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Design & Development of Arduino Based Vehicle Accident Alert System Using Gps, Gsm Module, Distance & Force Sensor

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Abstract
As indicated by an investigation and insights of WHO (World Health Organization), every year more than 50%of people lose their lives due to street traffic wounds of which most of them are due to bike riders as a result of head wounds. When an accident occurs, there is a delay in rescuing the person and so the proposed research work aims to work on this topic by building an automated system to alert the family member as soon as the occurrence of the accident. In this perspective, the proposed model integrates Arduino UNO R3 micro controller, a GPS GY6MV2 beneficiary and GSM module SIM900A. Further, GPS GY6MV2 is sued to get the scope and longitude of the accident region. The GSM module SIM900A is utilized to send SMS and enlighten the individual regarding the type of accident and provides accident location using Google Maps. ADXL335 MEMS Accelerometer sensor catches the X and Y co-ordinates of the vehicle. Furthermore, 16x2 LCD is used to show messages, scope and longitude of the accident place.
The ever-increasing number of road accidents and their devastating consequences necessitate the development of advanced safety systems for vehicles. This abstract introduces an innovative solution. an Arduino-based Vehicle Accident Alert System that employs GPS technology, a GSM module, and a distance sensor to enhance road safety. The system is designed to detect and respond to potential vehicle accidents in real-time. It comprises three main components: a GPS module, a GSM module, and a distance sensor. The GPS module provides precise location data, allowing the system to track the vehicle's position continuously. The distance sensor is used to monitor the proximity of nearby vehicles or obstacles.

I. INTRODUCTION

The concept of an accident alert system has been around for several decades, but the technology to implement such a system has only become available in recent years. In the early 2000s, some car manufacturers started to incorporate sensors and crash detection systems into their vehicles. These systems were designed to automatically detect accidents and trigger emergency response protocols, such as deploying airbags and notifying emergency services. In 2006, the European Union launched the call initiative, which required all new cars in the European Union to be equipped with an accident alert system. The system was designed to automatically contact emergency services in the event of a serious accident and provide the location of the accident, even if the driver was unable to makes call. In the United States, the first accident alert system was developed by OnStar, a subsidiary of General Motors. The OnStar system, which was launched in 1996, used a combination of sensors and GPS technology to detect accidents and notify emergency services. Since then, various accident alert systems have been developed, both for vehicles and for use in other settings, such as on construction sites or in industrial settings. These systems use a range of technologies, such as sensors, cameras, and machine learning algorithms, to detect accidents and notify emergency services.

II. LITERATURE SURVEY

Pachipala Yellamma. (2021) [1] This paper discusses the problem of road accidents in India, which has become a major cause of death, and proposes a solution in the form of an Arduino based Automatic Accident Detection and Location Communication System (AAADLCS). The system uses an accelerometer and limit switch to detect accidents and GPS and GSM to send location information to hospitals, relatives, and the police. The paper highlights the need for a system that can provide timely medical assistance to accident victims, especially in remote areas where medical facilities are not readily available. The system is low- cost, easy to implement, and self-reliant, making it a feasible solution to address the problem of road accidents.
Souvik Roy. (2020) [2] This research work proposes an automated system for alerting family members in the event of a vehicle accident using Arduino UNO R3 microcontroller, GPS GY6MV2 receiver, GSM module SIM 800L, and ADXL335 MEMS Accelerometer sensor. The system aims to reduce delay in emergency services and rescue of the person by sending an alert message to family members as soon as an accident occurs. The GPS module is used to obtain the latitude and longitude of the accident location, while the GSM module is used to send SMS and notify family members about the type of accident and location of the accident using Google Maps. The ADXL335 MEMS Accelerometer sensor captures the X and Y coordinates of the vehicle, and a 16x2 LCD is used to display messages, location, and longitude of the accident place.

