



Accident Reporting and Vehicle Monitoring System

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ABSTRACT: Nowadays, with increasing population the use of automobiles has become superfluous as a consequence of which, people lose their lives every single day due to road accidents. The large loss of human life and property due to these road accidents is increasing a major concern globally. During accidents, the most evident reason for a person's death is that it is mainly due to the delay in notifying the ambulance or to the hospital. If proper medical attention is provided right time, these precious lives could be saved. The automotive industry is constantly developing to make vehicles more secure and safe to drive. But these technologies require upgrading the hardware and software, increasing the installation cost making these vehicles quite expensive which everyone can afford. This paper introduces a system which is an optimum solution not to prevent the accident, but at least can reduce its repercussions. The system aims at determining the state of any accident and reporting the precise location and the mobile number immediately upon its occurrence.

KEYWORDS: Speed, Accident Detection, GPS, GSM Notification

I. INTRODUCTION

In today's world, transportation has great importance in our daily life and the constant development of our daily chores quite easy. But the increased usage of automobiles is also of road accidents making it the second leading cause of death globally. According to report published by Transport Research Ministry of Road Transport & Highways, Government of India, almost 1317 road crashes occur every day about 413 people lose their life in these road accidents every day. Speeding is a major cause of the accounting to 66.5% of all road accidents. Delay of emergency services is a major issue of concern. If no action is taken, road traffic crashes are predicted to result in the deaths of 1.9 million annually by the year 2020.

Accident prevention is not completely possible, but at least the repercussions can certainly be reduced. The number of vehicles leads to heavy traffic jams and accident victim does not get help in the shortest amount of time between the accident and the victim getting proper medical treatment is often the difference between life and death. Moreover, each minute passed while providing an accident victim with medical care can make a huge difference in his/her survival rate. Analysis shows that decreasing accident response time by 1 minute correlates to a six percent difference in the number of lives saved. Generally, the ambulance and victim is not notified immediately. Also locating the accident spot accurately is quite difficult for emergency services. The victim's life can certainly be saved by expediting the ambulance to the hospital.

To overcome this drawback, our project on accident detection and reporting system provides an optimum solution with advantages such as low cost, size, portability and ability to easily control. Our project proposes a new dimension to control these accidents and also reduces the response and rescue time. This system

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location precisely with the help of GPS module and the GSM used to send the emergency notification to the registered mobile number.

II. RELATED WORK

There are few system in the literature which were thoroughly reviewed to define the scope and requirements of the project work and its special features were also studied.

In [1] authors programmed a GPS and GSM module by adding a crash detector in order to report automatically via the GSM module (using messaging) to the nearby agencies, providing the precise location of the accident. They used Telit GM86-GPS wireless system which uses positioning signals provided by the satellite. The machines equipped with GPS chip, which determines its location with a precision of approximately 10m. The system architecture shows that if an accident takes place at a certain time, the message is sent to 5 pre-configured numbers. The GPS/GSM module works with a crash detector which is installed but if the predefined numbers are out of the network coverage areas, the accident is reported.

In [2] authors worked on a system through modules consisting of automatic speed control module, accident detection and information module and security enabling module. Automatic speed control module includes a RF transmitter and receiver installed at specific position in the vehicle. Accident detection module consists of GSM and GB module. Security enabling module has a sensory units which check the condition of seat belt and the driver. In case of any accident, the vibration sensor increases beyond the limit and information is sent to the GSM module. The GSM module then notifies its respective authority reporting the accident with the help of a message.

[3] Author introduced an automatic alarm device for accidents. Their system can automatically detect an occurrence of an accident, locate the accident spot and then alerts the emergency services within seconds to the nearby geographical coordinates. The GPS module installed in the vehicle communicating with the satellite and gets the coordinates in form of latitude and longitude and information is sent to the centralized server. The server then searches for the nearby hospital and sends the accident alert to the hospital.

