Accitrack: Real-Time Monitoring , Proactive Alerts & Safer Roads

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Abstract - This paper introduces AcciTrack: Real-time Monitoring, Proactive Alerts and Safer Roads an intelligent system that monitors drivers to detect signs of drowsiness, yawning and distraction using artificial intelligence. The system works in real time and uses computer vision, deep learning and cloud-based logging to analyze a driver's face and behavior without needing special hardware sensors. The key parts of this system include MediaPipe, Face Mesh for identifying facial landmarks, YOLOv8 for recognizing distractions based on objects and threshold-based EAR and MAR algorithms for checking fatigue. AcciTrack provides visual, audio and SMS alerts, and logs events into Supabase Cloud for further analysis. Results show high detection accuracy, fewer false alarms and better road safety by helping identify unsafe driving behavior early.

Key Words: Driver Monitoring, Computer Vision, YOLOv8, MediaPipe, EAR, MAR, Distraction Detection, Cloud Logging

1.INTRODUCTION

Fatigue and distraction are leading causes of road accidents worldwide. Even a brief two-second lapse in attention can significantly raise the risk of a crash. Many existing systems use invasive hardware sensors like EEG headbands, infrared blink sensors and steering pressure sensors. However, these tools are often uncomfortable, costly and not practical for everyday use.

Given these issues, this paper presents Accitrack, an intelligent driver monitoring system that uses artificial intelligence, deep learning and computer vision to assess driver alertness via a webcam.

It can analyze eye closures, mouth movements and the presence of distracting objects, such as phones, without the need for invasive devices. AcciTrack minimizes human involvement, works in real time, gives prompt alerts and stores unsafe events for later review. This helps improve road safety, track driver behavior and make informed decisions based on recorded data.

2. METHODOLOGY

The methodology includes five major steps: video capture, facial landmark extraction, fatigue analysis, object-based distraction detection, and cloud monitoring

The webcam continuously captures real-time video, and computer vision models analyze the Eye Aspect Ratio (EAR) and Mouth Aspect Ratio (MAR) from each frame. It also detects objects like phones that may distract the driver. When unsafe patterns occur beyond defined thresholds, the system generates alerts and uploads the event to Supabase.

At the first occurrence of an acronym, spell it out followed by the acronym in parentheses, e.g., charge-coupled diode (CCD).

2.1 System Architecture

The architecture consists of a video input module, MediaPipe landmark extractor, fatigue detection unit, YOLOv8 distraction model, alert generator and cloud logger.

The webcam captures the driver's face, while MediaPipe provides 468 facial landmarks that help analyze eyes and mouth. YOLOv8 detects objects related to distractions, such as mobile devices. A decision engine reviews the driver's state and decides when to issue an alert. Integration with a cloud interface enables remote monitoring through web dashboards, offering long-term visibility of driving behavior. The system is modular, scalable and adaptable to many environments.

