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Automobile SOS System using MEM Sensor

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Abstract

Background/Objectives: This project consists of a device which can alert a rescue team to detect the crash. **Methods/Statistical Analysis:** In this, MEMS are used to detect the crash through tilting. Tilting can be considered in three axes. The exact position with information of longitude and latitude will be traced by using GPS module. That information is send to the near ones through the GSM. For that we have to register that numbers. By considering the worst case, if the system is crashed, then the alarms and lights are blown in that area. It draws the attention of the passer in that area. Reset button is used to stop the total system, if nothing happened to the person in the car. **Findings:** This system has to provide the exact information of the location. It has to respond with in the less time. It has to give the solution in the worst case. **Applications/Improvements:** This can be implemented in automobile industry. This can save the life of the individual by sending the SOS messages.

Keywords: Accident, GPS, GSM, MEMS Accelerator ADXL001, SOS

1. Introduction

The SOS device systems are not up to the expectations. The loss of property, life damage of very costly assets is noticed frequently. This work aims to provide a method for communicating with the rescue party immediately and automatically whenever an accident occurs. Sin ce **in most of the car crash** accidents, passengers undergo a heavy shock, after severe injuries and sometimes it leads them to an unconscious state. Loss of life can be avoided if delay in reaching the first aid is minimized. In this work we suggest for a device which makes use of the MEMS Accelerometer ADLX001 for detection of the crash as built-in device. This system consists of MEMS, GPS, GSM, LIGHTS, ALARMS and Microcontroller.

2. Block Diagram

The systematic form of the system is explained in the Figure 1.

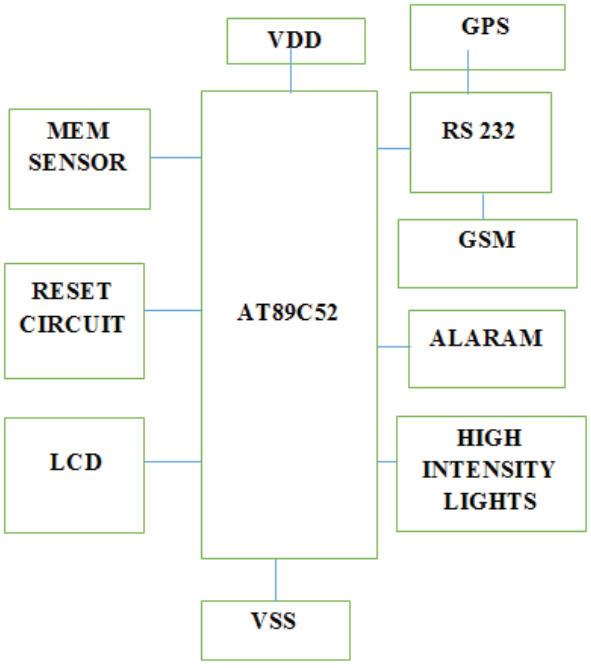

Figure 1. Block Diagram.

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3. Techniques Used

3.1 RS-232

This is simple protocol used for the communication between the system and the GSM, GPS modules. The communication protocol used in this device is RS-232[1]. It is a serial form of communication used between the two devices. It is the simple and asynchronous form of communication. The RS-232 standard is developed by the "Electronic Industry Association". A condition in this protocol is, the distance between the transmitter and the receiver can be less than or equal to 50 feet. The data transferring speed should be equal at both the ends. If that is not the case, then the data transmission error will occur. It transmission voltages varied from +15 to -15. The transmission of the data length is 7 bits. In logical values of the voltages are 1 and 0. 1 represents -15 and 0 represents +15. To save the power consumption the hardware tries to connect to logical 1, when the connection is idle. The communication is carried in 4 steps.

- Start bit.
- Seven bit data.
- Priority bit.
- Stop bit.

Start bit is the initiation bit to start the communication between the transmitter and the receiver. Seven bit is the data what we are sending. Priority bit is used for the error detection. In other words, it is the test bit to check whether the data is transmitted correctly or not. Stop bit is used to end the transmission or indication for the transmission is ended. This type of the transferring is done for each and every character. The cable used for the communication consisting of 25pin or 9 pin. Most preferable is 9 pin due to the size and the compatibility (Figure 2).

