SMART DRIVER ASSISTANCE USING ARTIFICIAL INTELLIGENCE SYSTEM

[1]RESHMA P S, [2]DIVYA A S, [3]DIVINA K V, [4]BALANAND A A, [5]SALVA

[1]Assistant Professor
Dept. of Electronics and Communication Engineering
Universal Engineering College
Vallivattom, Thrissur

Abstract: **In recent times, road accidents have become a significant concern. The proposed system aims to reduce the number of accidents and mitigate the severity of those that cannot be prevented, thereby preventing deaths and injuries. Human errors are often the root cause of vehicle accidents, but with the help of smart driver assistance using artificial intelligence, these errors can be avoided. The system offers features such as collision avoidance, timely medical assistance using GPS, and alerts to the driver when small vehicles are at risk of collision. To address these problems, we propose the use of smart driver assistance using artificial intelligence, which provides a superior solution.**

***Keywords*: GPS, GSM, Collision avoidance.**

I. INTRODUCTION

Driver assistance systems are designed to enhance road safety by supporting drivers with their driving tasks. These systems rely on a reliable human-machine interface to identify potential obstacles or driving errors and take appropriate action. They use automated technologies such as ultrasonic sensors, push buttons, and switches to achieve this goal. Depending on the specific characteristics of the bus, driver assistance systems can enable varying levels of autonomous driving. The primary aim of these safety features is to prevent accidents and collisions by providing warning alerts, implementing safety measures, and taking control of the vehicle when necessary. Additionally, some safety features integrate satellite navigation and GSM modules to promptly respond to medical emergencies. These systems are developed to automate, adapt, and upgrade car technologies to enhance safety and driving experience because most traffic accidents are due to human errors.

II. LITERATURE SURVEY

The proposed system works on Global positioning system and global system for mobile communication, which is used for vehicle tracking and provide safety environment for the traveller [1]. The real time collected warning data from the bus driver state monitoring system (DSM) and advanced driver assistance system (ADAS) which utilize to determine driver's comprehensive driving capability indicators [2]. Implementation of a driving simulator for teaching and training drivers and also to make use of the ADAS. [3].

Multiple front camera applications are integrated into TDA3X (Texas Instruments Driver Assist 3X) and analyses the effects of cameras on each section of TDA3X [4].Introduction of different differential GPS methods, Specific algorithm is also used for differential corrections [5]. An instruction like driving assistance systems for avoiding the collision and it will activate only in the situation where collision arise and also the driver is not properly operating the vehicle in this situation. Vehicle is controlled by both the driver and this system [6].

New way is introduced to count the vehicle number in a low cost manner. Camera module of Raspberry Pi is used for this purpose by this way traffic is controlled irrespective of the vehicles, colour, size and angle [7].This paper proposes to replace the manual inspection with a deep learning method and also use YOLOV5, which is the most powerful object detection algorithm at present. To better apply it is in the actual environment especially in supervision of facing mask in the public places [8].Developed low cost driver assistant system for security purpose in vehicles. This system is based on monocular camera. This system mainly consists of two parts. One part is for vehicle detection and the other part is lane [9].

An adaptive voice alert system is designed based on the drivers emotional cognitive features. The voice alert changes according to the moods of the driver. Moods of the driver are identified by the Deep Learning based Emotion Recognition System [10]. An efficient driver fatigue detection and alert system using the open source technologies [11].

Artificial intelligence is the best solution to manage the huge data flow and storage's in the IoT network. Now IoT's becoming more popular with the inventions of high-speed internet networks and many advanced sensors that can be integrated with a micro controller. The data flow internet now will have sensor data and user data that send and receive from the workstations. With the increase in the number of workstations and more sensors, some data may be facing problems on the storage, delay, channels limitation and congestion in the networks. To avoid all these problems, there were many solutions were proposed in the past of 10 years. Among all the solutions, Artificial Intelligence still being the best solution to the data mining, manage and control of congestion in the network [12].

In this paper, the authors have presented images of a cyst phantom reconstructed based on their formulation and presented a new algorithm for high-speed parallel processing of ultrasound pulse-echo data for real-time three-dimensional (3-D) imaging. A number of practical issues of significance in image reconstruction are addressed. Specially, an augmented model is introduced to account for imperfect blocking of echoes from outside the ROI .They have also introduced a column weighting algorithm for minimizing the number of filter coefficients. In addition detailed illustration of a full image reconstruction using sub image acquisition and compounding are given [13].

