Enhanced IoT Accident Detection and Alert System

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ABSTRACT_In nations with dense populations, accidents and insufficient emergency services claim lives on a daily basis. These lives could have been saved if hospitals had been open when they were required. Smart accident detection systems are those that recognize accidents on their own. This study looks at the most recent methods for accident detection using IoT technology, followed by an analysis of challenges, obstacles, and possible future trends. The Internet of Things (IoT) enables the connection of various devices, particularly sensors, and the use of information from sensors to carry out procedures that enable the identification of accidents. This project offers a solution to this problem. A sensor will immediately identify the signal from an automobile collision and transmit it to the Arduino microcontroller. An IOT device equipped with a microprocessor and a GSM modem will transmit an alarm message containing the recipient's location and authorization. Thus, the authorized individual utilizes the IOT modem to instantaneously ascertain the location after acquiring the information. Hardware components were used to model and practically design the suggested systems, and the results are as expected. THE system's objective is to provide details about the accident's cause and location. Being able to provide the accident victim with assistance and support as soon as possible is advantageous. The IOT module in this system is used to locate the car. To disseminate accident information, GSM is employed.

1.INTRODUCTION

The Internet of Things (IoT) is the interconnection of uniquely identifiable embedded computing devices within the existing Internet infrastructure. Typically, IoT offers advanced connectivity of devices, systems, and services that goes beyond machine-to-machine communications (M2M) and covers a variety of protocols, domains, and applications. The interconnection of these embedded devices (including smart objects), is implemented in nearly all fields

of automation enabling advanced applications like a Smart Grid. The term things in the IoT refers to a wide variety of devices such as heart monitoring implants, biochip transponders on farm animals, electric clams in coastal waters, automobiles with built-in sensors, or field operation devices that assist fire-fighters in search and rescue. Current market examples include thermostat systems and washer/dryers that utilize Wi-Fi for remote monitoring. In this project we describes about “IoT BASED VEHICLE ACCIDENT DETECTION AND TRACKING SYSTEM USING GPS TECHNOLOGY”. We are using Raspberry pi in our project. When the system is switched on, LED will be ON indicating that power is supplied to the circuit. The vibration sensors that we are using in our project sense the obstacle, and then it sends interrupt to Raspberry Pi. The GPS receives the location of the vehicle that met with an accident and gives the information back. This information will be sent to a mobile number through a message. This message will be received using internet present in the circuit. The message will give the information of longitude and latitude values. Using these values the position of the vehicle can be estimated. Modem performs modulation during transmission and performs demodulation during reception.

The word "smart car" refers to a amalgamation of existing technologies such as instruments, navigation, chips, network, interfaces, and automatic braking systems. Internal connections connect every component of the gadget. The primary goal of the ready system is to set up an aid system. Here, a smart car prototype is created, which may later be used to create an application for integration with smart vehicles. This approach will provide prompt emergency assistance while reducing the factors that contribute to traffic accidents. Accident location detection systems, anti-breaking systems, and accident prevention due to the upper issue are all included in the project as proposed. If any danger happens, the accident location detecting system sends out a notification with the accident's location. is delivered to the reference contact, who can take action to control the condition if necessary. Due to the system's usage of GPS technology, operation is straightforward. The accident site's coordinates are captured by GPS, and the location contact receives them via GPS. As Arduino serves as the system's primary control component, all controls are created utilizing it. This technology will facilitate access to emergency assistance for individuals. We can save human lives by reducing the causes of traffic accidents in a timely manner. The

type of system that is the fastest-growing safety feature in the automobile sectors is the Arduino-based accident detection system. With such a system, cars can determine the likelihood of collision and provide the driver with both a visible and audible warning so that the driver may take the required precautions to prevent a accident. The ultrasonic sensor is utilized to offer an estimation of the distance between two vehicles for the deployment of this system.

