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# e - Proceedings

# IUGeT

## Proceeding for International Undergraduates Get Together 2024 (IUGeT 2024)

"Undergraduates' Digital Engagement Towards Global Ingenuity"

**2nd Edition**

Organiser :

**Department of Built Environment Studies and Technology, College of Built Environment, UiTM Perak Branch**

Co-organiser :

**INSPIRED 2024. Office of Research, Industrial Linkages, Community & Alumni (PJIMA), UiTM Perak Branch**

**Bauchemic (Malaysia) Sdn Bhd**

**Universitas Sebelas Maret**

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# ANTI-EYE-FATIGUE DEVICE SYSTEM

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**Abstract**
IT specialists who spend extended periods staring at their laptop, phone, and computer monitor at close range face the risk of compromised eyesight and related visual health issues. The continuous near-distance visual concentration without adequate breaks, coupled with the blue light emitted by digital screens, leads to eye strain, dryness, redness, blurred vision, headaches, and increased sensitivity to light. These symptoms can negatively impact IT specialists' productivity, job satisfaction, and overall well-being. Implementing effective solutions and strategies to mitigate the adverse effects of prolonged screen usage on their eyesight and promote proper eye care practices is crucial. The Anti Eye-Fatigue Device System consists of two inputs: distance detected by the ultrasonic sensor and light intensity detected by the LDR sensor. Data from the sensor will be sent to the web server and displayed. This system focuses on adding monitoring and alerting features for laptop and computer users as these devices are often used in the IT field in their work.

**Keywords:** *IT specialists; eyesight; productivity; prolonged screen usage; Anti Eye-Fatigue Device System*

## 1. INTRODUCTION

Eye fatigue, also known as asthenopia, affects people, especially those who perform visually demanding activities like office work, computer use, or other occupations requiring sustained visual focus (Kaur, K., Gurnani, B., Nayak, S, 2022). The prevalence of eye fatigue has significantly increased due to modern workplaces' growing reliance on digital devices. This background study aims to examine the causes, effects, and solutions of eye fatigue on workers' daily lives.

Many actions can be taken, such as maintaining proper ergonomics, adjusting monitor height, chair position, and workspace setup, and using the best lighting conditions to prevent excessive glare can all significantly reduce eye fatigue (Blehm C, Vishnu S, Khattak A, Mitra S, and Yee RW, 2005). Encourage people to take frequent breaks, practice eye exercises, and adhere to the 20-20-20 rule, looking at an object 20 feet away for 20 seconds every 20 minutes to reduce eye strain (Kumar, S., & Pandey, H, 2024). Reminding people to blink frequently and using lubricating eye drops are two ways to combat dry eyes and lessen eye fatigue focus (Kaur, K., Gurnani, B., Nayak, S, 2022). A routine eye exam is required to detect hidden vision problems and, if necessary, prescribe corrective measures like glasses or contact lenses.

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## 2. METHODOLOGY

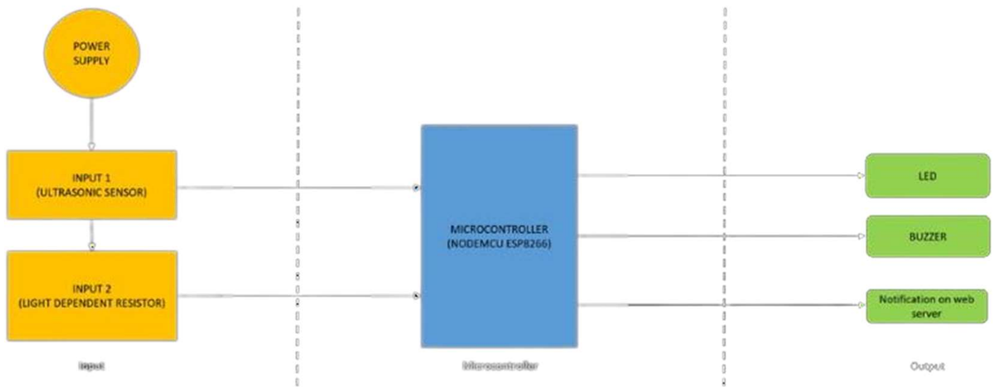


Figure 2.1: Block Diagram of the system (AEDS)