This paper describes about the structure, the piezoelectric effect, the working principle of piezoelectric sensors firstly. Analysis of impedance characteristics and impedance matching circuits of the piezoelectric transducers. On the basis of design the measurement circuit of the piezoelectric sensor and give the matter which is paid more attention when design the circuit and several important conclusions. Finally obtained the analysed and prospects of the applications of piezoelectric sensors [14].To improve the ride comfort of automobile vehicles are studied and side discomfort caused by velocity fluctuation is identified and an index called Ride Discomfort Index (RDI) is identified and a model that estimates this index is developed [15].

III. METHODOLOGY

Advanced Driver Assistance System

Advanced Driver Assistance Systems (ADAS) is a technology that assists drivers in various driving conditions. The Arduino-based system integrated into a vehicle can be controlled using a range of input devices. ADAS aims to automate and enhance vehicle technology for improved safety and driving experience. These systems have been proven to effectively reduce road accidents and minimize driver errors**.** It is also designed by providing assistance and automated features to drivers.

ADAS utilizes various sensors, cameras, radar systems, and computing power to gather data about the vehicle, surroundings, and the drivers 'actions, allowing for improved decision –making and response. Significant automotive safety improvements have been made in the past, such as the introduction of shatter-resistant glass, three-point seatbelts, and airbags. These passive safety measures were designed to minimize injury during an accident. However, advancements in technology have led to the development of active safety systems known as Advanced Driver Assistance Systems (ADAS).

ADAS systems utilize embedded vision and AI functions to actively improve safety by reducing the occurrence of accidents and minimizing injury to vehicle occupants. One of the key components of ADAS is the implementation of cameras in vehicles

A. Working

The Arduino based system installed within a vehicle can be controlled using various input devices including piezoelectric sensors, GPS, and ultrasonic sensors. The system's outputs are comprised of a GSM module and breaking system, and power is supplied through a power source. To prevent collisions between vehicles, an anti-collision breaking system is implemented using AI. When an ultrasonic sensor detects a distance less than 4 meters from another vehicle, the breaking system is activated, and the break lights indicate a stop.

In the event of an accident, the proposed system uses GPS and the GSM module to notify medical authorities for immediate assistance. This system plays a crucial role in vehicle monitoring, ensuring the safety and security of passengers using the sensors. Whenever there is an accident, the system automatically provides the current location of the vehicle to the corresponding authority for immediate medical services.

Additionally, a piezoelectric sensor detects changes in pressure and acceleration during a collision and sends an output signal through the GSM module to the corresponding authority. The driver is also notified of a possible collision through a front-facing indicator light.

B. Block Diagram

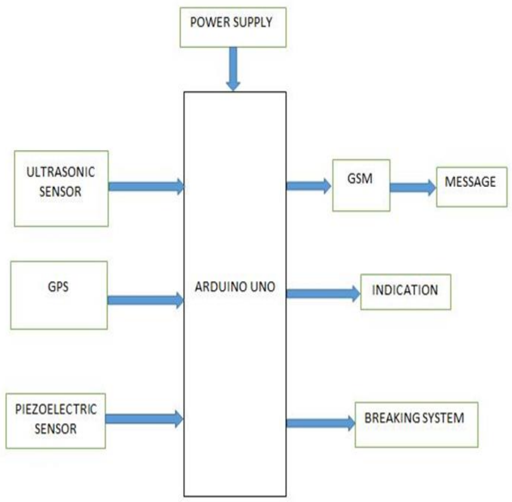

Figure 1: Block Diagram

A power supply functions as a device that transforms the output of an AC power line into a consistent DC output or multiple outputs. Initially, the AC voltage is rectified to generate a pulsating DC, which is then filtered to yield a smooth voltage. An ultrasonic sensor serves as an electronic apparatus designed to measure the distance to a target object by emitting ultrasonic sound waves and converting the reflected sound into an electrical signal.

Notably, ultrasonic waves travel at a faster pace than audible sound, which is perceivable by humans. Global positioning system (GPS) devices employ data received from satellites to determine the precise location of a specific point on Earth. This process is known as trilateration.

A GSM modem or GSM module constitutes a device that employs GSM mobile telephone technology to establish a wireless data link with a GSM network. Such modems find applications in mobile telephones and other equipment that interacts with mobile telephone networks.

Indicator lights, a type of illuminating device, are commonly employed to indicate whether equipment is receiving power or experiencing some form of malfunction. They serve a fundamental yet crucial function, particularly in highlighting any malfunctions A message refers to a communication or statement conveyed from one person or group to another.

