ABSTRACT

Traffic accidents caused by drowsy drivers are a serious issue that endangers road safety. This research aims to design and develop an Anti-Drowsiness Safety Belt using the MAX30100 sensor, which detects driver drowsiness through real-time heart rate monitoring. The MAX30100 sensor measures heart rate and blood oxygen saturation, which is then processed by the ESP32 microcontroller. If the driver's heart rate drops below the predefined drowsiness threshold (< 70 BPM), the system activates a buzzer and vibrator motor as an alert to keep the driver awake.

The system was tested on seven subjects under two conditions: normal and drowsy. The results indicate that the system can detect drowsiness with high accuracy, with a margin of error of ±3 BPM compared to standard heart rate monitoring devices. The system's response time to detect drowsiness is less than 3 seconds, enabling quick and effective early warnings.

The advantages of this system include its ease of use, as it is integrated into the seatbelt, and its practicality compared to camera-based drowsiness detection methods. However, some limitations remain, such as the manual activation requirement and sensor placement on the neck, which may be uncomfortable for some users. Future research should focus on optimizing the drowsiness detection algorithm and evaluating system effectiveness in various driving conditions.

Keywords: Safety Belt, MAX30100, ESP32, Drowsiness Detection, Vibrator Motor, Buzzer