IOT Based Automatic Vehicle Accident Detection and Rescue System

Simran R. Sayyad[1], Aboli R. Koli[2], Jyotsna J. Parchande[3,] Shivani B. Gangekar

Electrical Engineering Department, SKN Sinhgad College of Engineering Pandharpur Maharashtra (India)

[1]simransayyad1219@gmail.com
[2]abolikoli197@gmail.com
[3]gangekarshivani98@gmail.com
[4]jyotsnaparchande@gmail.com

Abstract-**The high demand of automobiles has also increased the traffic hazards and the road accidents. Life of the people is under high risk. This is because of the lack of best emergency facilities available in our country. An automatic alarm device for vehicle accidents is introduced in here.**

The proposed design is a system which can detect accidents in significantly less time and sends the basic information to first aid center within a few seconds covering geographical coordinates, the time and angle in which a vehicle accident had occurred.

This alert message is sent to the rescue team in a short time, which will help in saving the valuable lives. When the accident occurs the alert message is sent automatically to the rescue team and to the police station.

The message is sent through the GSM module and the location of the accident is detected with the help of the GPS module. The accident can be detected precisely with the help of accelerometer (MEME) sensor. The angle of the roll-over of the car can also be known by accelerometer. This application provides the optimum solution to poor emergency facilities provided to the roads accidents in the most feasible way.

Keywords- **IOT, Arduino, ADXL335 sensor, GPS and GSM, etc.**

I. INTRODUCTION

With the advent of science and technology in every walk of life the importance of vehicle safety has increased and the main priority is being given to reduce the accident detection time when an accident occurs, so that the wounded lives can be attended in lesser time by the rescue team.

The Arduino along with accelerometer (MEME) sensor, GPS and GSM modules shorten the alarm time to a large extent and locate the site of accident accurately.

Consequently, the time for searching the location is reduced and the person can be treated as soon as possible which will save many lives. This system will have broad application prospects as it integrates the positioning systems and the network of medical based services.

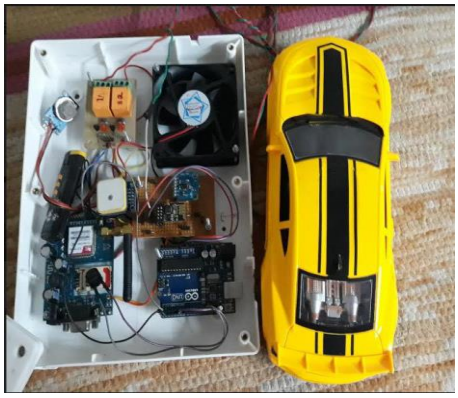
II. LITERATURE REVIEW

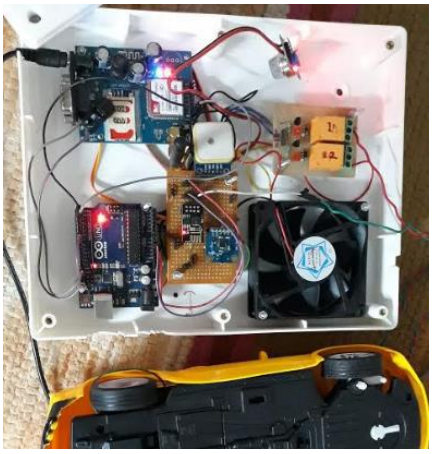
Due to higher accident rates vehicle tracking is very important now days. This can be done easily by the use of the GPS technology. Various other applications can also be used to do so. These applications are also used in fleet management, anti-theft vehicle systems and accident recovery

Kiran Sawant created an accident alert system using GSM and GPS modem. A MEMS sensor first senses the occurrence of an accident and gives its output to the arduino. The GPS detects the position of a vehicle and then sent as message through the GSM. The static IP address of central emergency dispatch

server is pre-saved in the arduino memory. Whenever an accident has occurred the position is detected and a message has been sent to the pre-saved mobile number.

