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IOT Based Real Time Communication Location Tracking System for Vehicle Emergency

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Abstract - In this project, we have introduced an emergency communication and location tracking system for any type of vehicular emergency. This system aims to minimize the damages after a vehicle meets any unfortunate situation like an accident by sending automatic message to the family member and also upload location on IOT web server with latitude and longitude. It is also helpful for other emergency situations such as medical emergency, criminal problem, civil emergency and also for mechanical problem in the car. In this project, we have presented an IOT enabled approach that can provide emergency communication and location tracking services in a remote car that meets an unfortunate accident or any other emergency situation. Immediately after an accident or an emergency, the system either starts automatically or may be triggered manually. Depending upon type of emergency (police and security, fire and rescue, medical, or civil) it initiates communication and shares critical information e.g. location information, a set of relevant images taken from prefixed angles etc. with appropriate server / authority. Provision of interactive real-time multimedia communication, real-time location tracking etc. have also been integrated to the proposed system to monitor the exact condition in real-time basis.

Key Words: Real Time Location tracking system, IOT, Vehicular Emergency, GPS/GSM Technology.

1. INTRODUCTION

Internet of Things is an emerging technology having the ability to change the way we live. In IoT vision, each and every 'thing' has the ability of talking to each other that brings the idea of Internet of Everything in reality. Numerous IoT services can make our daily life easier, smarter, and even safer. Using IoT in designing some special services can make a lifesaver system. For instance; the administration of India has taken an activity called Digital India to interface the country to web. Both GSM and GPS technologies area unit incorporated by the GPS/GSM primarily based system.

In a smart city every device or better to say every 'thing' is connected 24 ×7to the Ubiquitous network. They can communicate to each other regardless of their communication protocols and hardware / software infrastructure. Machine to machine (M2M) communication is rapidly growing to make the machines more intelligent and shared in nature.

In this paper, we have used the concept of a smart city to provide a life savior system for a smart vehicle in any kind of emergency situation occurred on road. Most of the modern cars are well equipped with several sensors, mechanical devices, software, embedded hardware etc. to pre-detect collisions or crashes and avoid them. 'Safety and security' is one of the most important criteria of a vehicle. These kinds of modern safety systems are very much useful and reliable for car drivers as well as passengers on road. But those safety systems have one major limitation. These systems can only be used to avoid crashes. But unfortunately, if the system fails to avoid an accident or there is any other emergency situation other than accident, those systems have no provision to deal with them. If the driver gets sick while driving or some road blockage occurs or some mechanical problem occurs, those systems can't help.

A study says that in India 141,526 people were killed on road in 2014 by different types of road accidents [7]. Most of them were killed due to late arrival of rescue teams to the accident location. So it is obvious that if the accident information can be sent to the respective authorities immediately after a situation has occurred some of the lives could be saved. Modern vehicle tracking systems commonly use GPS technology for locating the vehicle, but other types of automatic vehicle location technology can also be used. Vehicle information can be viewed on electronic maps via internet with specialized software. The history of vehicle tracking dates to the beginning of GPS technology in 1978.

1.2. LITERATURE REVIEW

[1].Manasi Patil et al., suggested a better traffic management system using Raspberry pi and RFID technology. The vehicle has a raspberry pi controller fixed in it which is interfaced with sensors like gas sensor, temperature sensor and shock sensor. These sensors are fixed at a predetermined value before accident. When an accident occurs, the value of one of the sensor changes and a message to a predefined number (of the ambulance) is sent through GSM. The GPS module which is also interfaced with the controller also sends the location of the vehicle. When the message is received by the ambulance, a clear route has to be provided to the ambulance. The ambulance has a controller ARM which is interfaced with the RFID tag sends electromagnetic waves. When an ambulance reaches the traffic signal the RFID reader which is placed on the joints detect the electromagnetic waves of the tag. If the traffic signal is red, then the readers goes through the database in fraction of seconds and turn the red light green. And

automatically in such condition the RFID on opposite joints turn the opposite signal red. This provides a clear route to the ambulance.

[2]V.Sagar Reddy et al., developed an accelerometer based System for driver safety. The system has the advantage of tracking or identifying vehicles location just by sending a SMS or email to the authorized person. The system is designed by using Raspberry Pi (ARM11) for fast access to accelerometer for event detection. Is there any event is occurs the message sent to the authorized person so they can take immediate action to save the lives and reduce the damages. Images captured by the camera on the vehicle are emailed to the concerned person (for example the owner of the vehicle) along with the type of accident and the time of the accident.

