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Smart Driver Assistance Using Augmented Reality

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Abstract: Augmented Reality (AR) technology enables users to monitor the real world through augmented glasses. The objective of this work is real-time monitoring of the instant location of vehicles, contributing to smart driver assistance. Through this effort, there is a possibility to prevent accidents by displaying real-time data on the Liquid Crystal Display (LCD) Unit via the Augmented glasses. Hence, this endeavor is beneficial for protecting the lives of the drivers as well as the vehicles.
Keywords: Augmented Reality, Smart Driver Assistance, Liquid Crystal Display, Real-Time Data, Augmented Glasses.

I. INTRODUCTION

Today, the integration of the Internet of Things (IoT) and AR is reshaping various sectors [1]. Especially, transportation infrastructure to smart homes. The convergence of these technologies, known as IoT-AR or AR-IoT, promises a more immersive and realistic experience. Manufacturers are increasingly exploring or implementing AR alongside IoT devices and other smart engineering solutions to gain a competitive edge. The integration of AR technologies with rapid prototyping is revolutionizing production processes, enabling firms to significantly reduce the time to market for their products [2].

This paper conducts a literature review in Section 2, evaluates existing systems in Section 3, articulates motivation in Section 4, proposes new contributions in Section 5, and finally concludes in Section 6.

II. LITERATURE SURVEY

Samarendra Nath et al. [3] discussed the enhanced sensitivity and faster response time of sensors, particularly in measuring gases like smoke. This capability enables the updating of security measures to prevent accidents and protect the lives and property of drivers and passengers. Even in the event of contamination, the system can continue to operate for a certain period, mitigating potential risks.

Additionally, the system features a web access function facilitated by an Arduino Ethernet expansion board, allowing for the exchange of information between users and the system via POST requests and PHP applications.

Regarding the detection of unlicensed taxis, Tsugunosuke Sakai et al. [4] explored the use of a bicycle preparation system to identify obstacles on the road and distinguish between vehicles. Ismail Ben Abdallah et al. [5] highlighted the use of multiple sensors to track vehicles, though the high cost of radar, lidar, and cameras remains a challenge. S. H. Teay et al. [6] emphasized the importance of vehicle infrastructure communication in reducing accidents and enhancing transportation safety.

Scihan Gercek et al. [7] discussed how transportation facilitates human movement, with recent advancements in embedded electronic systems and communication technologies leading to the development of intelligent vehicle systems.

The emergence of Industry 4.0 has further propelled the Internet of Things (IoT) technology, leading to the creation of the Internet of Vehicles (IOV) [8],[9]. Smart vehicle systems embedded with sensor infrastructure enable safe navigation, traffic control, and pollution management, revolutionizing traditional transportation methods [10].

This paper introduces a novel vehicle control system leveraging the Internet of Things and augmented reality, offering enhanced capabilities compared to existing methods.

Furthermore, the system's analysis is based on the current IoT infrastructure, positioning it as a promising solution for improving transportation safety and efficiency.

III. PROBLEM STATEMENT

The conventional approach to detecting concealed patterns relies on a network of mobile wireless ZigBee sensors. These sensors gather data from an embedded wireless sensor matrix and synthesize it into real-time graphics. The identified problem entails the development of an innovative approach to effectively analyze a wide range of elements and their respective internal states

IV. MOTIVATION FOR THIS WORK

Introducing an application that integrates AR devices and sensors, motivated by the pursuit of innovation. Networks and vision science converge to provide a novel approach to analyzing internal states. The presented application serves as a model, marking the initial stride toward future industrial production for moisture measurement and analysis.