III. DESIGN LAYOUTS AND ITS COMPONENTS





The important components of the system as follows- Arduino kit , MEMS Sensor ,Gas Sensor ,Buzzer ,Engine / Motor ,Fan,GSM MODEM ,GPS and Wi Fi Chip. The some important components are explained below

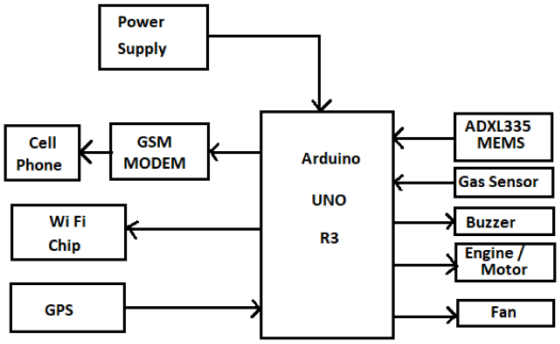


Fig 1. Bock Diagram

A. Accelerometer / MEMS Sensor

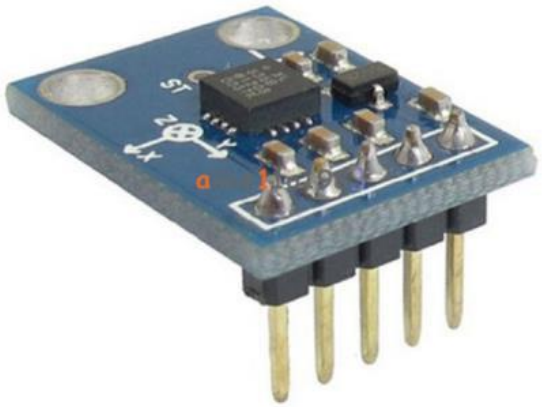


Fig 2. MEMS Sensor

An accelerometer is a tool that measures proper acceleration. Proper acceleration is the acceleration (the rate of change of velocity) of a body in its own instantaneous rest frame; this is different from coordinate acceleration, which is acceleration in a fixed coordinate system. For example, an accelerometer at rest on the surface of the Earth will measure an acceleration due to Earth's gravity, straight upwards(by definition) of g ≈ 9.81 m/s2. By contrast, accelerometers in free fall (falling toward the center of the Earth at a rate of about 9.81 m/s2) will measure zero.

Accelerometers have many uses in industry and science. Highly sensitive accelerometers are used in inertial navigation systems for aircraft and missiles. Vibration in rotating machines is monitored by accelerometers. They are used in tablet computers and digital cameras so that images on screens are always displayed upright. In unmanned aerial vehicles, accelerometers help to stabilize flight.

When two or more accelerometers are coordinated with one another, they can measure differences in proper acceleration, particularly gravity, over their separation in space—that is, the gradient of the gravitational field. Gravity gradiometer is useful because absolute gravity is a weak effect and depends on the local density of the Earth, which is quite variable.

B. GSM Modem

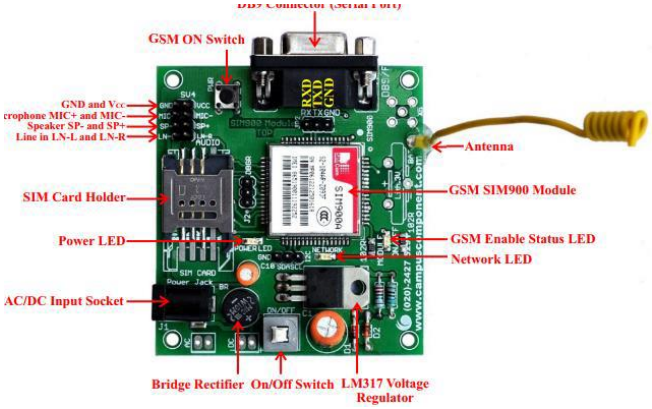


Fig 3. GSM Modem

This is actual SIM900 GSM module which is manufactured by SIMCom. Designed for global market, SIM900 is a quad-band GSM/GPRS engine that works on frequencies GSM 850MHz. GPRS multi slot class 10/ class 8 (optional) and supports the GPRS coding schemes CS-1, CS-2, CS-3 and CS-4. With a tiny configuration of 24mm x 24mm x 3mm, SIM900 can meet almost all the space requirements in User's applications, such as M2M, smart phone, PDAand other mobile devices.

