device?
- Our Specifications
- What is Edge Detection?
- Hardware Design
- Software Design
- Verification and Demonstration
- Our Accomplishments This Semester

Why is an Edge Detection Device Necessary?

Examples of Uses

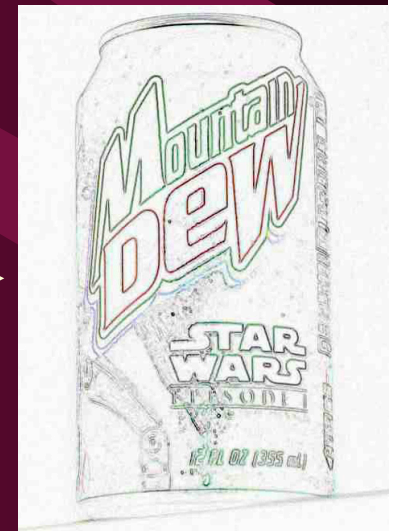
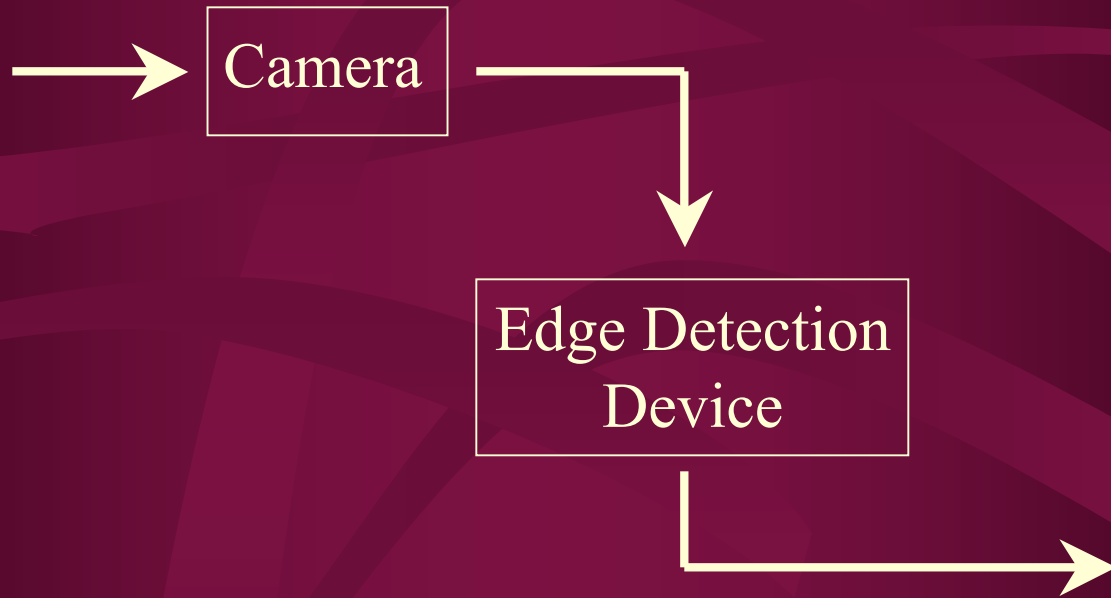
- Movement of autonomous robots
- Quality assurance robots on assembly lines
- Controllers for x-ray exposures
- Smart motion detectors

Edge Detection is the first step in image interpretation.

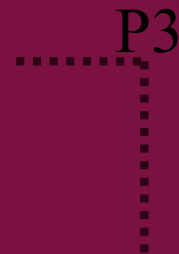
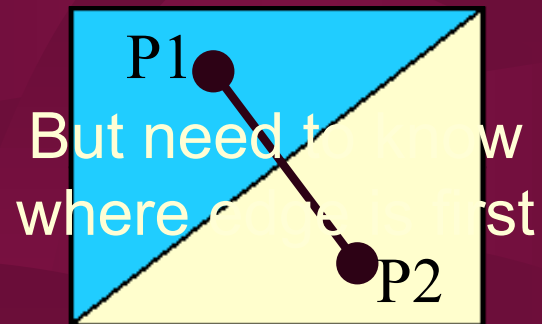
Specifications

- Low Power
- Low Cost (~\$60)
- Fast (5-10 fps)
- Portable
- Work with a specific camera

What is an Edge Detection Device?



What is Edge Detection?

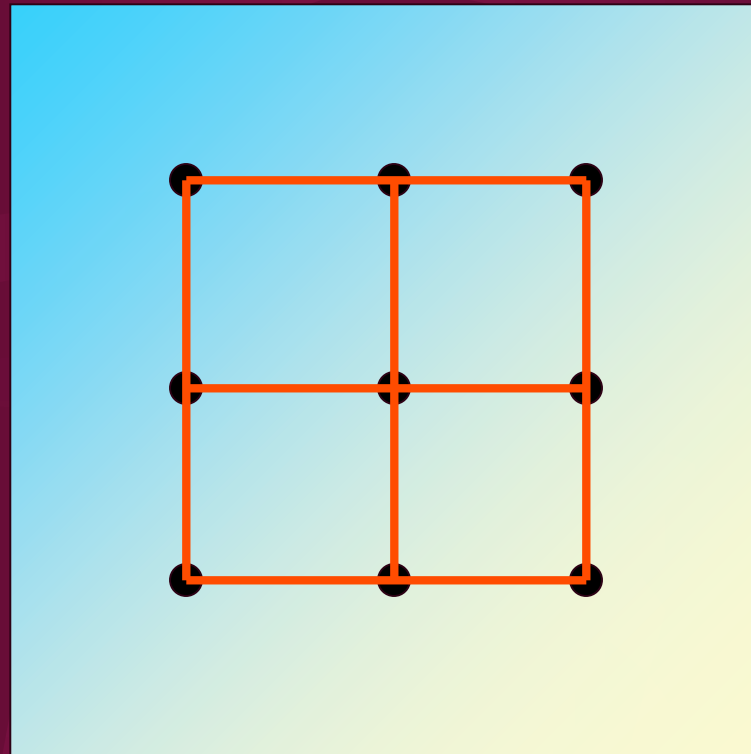


What is Edge Detection?