C. Flow Chart

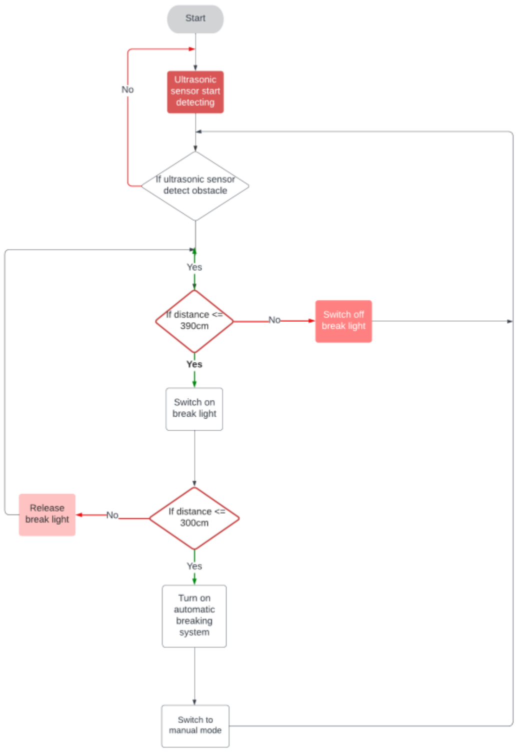

Figure 2: Flowchart for ultrasonic sensor

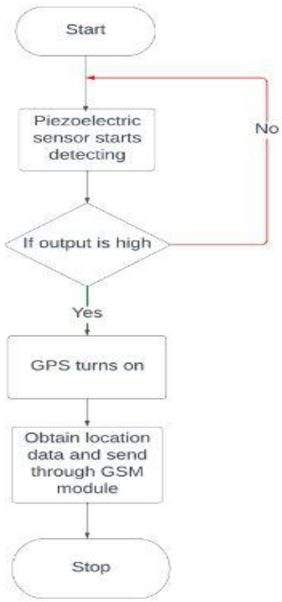

Figure 3: Flowchart for GPS and GSM module

The smart driver assistance system will be depicted by two flowcharts: one illustrating the operation of the ultrasonic sensor (Figure 2), and the other detailing the functioning of the GSM and GPS module (Figure 3).
In Figure 1, there are three loops present. The first loop is responsible for detecting obstacles, while the second and third loops handle distance checks. The second loop verifies a distance of 390 cm, whereas the third loop checks for a distance of 300 cm. Following the completion of these loops, the system transitions into manual mode before resuming the process.
In Figure 2, there is a single loop responsible for monitoring the sensor's detection threshold. When the threshold is detected, the operation continues. Conversely if the threshold is not detected, the loop will repeat.

D. Future Scope

The focus of this project is to implement an automatic system aimed at reducing vehicle collisions and minimizing loss of life. This system proposes to replace manual inspections with the use of YOLO v5, which is considered the most powerful object detection algorithm available. By utilizing YOLO v5, the accuracy of the entire project will improve, resulting in a decreased chance of accidents occurring. The images stored in YOLO v5 are compared with the driver, and in the event of a mismatch, a warning indication will be provided to the driver within one second.

IV. RESULTS

We utilized an ultrasonic sensor to measure the distance of a vehicle. If the distance is found to be less than 390 cm, the brake lights start blinking (indicated by a red LED) and buzzer will produce sound. The measurement process continues, and if the distance falls below 300 cm, a blue LED is activated and also buzzer will produce sound. Consequently, the vehicle initiates the braking procedure.
A piezoelectric sensor detects and measures the applied threshold. If the measured threshold exceeds 500 ohms, the GPS system will determine the location, and a message will be sent via GSM to the appropriate authority.

V. CONCLUSION

The system is equipped with mechanisms to prevent accidents and detect obstacles in front of the vehicle, thereby reducing the severity of potential accidents. It comprises various types of sensors, microcontrollers, and other components, which facilitate easier and more affordable maintenance of the system. When integrated into a vehicle, this system assists drivers in enhancing both the safety of the driver and the vehicle.

