FPGA-Scope
An FPGA Implemented Oscilloscope

Anartya Mandal
Kevin Linke
6.111
November 17, 2011
Oscilloscopes:

- Observe periodic voltage waveforms
- Measure electrical outputs and test circuits
- Basis for electrocardiography
Oscilloscopes lack scalability:

- Fixed number of input channels
- Limited bandwidth
- Upgrading is costly
FPGA-Scope:

Pros:

- Number of input channels scales with memory
- Bandwidth and accuracy scale with ADC
- Avoid cost of upgrades
Block Diagram:

- Analog Signal
- Data Collection
- Data Processing
- User Interface
- VGA Display
- Computer Monitor
Data Collection:

- **Analog Signal**
- **ADC Control**
- **Sampling Frequency**
- **ADC**
- **ADC Data Ready**
- **Samples BRAM**
- **User Interface**
- **Data Processing**
- **Button Input**
- **ΔT**
Data Processing:

- VGA Display
- Data Collection
- Decimal Display
- Math
- Scaling
- Numbers BRAM
- User Interface
- Waveform BRAM (x2)

Connections:
- Decimal warning
- Math warning
- ADC Data
- Ready
- BRAM Data
- Ready
- Write
- Decimal Data
- Math Data
- Trigger Address
- Ready
- Scaled Data
- Ready
- \( \Delta V \)
- \( \Delta T \)
User Interface:

Data Processing

Data Collection

De-bounce

Menu FSM

Write

ΔV

ΔT

ΔT

ΔT

ΔT BRAM

Button Input
## Timeline

<table>
<thead>
<tr>
<th>Week of</th>
<th>Anartya</th>
<th>Kevin</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nov. 14</td>
<td>ADC/ADC Controller</td>
<td>Decimal Module/Numbers BRAM</td>
</tr>
<tr>
<td>Nov. 21</td>
<td>Samples BRAM/Math Module/Scaling Module</td>
<td>User Interface/VGA Display</td>
</tr>
<tr>
<td>Nov. 28</td>
<td>System Integration/Testing</td>
<td></td>
</tr>
<tr>
<td>Dec. 5</td>
<td>Finishing Touches, Additional Features,</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Checkoff</td>
<td></td>
</tr>
</tbody>
</table>
Questions?