AUTOMATIC VEHICLE ACCIDENT DETECTION AND RESCUE SYSTEM

[1]Swapnil Tewari, [2]Shivanshi Gupta, [3]Brijesh Kumar Dubey

Student, Student, Assistant Professor

Bachelor of Technology Electrical and Electronics,

Pranveer Singh Institute of Technology, Kanpur, India

Abstract: The Rapid growth of technology and infrastructure has made our lives easier. The advent of technology has also increased the traffic hazards and the road accidents take place frequently which causes huge loss of life and property because of the poor emergency facilities. Our project will provide an optimum solution to this draw back. An accelerometer can be used in a car alarm application so that dangerous driving can be detected. It can be used as a crash or rollover detector of the vehicle during and after a crash. With signals from an accelerometer, a severe accident can be recognized. According to this project when a vehicle meets with an accident immediately Vibration sensor will detect the signal or if a car rolls over, and Micro electro mechanical system (MEMS) sensor will detects the signal and sends it to ARM controller. Microcontroller sends the alert message through the GSM MODEM including the location to police control room or a rescue team. So the police can immediately trace the location through the GPS MODEM, after receiving the information. Then after conforming the location necessary action will be taken. If the person meets with a small accident or if there is no serious threat to anyone`s life, then the alert message can be terminated by the driver by a switch provided in order to avoid wasting the valuable time of the medical rescue team. This paper is useful in detecting the accident precisely by means of both vibration sensor and Micro Electro Mechanical system (MEMS) or accelerometer. As there is a scope for improvement and as a future implementation we can add a wireless webcam for capturing the images which will help in providing driver`s assistance.

I. INTRODUCTION

The high demand of automobiles has also increased the traffic hazards and the road accident. Life of the people under the high risk. This is because of the lack of best emergency facilities available in our country. It is shocking to realize that in most cases causalities occur due to improper or no communication to the rescue team. We are looking forward to solve these issues by proposing an efficient idea and reduces the loss of human life as much as possible. This design is a system which can detect accidents in significantly less time and sends the basic information to first aid centre within a few seconds covering geographical coordinates, the time and angle in which a vehicle accident had occurred.

This alert message is sent to the rescue team in a short time, which will help in saving the valuable lives. A Switch is also provided in order to terminate the sending of a message in rare case where there is no casualty, this can save the precious time of the medical rescue team. When the accident occurs the alert message is sent automatically to the rescue team and to the police station. The message is sent through the Wi-fi module and the location of the basic idea is to localize the vehicle system by receiving the real time position of the vehicle through GPS and send the information

through Wi-fi module via SMS service with an added feature of GPRS transmission to the monitoring center through usage of. It used EEPROM to store the phone numbers. accident is detected with the help of the GPS module. The accident can be detected precisely with the help of both Micro electro mechanical system sensor and vibration sensor. The Angle of the rolls over of the car can also be known by the message through the sensor. This application provides the optimum solution to poor emergency facilities provided to the roads accidents in the most feasible way.

II. LITERATURE SURVEY

At present criteria, we cannot detect where the accident has occurred and hence no information related to it, leading to the death of an individual. The research work is going on for tracking of the vehicle even in dark clumsy areas where there is no network for receiving the signals. In literature, a number of approaches to provide security and safety through monitoring the vehicle's real time precise positioning and information using different technologies have been proposed. The general mechanism is to provide the real time geographical position of a vehicle using GPS receiver and send this information to GSM center through configurable software.

This is all done by the monitoring center which is working as a control unit that is connected not only by an optical cable but also connected wirelessly through TCP/IP protocols. The monitoring center distributes the data to the client in an understandable format and it also stores the travelling records and displays the real time information about vehicle on electronic map through GPS.

Another approach is that vehicle terminal includes a GPS receiver which extracts information about position through GPS satellites and sends it through Wi-fi network and to the control center which readsthe information, process it through GPS management system and saves it in the data base system and on user demand displays it on electronic map via Map-X tool.A different approach is proposed by integrating GPS and Wi-fi transmission technologies .

