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DEVELOPMENT OF AN AUTOMATIC ACCIDENT DETECTION SYSTEM

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Abstract- This project is about sending emergency message automatically and immediately when accidents occur in street vehicles as well as passengers' water vessels with exact location. This system enables to send accident information automatically and immediately with location to any mobile number to any place covered by GSM network. For automatic accident sensing, accelerometer is used which sends pulse when it is shaken at a certain level corresponding accident. This signal then goes to GPS (Global Positioning System) module. GPS module, receiving data from satellite in the form of longitude and latitude, sends exact position information to GSM (Global System for Mobile Communication) module which sends message to respective authority mobile number. Arduino mini (NANO V3.00, a single-board microcontroller), MAX 232 IC, a user friendly GPS antenna are also used for implementing this project.

Keywords: GPS, GSM, Accelerometer, Accident, Location.

1. INTRODUCTION

Vehicles accidents are increasing day by day and many people are dying every day. Death rate is increased more because of having no initial treatment after being hit during accident. Especially at midnight, at highway, people usually are not able to get medical help immediately after the accident. Moreover they cannot know the location exactly of accident so that they cannot inform the location to corresponding control room immediately. As a result, because of late response, they are suffering from serious injury even death. On the other hand, various passengers' water vessels or any other merchandising vessels face accidents and drown into deep water which causes death of number of life and loss of properties due to late rescue response or lack of information where the vessel has drowned.

Considering these cases, Our proposed system informs automatically about the accident (time, location) to the control room or corresponding authority who can take steps, immediately after the accident occurs. Besides, the rate of accident can also be surveyed in particular area by taking data. This system can also be applied to ship, launch, steamer or other vessels run in water in case of any accident which leads the vessels to be drowned by informing the authority the exact location of where the vessel is drowned so that, the rescue team can start the rescue operation within shortest possible time.

The aim of this research project is to design and development of a system which produces immediate message during accident and send it to authority number.

1.1 Benefits:
* Reduce response time of the emergency unit so that victim can have initial treatment before injury becomes worsen.
* Knowing exactly where the vehicle is and where the accident occurs with exact time at any time.
* It will be helpful in case of vehicle stealing.
* Besides, the rate of accident can also be surveyed in particular area by taking data.
* This system can also be applied to ship, launch, steamer or other vessels run in water in case of any accident which leads the vessels to be drowned by informing the authority the exact location of where the vessel is drowned so that, the rescue team can start the rescue operation within shortest possible time.

2. LITURATURE REVIEW

Engineers have been working on the vehicle security as well as passengers' security as a prior for many years. Significant developments are seen in this sector. Using GPS (global positioning system) device people can know where the vehicle is. Using seat belt and air bag, during accident, engineers are trying to reduce the injury of the drivers.

Using antilock brake system, developed recently, vehicles can survive from sliding in slippery roads hence reduce accident probability.

Locking systems include door and trunk locks, keyless entry systems, fuel tanks, light delay systems, and electronically coded keys can secure the vehicle from accident.

Disabling device and alarming device can also put an important help for total safety.

In some cases, energy absorber bumper has been introduced with the vehicles to avoid accidental injury. Among these facilities, most of them have been developed as pre accidental steps. Relatively post

accidental steps have not been developed significantly in worldwide, especially in countries like Bangladesh, India, Pakistan, Nepal and others third world regions.

In Bangladesh, though some private cars have such facilities described above, vehicles and passengers security is not developed satisfactorily. Most of the buses and trucks have no security system for passengers and drivers. Due to not getting initial medical aid, many people die after accidents. With the sequence of the development, I have implemented a project based on post accidental step**.**

3. DESIGN TOOLS

Major components of this system are : Accelerometer, GPS receiver, GSM module and Arduino mini (Nano V3.0) 5. MAX232 IC

3.1 Accelerometer (for automatic accident sensing)

An accelerometer (as shown in Fig.1) is a device that measures proper acceleration. The proper acceleration measured by an accelerometer is not necessarily the coordinate acceleration (rate of change of velocity). Instead, the accelerometer sees the acceleration associated with the phenomenon of weight experienced by any test mass at rest in the frame of reference of the accelerometer device. For example, an accelerometer at rest on the surface of the earth will measure an acceleration g= 9.81 m/s^2 straight upwards, due to its weight. By contrast, accelerometers in free fall or at rest in outer space will measure zero. Another term for the type of acceleration that accelerometers can measure is g-force acceleration.
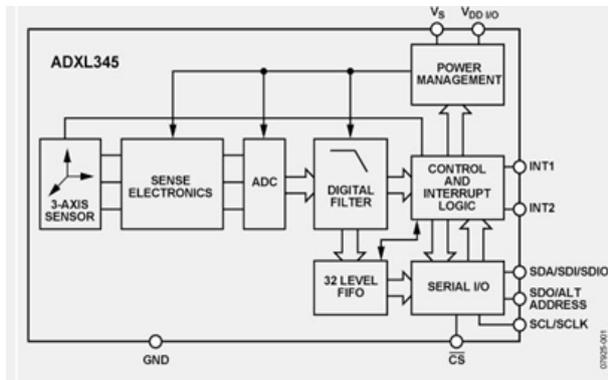
Fig.1 ADXL 345 accelerometer circuit diagram

