Accelerometer-Based Color via The Cloud

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Introduce Team Members

- Android Things App
  - Alec
- Mobile App
  - Alec
  - Aakanksha

Overview

- The mobile device will take accelerometer data to determine the orientation of the device and convert that orientation into a color on the color wheel which is uploaded to the Google Firebase cloud.

- If the mobile device is shaken, it will toggle the motor on and off

- An Android Things device will change the color of RGB LED connected to an android things device over the cloud whenever the color values in the cloud are updated.

Tools and Hardware used

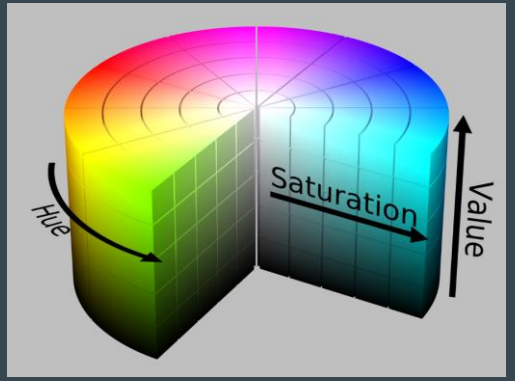
- Raspberry Pi 3
- PIC for PWM control
- RGB LED
- Google firebase
- Device Accelerometer sensor

Device Connections

Image Sources:
https://www.target.com
https://openclipart.org/detail/213897/black-android-mobile-phone
https://www.google.com

Design Approach - Mobile app

- The HSV color space consists of...
  - Hue - The color
  - Saturation - The “fullness” of the color (0% saturation ranges from black to white)
  - Value - The brightness
- The RGB color space consists of individual Red, Green, and Blue intensities
- We chose to use the device orientation to map to the Hue and Value of the HSV color space, with a slider to change Saturation
- The HSV color is converted to RGB which is displayed on the screen and sent to the Android Things device via Google Firebase



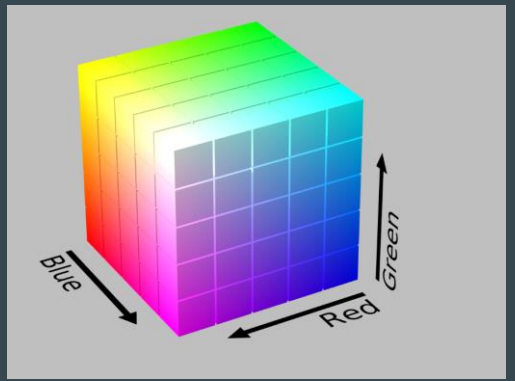


Image Sources:
https://en.wikipedia.org/wiki/HSL_and_HSV#/media/File:HSV_color_solid_cylinder_saturation_gray.png
https://en.wikipedia.org/wiki/HSL_and_HSV#/media/File:RGB_Cube_Show_lowgamma_cutout_a.png

Design Approach - Hue

- The hue is determined by clockwise rotation (“roll”)

- The top of the device points to the hue value which ranges from 0 to 360 degrees