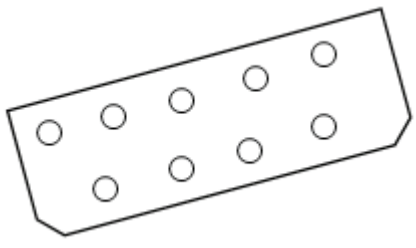

Figure 2. RS-232 9 pin configuration.

This cable consists of 9 connection pins which are essential for the communication between the two end points. The 9 pins are:

- Data carrier detect (CD).
- Receive data (RXD).
- Transmitted data (TXD).
- Data terminal ready (DTR).
- Signal ground (GND).
- Data set ready (DSR).
- Request to send (RTS).
- Clear to send (CTS).
- Ring indicator (RI).

When the modem initiates the connection, firstly the modem sends the signal to the Data carrier detect. The CD sends the signal to Data set ready. Then the receiver side gets activated at second instance. The signal is received by the Data terminal ready. At the third instance, after the DTR the signal is send to the Request to send. At the fourth instance the receiver end responds with the Clear to send. At the fifth instance, after the response from the CTS the data transmission starts. This is a full duplex form of communication having the single transmitter and receiver. The cable used in this communication is single ended cable.

1.2 MEMS Technology

A sensor which is having the capacity of monitoring the position of the system is Tilt sensor. This sensor consists of conductive plates and a metal ball. Whenever the vehicle starts, the gap between the ball and the conductive plate will be closed. The tilting position can be considered in three axes. When the crash occurs, the gap between the ball and the plate is opened and acts as an open circuit[2]. If the sudden crash was to occur for the moving vehicle, the speed of the vehicle would have decreased to zero[3].

An Accelerometer, an electromechanical device, consists of both the functions of the physics and the mechanics. MEMS are mostly preferred because they are small in size and the sensing capacity. These sensors are also called as the minute sensors and detects various signals. These can be used in viz. Accelerometers, Biomedical and Biological, Chemical, Forces, Optical, Pressure and Thermal fields.

In our project we are using the MEMS Accelerometer to detect the speed. These are used in the camera lens to make the standard image. MEMS can be manufactured by using the silicon and its derivatives, glass, quartz crystal, polymer and metals. Each type of the material has its own importance. Mostly preferred one is silicon and its derivatives. Quartz crystal is used for heavy piezoelectric

effect. Glass is used for having the tight bond with silicon. Polymer is used for having the thermoplastic property, bio absorbability, biodegradability. The working of the MEMS Accelerometer can be identified in two ways. One is piezo-electric effect which contains microscopic crystal. Velocity is generated whenever the crystal structures are get stressed. Another way is variation in the capacitance[4]. When the charging and the discharging of the capacitance happened, this proves the variation in the accelerometer.

4. Existing System

The already system having the vibrating sensors or with MEMS which has its own limitations. If sudden break or the long jerk is to occur, then the sensor considers as accident and creates a panic. Thus the present works becomes a need of the hour.

5. Proposed System

The drawback in the previous system was rectified in our proposed system. The extension that we are doing is adding the lights, alarms and reset circuit. After the breakage of the signal or the connection, our extension will start. After certain time if there is no response, then the lights and alarms are to be blown. Reset circuit is used to restart the total system, if the major accident did not occur.

6. How the System Works?

In the case of accident, the proposed system sends SOS messages, automatically with the details of locations latitude and longitude. Coming to the working of the main system, this total kit is arranged in two sides of the car.