The block diagram is depicted above (Figure 2.1) with two sensors, an ultrasonic sensor and an LDR sensor, which are used as input to monitor the distance and intensity of light. The purpose is to help users manage their distance from the screen and control their screen brightness level. The ultrasonic sensor's function is to detect the ideal distance between the user and the screen when doing their work in front of the screen. The LDR sensor will detect the intensity of the light and will notify the user to adjust their screen brightness according to the situation. The NodeMCU ESP8266 was used as the microcontroller for the system. The data from the input sensor will be sent to the microcontroller, and three outputs will function accordingly. The three outputs for this system are LED, Buzzer, and notification on the web server. The LED light will be the indicator to notify and alert the user if the ultrasonic sensor detects a distance lower than 40 cm, and the buzzer will also make a sound. The notification will be sent to the web server when those two input sensors detect an unideal situation.

## 3. RESULTS AND DISCUSSION

This section presents the development and evaluation of the Anti-Eye-Fatigue Device System (AEDS) is a cutting-edge solution equipped with Wi-Fi technology for real-time monitoring to mitigate eye strain. The AEDS addresses the significant issue of eye fatigue caused by prolonged screen exposure, especially among IT specialists. By integrating intelligent, lean manufacturing principles, the system optimises processes, reduces waste, and enhances efficiency, contributing to a healthier and more productive work environment.

Figure 3.1: The prototype (AEDS)

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Figure 3.2: The placement of the product

The Anti-Eye Fatigue Design System prototype is compact, highly portable, and user-friendly, making it easy to carry and use anywhere. Its small size enhances usability and allows it to be placed in various locations, like a webcam, as shown in Figures 3.1 and 3.2. This versatility will enable users to position the device conveniently for optimal screen usage monitoring.