3.2 GPS receiver (for detecting location)

GPS (Global Positioning System) is a worldwide radio-navigation system formed by a Constellation of 24 satellites and their ground stations. With an unobstructed, clear view of the sky, GPS works anywhere in the world, 24 hours a day, and seven days a week [1].

The GPS receiver (as shown in Fig.2).measures the time required for the signal to travel from the satellite to the receiver, by knowing the time that the signal left the satellite, and observing the time it receives the signal, based on its internal clock. If the receiver had a perfect clock, exactly in sync with those on the satellites, three measurements, from three satellites, would be sufficient to determine position in three dimensions via trilateration.

However, that is not the case, so a fourth satellite is needed to resolve the receiver clock error. With four satellites, a GPS receiver can provide very accurate clock (time, date) and position information (latitude, longitude, altitude, speed, travel direction/heading)
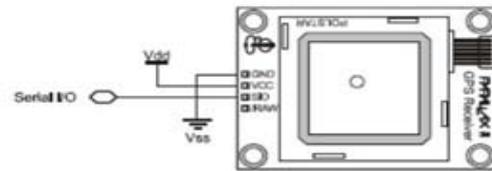
Fig.2 GPS receiver circuit

3.2 GSM Module (for sending message to certain mobile number)

GSM (Global System for Mobile Communications, originally Groupe Spécial Mobile) (as shown in Fig.3), is a standard set developed by the European Telecommunications Standards Institute (ETSI) to describe protocols for second generation (2G) digital cellular networks used by mobile phones.

In 1981, work began to develop a European standard for digital cellular voice telephony when the European Conference of Postal and Telecommunications Administrations (CEPT) created the Groupe Spécial Mobile committee and later provided a permanent technical support group based in Paris. Five years later, in 1987, 15 representatives from 13 European countries signed a memorandum of understanding in Copenhagen to develop and deploy a common cellular telephone system across Europe, and EU rules were passed to make GSM a mandatory standard [2].
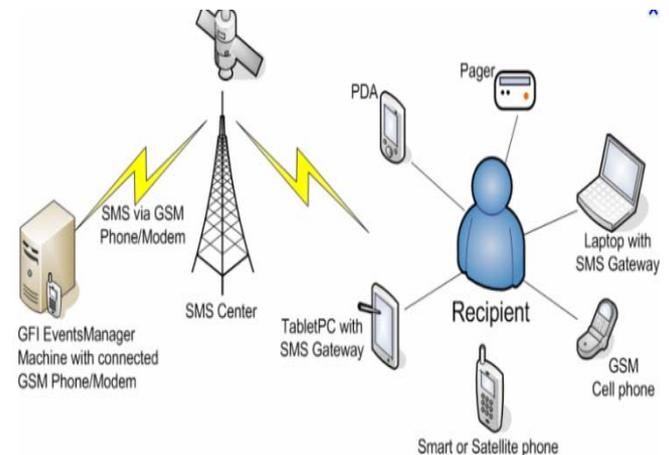
Fig.3 GSM working

3.3 Arduino (Nano V 3.0, for communicating among GPS, GSM and accelerometer)

Arduino is a single-board microcontroller(as shown in Fig.4) to make using electronics in multidisciplinary projects more accessible. The hardware consists of an open-source hardware board designed around an 8-bit Atmel AVR microcontroller, or a 32-bit Atmel ARM. The software consists of a standard programming language compiler and a boot loader that executes on the microcontroller [3]..
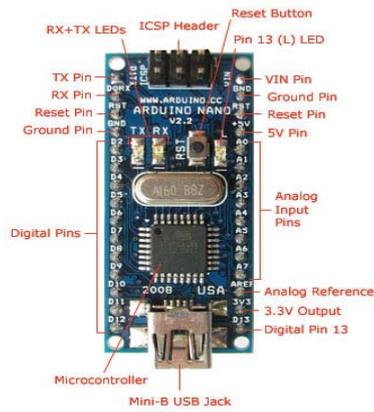
Fig.4 Arduino circuit board