Our major goal is to update our automobiles and eliminate any outdated versions from them. That will assist our folks in avoiding issues of this nature. We can defend our autos by using a gadget. We may examine a vehicle's braking system using a sensor. We are able to identify a vehicle's braking system thanks to a sensor. We are able to prevent car theft thanks to sensors. With the help of these elements, we were able to create a smart car that can prevent accidents, break-ins, and vehicle theft, so that any worry can be used everywhere by the cars. If someone tries to start the car, it may be stopped by sending a message from their own mobile device or laptop.

2. EXISTING SYSTEM

Current accident response systems heavily rely on manual intervention, where witnesses or victims themselves must place emergency calls to alert authorities. This manual process often leads to delays in response times, especially in cases where the victims are incapacitated or unable to call for help. Moreover, the accuracy of location reporting is limited to the caller's ability to convey their position.

3.PROPOSED SYSTEM

An eye blink sensor could improve the suggested Accident Detection and Alert System. This sensor records the eye blink patterns of the people within the car, giving important information about their mental and physical conditions both during and after an accident. In addition to identifying medical issues, the technology may be used to evaluate the health of the occupants and spot indicators of driver weariness. By giving real-time information regarding the collision and the possible condition of the car occupants, it can help improve contact with emergency personnel. Emergency services can receive voice and visual notifications that indicate whether or not there is a medical emergency or increased distress based on the inhabitants' eye blink patterns. Based on the occupant's eye blink data, customized messages can be delivered to designated contacts, giving context and letting them know how serious the situation is. Furthermore, eye blink

patterns can be added to data logging capabilities, allowing for a more thorough post-accident analysis for inquiries and insurance claims. This extra layer of information helps to improve the overall efficacy of the Accident Detection and Alert System by enabling more focused and educated emergency responses.