MEMS (Macro Electro Mechanical Sensor) are the sensors used to detect the vibrations. MEMS convert the mechanical vibrations into the electrical signals and sends the input through the analogue to digital convertor to the microcontroller. We are using 8052 microcontroller. Whenever a vehicle is collide with another vehicle then some vibrations are generated. Those vibrations are detected by the MEM sensor. These vibrations are converted as the input signals using the ADC convertor. These digital signals are given as input to the microcontroller. Then the microcontroller gives the input to the GPS. GPS is used to trace the exact location of the vehicle[5]. This saves considerable time of the process. The communication protocol used between the microcontroller and GPS and GSM is done using RS-232[6]. This finds the location address with longitude and latitude. The next step of this work is to activate the GSM. This was done by the microcontroller. GSM is used to send the SOS messages. These messages are send to mainly to 4 members using GSM Modem[7]. Main preference is given to the rescue team. In that team we are having two members. First one for the medical team and second one is for the mechanical workman. Mechanical workman is used remove the car if it is in the tilted position. Without his work, the medical team cannot do anything. This is also a problem. Second preference is given to the family and the police at that area. If these things are done perfectly no problem is raised. If not, this is a big failure. This will happen, if the system gets crashed due to heavy clash, due to unavailability of the signal and any other reasons. For that our solution is having the lights and alarms. After certain time delay there is no any response, this module gets activate. Lights and Alarms are blown continuously. These can draw the attention of the passers on that way. The accident was major and no injuries happened to the driver or any other person who are travelling in that car. Then there is a reset module and this will stop the total functioning of the system. This can save the valuable time of the police and the rescue team. The process up to tracing the vehicle location can also termed as vehicle tracking[8]. This also helps to avoid the unnecessary tension for the family members. In this way this system works

7. Output Analysis

The expected output is to send the SOS messages whenever the accident occurred. It has to send the location of the accident in the SOS messages. The lights and alarms should be activated in the worst case. Reset switch can be used if the person is in the good condition. The results of the system are shown in Figures 3, 4 and 5.

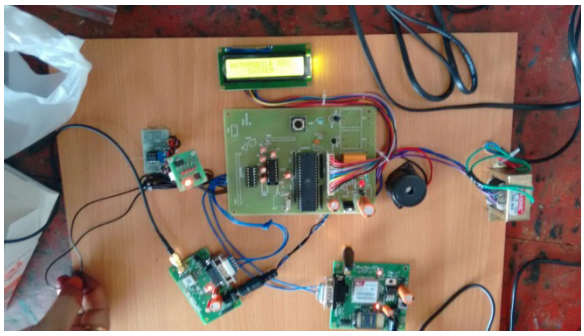

Figure 3. Accident detection.

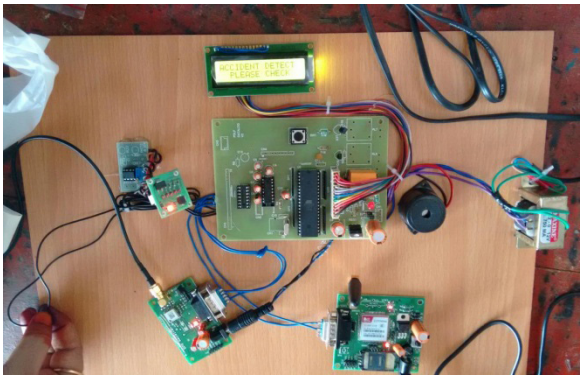

Figure 4. Getting the information.

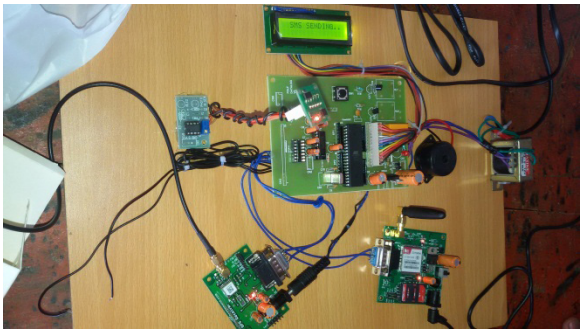

Figure 5. Sending the messages.

8. Future Scope

Camera can be used with the kit to view the situation of the patient. This helps to the doctor to arrange the medical requirements.

9. Conclusion

The proposal of the project is to find the fastest way to save the life. This reduces the time lag in medical assistance. The GPS tracker should trace the geographical location of the car. The alert messages are sent to the family members. By using the ROM'S the permanent contact numbers of the family members can be saved. Experimental verification is carried out in a verified manner.

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