Driver Drowsiness Detection

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***Abstract*- This system presents an innovative approach leveraging the Raspberry Pi platform for the simultaneous detection of driver drowsiness and alcohol levels, aimed at enhancing road safety. The integration of computer vision and sensor technologies establishes a robust framework capable of real-time monitoring and alerting within vehicular environments.The drowsiness detection module employs a Raspberry Picompatible camera to track facial landmarks, monitoring key indicators such as eye closure duration and head position. Machine learning algorithms, including facial recognition and pattern analysis, ascertain driver fatigue, triggering timely alerts or interventions to prevent potential accidents.In parallel, the alcohol detection system incorporates sensor modules interfaced with the Raspberry Pi to measure alcohol vapors within the vehicle cabin. Utilizing gas sensors or breathalyzers, this module continuously samples air quality, identifying alcohol presence and quantifying levels exceeding legal limits. Integration with vehicle control systems enables proactive measures like disabling ignition or notifying authorities when necessary.The proposed system amalgamates these functionalities into a cohesive framework, offering a comprehensive solution for proactive safety measures in automobiles. By leveraging the computational capabilities of the Raspberry Pi and amalgamating sensor technologies, this approach aims to significantly reduce the risks associated with drowsy and inebriated driving, ultimately contributing to the overall enhancement of road safety.**

***Keywords*: Raspberry Pi platform, Driver drowsiness, Alcohol detection, Road safety, Computer vision, Sensor technologies, Real-time monitoring.**

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INTRODUCTION

The project centers on leveraging the Raspberry Pi platform to develop a pioneering system capable of concurrently detecting driver drowsiness and alcohol levels within vehicular environments, with the primary objective of advancing road safety. This innovative approach amalgamates computer vision and sensor technologies, establishing a robust framework for real-time monitoring and alerting. Through the integration of a Raspberry Pi-compatible camera, the drowsiness detection module meticulously tracks facial landmarks, monitoring critical indicators like eye closure duration and head position. Advanced machine learning algorithms, including facial recognition and pattern analysis, discern signs of driver fatigue, triggering timely alerts or interventions to preempt potential accidents. Concurrently, the alcohol detection system integrates sensor modules interfaced with the Raspberry Pi, continually sampling the air within the vehicle cabin using gas sensors or breathalyzers. This module accurately identifies alcohol presence and quantifies levels exceeding legal limits, enabling integration with vehicle control systems for proactive measures such as ignition disabling or alerting authorities when necessary. The cohesive amalgamation of these functionalities positions this proposed system as a comprehensive solution for proactive safety measures in automobiles, aiming to significantly diminish the hazards associated with drowsy and inebriated driving, thereby enhancing overall road safety. In summary, this project represents a paradigm shift in automotive safety technology by

harnessing the computational capabilities of the Raspberry Pi and integrating sophisticated sensor and computer vision systems. By combining drowsiness detection with alcohol level monitoring in a unified platform, the project aims to address critical safety concerns on the road. The integration of machine learning algorithms ensures accurate and timely detection of potential driver impairment, while the system's proactive measures provide the potential to prevent accidents before they occur. Ultimately, the goal is to deploy a sophisticated yet accessible solution that significantly reduces the risks posed by drowsy and intoxicated driving, fostering a safer and more secure environment for all road users.

LITURATURE SURVEY

Driver Drowsiness and Alcohol Detection System Using Arduino 2023 Sushma Sharad Tandle, Akshita S, Amtul Malik, Joncia Fernandes, Shilpa NS Drowsiness in driving reasons the primary street injuries. Now a day's drowsiness because of drunken using is growing. If driving force is located to be drowsiness in eyes greater than 5 secs, then the attention blink sensor senses the blink price. If the eyes are found to be closed, then the speed of the auto slows down.[1]