REFERENCES:

1. P. A. Shinde and Y. B. Mane, "Advanced vehicle monitoring and tracking system based on Raspberry Pi," 2015 IEEE 9th International Conference on Intelligent Systems and Control (ISCO), Coimbatore, India, 2015, pp. 1-6, doi: 10.1109/ISCO.2015.7282250.
2. T. Wang, Y. Chen, X. Yan, W. Li and D. Shi, "Assessment of Drivers' Comprehensive Driving Capability Under Man-Computer Cooperative Driving Conditions," in IEEE Access, vol. 8, pp. 152909152923,2020,doi:10.1109/ACCESS.2020.3016834.
3. T. Ogitsu and H. Mizoguchi, "A study on driver training on advanced driver assistance systems by using a driving simulator," 2015 International Conference on Connected Vehicles and Expo (ICCVE), Shenzhen, China, 2015, pp. 352-353, doi: 10.1109/ICCVE.2015.70.
4. M. Mody et al., "High Performance Front Camera ADAS Applications on TI's International Conference on High Performance Computing (HiPC), Bengaluru, India, 2015, pp. 456-463, doi: 10. TDA3X Platform," 2015 IEEE 22nd 1109/HiPC.2015.56.
5. M. Shao and X. Sui, "Study on Differential GPS Positioning Methods," 2015 International Conference on Computer Science and Mechanical Automation (CSMA), Hangzhou, China, 2015, pp. 223-225, doi: 10.1109/CSMA.2015.51.
6. K. Chen, T. Yamaguchi, H. Okuda, T. Suzuki and X. Guo, "Realization and Evaluation of an Instructor-Like Assistance System for Collision Avoidance,"in IEEE Transactions on Intelligent Transportation Systems, vol. 22, no. 5, pp. 2751-2760, May 2021, doi: 10.1109/TITS.2020.2974495.
7. T. Sorwar, S. B. Azad, S. R. Hussain and A. I. Mahmood, "Real-time Vehicle monitoring for traffic surveillance and adaptive change detection using Raspberry Pi camera module," 2017 IEEE Region 10 Humanitarian Technology Conference (R10-HTC), Dhaka, Bangladesh, 2017, pp. 481-484, doi: 10.1109/R10-HTC.2017.8289003.
8. G. Yang et al., "Face Mask Recognition System with YOLOV5 Based on Image Recognition," 2020 IEEE 6th International Conference on Computer and Communications (ICCC), Chengdu, China, 2020, pp. 1398-1404, doi: 10.1109/ICCC51575.2020.9345042.
9. J. -S. Kang, J. Kim and M. Lee, "Advanced driver assistant system based on monocular camera," 2014 IEEE International Conference on Consumer Electronics (ICCE), Las Vegas, NV, USA, 2014, pp. 55-56, doi: 10.1109/ICCE.2014.6775905.
10. S. M. Sarala, D. H. SharathYadav and A. Ansari, "Emotionally Adaptive Driver Voice Alert System for Advanced Driver Assistance System (ADAS) Applications," 2018 International Conference on Smart Systems and Inventive Technology (ICSSIT), Tirunelveli, India, 2018, pp. 509-512, doi: 10.1109/ICSSIT.2018.8748541.
11. M. Ali, S. Abdullah, C. S. Raizal, K. F. Rohith and V. G. Menon, "A Novel and Efficient Real Time Driver Fatigue and Yawn Detection-Alert System," 2019 3rd International Conference on Trends in Electronics and Informatics (ICOEI), Tirunelveli, India, 2019, pp. 687-691, doi: 10.1109/ICOEI.2019.8862632.
12. A. A. Osuwa, E. B. Ekhoragbon and L. T. Fat, "Application of artificial intelligence in Internet of Things," 2017 9th International Conference on Computational Intelligence and Communication Networks (CICN), Girne, Northern Cyprus, 2017, pp. 169-173, doi: 10.1109/CICN.2017.8319379.

13. JianShen and E. S. Ebbini, "Filter-based coded-excitation system for high-speed ultrasonic imaging," in IEEE Transactions on Medical Imaging, vol. 17, no. 6, pp. 923-934, Dec. 1998, doi: 10.1109/42.746625.
14. Li Tianze, Zhang Xia, Jiang Chuan and Hou Luan, "Analysis of the characteristics of piezoelectric sensor and research of its application," 2009 18th IEEE International Symposium on the Applications of Ferroelectrics, Xian, 2009, pp. 1-4, doi: 10.1109/ISAF.2009.5307537.
15. F. Wang, N. Ma and H. Inooka, "A driver assistant system for improvement of passenger ride comfort through modification of driving behaviour," 2001 ADAS. International Conference on Advanced Driver Assistance Systems, (IEE Conf. Publ. No. 483), Birmingham, UK, 2001, pp. 38-42, doi: 10.1049/cp: 20010494.