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Smart Alert System for Drowsy Driver Detection Using IOT

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Abstract: The proposed system is an intelligent driver drowsiness and distraction detection system designed to enhance road safety based on detecting sleeping, yawning and distraction behaviour using IOT based technique. By utilizing computer vision techniques OpenCV and face recognition analysis, the system aims to monitor the driver's eye and mouth activities in real- time. It triggers alarms and alerts the driver when signs of drowsiness or distraction are detected. The system contributes to reducing the risk of accidents caused by driver fatigue and inattention .

Key terms: OpenCV, Face Recognition, Computer Vision (CV), Drowsiness Detection.

I. INTRODUCTION

The majorities of traffic accidents are caused by tiredness and intoxicated driving, as well as workplace conditions, lack of sleep, and time constraints. Drunk driving impairs decision-making skills and perception level due to driver tiredness and exhaustion. These two circumstances have an impact on the capacity to operate the vehicle. Several strategies are used to identify tiredness in drivers, such as monitoring driver operation or physiological aspects of the driver, such as vehicle movement.

Advanced Driver Assistance Systems (ADAS) use a range of aiding technologies to simplify and support the driver in monitoring, warning, braking, and steering responsibilities. . The primary purpose of these systems is to provide driver safety and aid in the prevention of road accidents. ADAS systems are unquestionably one of the automobile industry's fastest expanding segments. They provide greater automobile and road safety by providing technologies that notify the driver to possible hazards, assisting in the avoidance of crashes and accidents when developed with a safe human-machine interface.

An IOT based driver drowsiness system in electric vehicles could provide real-time monitoring of driver behavior and alert the driver when they become drowsy or distracted, potentially preventing accidents and saving lives. The system would use sensors to monitor various parameters such as steering wheel movement, eye movements, and head posture, and send alerts when it detects signs of drowsiness. In addition to improving road safety, an IOT based driver drowsiness system could also have economic benefits, such as reducing insurance costs and vehicle downtime due to accidents. Overall, such a system has significant potential to improve the safety and efficiency of electric vehicles and help accelerate the transition to a more sustainable transportation system.

Driver drowsiness remains a major cause of road accidents, emphasizing the need for innovative safety solutions. This project proposes an integrated system that combines computer vision techniques using OpenCV and Python, ESP32 microcontroller for hardware interfacing, and Google Firebase for Android app notifications. Additionally, safety features such as an LCD display, accelerometer for accident monitoring, and a relay to auto-switch off the engine during drowsiness detection are incorporated

A. PROBLEM STATEMENT

The system that utilizes camera, accelerometer, google firebase cloud and real-time alerts to detect and prevent drowsiness related incidents while driving. To create a reliable and efficient mechanism that ensures driver safety by providing timely alarm when signs of drowsiness are detected. The existing system focuses solely on drowsiness detection ,not distractions detection. It lacks a comprehensive approach to handling different types of distractions. The system might generate false alarms or fails to detect certain scenarios due to limited feature coverage. The system might generate false alarms or fail to detect certain scenarios due to limited feature coverage.

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B. OBJECTIVES

- Enabling automatic detection and alerting without the need for any external hardware.
- Real-time detection of driver drowsiness and distraction using facial landmarks.
- Utilizing eye aspect ratios for drowsiness and distraction identification.
- Providing a user-friendly interface with live video feed for monitoring.
- It provides extensive information on the alertness and driving performance.
- Safety system that not only alerts the driver but also takes preventive measures to ensure road safety

II. METHODOLOGY

The system utilizes OpenCV and Python to implement a drowsiness detection algorithm. Analyzes facial features, eye movements and blink patterns to identify signs of driver fatigue. Real-time processing of video feed from a webcam to assess the driver's condition. Interfacing with an ESP32 microcontroller to connect the OpenCV system with the hardware components. Establishes a connection with Google Firebase to enable real-time data communication between the ESP32 and an Android app. Sends notifications to the Android app that receives notifications from the Furebase cloud. Provides a user-friendly interface to display alerts and additional information related to drowsiness detection. Integrates an LCD display to provide real-time feedback to the driver about their drowsiness status. Incorporates an accelerometer to monitor sudden accelerations or eccelerations, indicative of a potential accident.