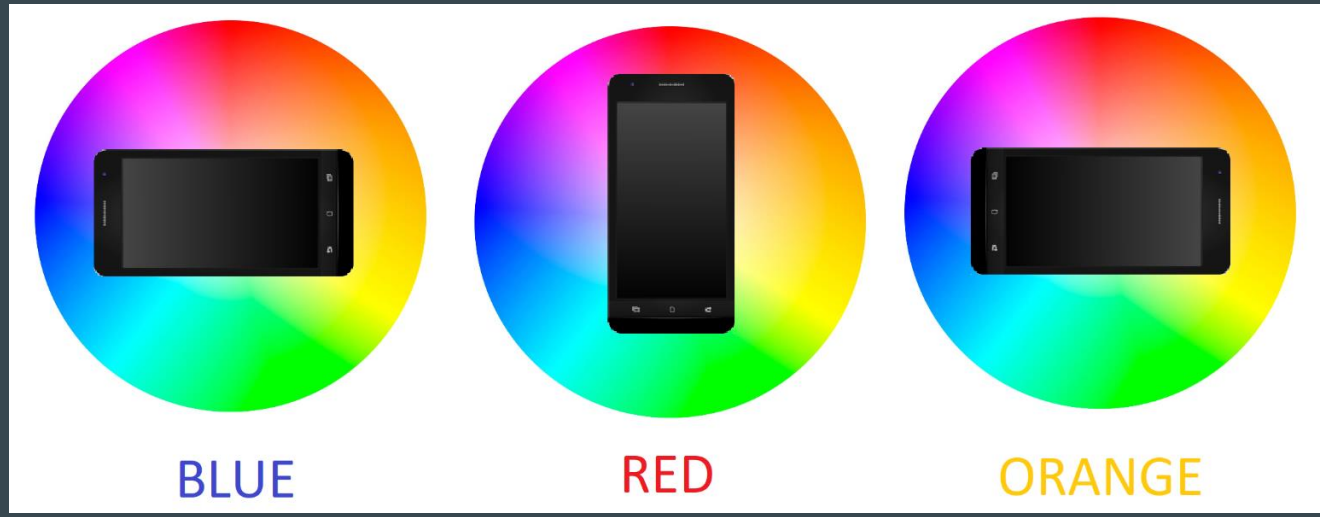
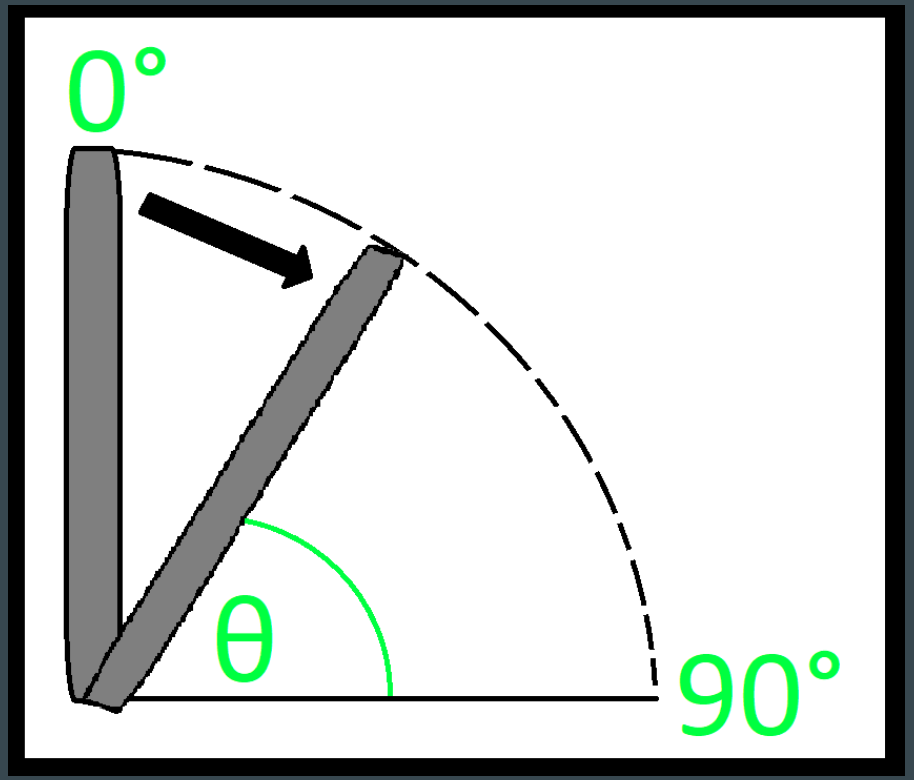


Image Sources:
https://color.adobe.com/create/color-wheel/
https://openclipart.org/detail/213897/black-android-mobile-phone

Design Approach - Value

- The Value is changed by tilting the device forwards and backwards (“pitch”)
- Holding the device vertically results in maximum Value
- Holding the device flat, normal to the direction of gravity, results in 0 Value



Design Approach - Saturation

- The Saturation is controlled by a seekbar on the right side of the app layout

Design Approach - Motor control

- The motor speed is changed with the seekbar on the left side of the app layout
- The motor is toggled on and off by shaking the device

Goals Achieved

Required Features

- Rotating device on “roll” axis changes Hue
- Rotating device on “pitch” changes Value/brightness
- Shaking the device toggles the motor on and off

Additional Features

- Color of the mobile app background changes to match the LED
- Saturation and motor speed seekbars to change values

Challenges

- Creating the algorithms for determining Hue and Value
- Changing the background color

Demo Video

https://youtu.be/IZfvH51OIkQ