AWAKE: A Cost-Effective IoT System for Drowsy Driving and Alerts to Save Lives

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Drowsy driving is a major cause of car accidents in the US; it is responsible for 21% of crashes and 1,500+ deaths annually (Gross, 2023). Micro-sleeping, with eye blinking and head tilts, impairs a driver's ability to maneuver, risking lives (Sleep Foundation, 2023). Currently, no cost-effective standard solution exists that can be installed in all vehicles to address this problem, despite the efforts of some automakers. This research aimed to develop a cost-effective driver drowsiness detection system to alert users and emergency contacts of dangerous drowsiness behavior. The system was designed and built using microtechnology, sensors, and taking advantage of artificial intelligence. Two circuits are connected through a cloud database and programmed to detect head tilts or eye-shutting patterns that can indicate drowsiness. AWAKE has a real-time website to monitor any dangerous driving. The user will be woken up by the loud noise of a buzzer and a phone call alert. The system's reliability was tested in 240 observations across different factors such as tilt direction, distance, illumination levels, and subjects of different ages and genders. Three Two-Factor ANOVAs resulted in an interpreted accuracy higher than 96%, with all P-values greater than 0.05 regardless of experimental conditions. It was statistically concluded that the results of the device were significantly independent of the evaluated factors. The AWAKE system costs $53.70 per vehicle and could be installed on all 286 million registered vehicles in the US. This is 4.7% of the 3-year cost of fatigue-related accidents, equal to the device's useful life.

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