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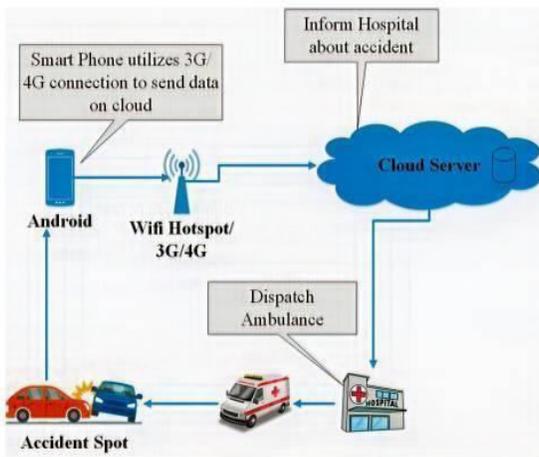

Figure 1: Over view of system

III. MAJOR CAUSES OF ROAD ACCIDENTS

1. Distracted Driving
2. Speeding
3. Drunk Driving
4. Running Red Light
5. Wrong Way Driving
6. Fog
7. Street Racing
8. Night Driving

IV. STEPS TO AVOID ROAD ACCIDENTS

1. Keep your eyes on the road
2. Never use your cell phone
3. Follow Traffic Rules
4. Ignore Aggressive Driving
5. Never ever drink and Drive
6. Avoided Construction Area
7. Avoided Communication at the time of Drivng

V. HARDWARE DESIGN AND SPECIFICATION

1. Arduino UNO

Arduino Uno is a microcontroller board based on the ATmega328P (datasheet). It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz quartz crystal, 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.. You can tinker with your UNO without worring too much about doing something wrong, worst case scenario you can replace the chip for a few dollars and start over again.

"Uno" means one in Italian and was chosen to mark the release of Arduino Software (IDE) 1.0. The Uno board and version 1.0 of Arduino Software (IDE) were the reference versions of Arduino, now evolved to newer releases. The Uno board is the first in a series of USB Arduino boards, and the reference model for the Arduino platform; for an extensive list of current, past or outdated boards see the Arduino index of boards.

Figure 2: Arduino UNO

2. Arduino nano

The Arduino Nano is a small, complete, and breadboard-friendly board based on the ATmega328P (Arduino Nano 3.x). It has more or less the same functionality of the Arduino Duemilanove, but in a different package. It lacks only a DC power jack, and works with a Mini-B USB cable instead of a standard one.
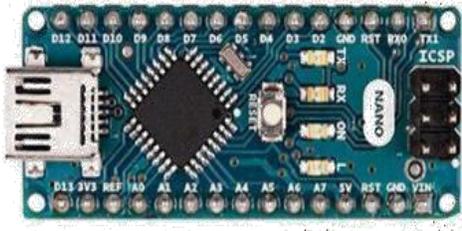
Figure 3: Arduino NANO

3. Wi-Fi Module

The ESP8266 Wi-Fi Module is a self-contained SOC with integrated TCP/IP protocol stack that can give any microcontroller access to your Wi-Fi network. The ESP8266 is capable of either hosting an application or offloading all Wi-Fi networking functions from another application processor. Each ESP8266 module comes pre-programmed with an AT command set firmware, meaning, you can simply hook this up to your Arduino device and get about as much WiFi-ability as a WiFi Shield offers (and that's just out of the box)! The ESP8266 module is an extremely cost effective board with a huge, and ever growing, community.

This module has a powerful enough on-board processing and storage capability that allows it to be integrated with the sensors and other application specific devices through its GPIOs with minimal development up-front and minimal loading during runtime. Its high degree of on-chip integration allows for minimal external circuitry, including the front-end module, is designed to occupy minimal PCB area. The ESP8266 supports APSD for VoIP applications and Bluetooth co-existance interfaces, it contains a self-calibrated RF allowing it to work under all operating conditions, and requires no external RF parts.
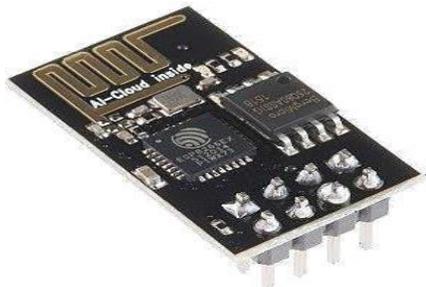

Figure 4: Wi-Fi Module

4. Global Positioning System Module

This is a complete GPS module that is based on the Ublox NEO-6M. This unit uses the latest technology from Ublox to give the best possible positioning information and includes a larger built-in 25 x 25mm active GPS antenna with a UART TTL socket. A battery is also included so that you can obtain a GPS lock faster. This is an updated GPS module that

can be used with ardupilot mega v2. This GPS module gives the best possible position information, allowing for better performance with your Ardupilot or other Multirotor control platform.