[4] The authors designed a system that senses any accident and notifies pre-configured numbers. The GSM technology is used to send the location of the vehicle. The position of the vehicle can be determined by the owner by sending a message to the number of the sim card installed in GSM module. The message contains time, latitude and longitude position of the vehicle. When there is an accident, the accelerometer sensor detects the change in position and sends a signal to the processor. The processor sends the signal and sends the vehicle location and an accident alert to the pre-configured numbers.

III. COMPONENTS

A. Development Board:



Fig. 1. ARM Cortex M4 microcontroller

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STM32P405 is a development board featuring ARM Cortex-M4 microcontroller. It is a medium-sized development board with a small prototype area for a large number of different applications such as U communication and powering; separate power jack for powering; reset and oscillator buttons for programming and debugging; serial driver and DE9 connector; UEXT expansion connector; prototype programmable LED; programmable button and many more. The board can be powered by a number of different sources

B. GPS Module:



Fig. 2. GPS Module

GPS is a navigation system used globally to determine location and time. Initially these were used for defense academy and later on came into usage for everyone. Main advantage of GPS is to track the location which has the GPS device. It operates based on four or more satellites to determine the location. In this project the GPS module is used for tracking the location of the vehicle.

C. GSM Module



Fig. 3. GSM Module

GSM resembles the mobile phones where few of the features are not available for the GSM. Similar to mobile phones it can connect to network operator where we can communicate through messages. The frequency of the GSM generally varies over 900MHz or 1800MHz. It also has LEDs where it can give power supply of 12v to the GSM sensor. Blue light which indicates the network signal it gives. Overall the sole purpose of GSM is for communication.

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D. Accelerometer:



Fig. 4 Accelerometer

The Accelerometer sensor measures the abrupt changes occurring in relation with vehicle's acceleration and tilt which determine whether an accident is taken place or not. It measures through all the three axes. The output signals generated by these systems are analog signals proportional to acceleration.

IV. BLOCK DIAGRAM

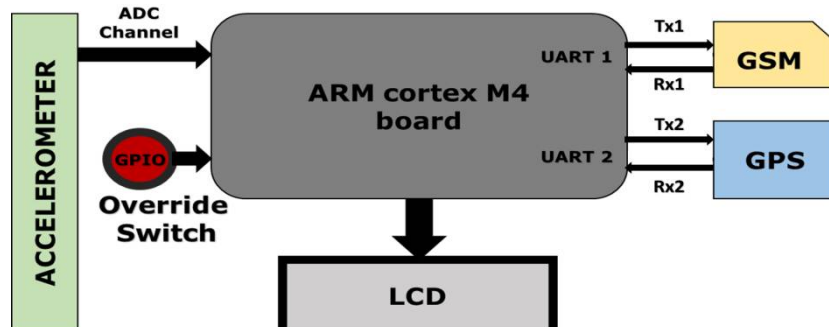


Fig. 5 Block Diagram

The Fig5 shows the strategic installation of the components of the system which is the ARM cortex M4 board, GPS module, GSM module, Accelerometer and LCD screen.

The GPS module is connected via UART and the ADC output of the accelerometer is connected to the ADC channel of the microcontroller. The GSM module is connected via UART through a different channel and installed card which sends the alert message when triggered.

V. WORKING

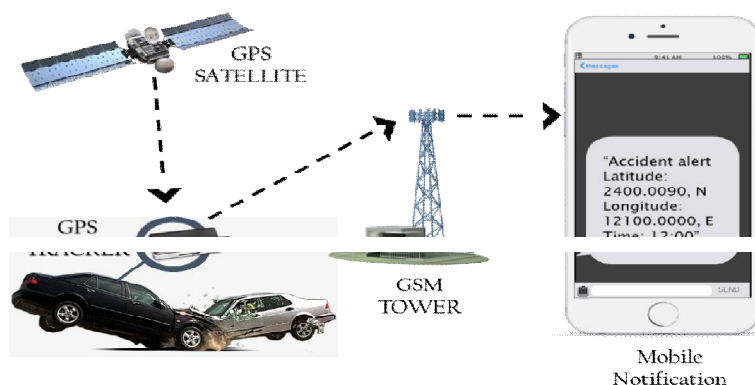


Fig. 6 Overview of the project

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The Accident Reporting System gets triggered in following mentioned scenarios:

1. Abrupt change in vehicle s acceleration.
2. Vehicle tilt is more than the specified value.
3. Vehicle acceleration is beyond speed limit.