V. PROPOSED SYSTEM

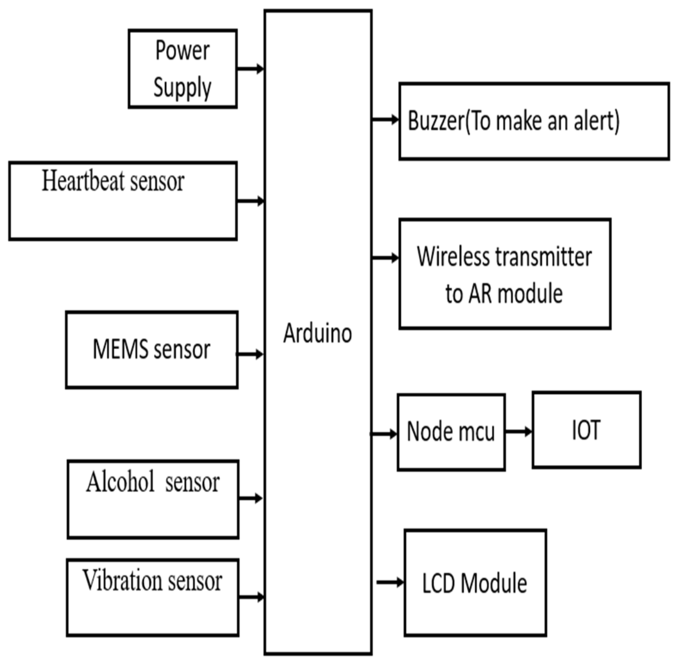
This project showcases the visualization of sensor data on an LCD panel, demonstrating the immediate detection of changes in sensor states, whether in amplitude or location, by the user's body. Augmented reality visualizations offer users instant insights into the nature of the displayed content. Furthermore, the data displayed on the LCD panel, directly connected to the Organic Light Emitting Diode, is mirrored on AR glasses, allowing for real-time monitoring. In case of anomalies, alerts are promptly shown, enhancing user awareness and safety.

A. Methodology

The AR Interactive Vehicle Display, a transparent interface, enables passengers to engage with augmented reality content while in transit. Instantly presenting visual information within their line of sight, the system offers adaptability across various modes of transportation, seamlessly integrating into vehicle windows, manuals, and personal devices.

B. Transmitter Section

The block diagram Fig.1 comprises an Arduino Fig.1 Transmitter Module block diagram



ATmega328 serves as the central hub where all sensors are interfaced. Connected sensors include the Heartbeat Sensor, Moisture Sensor, Gas Sensor, and Vibration Sensor. To power these sensors, a 12V power supply and MCU are utilized, along with a buzzer for alerting purposes. Sensor data is visualized on an LCD, while simultaneously mirrored onto AR glasses through the Receiver Module.

C. Receiver Section

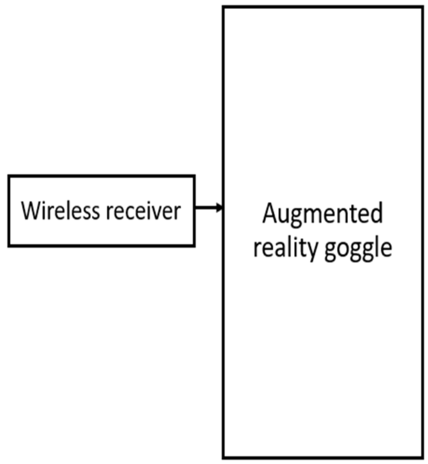


Fig.2. Receiver Module block diagram

The Receiver Module Block diagram, consists of the wireless receiver and the Augmented Reality goggles, as shown in Fig. 2. The wireless receiver receives data from the transmitter module, and that data is displayed in the Augmented Reality goggles.

D. Augmented Reality Module

Augmented reality is an approach to reality in which physical objects are connected to virtual objects through computer-generated data. AR has evolved from a scientific fantasy into a well-established scientific discipline. However, the value of augmented reality has been somewhat limited thus far. AR can be made more accurate using smartphones, tablets, smart glasses, and even headsets at competitive prices. Today, Mobile Augmented Reality (MAP) is at the center of a cycle of technological excitement that attracts research and industry attention. Therefore, with the development of smart mobile devices, many applications, services, and content have expanded. With the support of these computing devices, the focus is on expanding the perception of the real world using mobile devices, presenting virtual images that go beyond the physical experience.

