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Vehicle Accident Alerting System

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Abstract - This journal presents a detailed exploration of the design, development, and implementation of a vehicle accident alerting system aimed at significantly enhancing road safety and improving emergency response to accidents. The system employs a multi-faceted approach, integrating advanced sensor technology, real-time data processing algorithms, and efficient communication protocols to detect accidents promptly and notify emergency services and relevant stakeholders.

The core components of the system include sensors strategically installed within vehicles to monitor motion, orientation, and environmental conditions. These sensors provide raw data, which is processed in real-time using sophisticated algorithms to detect patterns indicative of potential accidents. The system incorporates confirmation mechanisms to reduce false positives and accurately assess the severity of detected events.

***Key Words*:** Accident detection, alert system, GPS, GSM, Accelerometer, Android application.

1.INTRODUCTION

With the increasing number of vehicles on roads worldwide, ensuring road safety has become a paramount concern. Accidents not only result in loss of lives and property damage but also pose significant challenges to emergency response systems, often leading to delayed intervention and increased severity of injuries. In response to these challenges, there is a growing need for innovative solutions that leverage technology to improve accident detection and facilitate rapid emergency response.

This journal introduces a comprehensive project focused on the development and implementation of a Vehicle Accident Alerting System. The system aims to revolutionize road safety by leveraging advancements in sensor technology, real-time data processing, and communication protocols to detect accidents promptly and notify emergency services and relevant stakeholders in a timely manner.

Traditional methods of accident reporting often rely on eyewitness accounts or manual intervention, leading to delays in emergency response and limited accuracy in accident detection. The Vehicle Accident Alerting System presented in this journal addresses these limitations by harnessing the power of technology to automate accident detection and alerting processes..

2. DESCRIPTIONS

The vehicle accident alerting system project journal provides a detailed account of the development and implementation of an innovative system aimed at enhancing road safety. The journal begins with an introduction outlining the project's motivation and objectives, followed by a literature review summarizing existing research in the field. The methodology section describes the approach taken in designing the system, including sensor selection, algorithm development, and communication protocols. The system architecture is then discussed, detailing the components and their interactions. Implementation challenges and solutions are explored, along with results and evaluation metrics assessing the system's performance. A discussion section analyzes findings and suggests avenues for future research. Finally, the journal concludes with a summary of key insights and implications for road safety technology.

2. LITERATURE REVIEW

The literature review section of the vehicle accident alerting system project journal provides a comprehensive overview of existing research and developments in the field of automated accident detection and alerting systems. It covers a range of topics, including sensor technologies, algorithmic approaches, communication protocols, and real-world implementations. The review begins by examining the prevalence and impact of road traffic accidents globally, highlighting the need for effective accident alerting systems. It then surveys previous studies on sensor selection and integration, discussing the strengths and limitations of various sensor types, such as accelerometers, gyroscopes, and GPS. Algorithmic approaches for accident detection and confirmation are explored, including rule-based methods, machine learning models, and hybrid approaches combining multiple techniques. Communication protocols for transmitting accident alerts to emergency services and stakeholders are also reviewed, with a focus on reliability, latency, and scalability. Finally, the review identifies gaps in current research and outlines the objectives and contributions of the present study in addressing these gaps.

Mr. S. Kailasam, Mr. Karthiga, Dr. Kartheeban, R.M. Priyadarshani, K Anithadevi[1] states that due to lack of attention, Drowsiness, and drunk driving are the major causes of road accidents, this paper proposes preparing a system to prevent these circumstances. The proposed system herein aims at preventing and controlling accidents by using a Night Vision Camera. This system monitors the driver’s face when the car

starts which mainly helps in observing continuously. It uses two functions: One to detect the eye blinking, second is for reading the blinking. Automatic driving and braking systems are also combined with a controlling system using python programming. Speed is automatically reduced until the driver becomes alert and returns to consciousness. The proposed system alerts the driver depending on his state, and makes sure that he is not drowsy. However, if the driver has a medical condition or blinks at an abnormal rate despite not being drowsy, the system will give a false alarm. In the worstcase scenario, the driver happens to be in an accident, the system fails to detect the impact and contact the concerned authorities. Lastly the system would constantly consume power and drain the power supply since it monitors the driver continuously. Hence the outcome of not being able to identifying the actual accident scenario made us reject the idea of adding face recognition to our system as it would be costly, power- consuming and inefficient.

