International Journal of Scientific Research in Engineering and Management (IJSREM)
Volume: 08 Issue: 11 | Nov - 2024 SJIF Rating: 8.448 ISSN: 2582-3930

ADVANCE DRIVER MONITORING SYSTEM [ADMS]

[1]Prof. A.S.Mali, [2]Pranav Tonape
[1]*Assisant Professor, Dept of E&TC Engg., Tatyasaheb Kore Insti. of Engg. & Tech Warnanagar, Kolhapur*
[2]*M. Tech student, Dept of E&TC Engg., Tatyasaheb Kore Insti. of Engg. & Tech Warnanagar, Kolhapur*

---***---

Abstract *This paper presents an Advanced Driver Monitoring System (ADMS) that uses MEDIAPIPE object detection for real-time monitoring of driver drowsiness and Face ID detection to identify driver. Implemented on a Raspberry Pi, the system incorporates dual USB cameras to capture driver data and employs a CAN (Controller Area Network) bus interface for vehicle. By detecting signs of drowsiness and ensuring drivers identity compliance, this ADMS enhances road safety, targeting the reduction of accidents caused by driver fatigue or negligence. Key features, algorithms, advantages, and potential improvements are discussed to highlight the system's impact on automotive safety.*

Keywords: CAN (Controller Area Network), ADMS, MEDIAPIPE, Machine Learning.

1.INTRODUCTION

Driver fatigue is common factors in road accidents. Traditional monitoring systems are limited in their detection accuracy and ability to respond in real time. In this ADMS, real-time video analysis is performed using MEDIAPIPE for robust object detection and classification of driver states. The Raspberry Pi acts as the system's core, performing high-speed analysis on input from dual USB cameras. The system uses CAN interfacing to communicate with the vehicle's electronic control unit (ECU), enabling an alert mechanism and automatic speed control when unsafe conditions are detected. This paper outlines the development, features, and benefits of an advanced, cost-effective driver monitoring system for modern automotive safety needs.

[2] LITERATURE SURVEY

1.Bappaditya Mandal, Liyuan Li, Gang Sam Wang, and Jie Lin "Towards Detection of Bus Driver Fatigue Based on Robust Visual Analysis of Eye State" Driver's fatigue is one of the major causes of traffic accidents, particularly for drivers of large vehicles due to prolonged driving periods and boredom in working conditions. In this paper, we propose a visionbased fatigue detection system for bus driver monitoring, which is easy and flexible for deployment in buses and large vehicles. The system consists of modules of head-shoulder detection, face detection, eye detection, eye openness estimation, fusion, drowsiness measure percentage of eyelid closure estimation, and fatigue level classification.

2.Zuojin Li, Liukui Chen, Jun Peng and Ying Wu "Automatic Detection of Driver Fatigue Using Driving Operation Information for Transportation Safety" Fatigued driving is a major cause of road accidents. For this reason, the method in this paper is based on the steering wheel angles (SWA) and yaw angles (YA) information under real driving conditions to detect drivers' fatigue levels.

3. S. Cotter revealed the methodology for the system that records eye movements using the corneal reflection approach in 2011. However, there were significant drawbacks, including the requirement for a headset, which made the method inappropriate and very intrusive.

4. The conjoint hybrid driver drowsiness detection model was built in accordance with the endeavor led by J.S. Bajaj, N. Kumar, R.K. Kaushal, H.L. Gururaj, F. Flammini, and R. Natarajan. This model includes a camera and Galvanic Skin Response sensor to obtain behavioral data which addresses the eye and mouth positions and physiological sensory data observed in skin conductance levels. A chosen different evaluation using an additional image-based data set reported an 86% accuracy of the model. This technique was better than subjective ratings, to the stated use of vehicle-based detective controls, and to non-invasive physiological measures. Nevertheless, while acknowledging the shortcomings of the model, it is noteworthy to point out that future studies should use a broad data set rather than relying on this narrow data.

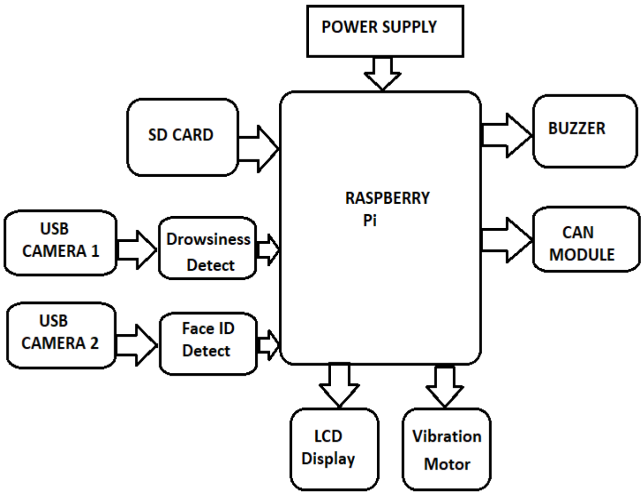
5.The study was conducted by Bradley Barnhard, Kartik Prabhu, and Arun Seetharaman. They used image processing techniques to detect drowsiness in drivers whose duration of blink and heart rate variability were both used. The eye detection was implemented using OpenCV classifiers with about 10 videos per class from the AffectNet database. Applied pattern recognition methods included independent component analysis and a chrominance-based method for heart rate variability. Relatively good results were obtained but were not able to reach the high accuracy illustrated in some other publications. This difference is probably because assessments have to occur in highly contrived environments. Throughout, the authors continuously tried and tested the model time after time by varying a variety of parameters and doing performance tests aiming at improving results.