E. Graph Results

Fig.3 Graph of IOT data log.

The results are displayed in the form of a graph on the IoT website. The graph shows the output of various sensors, such as Gas Sensor, Vibration Sensor, Heart Beat Sensor, Ultrasonic sensors, and Micro Electro Mechanical System Sensors, as shown in Fig. 3.

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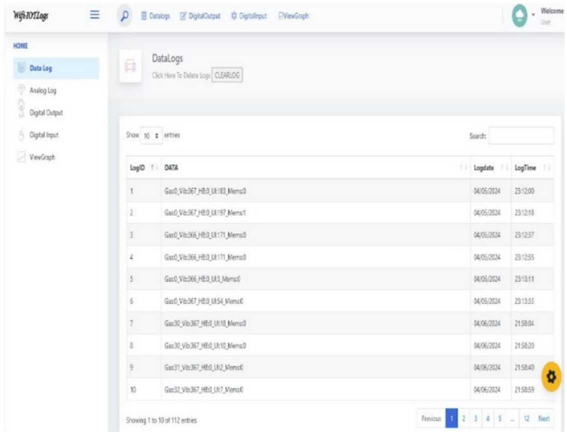

Fig.4 Image of IOT webpage.

F. Hardware

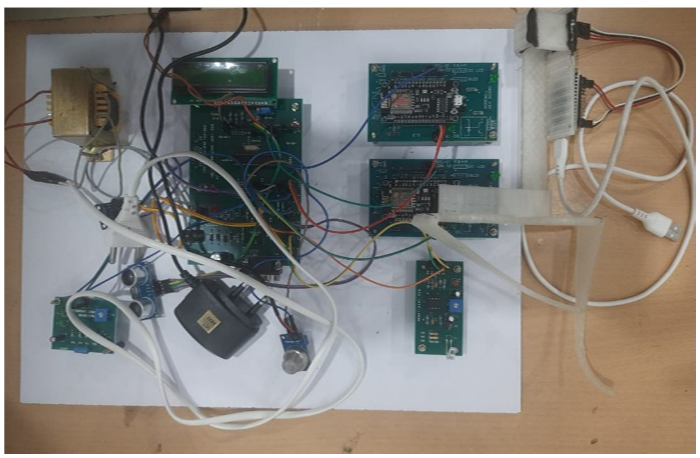

Fig.5 Image of Hardware kit.

This is the hardware kit for Smart Driver Assistance using AR. We have deployed all the sensors and connected Arduino, Node Micro Controller Unit, AR module, and a 12V power supply.

G. IoT Software Platform

As seen in Fig.4, the most important part of the system architecture is the IoT software platform used to store data received from IoT sensors. IoT cloud platforms provide a powerful way to store data collected by sensors and should offer close access to this data from anywhere. For this project, the cloud data is displayed on the platform for the AR system. The IoT platform provides all the functions of an IoT cloud platform. It introduces the concept of channels to send data from sensor nodes to the cloud. Each channel is allowed to store up to eight locations of up to 255 characters. Additionally, all data sent via the IoT Channel is timestamped and verified using an identification number. It is important to note that these channels can be private or public, and they are also associated with Uniform Resource Locators (URLs) that can be used to embed images into our AR applications.

VI. CONCLUSION

The implementation of Smart Driver Assistance utilizing Augmented Reality Glasses encompasses the precise measurement of sensor ranges, ensuring the utmost safety for both the driver and the vehicle. Leveraging the Internet of Vehicles enables the acquisition and refinement of IoT data, thereby enhancing system analysis. This functionality presents a sufficient opportunity for ongoing refinement, facilitating the identification and localization of diverse variables. Moreover, this initiative extends beyond safeguarding the lives of occupants within the vehicle, extending its protective reach to those sharing the road, thus epitomizing a comprehensive approach to road safety.

