Vehicle Tracking and Accident Detection System Using GPS AND GSM Module

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Abstract- In today's world, most accidents do happen on the roads nowadays due to increased traffic and also due to the driver's reckless driving. In many cases, family members or the ambulance and police are not kept informed on time. This results in delaying the assistance provided to the injured person by accident. This Project titled "Vehicle Tracking and Accident Detection System and Arduino as the master controller" aims at finding the vehicle where it is and locating the vehicle using a computer within the vehicle system to send a message. Initially, the GPS continuously takes input data from the satellite and stores the latitude and longitude values in Arduino. If we have to track the vehicle, we need to send a message to the GSM device, by which it gets activated. It also gets activated by detecting accidents on the vibration sensor. Once GSM gets activated it takes the last received latitude and longitude positions values from the buffer and sends a message to the particular number or laptop which is predefined in the program. Once the message has been sent to the predefined device the GSM gets deactivated and GPS gets activated. This project presents analyzes of the accident detection techniques and some future possibilities in this field.

Keywords: Vibration Sensor, Arduino, GSM, GPS, Buffer, etc.

I. INTRODUCTION

The motor vehicle population is developing at a faster rate than the financial and population growth. Injuries and the death rate due to road accidents have been increased and most of the deaths that take place are due to the lack of instant clinical assistance, at the roads like express highways. A facility for offering instant clinical help to the accident location can reduce the fatality to a greater extent. thus comes the concept of an alert system that senses the accident and its seriousness to alert the medical center, to the passenger's close to and dear ones for imparting ambulance or clinical resources to the accident place. To avoid all such situations, we have designed two modules, the first one is known as "Vehicle Tracking" and the second module is known as "Accident detection". The main concept behind this project is known as "Vehicle Tracking" which aims at finding the vehicle where it is and locating the vehicle using a computer within the vehicle system to send a message. Initially, the GPS continuously takes input data from the satellite and stores the latitude and longitude values in Arduino. If we have to track the vehicle, we need to send a message to the GSM device, Once GSM gets activated it takes the last received latitude and longitude positions values from the buffer and sends a message to the particular number or laptop which is predefined in the program. Once the message has been sent to the predefined device the GSM gets deactivated and GPS gets activated. In this way, the vibration sensor does the operation of "Accident detection" by detecting accidents. We can track the location via the

Google Maps link or by using the VA output unit app we created. this project presents an analysis of the accident detection techniques and some future possibilities in this field.

II. HARDWARE PLATFORM

The Hardware Platform that has been used here are 7.5V DC Adapter, Vibration Sensor, Arduino Uno microcontroller, GPS Receiver, GSM Module, LCD Display, Buzzer.

2.1 Arduino UNO R3 Micro Controller-

Historically, an Arduino board includes an Atmel eight-, sixteen-, or 32-bit AVR [14] microcontroller with complementary additives that allow for programming and integration into other circuits. The Arduino's standard connectors are an essential characteristic considering they permit users to link the CPU board to several interchangeable upload-on modules known as shields. Few shields interact at once with the Arduino board through special pins, but numerous shields are personally addressable thru an I2C serial bus, allowing many shields to be stacked and utilized in parallel. It provides 14 virtual I/O pins, six of which could produce pulse-width modulated indicators, and 6 analog inputs, which can also be used as six digital I/O pins. This board has a five-volt linear regulator and a sixteen MHz crystal oscillator [21].

2.2 7.5V DC Adapter-

This adapter is important to power up the Pixl board, which can be found in the Poppy Ergo Jr robot. Its output voltage is 7.5V DC and its output current is 2A. it is also well matched with the Arduino UNO and Arduino Mega boards (as well as the Ethernet Arduino Board with POE module).