The Unbox NEO-6M GPS engine on this board is a quite good one, with a high precision binary output. It has also high sensitivity for indoor applications. UBLOX NEO-6M GPS Module has a battery for power backup and EEPROM for storing configuration settings. The antenna is connected to the module through a ufl cable which allows for flexibility in mounting the GPS such that the antenna will always see the sky for best performance. This makes it powerful to use with cars and other mobile applications.

Figure 5: Global Positioning System Module

5. Buzzer

A buzzer or beeper is an audio signaling device, which may be mechanical, electromechanical, or piezoelectric (piezo for short). Typical uses of buzzers and beepers include alarm devices, timers, and confirmation of user input such as a mouse click or keystroke**.**

Figure 6: Buzzer

6. 16X2 LCD

LCD modules are vey commonly used in most embedded projects, the reason being its cheap price, availability and programmer friendly. Most of us would have come across these displays in our day to day life, either at PCO's or calculators. The appearance and the pinouts have already been visualized above now let us get a bit technical.

16×2 LCD is named so because; it has 16 Columns and 2 Rows. There are a lot of combinations available like, 8×1, 8×2, 10×2, 16×1, etc. but the most used one is the 16×2 LCD. So, it will have (16×2=32) 32 characters in total and each character will be made of 5×8 Pixel Dots.

Figure 7: 16X2 LCD

VI. OPERATION

A crystal is a solid, in which the constituent atoms, molecules, or ions are packed in a regularly ordered, repeating pattern extending in all three spatial dimensions. Almost any object made of an elastic material could be used like a crystal, with appropriate transducers, since all objects have natural resonant frequencies of vibration. For example, steel is very elastic and has a high speed of sound. It was often used in mechanical filters before quartz.

The resonant frequency depends on size, shape, elasticity, and the speed of sound in the material. High-frequency crystals are typically cut in the shape of a simple, rectangular plate. Low-frequency crystals, such as those used in Digital watches are typically cut in the shape of a tuning fork. For applications not needing very precise timing, a low-cost ceramic resonator is often used in place of a quartz crystal. When a crystal of quartz is properly cut and mounted, it can be made to distort in an electric field by applying a voltage to an electrode near or on the crystal. This property is known as piezoelectricity.

When the field is removed, the quartz will generate an electric field as it returns to its previous shape, and this can generate a voltage. The result is that a quartz crystal behaves like a circuit composed of an inductor, capacitor and resistor, with a precise resonant frequency. Quartz has the further advantage that its elastic constants and its size change in such a way that the frequency dependence on temperature can be very low.

The specific characteristics will depend on the mode of vibration and the angle at which the quartz is cut (relative to its crystallographic axes)1 Therefore, the resonant frequency of the plate, which depends on its size, will not change much, either. This means that a quartz clock, filter or oscillator will remain accurate. For critical applications the quartz oscillator is mounted in a temperature-controlled container, called a crystal oven, and can also be mounted on shock absorbers to prevent perturbation by external mechanical vibrations.

VII. WORKING

1. A sensor will sense the occurrence of an accident and give its output to the microcontroller. Here a button sensor is used for detection which will get pressed when the vehicle meets with an accident.
2. A buzzer is present in this system with starts beeping indicating that the system is now activated.
3. The GPS detects the latitude and longitudinal position of the vehicle. It is essential to locate the position to provide medical assistance.
4. The phone numbers are pre saved in the EEPROM by the user. These numbers can be changed at any point of time.
5. The microcontroller sends an alert message to these pre saved numbers using the GSM module. Any message can be pre entered in the system by the user.
6. A LCD screen displays the status of the output.
7. In case there is no casualty, the sending of the message can be terminated with the help of a switch. The switch will restart the microcontroller and its function will start from the beginning.
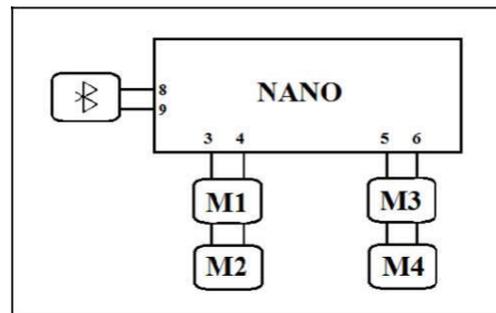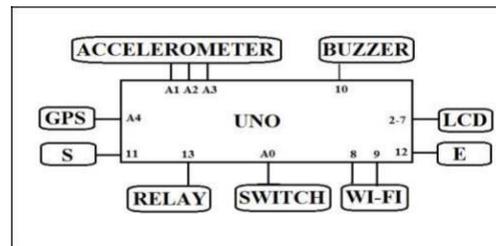

Figure 8: Circuit Block Diagram

VIII. TECHNIQUE OF IMPLEMENTATION

The proposed system consists a unit, which coordinates with each other and make sure that the rescue is to be done in a minimum time.

