Portable Laser Function Generator

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Project Overview

- A functional function generator with multiple viewing modes
- Portable, relatively cheap and easy to assemble
Overall System

Two core modules:

- Waveform generation module responsible for creating a digital representation of a waveform
- Windowing / display module responsible for resizing the waveform to a viewable size and generating the proper display
Function Generator Hardware

Input:
Buttons allow for incrementing and decrementing frequency, amplitude phase and duty cycle

Switches allow for a user to select freq, waveform, frequency increment and phase/duty cycle
Function Generator Hardware

Output:

Segment LEDs will display numerical representation of waveform type, frequency, duty cycle / phase.

Output DACs will be connected to one of the user I/O ports.
Function Generator Module

- Function Generator State Machine determines waveform and waveform properties with user input.
- FSM uses waveform modules to generate waveform.
- FSM sends waveform output to scaling factor module which scales amplitude.
- Scaled samples are stored in memory and output to DACs.
Displaying Hardware and Module

- Debounced Nexys 4 User Input
- Output DACs
- Function Generator Module
- Nexys 4 Segment Display and LED Bank
- VGA Output
- Windowing / Display Module
- Galvo Driving DACs
Display Hardware

- VGA Display Interface
- Output DAC for Galvanometers
- Galvanometers
Window and Display Module

- Waveform loaded from waveform memory (BRAM) and scaled using user input
- Added with information regarding waveform with characters from lookup table
- Pixel Map generated and accessible to VGA display driver and galvo control
- Pixel map translated into galvo voltages
## Timeline

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