Drawing Glove

Mock Design Review

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ECE445
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1. Block Diagram

2. Circuit Schematic
3. Calculations

**IR LED**
100 mA Forward Current
1.5 V Forward Voltage

\[ V = IR \]

\[ 5V - 1.5V = 3.5V \]

\[ 3.5V / .1A = 35 \text{ ohms} \]

Power : \[ V \times I = .15W \]

**RGB LED**
Red = 20 mA, 1.8 to 2.2 V
Green = 20 mA, 3 to 3.4 V
Blue = 20 mA, 3 to 3.4 V

**MIN Resistance Needed**

5V - 2.2V = 2.8V

\[ 2.8V / .02A = 140 \text{ ohms RED LED} \]

5V - 3.4V = 1.6V

\[ 1.6V / .02A = 80 \text{ ohms GREEN LED} \]

5V - 3.4V = 1.6V

\[ 1.6V / .02A = 80 \text{ ohms BLUE LED} \]

**MAX Resistance Needed**

5V - 1.8V = 3.2V

\[ 3.2V / .02A = 160 \text{ ohms RED LED} \]

5V - 3V = 2V
2V/.02A = 100 ohms GREEN LED

5V - 3V = 2V
2V/.02A = 100 ohms BLUE LED

4. Simulations

![Graph showing power consumption of RGBLED vs Min/Max Voltage]

5. Block Description

User Interface

The user interface module encompasses all of the user aspects of the glove. It includes the controls for the user that allows for different drawing features. This module is powered by the power supply module, specifically 9V with a voltage regulator to keep a steady supply of power to the glove components. This module is also involved in the communication with the camera of the processing module through the different LEDs of the signaling module. In summary, the glove controls will manage the LEDs which will be seen by the processing module to decipher the signals.
**On/Off Control**
The first control will be a push button to control if the IR LEDs will be on or off. The IR LEDs will be defaulted to off and will turn on as long as the button is on as well. The button will be placed under the pointer finger (palm side) of the glove so when the user positions their hand in the way they hold a pen, their thumb will be ready to press the on/off button.

**RGB LED Control**
The next control is for the color of the RGB LED through three potentiometers. Each potentiometer is wired to a pin of the LED and by twisting the potentiometer, its resistance would change and the color of the LED would change. This control will be located on the back of the hand for an easily accessible location.

**IR LED Control**
This last control is for controlling the brush size while drawing. This is controlled through another IR LED and push button. So in total there will be 2 IR LEDs and 2 push buttons. One IR LED will be used by the camera to locate where the glove is in space. This is controlled by the on/off push button. The other IR LED is used for changing the brush size used for drawing. The second push button controls the second IR LED and this LED communicates with the processing module by blinking on and off. Each press of the push button turns the IR LED on then off. When the camera sees this LED turn on then off, the processing module will then know to increase the brush size one step. There will be 7 different brush sizes and each button press will increase the brush size. If the brush size is at 7 and the button is pressed again, the brush size will cycle back to 1. To be able to distinguish between IR LEDs, the brush size can only be changed while the on/off button is pressed. This way the second IR LED can only be powered if the first IR LED is also powered. By configuring the LEDs to work this way, the second IR LED will never be seen as the LED used for location detection. Since both buttons will have to be pressed to change the brush size, the second push button will be placed on the back of the hand so the non drawing hand can easily press the button.
6. Requirements and Verifications

<table>
<thead>
<tr>
<th>Requirements</th>
<th>Verification</th>
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<tbody>
<tr>
<td>Is the total power outputted by the LED’s from .306 to .33 W? And can our 9v Duracell battery hold continuous use for 1 hour?</td>
<td>Test the power emitted from our circuit with a 9 V Duracell that has around 550 mAH, if we turn our RGB LED’s to their highest voltage and continued usage for 1 hour check if there are any hiccups (LED Blinks or are the considerably fainter) by using a Photometer to detect the luminosity of the LED.</td>
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<tr>
<td>Is the circuit running too hot to be put on the glove? All components of the glove</td>
<td>Check the temperature of the components by using a digital</td>
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must be under 110°F (temperature when skin starts to feel pain)  thermometer after 1 hour of use.

| Check if the calibrated range of potentiometer resistance keeps the LEDs in forward bias. The voltage across the LED must be within the tolerance (1.8V - 2.2V for Red, 3.0V - 3.4V for Green and Blue) for every resistance in the selected range of the potentiometer. | Start at the minimum resistance of the potentiometer and measure the voltage across the LED and determine if the LED is on. Repeat for 5 different points spread across the desired potentiometer range. |

### 7. Safety Statement
The LEDs and resistors will definitely get hot. We need to take this into serious consideration because everything will be on the hand of the user. If it gets too hot, it may lead to burns or damage to the glove material, especially over long periods of use.

### 8. Citations

**IR LED**

https://cdn-shop.adafruit.com/datasheets/IR333_A_datasheet.pdf

**RGB LED**


**OTHER CITATIONS**

http://burncentrecare.co.uk/about_burned_skin.html