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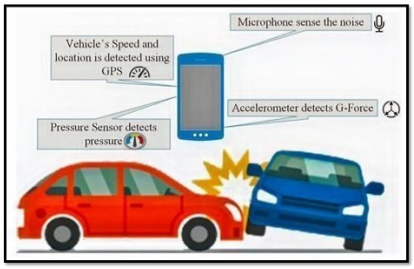

Figure1. Vehicle Accident Alert System Block Diagram 1

Adnan M. Al-Smadi. (2019) [3] This paper proposes a design for detecting an imminent collision and works to prevent or reduce the strength of the imminent collision at the rear or front of the vehicle. The method presented here uses an ultrasonic sensor. Detects that the driver is approaching his vehicle and displays an alert to the driver. This system measures the distance between two vehicles moving in the same lane and in the same direction. If the trajectory of an object is directed at your vehicle and becomes dangerous, the system will deploy security measures to your vehicle

P. Ramya (2018) [4] The purpose of the project is to provide a technical approach to detect and monitor driver fatigue levels to avoid accidents early. Is to do. The purpose is to detect if the driver is drunk. This locks the vehicle's ignition system. This system controls the direction of the vehicle when the limit distance is exceeded and avoids accidents. We also send information to relevant authorities or owners in the event of an accident caused by the use of the GSM module. From observations, we can conclude that there are three main causes of road accidents: sleep, overtaking, and drinking, which are related to the driver. One of the main reasons for drunk driving is that not all police officers can check every car to determine if a person is drinking. Therefore, there is a need for an effective system for screening drunk drivers with alcohol detectors. By connecting the Raspberry Pi and the ultrasonic sensor, it is possible to detect the forward movement of the vehicle and control the vehicle at a very high speed, or turn left and right according to the vehicle in another lane to control the direction of the vehicle. In the event of an unavoidable accident, an SMS will be sent to the relevant authorities or the owner of the vehicle.

Aditi Padayar. (2018) [5] The main goal of this project is to develop a system for determining alcohol content. The driver's air exhales and automatically turns off the car when the alcohol concentration exceeds the limit. This project uses the 8051 family (89s52) microcontrollers.MQ3 is used as an alcohol sensor in this project, which aims in alcohol content detection in human breathing. The alcohol sensor outputs analog data that cannot be analysed by the 8051 micro-controllers. The data received from the alcohol sensor is converted to digital format by a digital converter (analog-to- digital converter). The data is then stored in the microcontroller and compared to the threshold. If the value exceeds the set limit, the program controller will take appropriate action to control the ignition system. Here, an electromechanical relay was used to control the ignition system. In this project, by controlling the ignition system, it is possible to prevent accidents caused by drunk driving and driving.

Mubashir Murshed. (2017) [6] Car Accident is considered one of the most devastating phenomena. There are many reasons for a traffic accident, but most accidents are caused by the driver's carelessness and uncontrolled speed. There also seems to be a problem in getting to the scene of the accident in time due to lack of awareness. As a solution, the advent of Internet of Things (IoT) technology can reduce the number of accidents. This article describes an intelligent system that alerts and controls the speed of the vehicle and notifies people accordingly in the event of an accident. The system uses distance sensors to constantly monitor the distance between the vehicle and obstacles in front of it. It controls speed and warns the driver to slow down when the critical distance is reached. Whenever a dangerous accident occurs, an email notification with vehicle details will be sent to the responsible person

III. COMPONENTS

1. Arduino uno

Arduino UNO is a microcontroller board based on the ATmega328P. It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz ceramic resonator, a USB connection, a power jack, an ICSP header and a reset button. It contains everything needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with a AC-to-DC adapter or battery to get started.

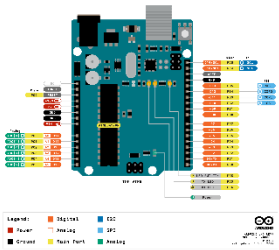

Figure2. Arduino uno

2. GSM Module

GSM (Global System for Mobile Communications, originally Groupe Spécial Mobile), is a standard developed by the European Telecommunications Standards Institute. For the communication between accelerometer phone and microcontroller Bluetooth module (HC-05) is used. To run the vehicle using android Read, write and delete SMS messages Send SMS messages. Monitor the signal strength.

Figure3. GSM module

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3. GPS module

The Global Positioning System (GPS) is the most widely used satellite navigation system around the world. It is one of the Global Navigation Satellite Systems (GNSS) that provides geolocation, time, and velocity information. GPS is operational since 1978 and globally available since 1994. The latest GPS receivers provide geolocation with an accuracy of 30 centimetres. GPS is a network of 30+ Medium Earth Orbit (MEO) satellites. These satellites continuously send signals over dedicated RF frequencies that a GPS receiver can listen to the location given by GPS module is very accurate

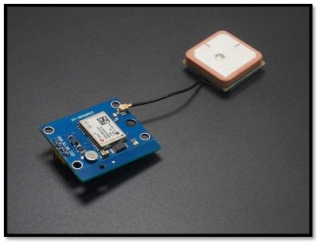

Figure4. GPS Module

4. Force Sensor

By definition, force sensor is a type of transducer, specifically a force transducer. It converts an input mechanical force such as load, weight, tension, compression or pressure into another physical variable, in this case, into an electrical output signal that can be measured, converted and standardized. As the force applied to the force sensor increases, the electrical signal changes proportionally.