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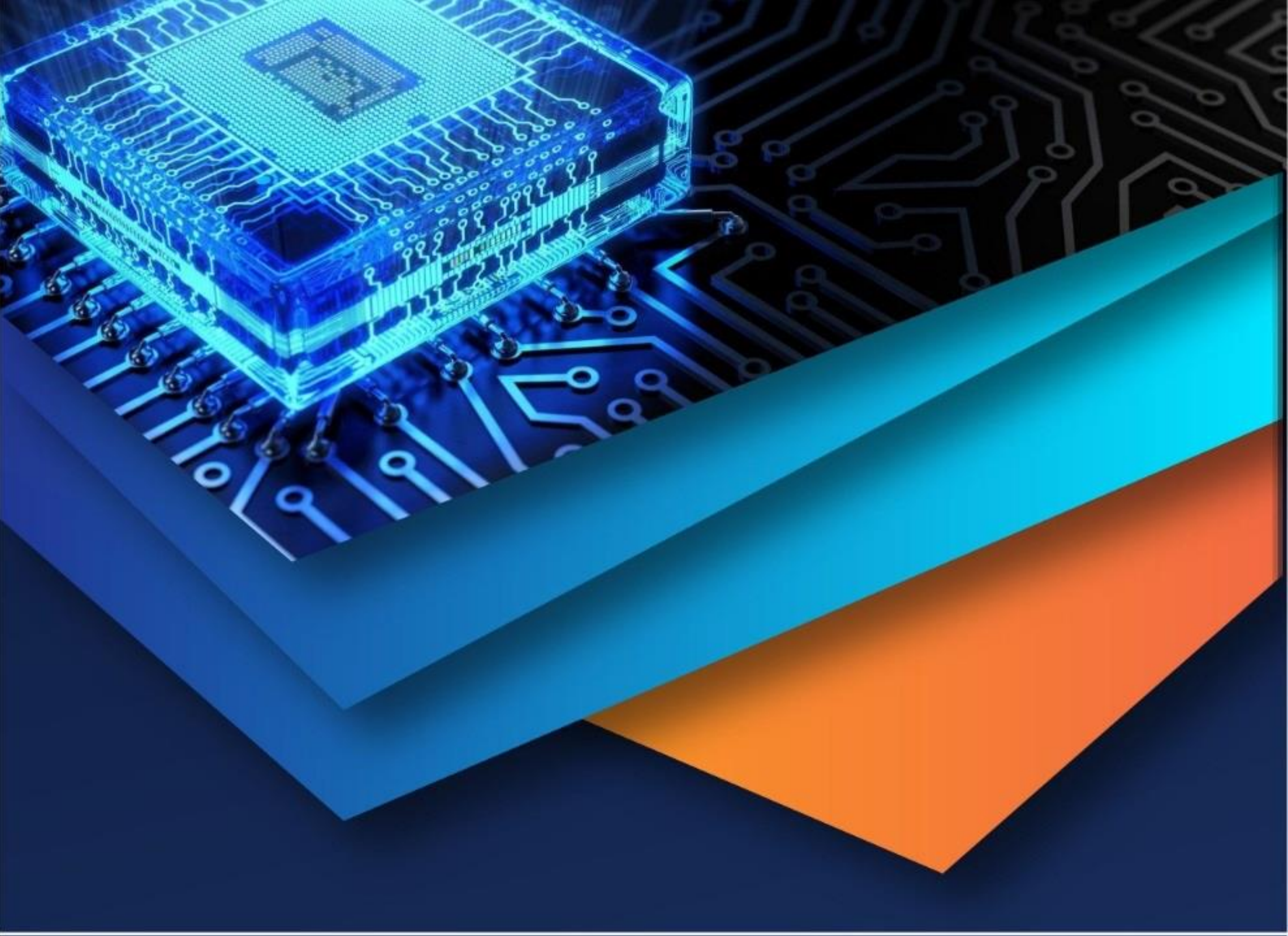

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