3. COMPONENTS USED

The components used are

1. 12E NODE MCU Wi -fi module
2. L298N Motor Driver Controller
3. NEO – 6M GPS module
4. LCD 1602 with i2C
5. IR Sensor
6. Lithium Battery
7. On / Off Switch
8. Gear motor Dc 12V
9. Jumper wires
10. Gear motor wheel

12E NODE MCU Wi -fi module

The ESP8266 module enables microcontrollers to connect to 2.4 GHz Wi-Fi, using IEEE 802.11 bgn. It can be used with ESP-AT firmware to provide Wi-Fi connectivity to external host MCUs, or it can be used as a self-sufficient MCU by running an RTOS-based SDK. The module has a full TCP/IP stack and provides the ability for data processing, reads and controls of GPIOs.

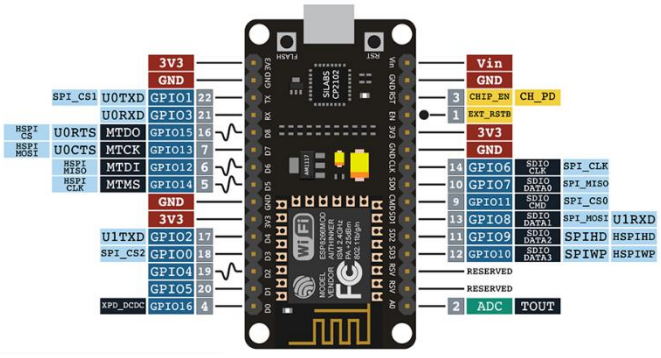

Fig. 1. ESP8266 Block Diagram

L298N Motor Driver Controller

The L298N is a popular dual H-bridge motor driver IC that can control two DC motors or one stepper motor. The "2A" in its name refers to its maximum continuous output current per channel, which is around 2 amps. The L298N module typically includes the L298N IC along with additional components like diodes, capacitors, and connectors on a PCB, making it easier to use in motor control projects. It's widely used in robotics, automation, and other applications requiring motor control.

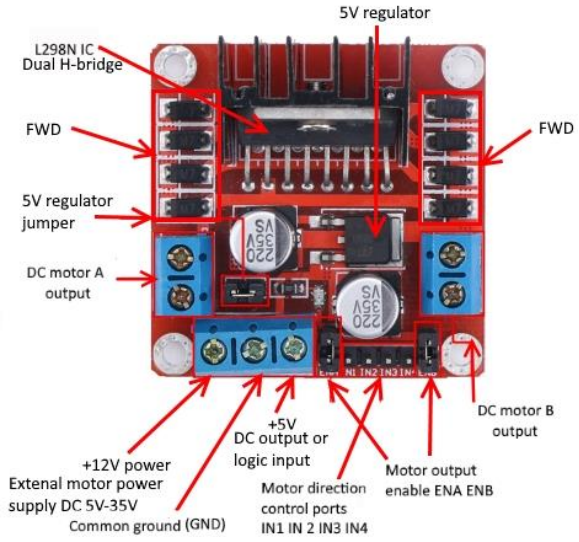

Fig. 2. L298N 2A Based Motor Driver Module

NEO – 6M GPS module

The NEO-6M GPS module is a compact and cost-effective GPS receiver module manufactured by u-blox. It is part of the NEO series of GPS modules and is designed for easy integration into projects requiring accurate GPS positioning.

Fig. 3. NE O – 6M GPS Module

LCD 1602 with i2C

LCDs are commonly used for visual output in Arduino projects. They come in various sizes, from small character displays to larger graphical displays. They are often used to show sensor readings, messages, or menu options. Character LCDs are simple displays that can show text and limited symbols. They consist of a grid of characters arranged in rows

and columns. Character LCDs commonly come in formats like 16x2 or 20x4, indicating the number of characters per row and the number of rows. Graphical LCDs can display both text and graphics. They offer more flexibility in displaying information compared to character LCDs.

