ECE 558: Final Project Progress Report
Accelerometer-Based Color via *The Cloud*

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What Will our Project Do?

Our mobile device will take data based on the orientation of the device and convert that orientation into a color on the color wheel. Imagine that holding the device in front of you and rotating it left and right (on the "roll" axis) will point the top of the smartphone to a color on an imaginary color wheel:
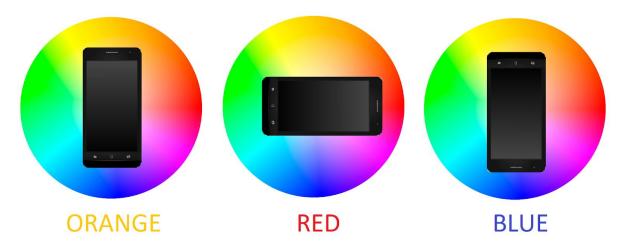

ORANGE   RED   BLUE

Image Sources:
https://color.adobe.com/create/color-wheel/
https://openclipart.org/detail/213897/black-android-mobile-phone

The mobile app will use a combination of trigonometry calculations from accelerometer readings on that axis to determine the *Hue* (color) on the HSV scale. Tilting the device forwards/backwards will change the *Value* (brightness) of the light. The *Saturation* (intensity of the color) will be set to 100% by default (we may add a slider to change this, but it won't be very visually interesting). Using the *Hue, Saturation* and *Value* we can convert the color to RGB. The mobile app will then connect to *the cloud* via Google Firebase and update the RGB readings. We have decided to do this on the mobile side because the device's computation power is greater than that of the Raspberry Pi 3 and can update the color more frequently.

If the device is shaken (the accelerometer detects large acceleration about 2x the acceleration of gravity) the mobile app will toggle the motor on or off by setting the PWM value of the motor in the cloud. The mobile app will have a slider that determines what PWM value to write to the motor when it is toggled on. When toggled off, the app will write a value of 0 to the cloud.

(NOTE: All PWM values range from 0-100)

The Android Things app will be set up to listen for changes on the Google Firebase server and respond almost instantaneously. It will simply get RGB PWM values, and the motor PWM value and write them to the PIC via I2C.

Project Status

Currently we are very close to completing the entire functionality of the project, and are on track to completion. We should be able to implement some of our optional features.

Completed Milestones:
- Android Things device is connected to the cloud
- Mobile app connected to the cloud
- Mobile app can access the accelerometer data
- Accelerometer-to-RGB algorithm working
- Shake Detection working, toggles Motor value in cloud on and off

To-Do List:
- Implement Motor PWM slider
- Get the motor working upon shaking the device
- Connect to the "PSU-IoT" Wi-Fi connection on campus

Stretch Goal (optional) To-Do List:
- Add Saturation slider
- Add Motor PWM slider
- Add buttons to toggle color channels
- Change the color of the mobile app background
- Create a non-breadboard hardware solution