A Controllable Function Generator

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Overview

Amplitude: 3 V
Frequency: 100 Hz
Duty Cycle: N/A %
Waveform FSM

- Inputs: waveform type, freq, amp (buttons)
- Outputs:
  - 8 bits to DAC
  - freq, amp, duty cycle (to display module)
- 4 modes of operation (sub-FSMs)
  - Square: alternate between 2 values
  - Ramp: count up to a value, reset to 0
  - Triangle: count up, count back down
  - Sine: most difficult, using CoreGen sin function
**CoreGen**

- Uses LUT to calculate \( \sin(\Theta) \)
- Stores half or quarter wave on dist. ROM
- Limited to 8 bits of output to DAC
- Using 10 bits of input for \( \Theta \) to make as smooth a curve as possible
- 80 core resource utilization...not much
DAC

- 8 bits, Analog Devices AD7224

- Settling time of 7 µs => max freq 142 kHz
  - Our range: 100 Hz – 100 kHz

- Can swing from 0V to \((255/256)\text{V}_{\text{REF}}\)
  - Our range: 0V to 5V
Video

- 50 MHz System Clock

- Images from Image RAM
  - bitmap converted to RGB values in MATLAB

- Real time images
  - uses output from Waveform FSM

- Implementation of mouse control
Timeline

- **Sunday 11/21**
  - square, ramp, triangle waves functional
  - video module completely coded and tested using Image RAM
- **Wednesday 11/24**
  - sine wave functional
- **Sunday 11/28**
  - include real time images and basic mouse control
- **Wednesday 12/1**
  - integrate systems to make sure display and generation are synchronized
- **Monday 12/6**
  - testing complete and system functional, additional mouse control added
- **Checkoff 12/7–12/9**