3.4 MAX 232 IC (For communicating between GSM module and Arduino)

The MAX232 is an IC, first created in 1987 by Maxim Integrated Products, that converts signals from an RS-232 serial port to signals suitable for use in TTL compatible digital logic circuits. The MAX232 is a dual driver/receiver and typically converts the RX, TX, CTS and RTS signals

4. SYSTEM DEVELOPMENT

This system is sending emergency message automatically and immediately when accidents occur in street vehicles as well as passengers' water vessels with exact location. The system is developed in the flowing steps (as shown in Fig.5)

4.1 System Flow Chart
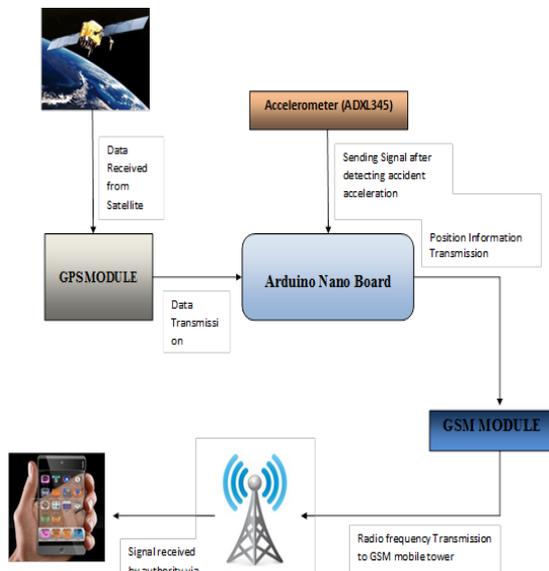
Fig.5 Block diagram of the project

During accident the shake of accelerometer which is built in breadboard. After shaking at a certain level which indicates accident, accelerometer transmits pulse to Arduino Nano circuit. Then Arduino, already receiving data from satellite, transmits pulse with position info to GSM module. Then GSM module, with the aid of GSM tower, transmits radio frequency to GSM mobile.

4.2 Circuit diagram of the system
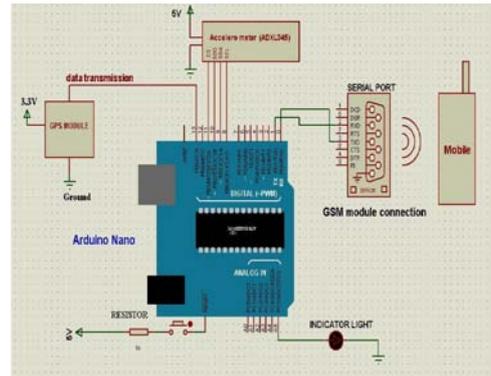
Fig.6. Circuit diagram of the project scetched in PROTEUS (circuit design sofware)

The total circuit (Fig.6) is designed and scetches by a desig software PROTEUS which consists of the flowing components

### 4.3 Complete System Development and Working Procudure

Fig.7: Automatic sending emergency message system hardware

Complete system is shown in Fig.7. Here accelerometer ADXL 345 is used. It needs the input voltage of 5V. Its pin CS, SDD, SDA and SCL are connected with Arduino through B3, B2, B1 and B0, no. of pins. Accelerometer transmits pulse with certain shaking trough these pins to Arduino. GPS module communicates with Arduino trough PB5 pin in Arduino. Then Arduino communicates trough TX and RX pins to GSM module by a serial port. After this serial communication, GSM sends radio frequency to GSM tower and finally a signal with message sends to GSM mobile. A indicator light is connected trogh A5 pin with Arduino for indicating GPS data locking. A 5V resistor with 1K resistance is connected to Arduino. Corresponding programing coding is burnt to Arduino micro controller for doing certain opration.

5. RESULTS AND DISCUSSION

Implementing this research project enables to detect accident automatically and send emergency message. In this research a single board macro controller Arduino mini(NANO V 3.0) has been used which lessens

complexity than previous approch. Moreover it makes the system more compact and small in size.

This project will be done by accelerometer which is reliable, cost effective, long durable and available detect accident precisely. Besides by using GPS and GSM devices, we can know the exact time and position of where the accident happens as well as tracking the vehicle in case of stealing. People can get primary medical help in a shorter time which can save their life and death in accident can be lessened significantly.

6.CONCLUSION

This research project is about sending emergency message automatically and immediately when accidents occur in street vehicles as well as passengers' water vessels with exact location. From the above discussion the following conclusion can be drawn

1. This system enables to send accident information automatically and immediately with location to any mobile number to any place covered by GSM network.
2. The system is reliable, cost effective, long durable and available detect accident precisely.
3. By using GPS and GSM devices, we can know the exact time and position of where the accident happens as well as tracking the vehicle in case of stealing.
4. People can get primary medical help in a shorter time which can save their life and death in accident can be lessened significantly.

7. REFERENCES

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