2.3 Vibration sensor-

The vibration sensor module is good at detecting small vibrations in the environment. It is broadly utilized in vibration detection products such as automobile alarm systems, motorcycle alarms, robbery alarms, and so on. This module makes use of HT45F56 MCU to detect the small output signal from the magnetic type vibration sensor. The HT45F56 has a 7fd5144c552f19a3546408d3b9cfb251 operational amplifier to amplify the small vibration signal. The alarm output is triggered when the signal strength exceeds the preset value. This module has a variety of vibration signal decision mechanisms to make sure the accuracy and reliability of the vibration detection alarm. This product can be used alone or built-in connection with an external MCU. While used alone, users only want to supply the power and connect the alarm output signal to a speaker or other alarm devices. While communicating with an external MCU, it uses a one-cord integrated interface. While integrated one-cord communication to read the detection state, users can also alter many settings for this module, such as vibration sensitivity level, alarm signal output type, and duration, etc.

2.4 GPS Receiver-

The Global Positioning System (GPS) is a satellite-based navigation system that gives location and time facts. The system is freely handy to anybody with a GPS receiver and unobstructed line of sight to 4 GPS satellites. A GPS receiver calculates its role using precisely timing the signals sent via GPS satellites. GPS is these days widely used and additionally has become a necessary part of smartphones. The GTPA010 module is easy to use, having RS232 built-in in addition to a USB interface. It operates over a 3.2 to 5V delivery range thus allowing interfacing with microcontrollers with 3.3V as well as 5V. The module outputs GPS data in the NMEA0183 layout. Every message string starts with '$' and then the message identifier. Every parameter is separated using a comma so that the message can be parsed with the help of the commas.

2.5 GSM Module-

The SIM800A Quad-Band GSM/GPRS Module with RS232 Interface is an entire Quad-band GSM/GPRS solution in an LGA(Land grid array) type which may be embedded in customer applications. SIM800A supports Quad-band 850/900/1800/1900 MHz, it can transmit Voice, SMS, and data information with low energy consumption. The SIM800A modem has a SIM800A GSM chip and RS232 interface while enabling smooth connection with the laptop or computer using the USB to the Serial connector or the microcontroller using the RS232 to TTL converter. After you connect the SIM800A modem in the USB to RS232 connector, you want to find the best COM port from the tool manager of the USB to Serial Adapter. Then you can open Putty or any other terminal software and open a connection to that COM port at 9600 baud rate, that's the default baud rate of this modem. Once a serial connection is open via the pc or your microcontroller you can start sending the AT commands. When you send AT commands in "ATr" you need to receive a reply from the SIM800A modem saying "ok" or a different response depending on the command sent. features: Quad-band 850/900/1800/1900MHz, GPRS class 2/10 manipulate via AT commands (3GPP TS 27.007, 27.0.5, and SIMCOM better AT command set). 86f68e4d402306ad3cd330d005134dac Product (no longer hobby grade). 5V interface for direct verbal exchange with MCU package. Configurable baud rate. 7fd5144c552f19a3546408d3b9cfb251 SIM Card holder. 7fd5144c552f19a3546408d3b9cfb251 network status LED. Inbuilt

powerful TCP/IP protocol stack for internet data transfer over GPRS. Low Power Package includes 1 x SIM800 A Quad-Band GSM/GPRS Modem with RS232 Interface.

2.6   *LCD Display-*

A liquid-crystal display (liquid crystal display) is a flat-panel display or another electronically modulated optical tool that uses the light-modulating properties of liquid crystals combined with polarizers. Liquid crystals do no longer emit light at once, rather using a backlight or reflector to produce images in coloration or monochrome. Liquid Crystal Display screen is an electronic display module and finds an extensive range of packages. A 16x2 liquid crystal display is a very fundamental module and is very commonly utilized in various gadgets and circuits. These modules are preferred over seven segments and different multi-segment LEDs. The reasons are: LCDs are cost-efficient; effortlessly programmable; have no limitation of displaying special & even custom characters (unlike in seven segments), animations, and so forth. A 16x2 liquid crystal display means it could show 16 characters per line and there are 2 such lines. in this LCD, each character is displayed in a 5x7 pixel matrix. This liquid crystal display has registers, namely, Command and data. The B international journal of scientific and research publications, volume 6, issue 7, July 2016 358 ISSN 2250-3153 www.ijsrp.org command register stores the command instructions given to the liquid crystal display. A command is an instruction given to LCD to do a predefined project like initializing it, clearing its screen, setting the cursor position, controlling the display, etc. The statistics register stores the information to be displayed on the LCD. The information is the ASCII value of the character to be displayed on the LCD.

