Interactive Electronic Hopscotch Board

- Team Recess (Lose the Chalk)
- Joe Gillespie and Karine Hoffman
- Customer: Ages 4-14 & young at heart
Design Objectives

• Traditional hopscotch game play with a digital twist
• Pressure sensors record hops
• LEDs light the board
Original Design

• Selected LEDs individually
• Decoded 7 bit parallel from microcontroller to 78 outputs
• 26 FSRs scanned by 32:1 Analog Mux through ADC port in Atmega 32
• 12 Transistor arrays to power 12 V to LEDs
Original FSR & Atmega32

- Works! Sent out to Analog Devices for fabrication.
- Coded light sequence and FSR scanning methods
- Thanks to Eric for helping us desolder a mangled Analog Mux surface mount and soldering its replacement like a work of art!

4/14/2009
• Thanks to Mike for helping us solder the 160 pin monster.
• JTAG header problems and we still cannot find the ‘short’ on the board. Fail. Thanks to Eric for the option to bake the chip off the board.
Optimization

- Array for LED rings = smaller CPLD, less pins on Atmel chip
- Increased wiring complexity but decreases material usage by 75%
- New PCB design $\rightarrow$ much smaller
## Comparison

<table>
<thead>
<tr>
<th>Original Design</th>
<th>Optimized Design</th>
</tr>
</thead>
<tbody>
<tr>
<td>12 transistor arrays</td>
<td>4 transistor arrays</td>
</tr>
<tr>
<td>160 pin CPLD</td>
<td>44 pin CPLD from 3701</td>
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<tr>
<td>Headers</td>
<td>Less headers</td>
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<tr>
<td>One connection for each light option.</td>
<td>Array aligns power and color options.</td>
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<tr>
<td>1 input yields result</td>
<td>2 inputs (row: col) yields result</td>
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<tr>
<td>Code: toggle leds</td>
<td>Same code concepts</td>
</tr>
</tbody>
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4/14/2009
To Quantify…

• 200 ft cable for LED rings
  – Red, Green, and Blue led stands per 26 LED rings
• 100 ft of Cable for 26 FSRs
• 312 (104 per color) LEDs: numerous burnouts, mess ups and broken wires later- We did it! Thanks to the hot glue gun.
• 2 foam mats (12’ by 4.5’): special adhesive-porous plastics are special to say the least!
• 2 slip resistant, water resistant, translucent tarps
• Countless hours … and still counting
Whistle while you work...
Current Work

• Re-milling CPLD board to power lights (should be done today)
• Iron out game play code
• Finish FSR wiring
• Give game mat professional touches
• Prep for Demo in rotunda