JETIR.ORG ISSN: 2349-5162 | ESTD Year : 2014 | Monthly Issue
JOURNAL OF EMERGING TECHNOLOGIES AND INNOVATIVE RESEARCH (JETIR)
An International Scholarly Open Access, Peer-reviewed, Refereed Journal

AN INNOVATIVE AND NON-INTRUSIVE DRIVER ASSISTANCE SYSTEM FOR VITAL SIGNAL MONITORING

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Abstract : This project proposes an abstract interface for integrating various sensors to monitor the vital signs of a vehicle driver and environmental conditions within the driver's compartment. The proposed system utilizes an eyeblink sensor, temperature sensor, alcohol sensor and ignition key heartbeat sensor, DHT11 sensor for temperature and humidity. The primary objective is to ensure driver safety by continuously monitoring their vital signs and environmental conditions, and alerting registered recipients in case of abnormal readings. Additionally, the ultrasonic sensor detects vehicles approaching the vehicle from either the front or back, enhancing situational awareness and aiding in collision avoidance. When the vital signs of the driver surpass predefined thresholds, indicating potential risks such as fatigue or health issues, the system triggers an alert mechanism. This mechanism automatically sends a text message to registered recipients, providing vital sign readings along with latitude and longitude coordinates to facilitate immediate assistance. The proposed interface offers a comprehensive solution for monitoring the driver's well-being and enhancing vehicle safety. By integrating multiple sensors and an alert system, it enables proactive measures to mitigate risks associated with driver fatigue, health emergencies, and potential collisions

***Index Terms* - Arduino, IOT, Driver Safety, Alert Mechanism, Sensor Detection, Risk Mitigation**

I. INTRODUCTION

Non-intrusive approaches to driver drowsiness detection present a compelling alternative to intrusive methods, mitigating issues related to constant human contact and vulnerability to external artifacts. These methodologies concentrate on external clues and behavioral patterns, eliminating the need for direct physical interaction with the driver. Ongoing research in this field has experienced a surge, fueled by global concerns over road accidents, where drowsiness contributes significantly to fatalities. Non-intrusive driver monitoring systems leverage advanced technologies such as machine learning, deep learning, and thresholding techniques. Unlike vehicle sensor-based approaches focused on aggressive driving behaviors, these methods scrutinize driver behavior itself, considering factors like head movements, eye closure duration, and facial expressions to identify signs of drowsiness or distraction. This reliance on external indicators enables non-intrusive approaches to offer a dependable means of detecting driver fatigue. The significance of such approaches becomes evident, especially for drivers of buses and heavy trucks operating during extended periods of peak drowsiness, where monotony and boredom increase accident risks. Thus, an intelligent system proficient in efficiently identifying drowsiness and fatigue is pivotal for enhancing road safety.

The research work carried out here provided an insight into the development of IoT systems. The research area of the Internet of Things in recent years has experienced growth and development in an interdisciplinary manner.

II. LITERATURE SURVEY

Ovidiu Stan et.al. Says in the paper "Eye-Gaze Tracking Method Driven by Raspberry PI Applicable in Automotive Traffic Safety" that This paper comes as a response to the fact that, lately, more and more accidents are caused by people who fall asleep at the wheel. Eye tracking is one of the most important aspects in driver assistance systems since human eyes hold much information regarding the driver's state, like attention level, gaze and fatigue level. The number of times the subject blinks will be taken into account for identification of the subject's drowsiness. Also the direction of where the user is looking will be estimated according to the location of the user's eye gaze. The developed algorithm was implemented on a Raspberry Pi board in order to create a portable system. The main determination of this project is to conceive an active eye tracking based system, which focuses on the drowsiness detection amongst fatigue related deficiencies in driving.