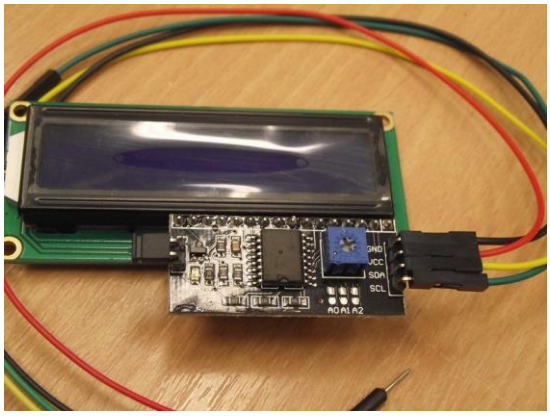

Fig. 4. LCD 1602 with i2C

IR Sensor

The IR sensor or infrared sensor is one kind of electronic component, used to detect specific characteristics in its surroundings through emitting or detecting IR radiation. These sensors can also be used to detect or measure the heat of a target and its motion. In many electronic devices, the IR sensor circuit is a very essential module. This kind of sensor is similar to human's visionary senses to detect obstacles.

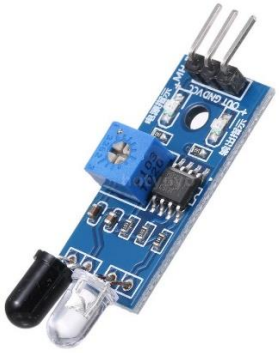

Fig. 5. IR Sensor

Lithium Battery

LithiumIon Polymer Battery - 3.7v 1200mAh: ID 258 - Lithium-ion polymer (also known as 'lipo' or 'lipoly') batteries are thin, light, and powerful. The output ranges from 4.2V when completely charged to 3.7V. This battery has a capacity of 1200mAh for a total of about 4.5 Wh.

Fig.6. Li – ion cell 1200mah

On / Off Switch

On/off switches come in various forms, including toggle switches, rocker switches, push-button switches, and rotary switches. They are ubiquitous in everyday devices such as lamps, appliances, computers, and electronic gadgets. The simplicity and effectiveness of on/off switches make them indispensable for controlling power in countless applications, providing users with convenience, safety, and energy efficiency.

Fig. 7. On-Off Switch

Gear motor Dc 12V

A 60 RPM geared motor DC 12V is a type of direct current (DC) motor with a gear reduction mechanism designed to operate at a speed of 60 rotations per minute (RPM) when powered by a 12-volt DC power source

Fig.8. Geared Motor DC 12V

Jumper wires

Jumper wires are electrical wires with connectors on each end used to create temporary connections between electronic components on a breadboard, circuit board, or between different components in a circuit.

Fig. 9. Jumper Wires

FUTURE ENHANCEMENT

The proposed system deals with the detection of the accidents. But this can be extended by providing medication to the victims at the accident spot. By increasing the technology we can also avoid accidents by providing alerts systems that can stop the vehicle to overcome the accidents.

3. CONCLUSIONS

Speed is one of the most significant causes of an accident. Nowadays, GPS receiver has become an integral part of a vehicle. Besides using in other purposes, the GPS can also monitor the speed and detect an accident. It can use a very cheap and popular GSM modem to send the accident location to the Alert Service Centre. It can also send the last speed before accident which will helps to assess the severity of the accident and can initiate a voice call. Beside the automatic detection system, the vehicle occupant will be able to manually send the accident situation by pressing the Manual Detection Switch. A rescue measures in time with sufficient preparation at the correct place can save many life. Thus, the proposed system can serve the humanity by a great deal as human life is valuable.

BENEFITS

Rapid Emergency Response: The system notifies emergency services immediately, reducing response time and potentially saving lives.

Accurate Location Information: GPS technology ensures that the accident scene is accurately located, aiding emergency services in reaching the scene quickly.

Reducing Secondary Accidents: Prompt notification helps prevent secondary accidents by warning approaching vehicles and diverting traffic.

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