As shown in Fig.6, an accelerometer constantly monitors the motion of the vehicle. In case of occurrence of any mentioned conditions, the accelerometer generates an interrupt. This generated interrupt triggers the system which collects inputs from the GPS module in the form of GPS coordinates. A SIM card installed on the GSM module is used to send the data in the form of a message to the registered phone numbers. The message contains the location of the accident so that the receiver can take the desired action.

To avoid a miss trigger the message kicks in which gives the driver of the vehicle 10 seconds to disengage the GSM module

VI. FLOWCHART

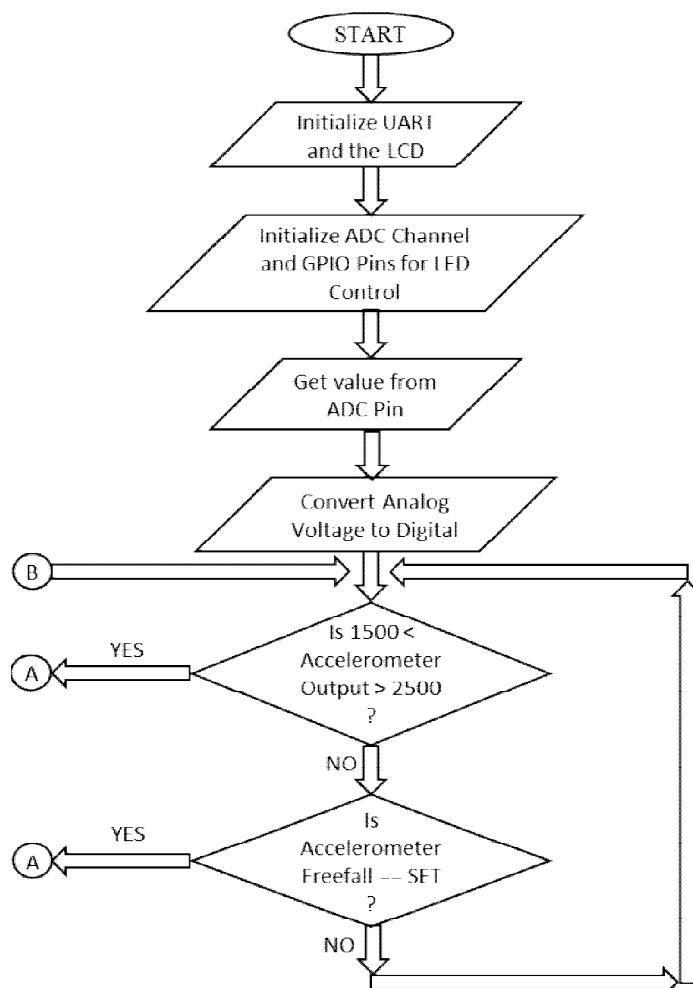


Fig.7.Accident Detection

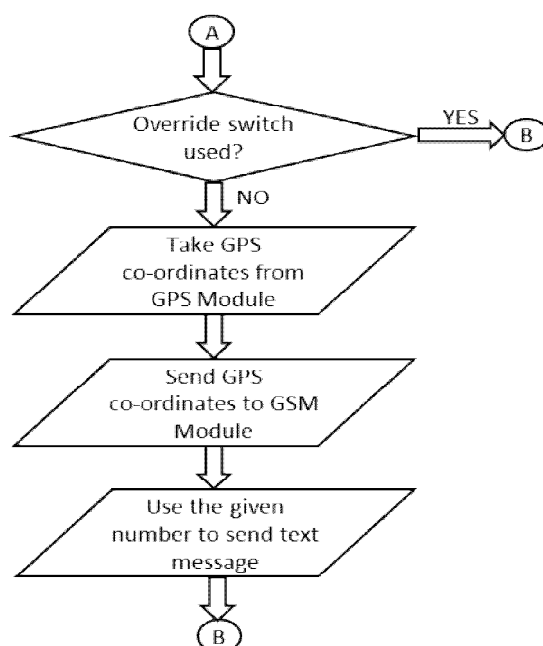


Fig. 8 Accident Reporting

VII. RESULTS

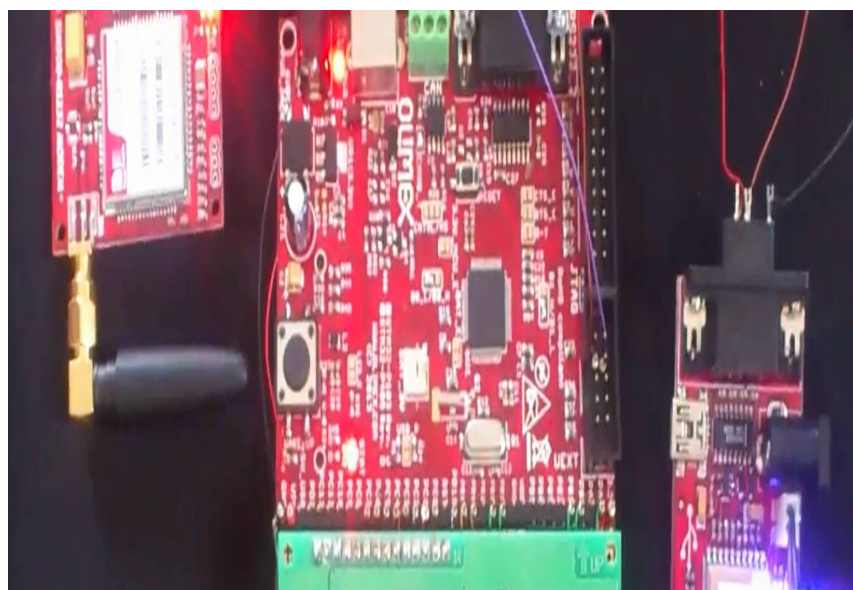


Fig. 9. Snapshot of the project stage

The y axis of accelerometer is monitored as shown in fig 9 its output can be seen on the LCD Screen. The accelerometer will trigger a series of responses when there is an abrupt change in vehicles acceleration or the below or beyond a certain value which can be predefined. In this case the accelerometer is calibrated to generate an interrupt when the value is below 1500 or above 2600.

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Fig. 10 Snapshot of the project's final result

When the accelerometer value goes below 100, the LED light on development board starts to blink indicating one of the need conditions has occurred. Then the inputs from the GPS module are taken and screen displays current time, latitude, longitude and simulate NMEA format shown in fig.10

VIII. ADVANTAGES

- x In case of accident, the victim's family is notified immediately reducing the response time.