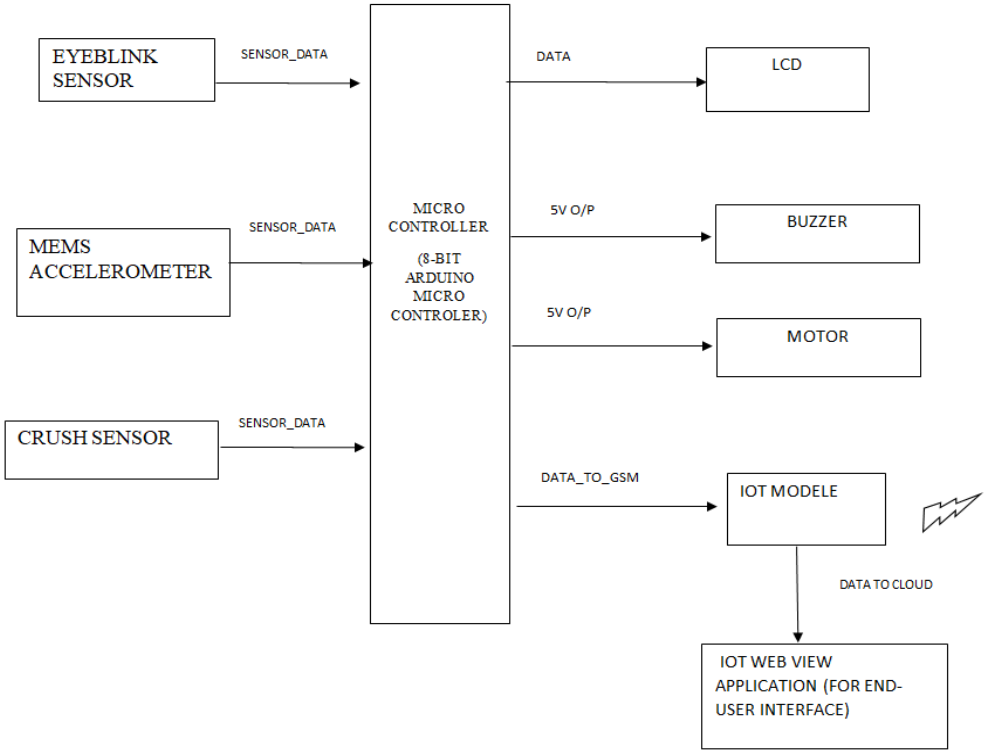


Fig 1:Block Diagram

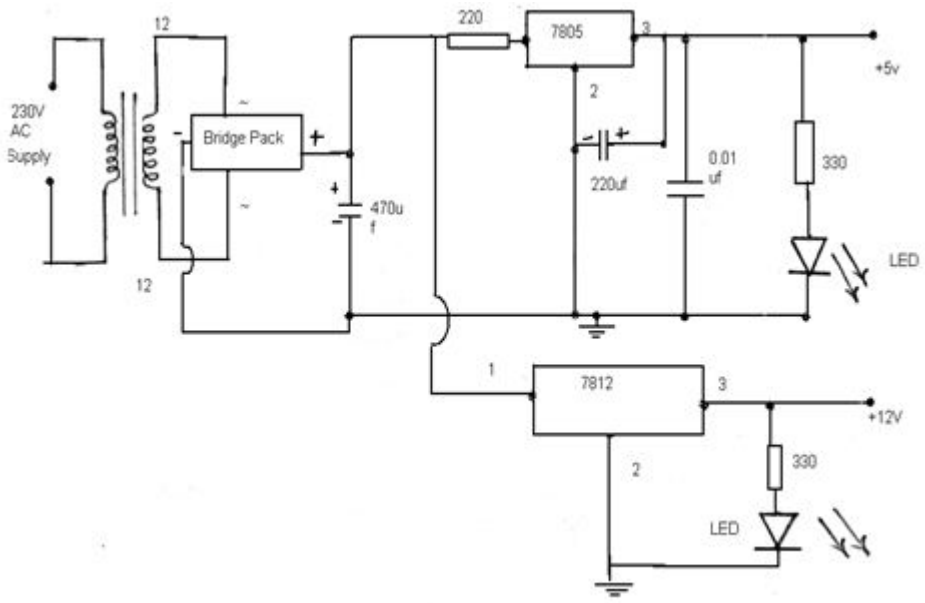


Fig 2: Circuit Diagram

4. COMPONENTS USED AND DESCRIPTION

4.1 MEMS ACCLEROMETER

MEMS accelerometers are sensors that measure acceleration forces, including gravity, and are widely used in various applications, including automotive systems, smartphones, wearable devices, and industrial equipment, including electric vehicles. They can be integrated into an AI and IoT-based electrical vehicle monitoring system to detect vehicle orientation, safety features, vibration monitoring, driver assistance systems, and energy harvesting.

Vehicle orientation detection helps determine whether the vehicle is stationary, moving, or accelerating, accurately estimating speed and motion. Safety features include detecting sudden deceleration events and triggering emergency response systems. Vibration monitoring helps identify potential issues with vehicle components, such as the battery, motor, or suspension system. Driver assistance systems, such as stability control and traction control, can be improved by continuously monitoring acceleration and deceleration.

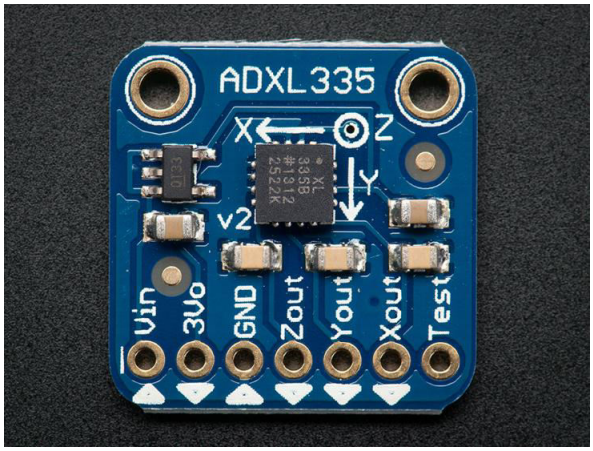


Fig 3 : MEMS ACCLEROMETER

4.2 CRUSH SENSOR

A crush sensor, also known as a force-sensitive resistor (FSR) or pressure sensor, is a type of sensor that detects physical pressure or force applied to its surface. It changes its electrical resistance in response to the amount of force applied. In the context of an electric vehicle monitoring system, a crush sensor can serve several purposes:

Safety Monitoring: Crush sensors can be strategically placed in different parts of the vehicle to detect impacts or collisions. When a significant force is applied to the sensor, indicating a crash or collision, the sensor can trigger safety systems such as airbag deployment, seat belt tightening, or emergency call systems.