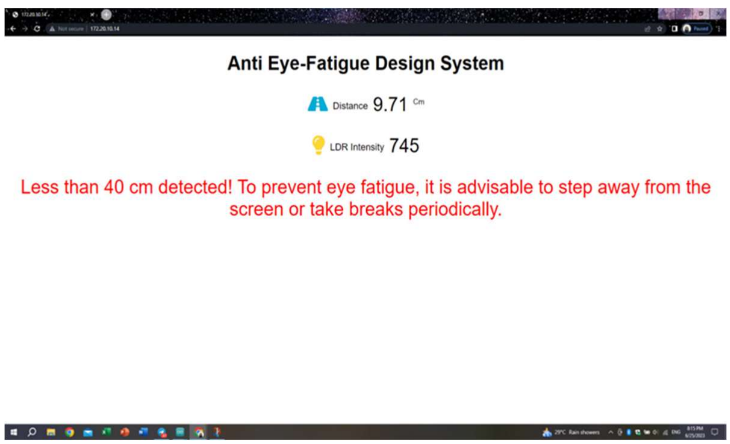


Figure 3.3: Web page display when the ultrasonic sensor is less than 40 cm

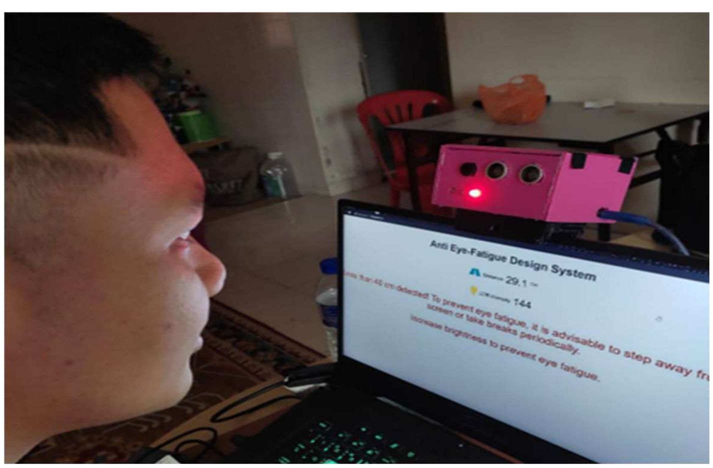


Figure 3.4: Red led on when the ultrasonic sensor is less than 40 cm

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The system utilises ultrasonic and LDR sensors to monitor real-time conditions, displaying data on a web page. The ultrasonic sensor is set to trigger an alert if the user is closer than 40 cm to the screen, while the LDR sensor checks light intensity, requiring a value between 300 and 1000 to avoid alerts. When conditions are met, no alerts are displayed, and the LED remains off. However, if a user is too close to the screen, a warning appears, the red LED lights up, and a buzzer sounds to alert the user of potential eye fatigue, as shown in Figures 3.3 and 3.4.

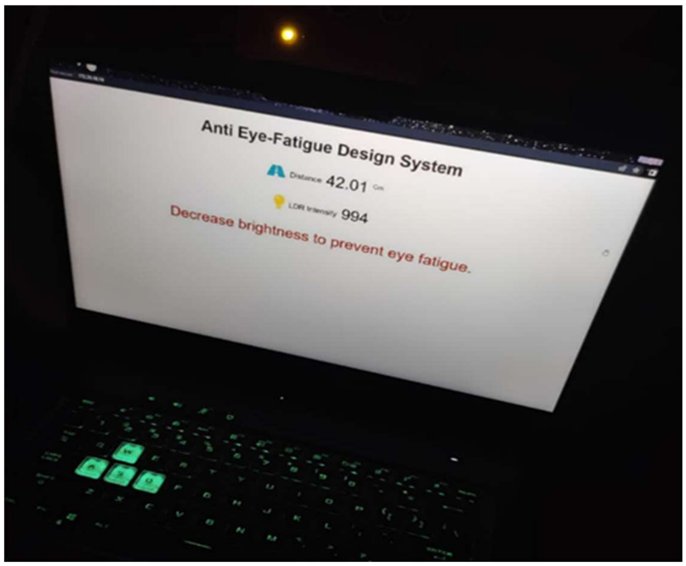


Figure 3.5: Green LED turns on when the room is dark

Figure 3.5 shows that when light intensity exceeds 900, the system suggests lowering the laptop's brightness and turning on a green LED as a reminder. When both low light and proximity to the screen occur, the red and green LEDs illuminate, signaling the user to adjust their position and screen settings. Conversely, if the room's brightness is too high, the system will guide users to maintain optimal conditions to prevent eye fatigue.

## 4. CONCLUSION

The Anti-Eye-Fatigue System is an innovative solution to alleviate eye strain caused by prolonged screen usage. It utilises an ESP8266 NodeMCU as the central controller, with an ultrasonic sensor for distance detection and an LDR sensor to measure ambient light intensity. LEDs and a buzzer provide real-time feedback to users about their proximity to the screen and surrounding light conditions, encouraging healthier screen habits.

The system promotes better eye health over time by reminding users to maintain an appropriate distance from the screen and adjust brightness levels (Blehm C, Vishnu S, Khattak A, Mitra S and Yee RW, 2005). Future improvements include integrating big data technology to store sensor values, allowing users to track and analyze their screen time. A widget or pop-up system on the laptop could offer easy access to feedback, enhancing user awareness.

Additionally, the design could incorporate an alarm system to follow the 20-20-20 rule for eye health, prompting users to take breaks every 20 minutes and focus on a distant object for 20 seconds. By combining big data analytics and user-friendly features, the system empowers users to make informed decisions and proactively prevent eye fatigue.

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## 6. REFERENCES

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Saya yang menjalankan amanah,

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