Drowsiness Detection System 2017 Prashant Dhawde, Pankaj Nagare, Ketan Sadigale, Darshan Sawant, Prof. J. R. Mahajan -The major aim of this project is to develop a drowsiness detection system by monitoring the eyes; it is believed that the symptoms of driver fatigue can be detected early enough to avoid a car accident.[2]

Driver Drowsiness Detection Using Machine Learning

2022 Prof. Swati Gade, Kshitija Kamble, Aishwarya Sheth, Sakshi Patil, Siddhi Potdar This document is a review report on the research conducted and the project made in the field of computer engineering to develop a system for driver drowsiness detection to prevent accidents from happening because of driver fatigue and sleeping. The report proposed the results and solutions on the limited implementation of the various techniques that are introduced in the project. Whereas the implementation of the project gives the real world idea of how the system works and what changes can be done in order to improve the utility of the overall system. Furthermore, the paper states the overall of the observation made by the authors in order to help further optimization in the mentioned field to achieve the utility at a better efficiency for a safer road. [3]

AIM & OBJECTIVES

1. Design and develop a robust integrated system leveraging the Raspberry Pi platform to detect driver drowsiness and alcohol levels simultaneously.
2. Implement computer vision techniques utilizing a Raspberry Pi-compatible camera to track facial landmarks and assess indicators of drowsiness in real-time.
3. Integrate sensor modules with the Raspberry Pi to continuously monitor alcohol levels within the vehicle environment, providing accurate and timely detection exceeding legal limits.
4. Provide personalized recommendations and resources to improve mental wellbeing. 5. Establish a system capable of real-time monitoring and analysis to promptly identify signs of driver impairment

MOTIVATION

The driving force behind this project lies in combating the pervasive and devastating consequences of impaired driving on road safety. Despite ongoing efforts, accidents caused by drowsy or intoxicated drivers persist, resulting in tragic loss of lives and extensive damage. The motivation here is to proactively address this critical issue by harnessing the technological prowess of the Raspberry Pi platform. By integrating cutting-edge computer vision and sensor technologies, the project aims to create a holistic solution capable of real-time monitoring and intervention within vehicles. The ultimate goal is to prevent accidents caused by driver impairment due to drowsiness or alcohol consumption. This initiative not only seeks to enhance road safety but also to foster a culture of responsible driving by employing innovative technology. By offering a comprehensive solution to detect and mitigate driver impairment, the project aspires to significantly reduce accidents, save lives, and profoundly impact the safety landscape on our roads

APPLICATION:

1. Automobile sector
2. Public sector
3. Government sector

SYSTEM ARCHITECTURE

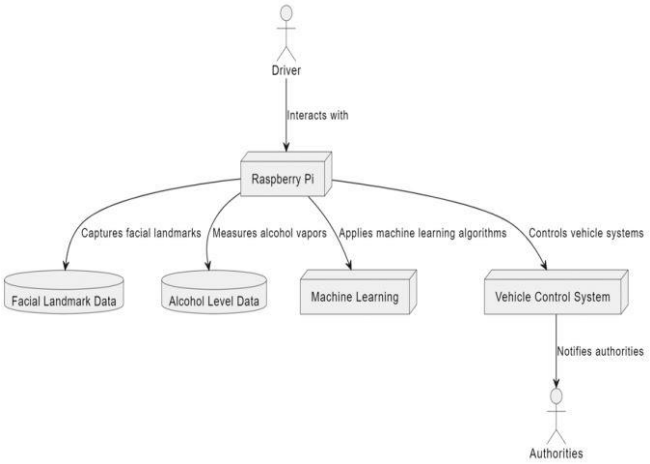

Fig -1: System Architecture Diagram

ADVANTAGES

Comprehensive Safety Solution: The system addresses two critical factors affecting road safety – drowsy driving and driving under the influence of alcohol. By combining these functionalities into a single framework, it offers a comprehensive solution to mitigate risks associated with these issues.

