The SmartSleeper: A Novel Approach to a Better Night's Sleep Isaiah Pereira

Background and Project Aim

According to the CDC, over a third of U.S. adults reported not getting enough sleep and three out of every four teenagers don't get the recommended sleep. By reading studies on sleep, I learned that there are 6 main external factors within your room's sleeping environment that have a significant impact on your quality of sleep: temperature, humidity, air quality, blue light, ambient light, and ambient sound. My project goal was to create a smart device that helps improve sleep quality by analyzing your room's sleeping environment and providing actionable insights.

Procedure

I determined I would require the following components: an **AHT20** module for temperature and humidity, a **TCS34725** to measure lux and Melanopic lux, an **LM393 sound module** for ambient sound levels, and a **PMS5003** for PM2.5 Air Quality Detection. To connect all of the components, I used an **Arduino GIGA R1 WiFi** and I programmed it in **Arduino IDE**. I used **SquareLine Studio** to design an intuitive user interface and connected the microcontroller to a **GIGA Display Shield**. I then designed a star-shaped casing in **TinkerCAD** and **Bambu Studio.** The 3D-printed housing includes a snap-on magnetic enclosure for easy access to the electronic components.

Results and Observations

I conducted both consistency testing and accuracy testing for each metric on The SmartSleeper. I compared The SmartSleeper's readings to readings of measuring devices known to be accurate. The sound module showed a standard deviation of 34.64%, which was the only metric exceeding 1%. On average, The SmartSleeper's readings demonstrated 99.09% accuracy.

Conclusion

The SmartSleeper can help people optimize a room's sleeping environment in real time. This is important because a better sleep can change many lives by improving physical performance, mental health, cognitive function, immunity, digestion, and more.

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