[3].Sri Krishna Chaitanya Varma et al., proposed an Automatic Vehicle Accident Detection and Messaging System Using GPS andGSM Modems. AT89C52 microcontroller is used in the system. When the system is switched on, LED is ON indicating that power is supplied to the circuit. When the IR sensors that are used sense any obstacle, they send interrupt to microcontroller. The GPS receives the location of the vehicle that met with an accident and gives the information back. This information is sent to a mobile number as a message. This message is received using GSM modem present in the circuit. The message gives the information of longitude and latitude values. Using these values the position of the vehicle can be estimated.
[4]Apurva Mane et al., described the methods for vehicle collision detection and remote alarm device using Arduino. Key features of this design include real-time vehicle monitoring by sending its information regarding position (longitude, latitude), time, and angle to the monitoring station and to the user/owners mobile that should help them to get medical help if accident or the theft occurs. Also user/owner has an access to get real-time position of a vehicle in real time. Whenever accident occurs, MEMS and vibration sensor detects and sends the signals to microcontroller, by using GPS particular locations where accident has occurred is found, then GSM sends message to authorized members.

In [6] authors have proposed a GPS based location tracking system able to collect location information and send it through SMS. But the main problem of this system is, it is not a fully automated system. The user has to start the system manually.

In [7] the authors have discussed the impact of Intelligent Transportation System (ITS) for future intelligent vehicles. Thompson, Chris, et al. in [8] have introduced a system that can detect an accident by a smart phone's sensors, e.g. accelerometer sensor etc. and the phone uses its 3G connection to transmit accident information. But the system is not integrated into the vehicle and also not fully automated and sometime needs third party reporter to send complete emergency information along with photos.

2. PROPOSED SYSTEM

For our system, the vehicle needs to be equipped with some hardware equipment's. For example, to track the exact location of the car, there should be a GPS device that will return the exact location information of the car. For our prototype, we have GPS service to get the location (latitude, longitude) in a real- time basis.

All different elements like the vibration sensor, accelerometer and GPS and GSM modules are connected to PIC 18f4520 microcontroller. The code for the working of this machine is written in C. The LCD display displays brief messages to keep track of the working of the system. The alarm is brought on when an accident is detected. Accelerometer is used to detect crash or rollover of the automobile and sends indicators when an accident happens to the microcontroller.
GPS is used in cars for each monitoring and navigation. When an accident passed off in any area then GPS system tracks the role of the automobile and sends the information to the particular individual through GSM with the aid of alerting the man or woman through SMS or by using a call. As an additional option, the location detection can be achieved the usage of Google maps interface

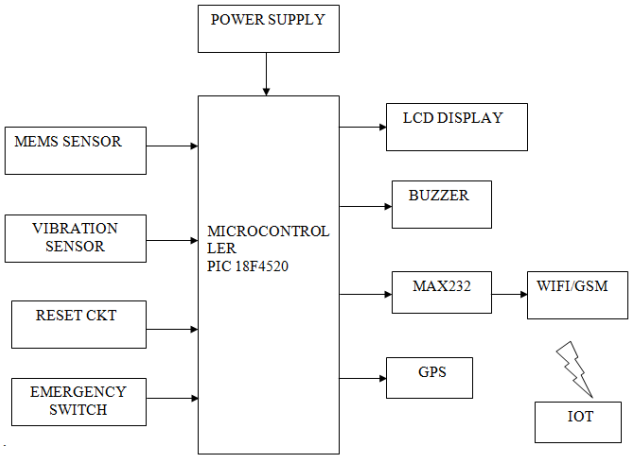

Fig -1: Block Diagram

2.1 PIC 18F4520 MICROCONTROLLER:

It is an 8-bit enhanced flash PIC microcontroller that comes with Nano Watt technology and is based on RISC architecture. Many electronic applications house this controller and cover wide areas ranging from home appliances, industrial automation, and security system and end-user products. This microcontroller has made a renowned place in the market and becomes a major concern for university students for designing their projects, setting them free from the use of a plethora of components for a specific purpose, as this controller comes with inbuilt peripheral with the ability to perform multiple functions on a single chip.

Fig -2: PIC18f4520

2.2 MEMS Sensor (ADXL345):

ADXL345 from Analog Devices is a triple-axis accelerometer with digital I2C and SPI interface. We added an on-board 3.3V regulator and logic-level shifting circuitry, making it a perfect choice for interfacing with any 3V or 5V microcontroller such as the pic.