Vehicle Unit

According to our system, every vehicle should have a vehicle unit. The vehicle unit consists of a vibration sensor, Microcontroller, a user interface, GPS system and a Wi-Fi module. There is need to process the low level voltage signal properly given by vibration sensor. We can use multiple sensors for detection of accident to avoid any error in detection. These sensors can be installed in vehicle body at most vibration sensitive locations. A central system can be implemented inside vehicle to process the signal coming from sensors and to detect the accident from the signals coming from multiple sensors.
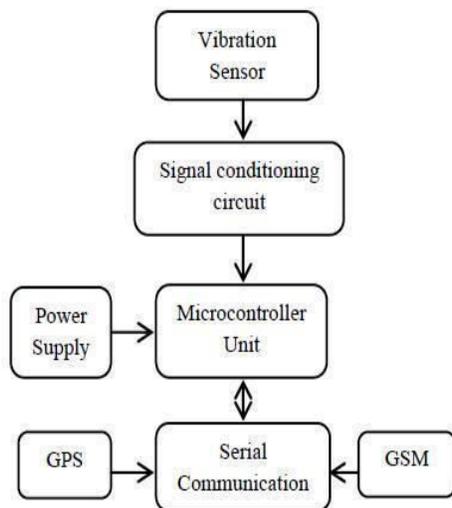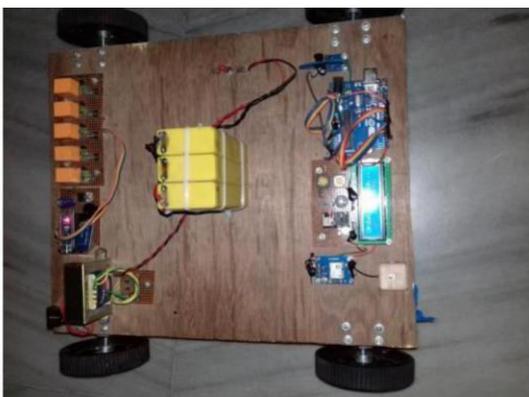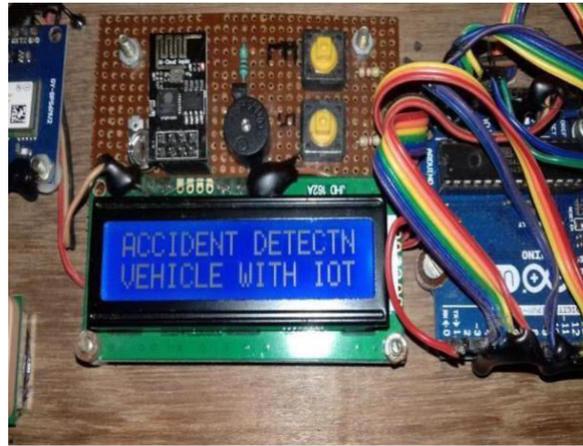

Figure 9: Vehicle Unit

Figure 10: Hardware Modal

Figure 11: OUTPUT

IX. CONCLUSION

This system provides the optimum solution to poor emergency facilities provided to victims in road accidents in the most feasible way. With the help of this technology immediate action can be taken when an accident occurs by alerting the respective people by sending a message. The drawback with this system is that it does not work without network. So in areas where no network is available the system will not be able to send the alert message. The proposed method is highly beneficial to the automotive industry. This will help the medical teams to reach the accident spot in time and save the valuable human lives. There is always scope for new improvements by interfacing it with different systems.

Thus, if this system is implemented in countries with large population like INDIA can produce better results. This system is more accurate with no loss of time. But there may be a delay caused because of GSM messages since it is a queue based technique, which can be reduced by giving more priority to the messages communicated through the controller. The experiment proved that this system can automatically detect accidents and information to the main controller is sent relatively and the traffic unit is also controlled by the ambulance unit to reach the accident spot in time and from accident spot to hospital without delay. Such functions can be useful for help and safety, of humans and society.

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