International Journal of Advanced Research

in Electrical, Electronics and Instrumentation Engineering

Smart Vehicle Safety Enhancement using Node MCU and Integrated Sensor Technology

Mr.S. Srikanth[1], L.Anuhya[2], M. Himaja[3], P. Vandhana[4]

Assistant Professor, Department of Electronics and Communication Engineering, Malla Reddy Engineering College for Women, Hyderabad, Telangana, India[1]

UG Scholar, Department of Electronics and Communication Engineering, Malla Reddy Engineering College for Women, Hyderabad, Telangana, India[2,3,4]

ABSTRACT: This Smart Vehicle Safety Enhancement System seeks to address these concerns through innovative technology integration. Vehicle safety remains a critical concern in modern transportation. This system makes use of the Node MCU's capabilities and the ESP8266's power for dependable wireless communication, enabling real-time data transmission and remote monitoring. The addition of a GPS module makes it possible to precisely track a vehicle's location and provides important information about its position and movement.

The accelerometer detects sudden motion changes, like sudden braking or collisions, which could indicate potential dangers or accidents. Supplementing this, a water level sensor screens the general climate for indications of flooding or water collection that could think twice about security. The system has a buzzer that goes off when there are immediate threats or anomalies to ensure quick response in critical situations.

I. INTRODUCTION

Integrating cutting-edge technologies to improve vehicle safety is essential in a time when road safety has emerged as a major concern. This venture centers around fostering a savvy vehicle security upgrade framework utilizing Node MCU and incorporated sensor innovation. This system aims to provide real-time monitoring and alerts, significantly increasing vehicle safety, by utilizing the ESP8266, GPS, accelerometer, buzzer, and water level sensor's capabilities.

The ESP8266 microcontroller provides power to the Node MCU, which acts as the central hub for processing and communication. It enables real-time data acquisition and processing by facilitating seamless sensor integration. When it comes to keeping an eye on vehicle movements and spotting potential dangers, the GPS module provides precise location tracking. The accelerometer is essential for identifying abrupt driving conditions or collisions because it measures the vehicle's acceleration and detects sudden movements or impacts.

II. EXISTING SYSTEM

In the current frameworks for vehicle security improvement, various sensors and advancements are frequently used to give fundamental wellbeing highlights. Utilizing ultrasonic sensors, cameras, and radar, these systems typically concentrate on particular safety features like collision avoidance, lane departure warnings, or blind spot detection. Additionally, they may include accelerometers for triggering airbags or emergency braking systems in response to sudden deceleration or impacts.

Be that as it may, these frameworks are for the most part restricted in degree and need far reaching combination with brilliant advances like the Web of Things (IoT) for constant checking and alarms. GPS's potential for safety purposes, such as tracking a vehicle's location in an emergency, is not fully utilized because it is frequently limited to navigation. Moreover, water level sensors are seldom integrated into vehicle wellbeing frameworks, which could be vital for distinguishing potential flood conditions and giving opportune alarms to forestall water-related mishaps.

2.1 DISADVANTAGES
•Reconciliation and Adjustment Difficulties
•Ecological Awareness
•Intricacy in Investigating and Support
•Network Reliance

III. PROPOSED SYSTEM

Using the NodeMCU (ESP8266) as the central controller, the proposed Smart Vehicle Safety Enhancement System is intended to provide comprehensive safety monitoring for automobiles. This framework coordinates numerous sensors, including a GPS module, accelerometer, ringer, and water level sensor, to upgrade vehicle security by observing different natural and vehicular circumstances. The ESP8266 processes information from these sensors progressively, permitting the framework to recognize possible dangers and go to preventive lengths

The GPS module ceaselessly tracks the vehicle's area, empowerinhe framework to give exact area information in crises. This element is especially helpful in circumstances like mishaps or abrupt stops, where fast reaction times are critical. The framework can consequently send the vehicle's GPS directions to crisis contacts or administrations, guaranteeing brief help when required.

3.1 ADVANTAGES
•Continuous Checking and Alarms
•Area Following
•Improved Driver Mindfulness
•Wellbeing and Security Improvement

IV. LITRATURE SURVEY

[4.1] M. Milera, F. Todic, and M. Ševrovic, "Extracting accurate location information from a highly inaccurate traffic accident dataset: A methodology based on a string-matching technique", Elsevier Transportation Research Part C, 68(2016), 185–193, 2016.

