Abstract— Drowsy driving is a significant contribution to the road accident, fatigue resulting in loss of lives and injuries. To address this issue we developed a driver monitoring system and improved road safety. The system employs a webcam positioned in front of the driver to continuously capture video frames, utilizing a facial landmark and an intelligent decision-making algorithm to create bounding boxes around the driver's face. By analyzing eye position and movement through eye-aspect ratio (EAR) calculations, the system categorizes the driver's state into three statuses: Active, Drowsy, and Sleeping. When the driver is identified as drowsy or sleeping, the system activates an alert mechanism comprising an LCD display, LED lights, a buzzer, and a vibration motor to provide timely alert to driver. The purpose of the LED lights is to indicate nearby vehicles. At the same time, Raspberry Pi sends data through the MQTT protocol to the Node-RED platform. If the driver’s state is in a sleeping or drowsy state, then family members or transport officers receive a notification in the Pushover application. The proposed real-time alert system mainly focuses on reducing road accidents caused by drowsy drivers.

Keywords—Drowsy driving, Raspberry Pi, Web Cam, Eye Aspect ratio, LCD display, Buzzer, LED light, Vibration Motor, Node-Red, Pushover application.

Introduction:

Road accidents are still a dire concern worldwide, causing many deaths and rendering many injured annually. Top among the causes of such accidents are fatigued driving and alcohol use, both of which enhance the risk of a driver losing control of a vehicle. The National Highway Traffic Safety Administration (NHTSA) emphasizes that drowsiness and drunkenness are contributing factors in a large percentage of crashes, and data indicate that at least 20% of severe motor vehicle crashes in 2024 involved driver drowsiness. As the population of the world continues to increase, so does the number of automobiles on the roads, leading to a consistent increase in accident numbers. This disturbing trend highlights the need for creative solutions to improve road safety and counter the dangers of human error. Fatigue among drivers, for instance, is a stealthy threat, as it can cause a slow diminution of alertness and, in extreme cases, result in drivers dozing off while driving. Normal circumstances like prolonged working hours, inadequate rest, and lack of attention to the environment worsen the situation, making accidents inevitable. Surveys again and again find that drowsy driving, frequently combined with alcohol consumption, is one of the leading reasons for crashes. With the spread of high-speed driving and rising traffic density, the impact of these accidents is growing more lethal, leading to a greater casualty of injuries and deaths. Prevention of this scenario involves an initiative approach, one that uses technology to track drivers' behavior and intervene in good time to forestall possible tragedies.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **S.No** | **Status** | **LED** | **Buzzer** | **Vibration** | **Timestamp** |
| **1** | Active | Low | Low | Low | 2025-03-10 16:03:14 |
| **2** | Drowsy | High | High | High | 2025-03-11 16:03:17 |
| **3** | Sleeping | High | High | High | 2025-03-10 16:03:20 |