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Wireless Black Box Using Mems for Vehicle Accidental Monitoring with Perfect Location and SMS Alert

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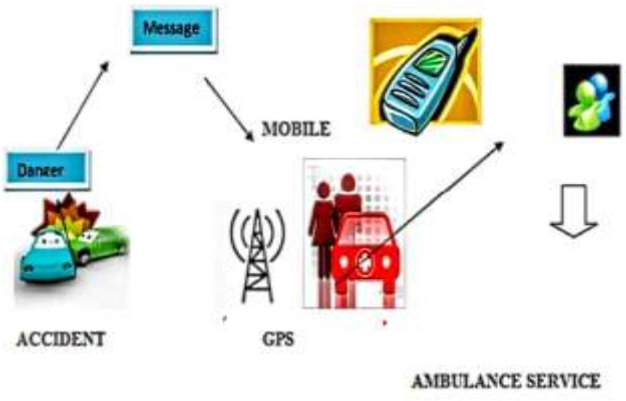
ABSTRACT-

This paper presents the design and development of an advanced wireless box using MEMS technology for vehicle accident monitoring with perfect location. The proposed system aims to detect and report vehicle accidents in real-time along with the location of the accident. The MEMS sensors incorporated in the wireless box can detect sudden changes in acceleration or other physical parameters associated with an accident. The data collected from the wireless box is transmitted to a remote server, which analyzes the data and sends notifications to the appropriate authorities or emergency services in case of an accident.

1. Introduction

Vehicle accidents are a major cause of fatalities and injuries worldwide. Accidents can occur due to various reasons, including driver error, mechanical failure, and environmental factors. In many cases, accidents go unnoticed, and it takes a significant amount of time for emergency services to arrive at the accident location. The proposed system aims to address this problem by providing real-time accident detection and reporting along with the exact location of the accident. Vehicle accidents are a major cause of fatalities and injuries worldwide. Our system aims to provide real-time accident detection and reporting along with the exact location of the accident to improve emergency response times. An advanced wireless box that utilizes MEMS (micro-electromechanical systems) technology for vehicle accidental monitoring can provide accurate location information during an accident. MEMS devices are incredibly small and can be integrated into a variety of systems, making them ideal for use in vehicle accident monitoring systems. The wireless box could contain a MEMS accelerometer that would measure the acceleration of the vehicle during an accident. This data could be transmitted wirelessly to a central monitoring system, providing real-time information about the accident. Additionally, the wireless box could include GPS technology to provide the exact location of the vehicle at the time of the accident. To ensure perfect location accuracy, the wireless box could use advanced algorithms to combine data from the MEMS accelerometer and GPS receiver. This would provide a more accurate and reliable location than GPS alone, which can sometimes be affected by signal loss or interference. In the event of an accident, the wireless box could automatically send an alert to emergency services, providing them with the location of the accident and the severity of the impact. This would allow emergency responders to quickly locate the accident and provide assistance to those involved. Overall, an advanced wireless box using MEMS for vehicle accidental monitoring with perfect location has the potential to greatly improve the response time and effectiveness of emergency services during vehicle accidents. Road Accidents are a major concern worldwide, with millions of people losing their lives or suffering from severe injuries every year. According to the World Health Organization, road traffic injuries are a leading cause of death globally, with more than 1.35 million deaths annually.

Fig1: Communication architecture

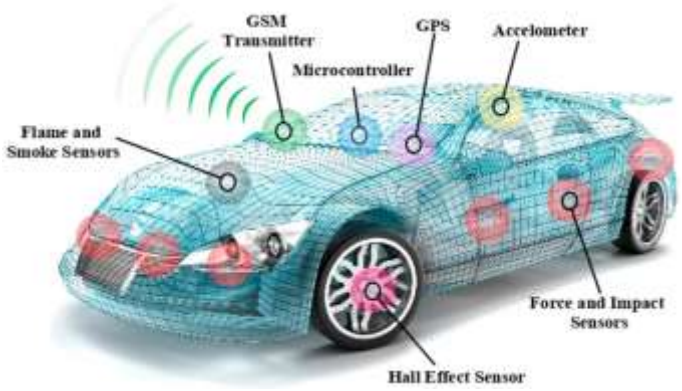


To find out the accident and spot at any location and Intimating to hospital or family member through GSM as well as vehicle temperature monitoring. Monitoring the vehicle's conditions and other features.

2. TECHNOLOGY

The technology used in the proposed system of "Advanced wireless box using MEMS for vehicle accidental monitoring with perfect location" includes Micro-Electro-Mechanical Systems (MEMS) sensors, wireless communication modules, and machine learning algorithms. MEMS technology involves the use of micro-sensors and micro-actuators that are integrated into a single chip to detect and respond to changes in the environment. MEMS sensors are used in various applications, including automotive, medical, and aerospace industries. In the context of the proposed system, MEMS sensors are used for real-time accident detection by measuring the vehicle's motion and acceleration.

Fig 2: Technology Implemented



MEMS sensors are small and compact, making them ideal for use in vehicles. The sensors can detect any sudden impact that could indicate an accident and trigger the system to send alerts to emergency services and insurance companies. The sensors used in the system can measure various parameters such as linear acceleration, angular acceleration, and magnetic field strength. The wireless communication modules used in the proposed system enable the transmission of alerts with the location and severity of the accident. The modules can use various technologies such as Wi-Fi, Bluetooth, or cellular networks to transmit the alerts to the relevant parties. The use of wireless communication modules ensures that alerts are sent in real-time, allowing for faster response times from emergency services. Machine learning algorithms are also used in the proposed system for accurate accident detection and analysis. Machine learning algorithms can enhance the accuracy of the system by analyzing the data collected.