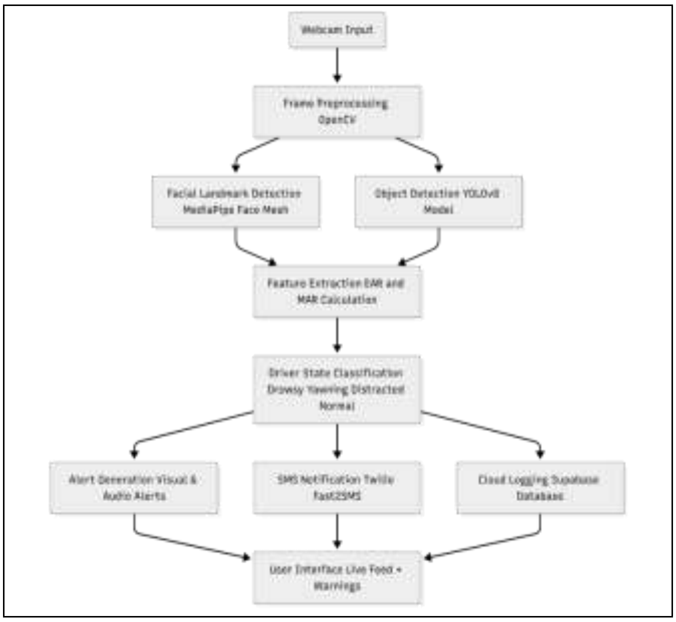

Fig 2.1: High-Level Design

2.2 Facial Landmark Sensing

The sensing block uses **MediaPipe Face Mesh** to identify precise facial landmarks in real time. Eye landmarks are used to compute **Eye Aspect Ratio (EAR),** which decreases during drowsiness, while mouth landmarks compute **Mouth Aspect Ratio (MAR)** to detect yawning.

The system uses Face Mesh for real-time facial landmark detection. MAR is calculated using mouth landmarks, and EAR is determined by eye landmarks, which decrease as drowsiness increases. This non-intrusive method is more accurate than EEG or infrared sensors and eliminates the need for specialized equipment. AcciTrack's sensing is based on tracking reliable facial deviations caused by various head angles, lighting conditions and body movements.

2.3 Control Logic

The control logic combines results from MAR, EAR and YOLOv8 into time-based decisions to reduce false positives. If the EAR drops below a threshold for several consecutive frames, it suggests drowsiness. A MAR above the threshold indicates a yawn. Frequent detection of a mobile phone by YOLOv8 indicates driver distraction. The control engine manages error checking, normalizes blinks, weights frames and handles fallbacks due to partial face visibility in different driving conditions.

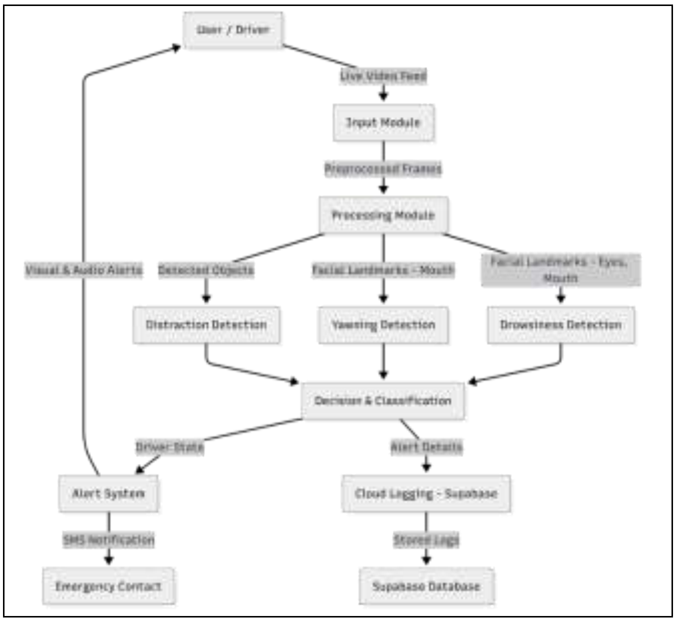

Fig 2.3: Data Flow Diagram

2.4 Actuation Block

The actuation block includes real-time alerts based on the driver's current state.
These alerts consist of:

- **Visual Alerts**: On-screen warnings, for example, *"DROWSINESS DETECTED"*
- **Audio Alerts**: Warning tones via an audio library such as Pygame
- **SMS Alerts**: Notifications using Fast2SMS or Twilio APIs
- **Cloud Logging**: Storing timestamped events in Supabase for analysis

This module translates digital decisions into real-time feedback that enhances safety and reduces the chance of accidents. Its multi-channel design ensures alerts remain effective even if one method fails.

