INTELLIGENT WEARABLE FOR SCREEN-DRIVEN EYE STRAIN MANAGEMENT

TEAM 4

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CHOICE OF SENSOR : IR BLINK SENSOR

- Widely used for eye blink rate detection.
- Not enough photon energy to cause significant photochemical reactions, so doesn’t cause any photochemical damage to the eyes.
- Low-power IR sensors: ~850 nm to 940 nm and passes through without significant heating – doesn't cause thermal damage.

WORKING OF IR BLINK SENSOR

1. **Infrared Emission and Reflection:** The IR blink sensor consists of an IR LED that emits infrared light toward the eye. When the eye blinks, the eyelid reflects a different amount of IR light compared to an open eye.
2. **Photodetector Sensing:** A photodetector (photodiode) captures the reflected IR light. The intensity of the reflected light varies based on whether the eye is open or closed.
3. **Signal Processing:** The sensor processes the received signal and converts it into an electrical output. This output can be used to detect blinks and trigger responses in applications like fatigue detection or human-computer interaction.

INTEGRATION OF HARDWARE

1. IR Sensor Connection to ESP8266:
    a. The IR eye blink sensor detects blinks by measuring infrared reflection from the eyelid.
    b. VCC connects to 3.3V, GND to GND, and the OUT signal to D2 (GPIO4) of the ESP8266.

2. Vibration Motor Control Circuit:
    a. A BC547 NPN transistor acts as a switch to control the motor.
    b. The motor's positive terminal connects to 3.3V, and the negative terminal connects to the transistor's collector.
    c. The emitter is grounded, and the base is connected to D5 (GPIO14) via a 10kΩ resistor.

3. ESP8266 Processing and Blink Detection:
    a. The ESP8266 continuously monitors the IR sensor output to count blinks.
    b. If eye closure is detected, it registers a blink and calculates the blink rate over a set time period (60 seconds).

4. Alert Mechanism :
    a. If the blink rate exceeds a predefined threshold (25 blinks per minute), the ESP8266 activates the transistor, turning on the vibration motor for 2 seconds as an alert.

5. Software and Testing:
    a. The setup is programmed using Arduino IDE, with necessary libraries installed.
    b. The blink rate is displayed via Serial Monitor and excessive blinking triggers the vibration alert.