X Direction

Y Direction

Edge



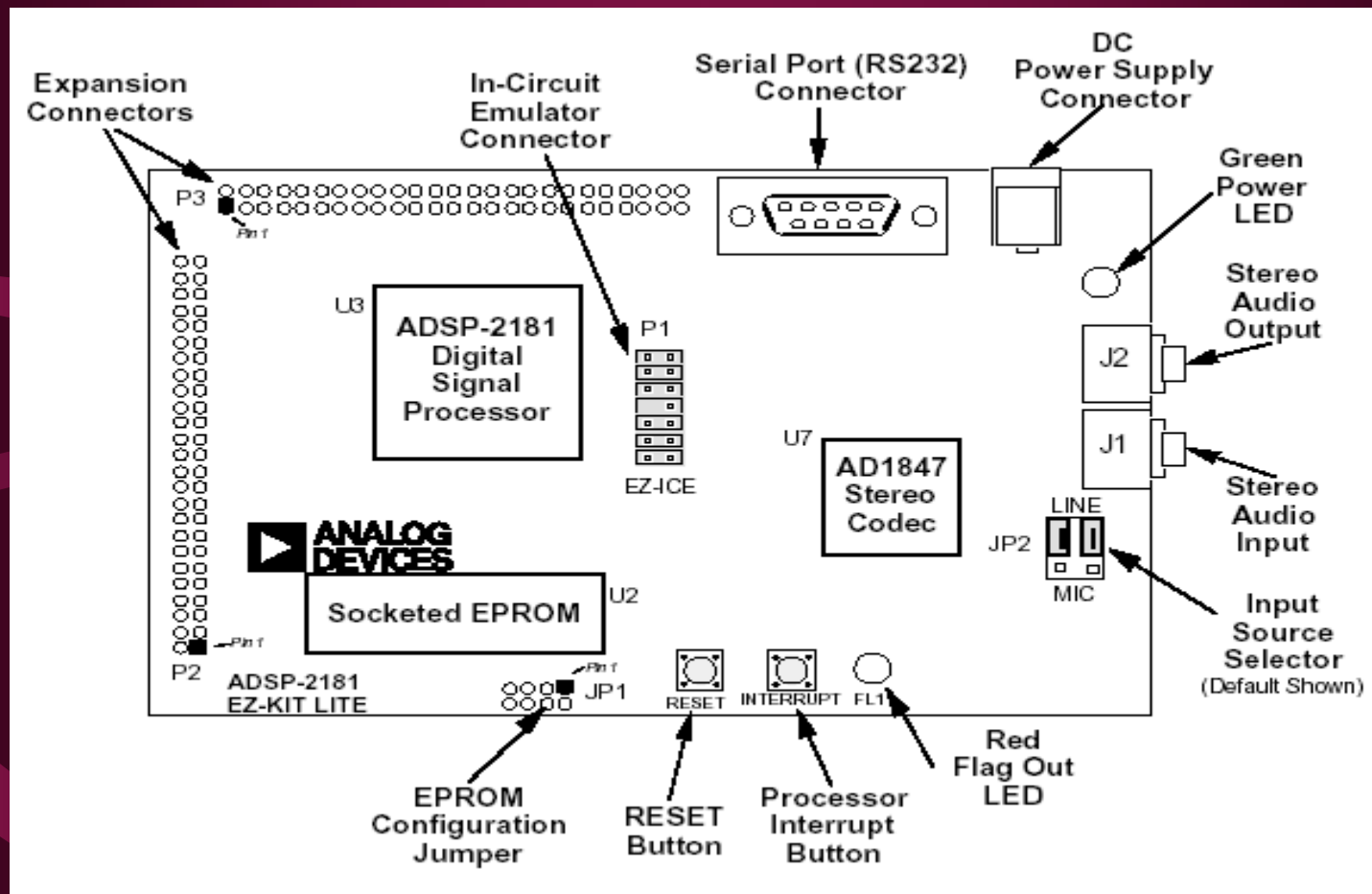
$$\text{Edge} = (X^2 + Y^2)$$

Hardware Design

- Expand on last semester's work with the PIC16C67
- Insufficient computing power for specifications
- Exploration of alternative processors
- PIC16C67 vs. TI-TMS320C31 vs. ADI ADSP-2181



Hardware Design – ADSP-2181



Hardware Design - Camera

Specifications

- Output digital data serially
- Grayscale
- Sufficient resolution
- Cost

TI TC255

Onboard serial register
8-bit grayscale
342 x 243 pixels
\$35.40

Software Design

- VisualDSP++ 2.0
- USART communication code
- Camera Emulation in Perl/Tk
- Data Verification in Perl/Tk



Our Accomplishments

- Completed design of the Edge Detection Device
- Met functional requirements except
 - Process only 2 fps
 - Cost is \$10 over desired
 - Power hungry
- Possible resolutions
 - Use lighter edge detection algorithm or faster DSP
 - Mass production reduces cost
 - Li Ion battery alternative

Future Work

- Implement the actual camera
- Run code on the DSP without development board
- Ready for production



Questions?

Grinberg & Imam, 2002