2.5 User Interface

The user interface shows a live video feed with detection boxes, EAR/MAR values, and alert messages. This simple design allows the drivers and testers to quickly understand the system's status. Cloud dashboards provide visualization of past events, enabling deeper insights into driving behavior, fatigue trends and the system's reliability over time

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2.6 Key Components

2.6.1 Camera

A standard HD webcam captures real-time video for analysis.

2.6.2 Processing System

A computer running Python executes MediaPipe, YOLOv8, and the alert logic.

2.6.3 AI Models

MediaPipe Face Mesh for facial landmarks; YOLOv8 for distraction object detection.

2.6.4 Cloud Backend

Supabase for event logs, timestamps, and driver state analytics

2.6.5 Alerting Modules

Audio buzzer, on-screen interface, and SMS notification APIs.

2.7 Advantages

This proposed AI-driven system offers real-time alerts, improved safety, less reliance on expensive sensors, operation in various scenarios, cloud-based analytics and a scalable software solution.

3. RESULTS AND ANALYSIS

AcciTrack performed well in real-time testing. EAR-based drowsiness detection remained accurate under both indoor and moderately lit outdoor conditions. YOLOv8 reliably identified mobile devices with low latency. The cloud dashboard enabled comprehensive logging and SMS alerts were triggered consistently. Time-based validation helped reduce false positives. The system effectively detected:

- Consistent eye closure
- Yawning duration
- Mobile phone usage
- Distracted head movement

Table 3.1 Performance Comparison Accuracy (%)

