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Realtime Light-Saber Generator

Final Project Checklist

External Components

-Dual-axis Accelerometer: 1. Measure the PWM pulse width of the accelerometer
           2. Return 4 values: Period and width of pulse for X and Y

-Saber handle and marker: 1. LEDs should light up
           2. Accelerometer should send pulses
           3. Gyroscope should calibrate/spin up when activated

-Filter accelerometer and gyroscope data

Video Input / Marker Detection Module

-Video camera input: Colored video displayed on screen

-Marker detection: 1. Highlight marker pixels on the screen
        2. Calculate position of the marker

-Filter data for noise: Filter out position changes that are less than 2 pixels

Extra: Calculate velocity of marker position

Math Module

Required:
The following quantities should be readable from the logic analyzer.
- Contents of rotation matrix; they should change reasonably when the saber is rotated.
- Contents of projection matrix; they should change reasonably when parameters change.
- Local lightsaber coordinates (fixed).
- Rotated lightsaber coordinates; they should change reasonably when the saber is rotated.
- Transformed lightsaber coordinates. The x and y values should be within +/- 1.
More criteria:
- Angles phi and theta should be unsigned, clipped to [0, 2pi]
- Computation process should complete in less than 1 ms.

Optional (math-specific):
- 8 points for lightsaber give it a "thick" cylindrical appearance instead of a flat plane.

Video Output Module
-print saber (colored quadrilateral) to screen given four coordinate points from math module
-base of saber starts at pixel coordinates from video input module

-blur effects
-anti-alias edges of saber
-Extra: color gradient
-Extra: gradually extend light-saber from base

Miscellaneous

Extra: Sound Module
-       Lightsaber hum pans from left to right to match video image
-       Lightsaber hum becomes quieter or louder depending on distance
-       Doppler effect

Extra: Support for multiple lightsabers