[3] METHODOLOGY

The ADMS consists of several key components:

1. **Raspberry Pi**: The main computational unit, handling MEDIAPIPE-based and OpenCV based video analysis in real-time.
2. **Dual USB Cameras**: One camera monitors eye and head movement for drowsiness detection, while the second focuses driver face detection in real time.
3. **MEDIAPIPE Object Detection**: MEDIAPIPE is used for its efficiency in object detection, identifying both drowsiness signals.
4. **OpenCV & frontal cascade Algo**: Face image training and Face ID detection.
5. **CAN Module**: Connects the ADMS get Vehicle Data
6. **Alert Mechanism**: Visual/auditory alerts activate in case of detected drowsiness

[4] BLOCK DIAGRAM



7. Fig. 1 Block Diagram

[5] ALGORITHMS & PROTOCOL

MEDIAPIPE-Based Detection Algorithm:

Drowsiness Detection: MEDIAPIPE identifies facial landmarks for eyes mouth to assess drowsiness by measuring eye closure duration and mouth angles.

Face Detection: OpenCV detects face patterns of the driver, verifying with proper trained model, to detect driver ID or Name

CAN Bus Protocol: Connects the ADMS get the data.

Advantages

- **Enhanced Safety**: Provides continuous monitoring of driver drowsiness and face ID or driver name, improving response times and reducing accident risk.
- **Real-Time Functionality**: MEDIAPIPE's efficiency allows for rapid detection, and CAN interfacing ensures immediate system response.
- **Cost-Effective Implementation**: The Raspberry Pi platform with MEDIAPIPE object detection is an affordable alternative to conventional, expensive monitoring systems.

Limitations

- **Lighting Conditions**: Performance may degrade under low light or varying brightness levels, impacting detection accuracy.
- **Processing Power**: Raspberry Pi's limited capacity can restrict the complexity of MEDIAPIPE models that can be deployed.
- **False Positives**: MEDIAPIPE's detection algorithm may occasionally misclassify objects, leading to unnecessary alerts.

[6] CONCLUSION AND FUTURE SCOPE

A complete solution for improving safety in various situations is the drowsiness detection system with alcohol detection integrating Raspberry Pi, camera module, alcohol sensor, buzzer, and speaker. The device can efficiently monitor vital signs, analyse facial features and analyse alcohol levels in real-time by fusing sensor technologies, image processing and machine learning algorithms.

A cost-effective and portable solution is provided by utilising Raspberry Pi as the central processing unit, making it appropriate for use in workplaces, transportation systems, and vehicles. The system's capacity to identify intoxication from alcohol and drowsiness enables prompt responses, lowering the chances of accidents involving alcohol and fatigue.

This ADMS offers an advanced, real-time safety solution, improving driver monitoring through the MEDIAPIPE-based detection of drowsiness and face detection. Future enhancements could include deploying more efficient deep learning models for better accuracy under diverse lighting, as well as expanding detection capabilities to include other safety factors such as phone usage and distraction. Incorporating edge computing hardware may also address current limitations in processing speed.

REFERENCES

1. Zhou, Y., et al., "Deep Learning for Driver Drowsiness Detection," *Journal of Road Safety and AI Integration*, 2021.
2. Kim, H. & Lee, S., "MEDIAPIPE-Based face detection," *Automotive Safety Journal*, 2022.
3. Patel, D. et al., "Real-Time Vehicle Safety Monitoring with CAN Bus," *International Journal of Transport Safety*, 2020.
4. Sharma, R., "Raspberry Pi in Safety Systems," *Journal of Embedded Systems and Applications*, 2021.
5. J. May and C. Baldwin, "Driver fatigue: The importance of identifying causal factors of fatigue when considering detection and countermeasure technologies," Transp. Res. F, Traffic Psychol. Behav., vol. 12, no. 3, pp. 218–224, 2009.
6. 5. Hee-Jong Yoo, "Is a certain acoustic alarm effective for preventing drowsiness driving?", Journal of the Acoustical Society of Korea, 2016.
7. 6. Sang-Hyuk Park, Chang-dong Yoo, "Efficient RealTime Drowsy Detection Algorithm for Safe Operation", 2011 Summer Conference of Electronics Engineering Society of Korea, pp..947-950, 6. 2011.
8. Quang N., NguyenLe T. Anh ThoToi Vo VanHui YuNguyen DucThang, "Visual Based Drowsiness Detection Using Facial Features", 6th International Conference on the Development of Biomedical Engineering in Vietnam (BME6) pp 723-727, BME 2017.
9. 2. Kunika Chhaganbhai Patel, Shafiullah Atiullah Khan, Vijaykumar Nandkumar Patil, "Real-Time Driver Drowsiness Detection System Based on Visual Information", International Journal of Engineering Science and Computing, March 2018.
10. 3. Rahman, M. Sirshar, A. Khan" Real Time Drowsiness Detection Using Eye Blink Monitoring" 2015