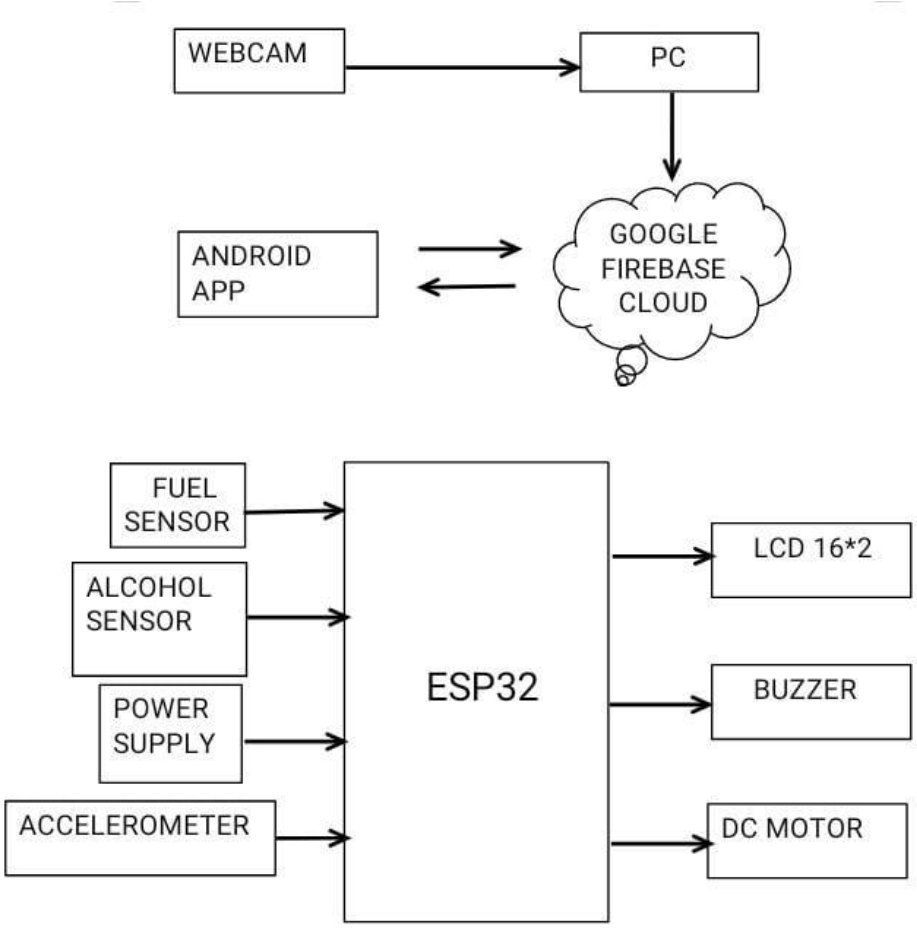

FIG1 BLOCK DIAGRAM

III. EXISTING SYSTEM

The existing system is an intelligent driver drowsiness and distraction detection system designed to enhance road safety. By utilizing computer vision techniques and facial landmarks analysis, the system aims to monitor the driver's eye and mouth activities in real-time. It triggers alarms and alerts the driver when signs of drowsiness or distraction are detected. The system contributes to reducing the risk of accidents caused by driver fatigue and inattention.

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IV. IMPLEMENTATION

1. **OpenCV-based Drowsiness Detection:**
- Utilizes OpenCV and Python to implement a drowsiness detection algorithm.
- Analyzes facial features, eye movements, and blink patterns to identify signs of driver fatigue.
- Real-time processing of video feed from a webcam to assess the driver's condition.

2. **ESP32 Integration:**
- Interfacing with an ESP32 microcontroller to connect the OpenCV system with the hardware components.
- Uses ESP32 for sensor integration, data processing, and communication with external devices.

3. **Google Firebase Integration:**
- Establishes a connection with Google Firebase to enable real-time data communication between the ESP32 and an Android app.
- Sends notifications to the Android app when drowsiness is detected, providing timely alerts to the driver.

4. **Android App Notification:**
- Develops an Android app that receives notifications from the Firebase cloud.
- Provides a user-friendly interface to display alerts and additional information related to drowsiness detection.

5. **Safety Features:**
- Integrates an LCD display to provide real-time feedback to the driver about their drowsiness status.
- Incorporates an accelerometer to monitor sudden accelerations or decelerations, indicative of a potential accident.
- Implements a relay system to automatically switch off the engine in the event of drowsiness detection or a detected accident, enhancing overall safety.

6. **Performance Evaluation:**
- Conducts thorough testing to assess the accuracy and reliability of the drowsiness detection algorithm and the overall system.
- Evaluates the responsiveness of the hardware components, such as the DC Motor , accelerometer,alcohol sensor, and fuel sensor in ensuring prompt and effective safety measures.

V. MOTIVATION

Developing this system aims to significantly enhance road safety by employing IOT technology to detect and alert drowsy drivers, potentially preventing accidents and saving lives.