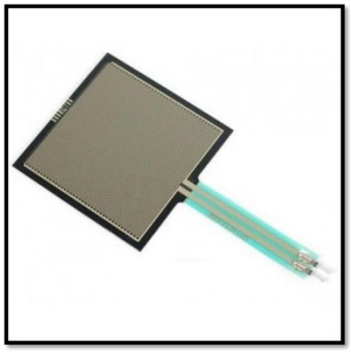

Figure5. Force Sensor

5. 16x2 LCD:

These are commonly used in the screen industries to replace the utilization of CRTs. Cathode Ray Tubes use huge power when compared with LCDs, and CRTs heavier as well as bigger. These devices are thinner as well power consumption is extremely less. The LCD 16×2 working principle is, it blocks the light rather than dissipate This article discusses an overview of LCD 16X2, pin configuration and its working.

Figure6. 16x2 LCD

6. Distance Sensor.

Distance sensor is a reliable tool for a variety of applications for accurate as well as fast measurement, accurate positioning, and discovery of an extensive range of materials. The probable applications of this sensor mainly include examining the unwinding of coils, twofold sheet recognition otherwise the precise high bay stackers positioning.

Figure7. Distance Sensor

IV. EXPERIMENTAL SETUP

This Arduino code uses an ultrasonic distance sensor to measure the distance between the sensor and an object in front of it. Based on the measured distance, it displays different messages on a 16x2 character LCD and triggers warnings or cautions. That's the explanation of how this code uses an ultrasonic sensor to display messages and warnings on an LCD based on the measured distance. It's a simple distance monitoring system with visual and auditory feedback for different distance ranges.

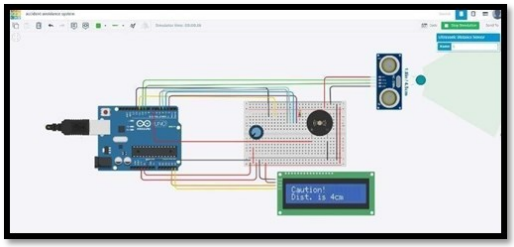

Figure8. Circuit Diagram using distance Sensor Simulation

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In the loop function, it triggers the ultrasonic sensor to measure the distance and calculates it based on the time taken for the echo. It then checks the distance and prints messages accordingly. There seem to be some issues with digital Write for pins 13 and 6 as these pins are not defined earlier in the code. This code is for a basic distance measuring system using an Arduino and an ultrasonic sensor. It checks the distance and prints warnings based on the distance measured. It also seems to have incorrect pin assignments for turning on/off LEDs (pins 13 and 6). You may want to correct these pin assignments according to your hardware setup. code is a basic example of how to interface with a GPS module using an Arduino and display the GPS data on the Serial Monitor for debugging and monitoring purposes. Please make sure your GPS module is properly connected to the specified pins (4 and 3) and configured with the correct baud rate (9600 in this case) for this code to work as expected.

Figure9. Actual model of the project

V. CONCLUSION

An Arduino-based vehicle accident alert system is an innovative project with several potential future scopes and applications. Here are some areas where this technology can evolve and find practical applications Advanced Safety Features: Improve the system to include more advanced safety features, such as collision prediction and prevention. This can involve integrating additional sensors like radar or lidar to detect obstacles and make real-time decisions to avoid accidents. Data Analytics: Analyse the data collected by the accident alert system to identify accident-prone areas and driving patterns. This data can be used by traffic management authorities to improve road safety. Machine Learning Integration: Implement machine learning algorithms to enhance the system's accident detection capabilities. With enough data, the system can learn to recognize various types of accidents and respond accordingly. Real-time Communication: Develop the system to communicate directly with emergency services and nearby vehicles. In the event of an accident, it can send alerts to nearby vehicles and emergency responders, enhancing the speed of response. Integration with Autonomous Vehicles: As autonomous vehicles become more prevalent, the accident alert system can be integrated to improve their safety. It can serve as a backup system to take control in critical situations.

VI. REFERENCES

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