2.7   *Buzzer-*

An Arduino buzzer is also referred to as a piezo buzzer. It is a tiny speaker that you may join at once to an Arduino. you can make it sound a tone at a frequency you set. The buzzer produces sound based totally on the opposite of the piezoelectric effect. The buzzer produces the same noisy sound no matter the voltage variant applied to it. It includes piezo crystals among two conductors. Whilst a potential is applied across those crystals, they push on one conductor and pull on the other. This, push and pull action, results in a sound wave, most buzzers produce sound inside the range of 2 to 4 kHz.

III. EXPERIMENT AND RESULT

The proposed system aims to check whether an accident has occurred and identify the seriousness of the injury to the accident victim/driver and detect the location of the vehicle in case of theft/need.
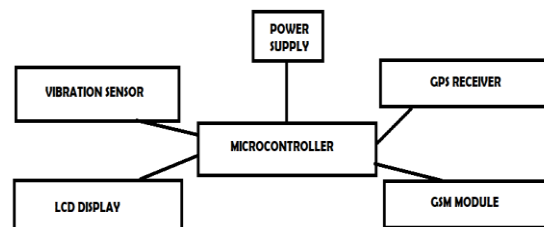

Figure 1.   block diagram of the vehicle tracking and accident detection system using GPS and GSM module

The proposed system consists of an accident detection and alert system, vehicle tracking system. The accident detection system will constantly monitor the vehicle. When the vehicle accident is detected using different sensors interfaced the system then immediately inform the location of the accident to the contact numbers. If in case of theft, the owner will send an SMS to the SIM used in the system any message having a word Track in it, for example, Track my Vehicle then the system in return sends an alerting message consisting vehicle's location to the owner. When the sensor gets activated based on the level of impact then the micro-controller ATmega in the Arduino fetches the location from the GPS receiver and sends the corresponding information to the contact number mentioned in the code which is dumbed in the Arduino i.e., to near and dear ones via SMS.
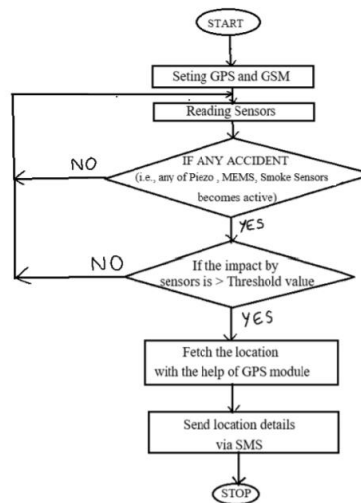
Figure 2.   flowchart of the vehicle tracking and accident detection system using GPS and GSM module

The proposed system includes an accident detection and alert system, automobile monitoring system. The accident detection system will constantly display the car and detect whether the vehicle is in normal driving posture or has fallen or any effect has taken place at the automobile. when the automobile accident is detected using unique sensors interfaced the system then immediately inform the area of the coincidence to the contact numbers mentioned in the program which is dumped inside the microcontroller (ATmega 328P) by utilizing the GPS module interfaced inside the machine.

If in case there occurs any theft the owner will send an SMS to the SIM used in the device any message having a word track in it, for instance, track my automobile then the system in return sends an alerting message consisting vehicle's location to the proprietor. the first part detects whether the vehicle has fallen. This module includes a sensor particularly, the Vibration sensor. once the vehicle accident is detected the data is sent to the second part of the system. the second part consists of an Arduino Uno, GSM module, GPS module.

when the sensors get activated based on the level of impact then the micro-controller ATmega inside the Arduino fetches the region from the GPS receiver and sends the corresponding data to the contact number mentioned within the code which is dumbed inside the Arduino i.e., to near and dear ones thru SMS.

This system consists of two ends. The user end and the vehicle end. The working method is when the car got theft then the person has to send an SMS to the cellular number this is used in the GSM module of the device, the message may be anything having a substring "track" for instance, track automobile, track my vehicle, and so on. Then the micro-controller reader the input from the GSM module and fetches the location details via GPS module and aging sends the location details to the personal cell number via SMS.