ABSTRACT

Mistaken area information in auto collision datasets can altogether frustrate powerful traffic the board and mishap examination. This paper presents a clever system for extricating precise area data from an exceptionally incorrect car crash dataset utilizing a string-matching strategy. Preprocessing the dataset is part of the proposed strategy for locating recurring patterns and inconsistencies in the recorded location data. We correct and standardize location descriptions using sophisticated string-matching algorithms to improve the reliability of the data. On a dataset of real-world traffic accidents, we tested our method and found that location accuracy and consistency improved significantly.

[4.2] R. K. Kodali, and S. Sahu, "MQTT based vehicle accident detection and alert system", IEEE 3rd International Conference on Applied and Theoretical Computing and Communication Technology (iCATccT), 186-189, 2017.

ABSTRACT

In order to cut down on response times and increase the efficiency of emergency services, it is essential to detect vehicle accidents and provide prompt alerts. A novel vehicle accident alert and detection system based on the MQTT protocol is proposed in this paper. The system monitors parameters like impact force and vehicle orientation with a varieof sensors to identify potential accidents. After identifying a mishap, the framework utilizes the MQTT convention to communicate an alarm message containing the vehicle's area and mishap subtleties to a focal server and assigned crisis contacts. The utilization of MQTT guarantees effective, dependable, and low-inertness correspondence, making the framework appropriate for constant applications. The proposed solution was put through its paces in a variety of situations, proving that it can quickly and accurately identify accidents and notify the appropriate parties, potentially shortening the time it takes to provide emergency assistance.

V. BLOCK DIAGRAM
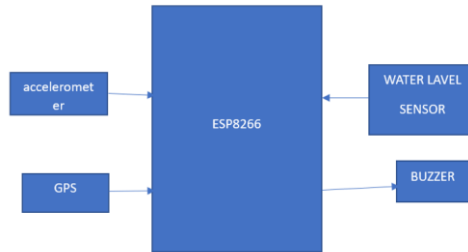
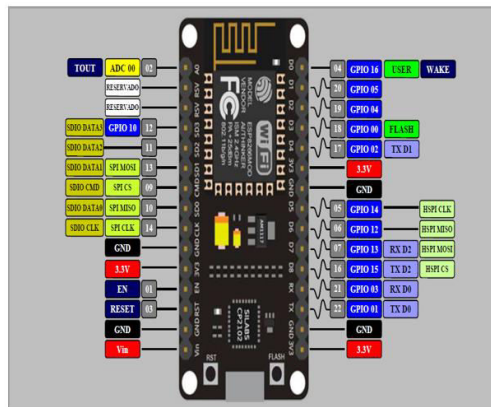## VI. HARDWARE REQUIREMENTS

- ESP8266
- ACCELEROMETER
- WATER LEVEL SENSOR
- BUZZER

VII. SOFTWARE REQUIREMENT

- ARDUINO IDE

VIII. HARDWARE DESCRIPTION

8.1 ESP8266

The ESP8266 is an extremely easy to understand and minimal expense gadget to give web network to your undertakings. The module can work both as a Passage (can make area of interest) and as a station (can interface with Wi-Fi), thus it can undoubtedly get information and transfer it to the web making Web of Things as simple as could really be expected. It can likewise bring information from web utilizing Programming interface's subsequently your venture could get to any data that is accessible in the web, in this manner making it more brilliant. This module's ability to be programmed with the Arduino IDE, which makes it significantly more user-friendly, is yet another exciting feature. Although you can hack it to use up to four GPIO pins, this module only has two, so you'll need to use it with another microcontroller like Arduino. Alternately, you can look into the more standalone ESP-12 or ESP-32 versions. This module is therefore the best option for you if you want to get started with IOT or connect your project to the internet.

8.2 ACCELEROMETER
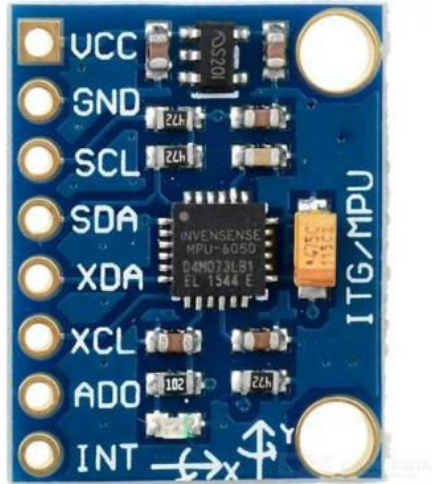
An object's orientation and angular velocity can be measured and maintained by a gyroscope sensor. Accelerometers are obsolete in comparison to these. These can quantify the slant and horizontal direction of the article though accelerometer can gauge the straight movement.Angular rate and velocity sensors are other names for gyroscope sensors. These sensors are introduced in the applications where the direction of the article is hard to detect by people.