- x The message sent by the system consists of the time and GPS of vehicle, thus faster medical help can be provided as exact location of the accident is known.
- x The system has Parental Control Mode which lets the user set a predefined speed limit and when it exceeds the speed limit, the user is alerted via SMS.
- x The user can change the mobile at any time according to his requirement.

IX. LIMITATION

The proposed system requires persistent GSM network in order to send the notification to the registered number. Hence it is not applicable in remote areas with poor network connectivity.

X. FUTURE SCOPE

The following modules can be implemented with the proposed system in order to prevent accident and provide automotive security.

- x Obstacle detection and alerting given.
- x Interfacing the system with vehicle airbag system for more safety.
- x Monitor parameters of vehicle like over-heat, gas leakage.
- x Introducing Alcohol sensor to avoid drink and drive situation.
- x Detecting driver drowsiness using MATLAB based eye monitoring.



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XI. CONCLUSION

This proposed system precisely track vehicle location automatically and send an alert SMS to registered mobile numbers. The time spent in searching the location is reduced and the victim can be treated in the shortest possible time. Experimental work is been carried out carefully and the result indicates higher sensitivity, accuracy making this project quite friendly and reliable. Our project will provide a feasible solution to traffic hazards and will give security to the vehicle and also reduce the loss of valuable lives and property. The proposed method is found to be highly beneficial for the automotive industry.

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