After interfacing sensors, GSM, GPS module in proteus software. the Arduino is dumped in with a program with the assist of Arduino IDE after debugging correctly. The simulation method and results are mentioned below and the Fig shows, the list of sensors connected to the Arduino microcontroller and simulated using Proteus 8 professional. In this system, a 5V DC supply is used as a power source to energy up the microcontroller. The source code of system implementation is uploaded in the microcontroller by the use of Arduino IDE. The accident detected from the vibration sensor is processed and displayed using sending the location via the GSM module as SMS. And the output is displayed via virtual terminal and from the LCD connected in this system.
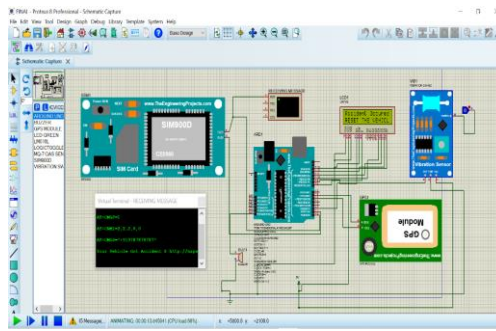
Figure 3.   Schematic Result of detecting accident
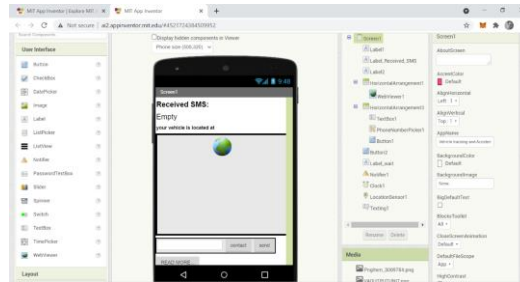

Figure 4.   Designing UI for VA OUTPUT UNIT in MIT app inventor

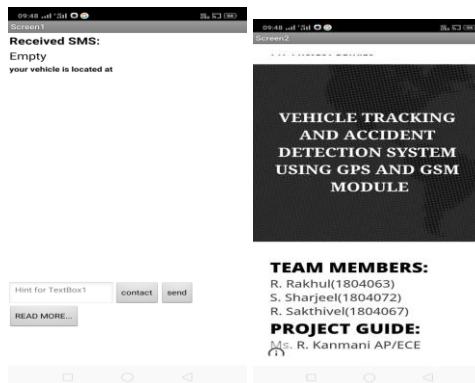Figure 5.   Successful compilation of app working logic

Figure 6.   Working of VA output unit before receiving message from GSM/mobile.
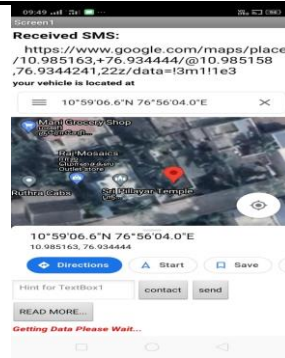
Figure 7. Working of VA output unit after receiving message from GSM/mobile.

In this stage, we used a smartphone rather than using a GSM module due to Proteus can't able to send SMS in stimulation. each GSM and smartphone will work identical. So, we determined to use a smartphone for the testing. After receiving a message from the specific number given in the Arduino, the message is directly embedded and starts looking for the area and effectively detects the location shown inside Fig 7.

IV.CONCLUSION

Every human life is valuable and well worth saving, life must not give up on road waiting for assistance in a crash. This project shouts out for assistance wherein we are unable to shout for help. The machine can detect the accident and then alert. the sufferers close to and dear ones to offer medical aid to accident sufferers. Vibration is used to decide whether an accident had taken place additionally gives the owner the characteristic of tracking his automobile in case of theft. The communications between the system and the responder or proprietor are carried out by GSM. we've got observed the performance of accident detection and alerting via SMS using GPS, GSM, and sensor. It facilitates now not handiest in finding the area of the automobile however also it is beneficial in saving the lives of sufferers by way of finding in which an accident has taken place.

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