García et. al. described ‘Driver Monitoring Based on Low-Cost 3-D Sensors’. They proposed a solution for driver monitoring and event detection based on 3-D information from a range camera is presented. The system combines 2-D and 3-D techniques to provide head pose estimation and regions-of-interest identification. Based on the captured cloud of 3-D points from the sensor and analyzing the 2-D projection, the points corresponding to the head are determined and extracted for further analysis. Later, head pose estimation with three degrees of freedom (Euler angles) is estimated based on the iterative closest points algorithm. Finally, relevant regions of the face are identified and used for further analysis, e.g., event detection and behavior analysis. The resulting application is a 3-D driver monitoring system based on low-cost sensors. It represents an interesting tool for human factor research studies, allowing automatic study of specific factors and the detection of special event related to the driver, e.g., driver drowsiness, inattention, or head pose.

III. EXISTING METHOLOGY

Conventional methods for monitoring driver vital signs and environmental conditions in vehicles often rely on fragmented systems, each addressing specific aspects of driver safety. For instance, some vehicles may incorporate simple temperature sensors or basic heartbeat monitors, while others may lack any dedicated monitoring systems altogether. These disparate approaches suffer from several drawbacks. Firstly, they lack comprehensive integration, leading to inefficiencies in data collection and analysis. Without a unified system, it becomes challenging to correlate different physiological parameters and environmental factors, hindering the ability to accurately assess the driver’s overall well-being. Additionally, conventional methods typically lack real-time alert mechanisms, relying on manual intervention or external devices to notify relevant parties in case of emergencies. This delay in response time can significantly impact the effectiveness of emergency assistance and jeopardize driver safety.

IV. DISADVANTAGES OFEXISTING METHOLOGY

The accuracy of the existing system is Limited, which can be monitoring in only single parameter monitoring and also Limited Integration with vehicle systems.

V. PROPOSED METHOLOGY

To address the limitations of conventional methods, a novel approach is proposed, leveraging advanced sensor technologies and seamless integration to monitor driver vital signs and environmental conditions comprehensively. The proposed method involves interfacing multiple sensors, including eyeblink, temperature, heartbeat, DHT11 (for temperature and humidity), and ultrasonic sensors, with a central processing unit within the vehicle. This integration enables real-time data acquisition and analysis, providing a holistic view of the driver’s well-being and surroundings. By continuously monitoring parameters such as blink rate, body temperature, heart rate, and cabin conditions, the system can detect abnormalities indicative of fatigue, health issues, or discomfort.

Moreover, the proposed method incorporates an automated alert mechanism triggered by predefined threshold values. When vital signs exceed these thresholds, signaling potential risks to the driver’s safety, the system sends instant text messages to registered recipients. These messages include vital sign readings along with latitude and longitude coordinates, facilitating prompt assistance in case of emergencies. This proactive approach enhances driver safety by enabling timely intervention and mitigating risks associated with drowsiness, health emergencies, or potential collisions. By integrating multiple sensors and implementing an automated alert system, the proposed method overcomes the shortcomings of conventional approaches. It offers a comprehensive solution for monitoring driver well-being and enhancing vehicle safety in real-time. Furthermore, the proposed method lays the foundation for future advancements in intelligent transportation systems, paving the way for safer and more efficient driving experiences.

5.1. Implementation Method :

Sensor Selection: Choose appropriate sensors capable of non-intrusively monitoring vital signals such as heart rate, respiratory rate, temperature, and possibly other parameters like skin conductance or eye movements. Consider sensors with high accuracy, reliability, and minimal discomfort to the driver.

Sensor Placement and Integration: Strategically place sensors within the vehicle cabin to capture vital signals effectively without obstructing the driver's view or movement. Integrate sensors seamlessly into the vehicle's interior design to minimize visual impact and ensure ease of use.