VI. RESULTS

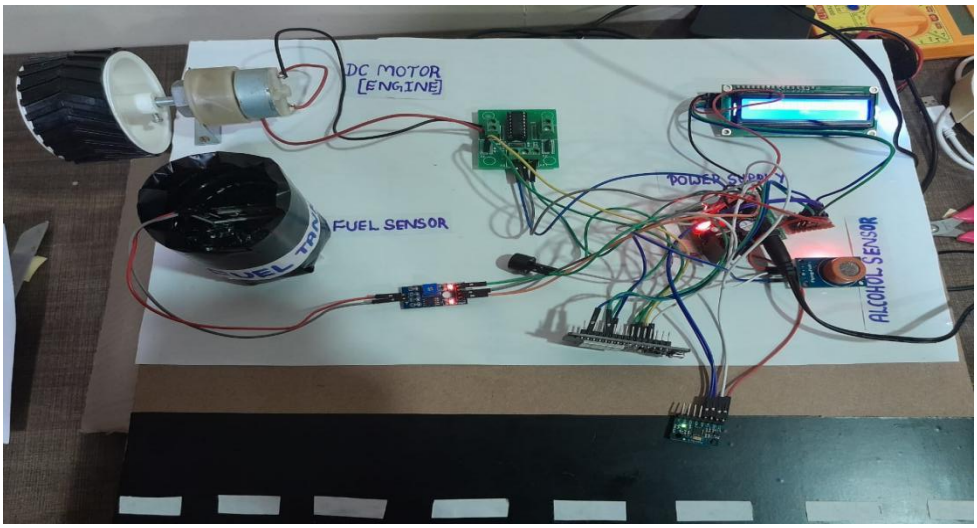

Fig:2 PROTOTYPE OF THE MODEL

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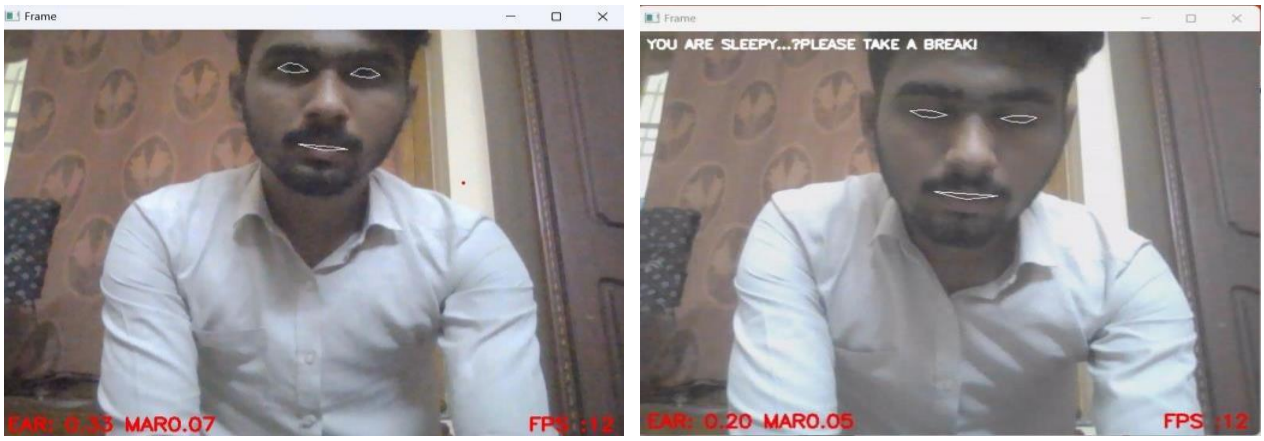

Fig3 OUTPUT SNAPSHOTS

VII. CONCLUSION AND FUTURE SCOPE

CONCLUSION: This project aims to deliver a comprehensive solution to address driver drowsiness by integrating OpenCV, Python, ESP32, Google Firebase, and additional safety features. The proposed system not only detects drowsiness but also takes preventive actions, showcasing its potential to significantly enhance road safety. The successful implementation and evaluation of this system could pave the way for future developments in intelligent transportation systems.

FUTURE SCOPE

Future work could focus on improving the accuracy of the system by using more advanced sensors and algorithms.

- Machine learning: Future work could involve the use of machine learning techniques to analyze data and improve the system's ability to detect signs of drowsiness.
- Personalization: Future work could focus on personalizing the system to suit the individual needs and preferences of each driver, improving their driving experience.
- Integration with other systems: Future work could involve integrating the drowsiness system with other vehicle safety systems, such as collision detection and lane departure warning systems, to provide a more comprehensive safety solution.
- Real-time intervention: Future work could focus on developing real-time intervention strategies, such as changing the vehicle's speed or adjusting the seat position, to prevent accidents caused by drowsy driving.

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