By the sensors and identifying patterns associated with Accidents. The algorithms can also be trained to differentiate between real accidents and false alarms Triggered by road conditions such as potholes or speed bumps. The term "black box" refers to a device or system that can be viewed as a closed box, with inputs and outputs that are visible but with the internal workings remaining hidden or opaque. The black box is metaphorically seen as a container where the inputs are transformed into outputs based on a set of rules or functions that are unknown to the user or observer.

Fig 3: Event data recorder

The Event Data Recorder (EDR) is a device that is typically installed in vehicles and is designed to record data related to the vehicle's operation, such as speed, acceleration, and braking. Unlike the Flight Data Recorder (FDR) used in aircraft, the EDR does not have layers as it is a single electronic device that is typically housed within the vehicle's airbag control module. The color of the EDR may vary depending on the manufacturer and model of the vehicle, but it is typically a small metallic box with an external connector that is used to extract the data. The color of the external connector may vary, but it is often black or gray. The working of a black box can vary depending on the specific device or system, but in general, a black box takes inputs, processes them, and produces outputs, without revealing its internal workings or processes. Here are some general steps involved in the working of a black box:

Input: The black box takes in one or more inputs, which can be in the form of analog or digital signals, such as sensor data or user commands.

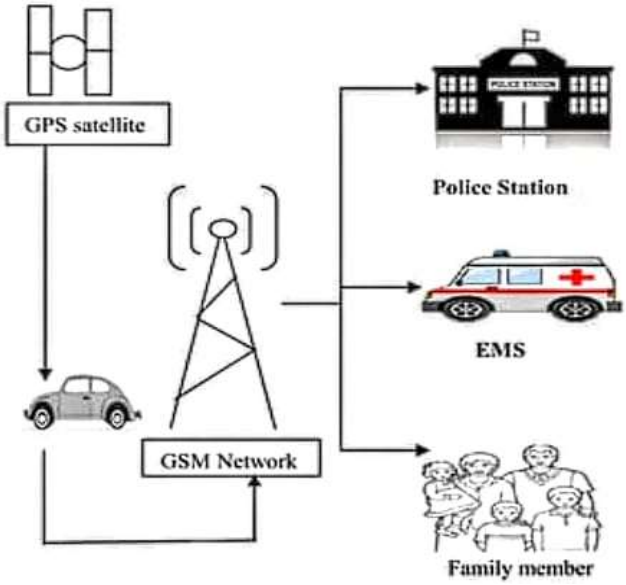
Processing: The black box processes the inputs using a set of rules or algorithms that are programmed into the device or system. These rules or algorithms are typically proprietary and not visible to the user or observer.

Output: The black box produces one or more outputs, which can be in the form of visual displays, audio signals, or digital data. The outputs are based on the processing of the inputs, but the internal workings of the black box are not visible or transparent.

3. METHODOLOGY

The proposed system uses MEMS sensors to detect sudden changes in acceleration or other physical parameters associated with an accident. The data collected from the wireless box is transmitted to a remote server, which analyzes the data and sends notifications to the appropriate authorities or emergency services in case of an accident.

Fig 4: System overview



The main objective of this work is to reduce the human death rate in road accident. The paper proposed a system to give quick assistance to the people who got the accident. The fall detection and reporting system for the vehicle can gain the attention because the system will save the life and give medical treatment on time. The system consist MEMS accelerometer, GSM module, and Temperature sensor, break sensor, steering sensor, accelerator sensor. An Accelerometer is used to detect the acceleration. It is the main sensor used to detect the accident. Once the accident is detected, controller gives this information to GSM module. By using GSM module we can send the message to family members. 8 bit microcontroller unit is used to process and store real time signal from the accelerometer and various sensor. Through Temperature

Sensor we can measure temperature in vehicle and which is display on LCD Continuously. Break sensor is used to sense amount of break applied. Steering sensor used to check the position of steering. Accelerator sensor used to sense the acceleration. All the information stored in memory card for analysis of accident cause. We can see overview of black box system. When car accident is detected, then message is send to family member, emergency medical service (EMS) and nearest hospital through GSM.

Pre accident detection, tracking of collision, intelligent system Arduino Uno is used as the main controller board. Accelerometer is used for detecting vehicle accident. Accelerometer will check the three axis of the vehicle accident occurred or not. Sensor is used to detect alcohol consumption. If the temperature goes beyond particular value, then the engine of the vehicle stops immediately. GPS module will receive latitude and longitude coordinates from the satellite. Sending alert messages is done by GSM module. IOT cloud is used as black box for recording data from the Arduino board through internet connection. The LCD display was used to display the GPS values and the sensor values. The coding was written in embedded C language and compile using Arduino IDE.

4. FUTURE SCOPE

The proposed system can be further enhanced by incorporating additional features, such as voice communication and automatic emergency braking. The system can also be extended to other modes of transportation, including trains and airplanes.

1. By applying ultrasonic sensors features we can detect the distance of a vehicles moving nearby our vehicles.

2. This system can be interfaced with vehicle airbag system that prevents vehicle occupants from striking interior objects such as steering wheel or window.
3. This can also be developed by interconnecting a camera to the controller module that takes the photograph of the accident spot that makes tracking easier.

5. CONCLUSION

Real-time vehicle accident monitoring using MEMS technology can help reduce fatalities and injuries resulting from accidents. The system is easily scalable and can be adapted to different transportation modes. The technology has a lot of potential for future advancements.

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