C. MAX232 IC

Fig 4. MAX232 IC

The MAX232 is an integrated circuit that converts signals from an RS-232 serial port to signals suitable for use in TTL compatible digital logic circuits, so that devices works on TTL logic can share the data with devices connected through Serial port (DB9 Connector).

D. Gas Sensor

Fig 5. Gas Sensor

A gas detector is a device that detects the presence of gases in an area, often as part of a safety system. This type of equipment is used to detect a gas leak or other emissions and can interface with a control system so a process can be automatically shut down. A gas detector can sound an alarm to operators in the area where the leak is occurring, giving them the opportunity to leave. This type of device is important because there are many gases that can be harmful to organic life, such as humans or animals.

Gas detectors can be used to detect combustible, flammable and toxic gases, and oxygen depletion. This type of device is used widely in industry and can be found in locations, such as on oil rigs, to monitor manufacture processes and emerging technologies such as photovoltaic. They may be used in firefighting.

Gas leak detection is the process of identifying potentially hazardous gas leaks by sensors. Additionally a visual identification can be done using a thermal camera These sensors usually employ an audible alarm to alert people when a dangerous gas has been detected. Exposure to toxic gases can also occur in operations such as painting.

E. Motor

Fig 6. Motor

A DC motor (Direct Current motor) is the most common type of motor. DC motors normally have just two leads, one positive and one negative. If you connect these two leads directly to a battery, the motor will rotate. If you switch the leads, the motor will rotate in the opposite direction.

F. Arduino (UNO)

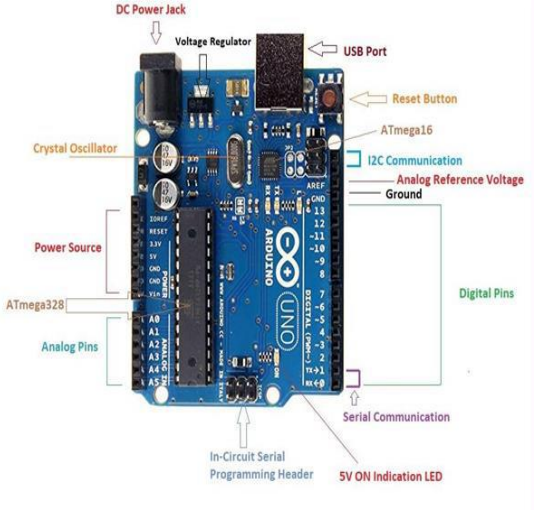


Fig 7. Arduino

The Arduino Uno board is a microcontroller based on the ATmega328. It has 14 digital input/output pins in which 6 can be used as PWM outputs, a 16 MHz ceramic resonator, an ICSP header, a USB connection, 6 analog inputs, a power jack and a reset button. Arduino consists of both a physical programmable circuit board (often referred to as a microcontroller) and a piece of software, or IDE (Integrated Development Environment) that runs on your computer, used to write and upload computer code to the physical board Functions. Segmenting code into functions allows a programmer to create modular pieces of code that perform a defined task and then return to the area of code from which the function was "called". The typical case for creating a function is when one needs to perform the same action multiple times in a program. In fact, you already are; the Arduino language is merely a set of C/C++ functions that can be called from your code. Your sketch undergoes minor changes (e.g. automatic generation of function prototypes) and then is passed directly to a C/C++ compiler (avr-g++).

G. GPS (Global Positioning System)

Fig 8. GPS

The Global Positioning System (GPS), originally NAVSTAR GPS,is a satellite-based radionavigation system owned by the United States government and operated by the United States Space Force. It is one of the global navigation satellite systems (GNSS) that provides geolocation and time information to a GPS receiver anywhere on or near the Earth where there is an unobstructed line of sight to four or more GPS satellites.[3] Obstacles such as mountains and buildings block the relatively weak GPS signals.

The GPS does not require the user to transmit any data, and it operates independently of any telephonic or internet reception, though these technologies can enhance the usefulness of the GPS positioning information. The GPS provides critical positioning capabilities to military, civil, and commercial users around the world. The United States government created the system, maintains it, and makes it freely accessible to anyone with a GPS receiver.

