Low-Cost Portable Edge Detection Device

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Mark Koob

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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?

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What is Edge Detection?

But need to know where edge is first

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What is Edge Detection?

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

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Hardware Design - Camera

Specifications

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

<table>
<thead>
<tr>
<th></th>
<th>TI TC255</th>
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<tbody>
<tr>
<td>Onboard serial register</td>
<td>Onboard serial register</td>
</tr>
<tr>
<td>8-bit grayscale</td>
<td>8-bit grayscale</td>
</tr>
<tr>
<td>342 x 243 pixels</td>
<td>342 x 243 pixels</td>
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<td>$35.40</td>
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Software Design

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

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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?