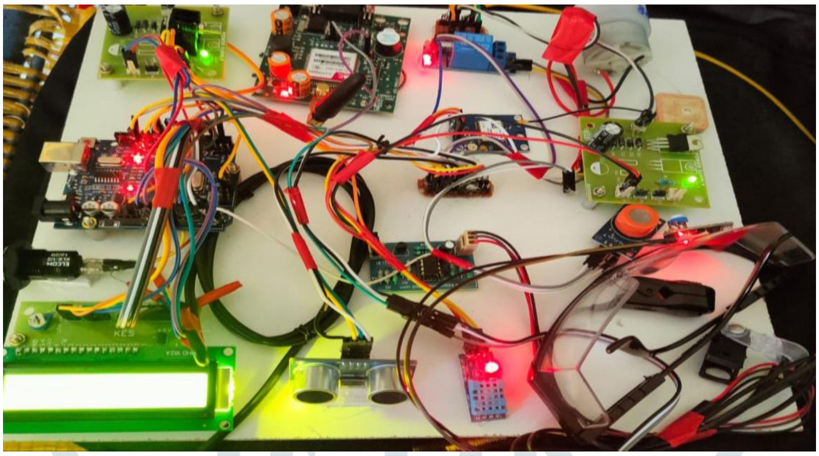
Context-Aware Analysis: Incorporate contextual information such as driving behavior, environmental conditions, and vehicle dynamics into the analysis to provide more meaningful insights into the driver's state. Adapt algorithms to account for variations in signal patterns during different driving scenarios

Alert Generation and Presentation: Implement mechanisms for generating timely alerts or warnings when abnormal vital signals are detected, indicating potential safety risks. Present alerts to the driver through intuitive interfaces such as visual displays,

Integration with Vehicle Systems: Integrate the driver assistance system with the vehicle's onboard systems, such as the infotainment system or advanced driver assistance systems (ADAS), to leverage existing interfaces and enhance functionality. Ensure compatibility with standard communication protocols to facilitate seamless integration.

VI. RESULTS AND DISCUSSION

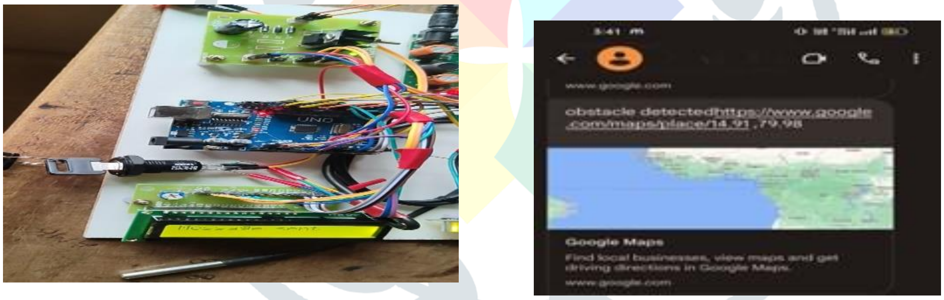
To Assist the Driver who is in-vehicle by monitoring Driver health condition and drivers compartment continuously through various sensors. This Method is proposed for reduction the risk condition occurance and alerting the driver and send message to register number with location of the Driver. Here various sensors are used to monitor the driver condition.



Working Model of Proposed System for ADAS

Sample Output through one of the Sensor used in the kit.

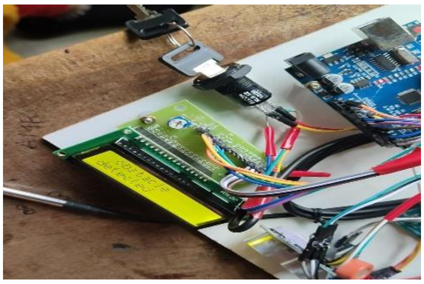
Here Ultrasonic sensor is used to detect the vehicles which are near to the vehicles or any Obstacles occur near the vehicle,an alert message will be given by sensor and buzzer will be on and vehicle will stop. And a Message will send to the registered number with location**.**



Outputs of Proposed System By one of the Sensor

VII. Acknowledgment

The preferred spelling of the word "acknowledgment" in America is without an "e" after the "g". Avoid the stilted expression, "Oneofus(R.B.G.)thanks..." Instead,try"R.B.G.thanks".Putapplicablesponsoracknowledgmentshere;DONOTplacethemonthefirstpageofyourpaperorasafootnote.



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