Real-time Monitoring: The use of computer vision and sensor technologies enables real-time monitoring of driver behavior. This proactive approach allows for timely interventions and alerts, contributing to accident prevention.

Facial Landmark Tracking: The drowsiness detection module utilizes facial landmark tracking through a Raspberry Pi-compatible camera. This allows for accurate monitoring of key indicators such as eye closure duration and head position, providing a reliable method for assessing driver fatigue.

Machine Learning Algorithms: The incorporation of machine learning algorithms, including facial recognition and pattern analysis, enhances the system's ability to ascertain driver fatigue accurately. This intelligent system can adapt and improve its performance over time through continuous learning.

Alcohol Detection System: The integration of sensor modules for alcohol detection adds an extra layer of safety. By continuously sampling air quality and identifying alcohol presence, the system can quantify alcohol levels and take proactive measures, such as disabling ignition or notifying authorities when necessary.

FUNCTIONAL & NON-FUNCTIONAL REQUIREMENTS

Non-Functional Requirements

Performance: The system shall operate in real-time and provide drowsiness alerts within a maximum latency of 2 seconds. The software shall have a false positive rate of less than

Reliability: The system shall be available 24/7 and have an uptime of at least 99The software shall have self-diagnostics to identify and report system malfunctions.

Security : Data collected by the system, including video footage, must be securely stored and encrypted to protect driver privacy. Access to sensitive system functions shall be

Compliance the system shall comply with relevant legal and safety regulations related to drowsiness detection.

Scalability: The software architecture shall be designed to accommodate future updates and additional features. Interfaces the system shall provide APIs for potential integration with third-party applications and services. Maintenance and Support The software shall support over-the-air updates for improvements and bug fixes.

Functional Requirements

Data Acquisition The system shall capture and process real-time video input of the driver's face and eyes. The system shall collect relevant data from vehicle sensors, including steering angle, speed, and lane-keeping information.

Drowsiness Detection The system shall employ computer vision techniques to analyze facial expressions, eye movements, and head position to detect drowsiness. The system shall track eye closure, blink rate, and gaze direction to assess driver alertness. The system shall use machine learning to continuously monitor the driver's level of alertness and identify drowsiness patterns.

Alert and Warning The system shall issue audible alerts, such as alarms or spoken warnings, when drowsiness is detected. The system shall provide visual alerts, including flashing lights and messages on the vehicle's dashboard. The system shall offer haptic feedback through seat vibrations or steering wheel feedback to alert the driver. The system shall integrate with the vehicle's user interface to communicate alerts and warnings.

User Interface The system shall display real-time information and feedback on the vehicle's dashboard. The system shall allow the driver to customize alert thresholds and preferences via the user interface.

Data Logging and Analysis The system shall store historical data on driver behavior, drowsiness events, and system performance. The system shall conduct data analysis to identify trends and patterns useful for improving road safety.

SYSTEM REQUIREMENTS

Software Used:

1. Operating System: Windows xp/7/8/10
2. Programming Language: Python
3. Software Version: Python 4.4
4. Tools: Anaconda/pycharm
5. Front End: Python

Hardware Used:

1. Processor - Pentium IV/Intel I3 core
2. Speed - 1.1 GHZ
3. RAM - 512 MB (min) 4. Hard disk - 20 GB
5. Keyboard - Standard Keyboard
6. Mouse - Two or Three Button Mouse
7. Monitor - LED Monitor

CONCLUSION

In conclusion, The Drowsiness Detection Model is competent of detecting the sleepi- ness by keeping track of the eye's movement of the driver. The inputs are obtained from the facial detection algorithm which is pre trained by the Dlib model of facial recognition. The model deals with the eye's aspect ratio to detect the region of in- terest. The eye's aspect ratio is calculated using the EAR function. The alert is generated if the value of the detection counter exceeds the threshold value defines inside the driver code. The main focus for developing this project is to reduce the number of accidents which occur due to the sleepiness of the drivers.

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