The change in the object's rotational angle per unit of time is referred to as its angular velocity, which is expressed in degrees per second.

8.3 WATER LAVEL SENSOR

Level sensors are mostly used to keep an eye on and control the amount of a particular free-flowing substance in a small area. These substances are typically fluid, be that as it may, level sensors additionally, and used to screen a few solids like powdered substances. Level sensors broadly utilized mechanically, as level goes about as a significant checking boundary.

This is a minimal expense simple to utilize. This water level sensor module has a progression of equal presented follows to quantify beads/water volume to decide the water level. Exceptionally Simple to screen water level as the result to a simple sign is straightforwardly corresponding to the water level.

8.4 BUZZER

A ringer or beeper is a sound flagging gadget, which might be mechanical, electromechanical, or piezoelectric (piezo for short). Alarm clocks, timers, and confirmation of user input like a mouse click or keystroke are all common applications for buzzers and beepers. A buzzer is a small but effective component that can be used to add sound features to our project or system. It is tiny and smaller 2-pin structure consequently can be handily utilized on breadboard, Perf Board and, surprisingly, on PCBs which makes this a broadly involved part in most electronic applications.

IX. SOSTWARE DICRIPTION

9.1 ARDUINO IDE

Programs composed utilizing Arduino Programming (IDE) are called draws. The file extension.ino is used to save these sketches, which were written in the text editor. The editor has tools for searching and replacing text as well as cutting and pasting. The message region gives input while saving and trading and furthermore shows blunders. The Arduino Software (IDE) outputs text to the console, which includes all of the information, including complete error messages. The base righthand corner of the window shows the designed board and sequential port. You can open the serial monitor, create, open, and verify programs, and upload and upload programs using the toolbar buttons.

X. CONCLUSTION

By providing comprehensive monitoring and alerting capabilities, the Smart Vehicle Safety Enhancement system, which makes use of NodeMCU and a variety of integrated sensors, effectively improves vehicle safety. Real-time data processing and remote communication are made possible by the ESP8266 module's seamless connectivity. By detecting sudden changes in vehicle acceleration, which could indicate unsafe driving conditions or collisions, the accelerometer improves safety. The GPS module provides precise location tracking, which is essential for responding to emergencies and monitoring routes. Also, the water level sensor forestalls issues connected with flooding or water entrance, while the bell gives prompt cautions to basic occasions. By utilizing cutting-edge technology and effectively integrating multiple sensors, this system offers enhanced protection and demonstrates a significant improvement in vehicle safety. These capabilities could be further refined in future developments, resulting in even greater safety and dependability.

REFERENCES

[1] "Extracting accurate location information from a highly inaccurate traffic accident dataset:" by M. Milera, F. Todic, and M. evrovic. A string-matching-based methodology," Elsevier Transportation Research Part C, 68 (2016): 185–193, 2016.

[2] "MQTT based vehicle accident detection and alert system," by R. K. Kodali and S. Sahu, 186-189, IEEE 3rd International Conference on Applied and Theoretical Computing and Communication Technology (iCATccT), 2017.

[3] "Universal safety distance alert device for road vehicles," by M. Virant and M. Ambro, MDPI Electronics, 5(19), 1-17, 2016.

[4] A. Parmar, K. Parmar, D. Patel, M. Darji, and M. Sanathra, "Car accident detection and notification: a logical review", Worldwide Exploration Diary of Designing andInnovation, 6(8), 1465-1468, 2019.

[5] L. A. Ajao, J. Agajo, O. M. Olaniyi, I. Z. Jibril, A. E. Sebiotimo, "A safe followingauto framework for oil and gas conveyance utilizing telematics and blockchain methods",Balkan Diary of Electrical and PC Designing, 7(3), 257-268, 2019.