Pedestrian Safety: In addition to monitoring vehicle collisions, crush sensors can also be used to enhance pedestrian safety. Placing crush sensors in the vehicle's bumpers or front end can help detect collisions with pedestrians. Upon detecting such an impact, the system can trigger alerts or deploy safety features to minimize injury to pedestrians.

Vehicle Parking Assistance: Crush sensors can aid in vehicle parking assistance systems by detecting contact with obstacles or other vehicles. When parking in tight spaces or maneuvering in crowded areas, the sensors can provide feedback to the driver, warning them of potential collisions and helping them avoid accidents.

Load Sensing: Crush sensors can also be used to monitor the distribution of weight or load within the vehicle. By measuring the force exerted on different parts of the vehicle's chassis or cargo area, the system can ensure that the vehicle remains within safe weight limits and prevent overloading, which could affect performance or safety.

Occupant Detection: In conjunction with other sensors, crush sensors can contribute to occupant detection systems. By detecting the presence and positioning of occupants in different seats, the system can adjust airbag deployment, seat belt tension, or other safety features to provide optimal protection for passengers.

Overall, crush sensors play a vital role in enhancing safety, assisting drivers, and

protecting both occupants and pedestrians in electric vehicles. By detecting and responding to physical pressure or force, these sensors contribute to the overall functionality and effectiveness of the vehicle monitoring system

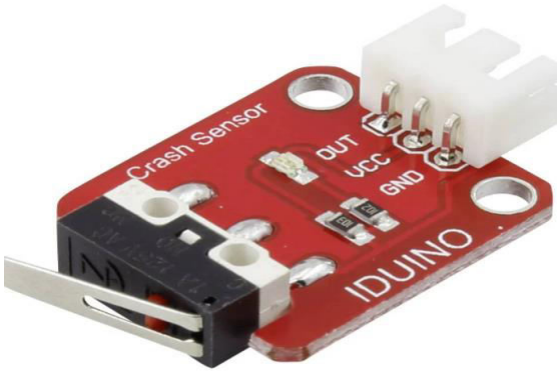


Fig 4: CRUSH SENSOR

4.3 EYE BLINK SENSOR

An eye blink sensor, also known as an eye movement sensor or blink detector, is a device that detects and measures the blinking of a person's eyes. It typically utilizes infrared light or electrodes to monitor changes in the electrical signals or reflections caused by blinking.