H. Wi fi chip

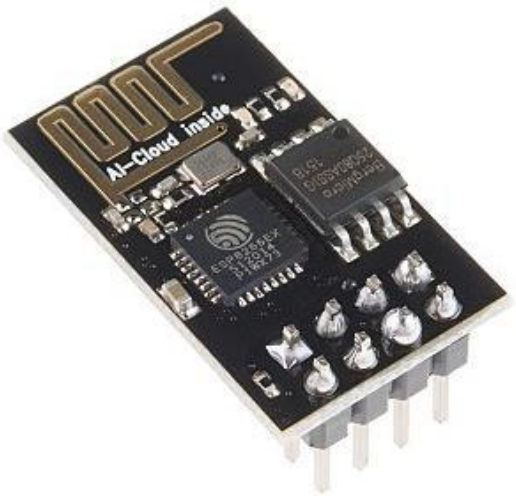


Fig 9. Wi Fi Chip

The **ESP8266** is a low-cost Wi-Fi microchip, with a full TCP/IP stack and microcontroller capability, produced by Espressif Systems[1] in Shanghai, China.

The chip first came to the attention of Western makers in August 2014 with the **ESP-01** module, made by a third-party manufacturer Ai-Thinker. This small module allows microcontrollers to connect to a Wi-Fi network and make simple TCP/IP connections using Hayes-style commands. However, at first there was almost no English-language documentation on the chip and the commands it accepted.[2] The very low price and the fact that there were very few external components on the module, which suggested that it could eventually be very inexpensive in volume, attracted many hackers to explore the module, the chip, and the software on it, as well as to translate the Chinese documentation.[3]

IV. WORKING OF SYSTEM

In this project, an IOT based vehicle accident detection and rescue information system is developed in order to detect vehicle accident and send the location information of the accident place to vehicle owner, nearest hospital and police station via web service. The communication between the web server and hardware device is established via GSM/GPRS shield and the location is traced by using the GPS shield. The accident is detected through vibration sensor, keypad and Buzzer. The project is developed for real time data fetching from the hardware device using through web applications, android mobile application or SMS. This project approximately provides the accurate detection of the location of accident occurred and send notification to the nearest police station and hospital.

V. RESULT AND DISCUSSION

Hence the automatic alarm device for vehicle accidents has been implemented using Arduino. This design is a system which can detect accidents in significantly less time and sends the basic information to first aid center within a few seconds covering geographical coordinates, the time in which a vehicle accident has occurred. The additional Google maps interface also makes the viewing of the location easier.

Additional applications of this concept are Stolen Vehicle Recovery, Fleet Management, Asset Tracking, School bus tracking for safety of children and to keep tab on drivers.

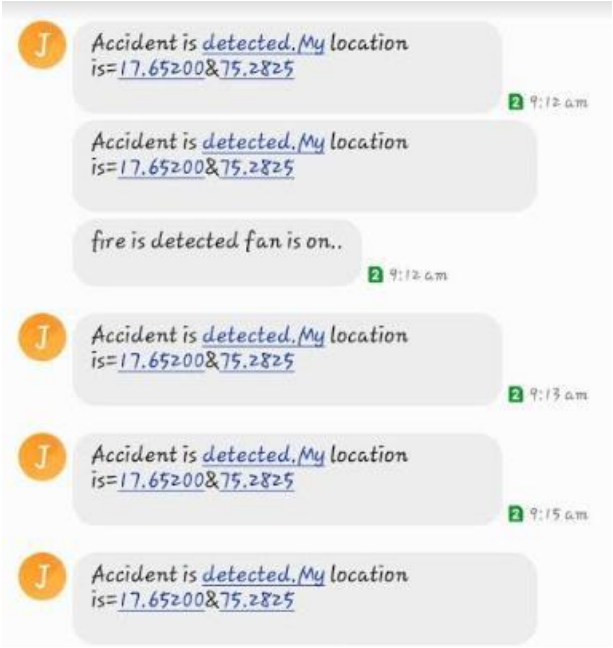


Fig 9. Results Display

VI. CONCLUSION

GSM based type of fault, location and theft detecting system has been developed. This model send information to the operator via SMS and will reduce the man power. Improve in all aspects. As a future scope voice message may be send to the consumer instead of the text message. It will minimize and also detects the power theft. To identify the location of power theft in consumer premises.

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