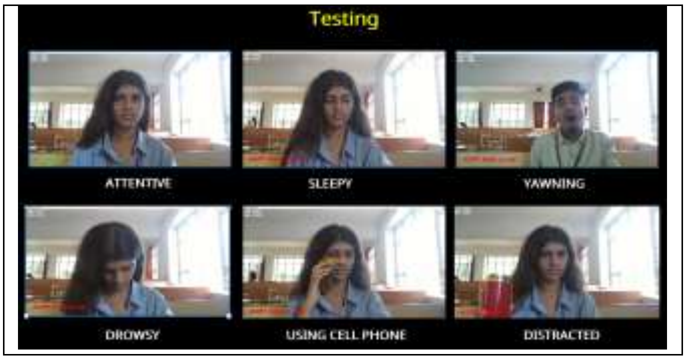

Fig 3.1 Live Webcam with Face Landmarks

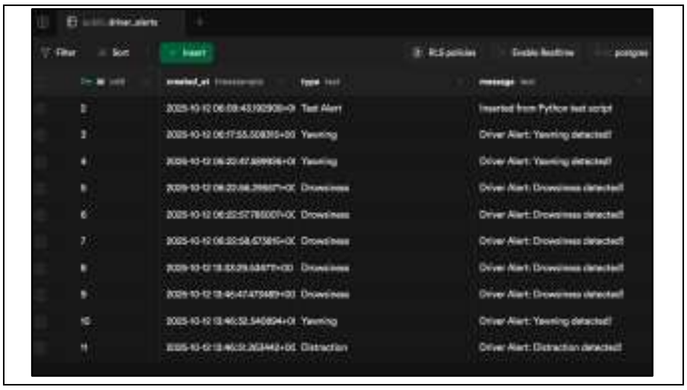

Fig 3.2 Supabase

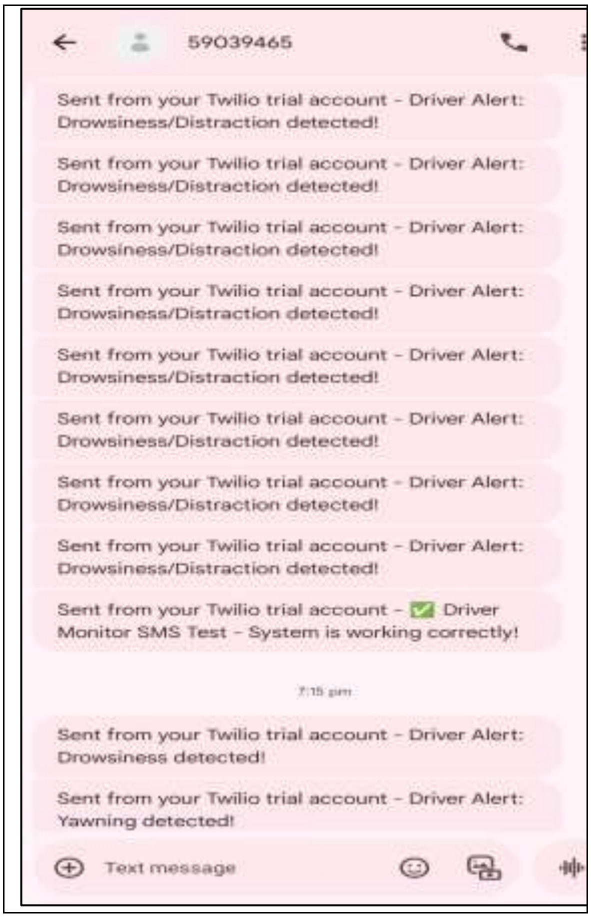

Fig 3.2 Twilio SMS

Duration (mins)	Traditional Method	CNN-Based	YOLOv8-Based	Proposed System
5	74.2	78.5	82.3	**86.1**
10	76.9	81.1	84.7	**88.4**
15	79.4	83.9	86.5	**90.6**
20	81.5	85.6	88.3	**92.2**
25	83.0	87.4	89.9	**93.8**

Frames (sec)	CNN	CNN + LSTM	YOLOv8	Proposed AcciTrack
10	76.4	79.2	82.5	**85.6**
20	78.9	81.5	84.1	**87.3**
30	81.0	83.2	86.0	**89.5**
40	82.7	85.0	87.8	**91.2**
50	84.3	86.6	89.1	**93.0**

Table.3.2 Alert Accuracy (%)

4. CONCLUSIONS

AcciTrack effectively combines AI-based face analysis and object detection to monitor drivers in real time. It improves road safety by detecting early signs of fatigue and distraction, providing timely alerts while reducing reliance on specialized hardware and enabling long-term behavior assessment through cloud logging. Further improvements may include gaze tracking, emotional state analysis, mobile dashboard integration and optimized deployment on embedded platforms such as Jetson Nano or Raspberry Pi for in-vehicle use.

ACKNOWLEDGEMENT

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REFERENCES

[1] 1 M. Ridho, A. S. Nugroho, F. Rahman, and L. Mulyana, “Drowsiness Detection using YOLOv5,” *ELECTRON Journal*, vol. 12, no. 4, pp. 45–53, 2024, Bandung, Indonesia.

[2] Y. Li, X. Chen, J. Zhao, and W. Liu, “Efficient Eye State Detection with YOLOv7-Tiny,” *Preprint Publication*, Beijing, China, 2024.

[3] R. Arava and S. Sundaram, “YOLOv5s + 3D Keypoints for Fatigue Detection,” *PMC Journal of Computer Vision and AI*, vol. 9, no. 4, pp. 210–219, 2024, Chennai, India.

[4] A. Sengar, P. Mehta, and R. Singh, “VigilEye: Real-Time Drowsiness Detection,” *arXiv Preprint*, vol. 2403.1521, California, USA, 2024.

[5] M. Faisal, N. Ahmad, S. Khan, and T. Rahman, “YOLO-CNN Hybrid for Drowsiness and Distraction Detection,” *Proceedings of the International Conference on Intelligent Computing Systems*, vol. 8, no. 2, pp. 311–318, Dubai, UAE, 2025.

[6] K. Brown, E. Gonzalez, R. Martins, and J. Weber, “Real-Time Driver Tiredness Detection using YOLOv5/v8,” *Sensing (MDPI)*, vol. 17, no. 2, pp. 98–107, Basel, Switzerland, 2025.