[6] J. Agajo, J. G. Kolo, L. A. Ajao, K. Y. Olusola, and A. Ruler, "Hardware and securitywork force following and restriction utilizing GPS/GSM geo-area strategy integratingublox Neo 6 GPS module", Diary of Designing and Innovation (Stream), 7(2), 87-102, 2016.
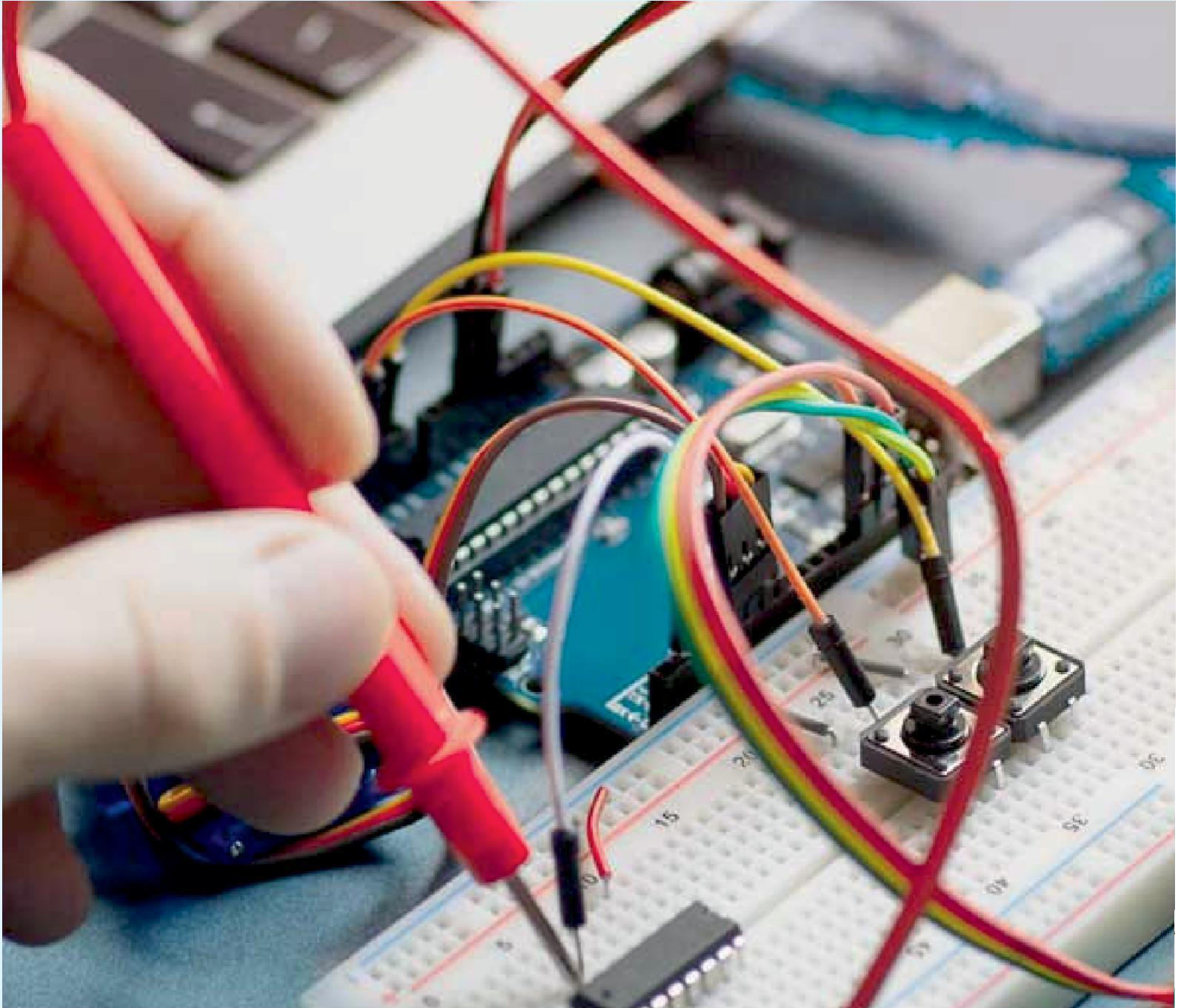
International Journal of Advanced Research

in Electrical, Electronics and Instrumentation Engineering

📱 **9940 572 462** 🟢 **6381 907 438** ✉️ **ijareeie@gmail.com**