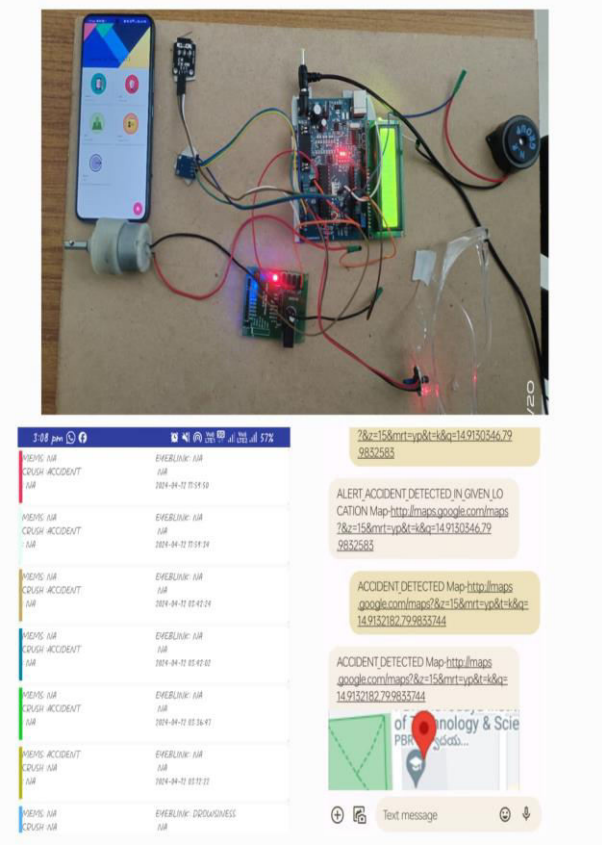
Fig 5: EYE BLINK SENSOR

4.4 GEAR MOTOR

Gear Motor: The gear motor is likely used to drive the electric vehicle. The gear motor reduces the speed of the motor and increases torque.

Fig 6: EYE BLINK SENSOR

5.RESULTS AND DISCUSSION



5.1 CRUSH ACCIDENT: -

Fig 7: Crush Accident

- Vehicle Collisions: High-speed collisions between vehicles on roads or highways can result in crush accidents, especially if the vehicles are large or heavy.
- Structural Failures: Building collapses, bridge failures, or industrial accidents can lead to crush accidents when structures collapse or collapse under load.
- Industrial Machinery Accidents: Accidents involving heavy machinery or equipment in industrial settings can cause crush injuries to workers caught between moving parts or trapped under equipment.
- Natural Disasters: Earthquakes, landslides, or avalanches can cause crush accidents by burying individuals under debris or collapsing structures.
- Crowd Disasters: Stampedes, crowd surges, or collapses in crowded spaces such as stadiums or festivals can lead to crush accidents, resulting in injuries or fatalities.

5.1.1 EYE BLINK: -

Fig 8: Eye Blink

- Blink Detection: In the field of human-computer interaction, eye blinking can be detected and used as an input signal in various applications, including assistive technologies for individuals with disabilities, user interfaces for virtual reality systems, and drowsiness detection systems in automotive safety.
- Biometric Identification: Blink patterns and characteristics can be used as biometric identifiers in security systems and authentication processes, similar to fingerprint or iris recognition.
- Health Monitoring: Abnormalities in eye blinking patterns or frequency can sometimes indicate underlying health conditions such as neurological disorders.

5.1.2 MEMS ACCELEROMETER: -

Fig 9: Mems Accelerometer

- Microfabrication: MEMS accelerometers are typically fabricated using microfabrication techniques, allowing for the integration of miniature mechanical structures, sensors, and electronic components on a single chip.
- Sensing Element: The sensing element of a MEMS accelerometer usually consists of a proof mass suspended by flexible beams or springs. When the accelerometer experiences acceleration, the proof mass moves relative to the sensor structure, causing a change in capacitance, resistance, or piezoelectric effect.

6.CONCLUSION

Safety and responsiveness are greatly increased when an accident detection and alert system is included into an electric vehicle monitoring system. The system makes use of sensors, such as eye blink sensors, accelerometers, and crush sensors, to quickly notify the driver or authorities of any possible accidents or dangerous conditions. Improved safety, help for drivers, effective emergency response, adaptable features, and smooth interaction with other car systems are just a few advantages that come with this system. In order to identify possible collisions or emergencies and to enable timely action to reduce risks and lessen the severity of accidents, the system continuously monitors driver behavior, external factors, and vehicle dynamics. It also lowers the possibility of mishaps brought on by human factors by promptly alerting users in the event of fatigue or distraction. The system provides precise information about the location and intensity of the issue, immediately initiating alerts to emergency agencies in the case of an accident. To sum up, the accident detection and alarm system plays a crucial role in an electric vehicle monitoring system by offering timely emergency reactions and preventative safety measures. The system enhances the overall safety, comfort, and dependability of electric vehicles through the utilization of sophisticated sensor technology and clever algorithms, hence encouraging their widespread adoption and augmenting the user experience.

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