The sensor has three axes of measurements, X Y Z, and pins that can be used either as I2C or SPI digital interfacing. You can set the sensitivity level to+-2g, +-4g, +-8g or +-16g. The lower range gives more resolution for slow movements, the higher range is good for high speed tracking. The ADXL345 is the latest and greatest from Analog Devices, known for their exceptional quality MEMS devices..

Fig -3: MEMS Sensor

2.3 Vibration Sensor:

The **vibration sensor** is also called a piezoelectric **sensor**. These sensors are flexible devices which are used for measuring various processes. The working principle of vibration sensor is a sensor which operates based on different optical otherwise mechanical principles for detecting observed system vibrations. The sensitivity of these sensors normally ranges from 10 mV/g to 100 mV/g, and there are lower and higher sensitivities are also accessible. The sensitivity of the sensor can be selected based on the application.

Fig -4: Vibration Sensor

2.4. GSM module:

This GSM modem has a SIM800A chip and RS232 interface while enables easy connection with the computer or laptop using the USB to Serial connector or to the microcontroller using the RS232 to TTL converter. Once you connect the SIM800 modem using the USB to RS232 connector, you need to find the correct COM port from the Device Manger 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, which is the default baud rate of this modem. Once a serial connection is open through the computer or your microcontroller you can start sending the AT commands.

Fig -5: GSM Module

2.5. LCD display:

A 16x2 LCD means it can display 16 characters per line and there are 2 such lines. In this LCD each character is displayed in 5x7 pixel matrix. This LCD has two registers, namely, Command and Data. The command register stores the command instructions given to the LCD. A command is an instruction given to LCD to do a predefined task like initializing it, clearing its screen, setting the cursor position, controlling display etc. The data register stores the data to be displayed on the LCD.

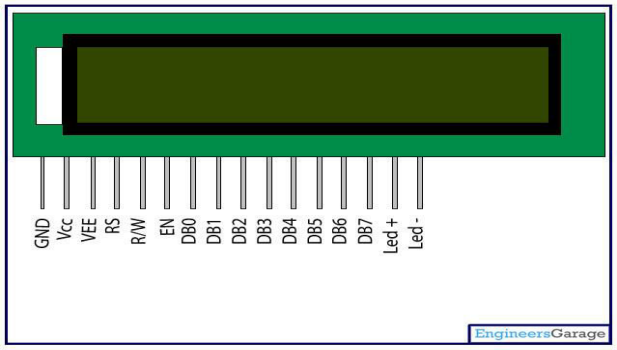

Fig -6: LCD Display

2.6. GPS Module:

This is New Version (V2) of our famous GPS Receiver with Antenna (5VTTL Serial) , with 4pin 2.54mm pitch Berg strip

connector option. It is made with third generation POT (Patch Antenna On Top) GPS module. The on board 3V3 to 5V level convertor enables us to directly interface with normal 5V Microcontrollers. Its low pin count (4Pin) will make it easy to interface and it is bread board friendly with 2.54mm (0.1″) Pitch connector pads. The 4 Pins are 5V, TXD, RXD and GND. Yes, there is no setting required, just plug in to the power (5v), your raw data (NMEA0183) is ready at TX pin!. This is a stand-alone 5V GPS Module and requires no external components .It is built with internal RTC Back up battery. It can be directly connected to Microcontroller's USART.

Fig -7: GPS Module

2.6. IOT:

"The Internet of Things (IoT) is a system of interrelated computing devices, mechanical and digital machines, objects, animals or people that are provided with unique identifiers and the ability to transfer data over a network without requiring human-to-human or human-to-computer interaction."

Things are either sensors or actuators. A sensor is something that tells us about our environment. Think of a temperature sensor, or even the GPS receiver on your mobile phone. Actuators are something that you want to control, things like thermostats, lights, pumps, and outlets. The "Internet of Things" brings everything together and allows us to interact with our things. For example, you could have your thermostat control itself based on where you're located.\

3. CONCLUSIONS

Thus the paper explains the basic structure and system design for IOT based real time vehicle tracking and vehicular emergency system. The article also explains the basic blocks and components used in this system.
In this project we have proposed an emergency contact and location tracking system for vehicular emergencies on road. The system is fully automatic in nature that can help us to minimize accidental and other emergency damages. The system is very much helpful for avoidance of road accidents and ambulance supply. Using this system we can do real time surveillance of vehicles and emergency systems. This Scheme is fully automated, thus it finds the accident spot, controls the traffic lights, helping to reach the hospital in time.

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