International Journal on Science and Technology (IJSAT)
E-ISSN: 2229-7677 ● Website: www.ijsat.org ● Email: editor@ijsat.org

Accident Detection System Using GPS GSM Module and Arduino

Tirthankar Hudati[1], Jasonnita Das[2]

[1]Student of Master Electronics and Instrumentation Engineering,
Department of Electronics and Communication Engineering
University Institute of Technology,
The University of Burdwan,
West Bengal, India
[2]B. Tech Electrical Engineering,
Department of Electrical Engineering
MCKV Institute of Engineering
GT Road North, Howrah
West Bengal, India

Abstract
To Prevent accidents, it is not our hand always but, it is possible to save victims. Under such circumstances an accident detection system is helpful. The deaths that take place in a accident increases due to not receiving appropriate help in time. This system includes a hardware system to hold sensor which upon impact due to the accident will send the latitude and longitude of the accident to the pre-registered mobile number using the GPS and GSM modules.
Hence the accident spot can be located easily and appropriate help can reach in time. The accelerometer will notify the Arduino during the impact of the accident. Arduino will then fetch the latitude and longitude from the GPS module. Arduino will send the latitude and longitude of the accident spot to the GSM module. GSM module will send an SMS containing the latitude and longitude of the accident spot to the pre-registered mobile number. The user of that mobile number can then ask the authorities for help. In this way, help can be provided in time.

Keywords: accident detection system, GPS and GSM modules, accelerometer.

1. Introduction

This An **Accident Detection System (ADS)** is a technology-driven system designed to detect accidents or collisions in real time, typically in vehicles. It uses a combination of sensors, cameras, and algorithms to monitor the vehicle's surroundings and its own internal data to identify any sudden and potentially dangerous events, such as crashes, rollovers, or other accidents. This system includes a hardware system to hold sensor which upon impact due to the accident will send the latitude and longitude of the accident to the pre-registered mobile number using the GPS and GSM modules. Hence the accident spot can be located easily.

2. Literature Review

[1] T Kalyani, S Monika, B Naresh,Mahendra Vucha, Accident Detection and AlertSystem, IJITEE, March 2019(Base paper).
[2] Parag Parmar, Ashok M.Sapkal, Real time detection and reporting of vehiclecollision, IEEE,2017.
[3] Md. Syedul Amin, Jubayer Jalil, M.B.I.Reaz, Accident Detection and ReportingSystem using GPS,GPRS and GSM Technology, IEEE,2012.
[4] Gowshika B, MadhuMitha, G,Jayashree,Vehicle accident detection system using GPS, GSM modem, IRJET,2019.
[5] Sayanee Nanda, Harshada Joshi, Smitha Khairnar, An IOT Based Smart System for Accident Prevention and Detection,IEEE,2018.
[6] Norsuzila Yaacob, Ainnur Eiza Azhar, Azita Laily Yusofl, Suzi Seroja Sarnin, Darmawaty Mohd Ali and Ammar Anuar, Real Time Wireless Accident Tracker using Mobile Phone,IEEE,2017.
[7] S.Sonika, Dr.K.Sathyasekhar, S.Jaishree, Intelligent accident identification system using GPS, GSM modem,DARCCE,2014.
[8] Dhruvesh H.Patel, Parth Sadatiya, Dhruvbhai K. Patel, Prasann Barot, IoT based Obligatory usage of Safety Equipment for Alcohol and Accident Detection,IEEE,2019.
[9] Ajith Kumar.A, Jaganivasan.V, Sathish.T, Mohanram.S,Accident detection and alert system using GPS&GSM,IJOPAAM,2018.
[10] ACCIDENT DETECTION AND ALERT SYSTEM G. Siri, G. Priyanka, B. Divya, G. Sameera, Ms. M. Pallav Student, Department Of Computer Science And Engineering, Vignan's Institute Of Engineering For Women, Andhra Pradesh, India.Guide, Department of CSE Vignan's Institute of Engineering For Women, Andhra Pradesh, India.

3. Objective Of The Project

The objective of an **Accident Detection System** is to automatically detect and alert relevant authorities or personnel about the occurrence of an accident, typically in vehicles, to reduce response time and minimize harm. The system typically focuses on:

1. **Immediate Incident Detection**:

   Detect accidents in real-time using sensors like accelerometers, gyroscopes, and GPS, or through computer vision techniques that analyze surroundings (e.g., using cameras or lidar).

2. **Automatic Alerts and Notifications**:

   Send immediate alerts to emergency services, such as police, ambulance, or fire services, and/or notify passengers' emergency contacts. This can be done via SMS, app notifications, or direct integration with emergency response systems.

3. **ReducingResponseTime**:
   By automating the detection and communication process, emergency responders are notified without human intervention, which significantly reduces the time it takes to reach the scene.

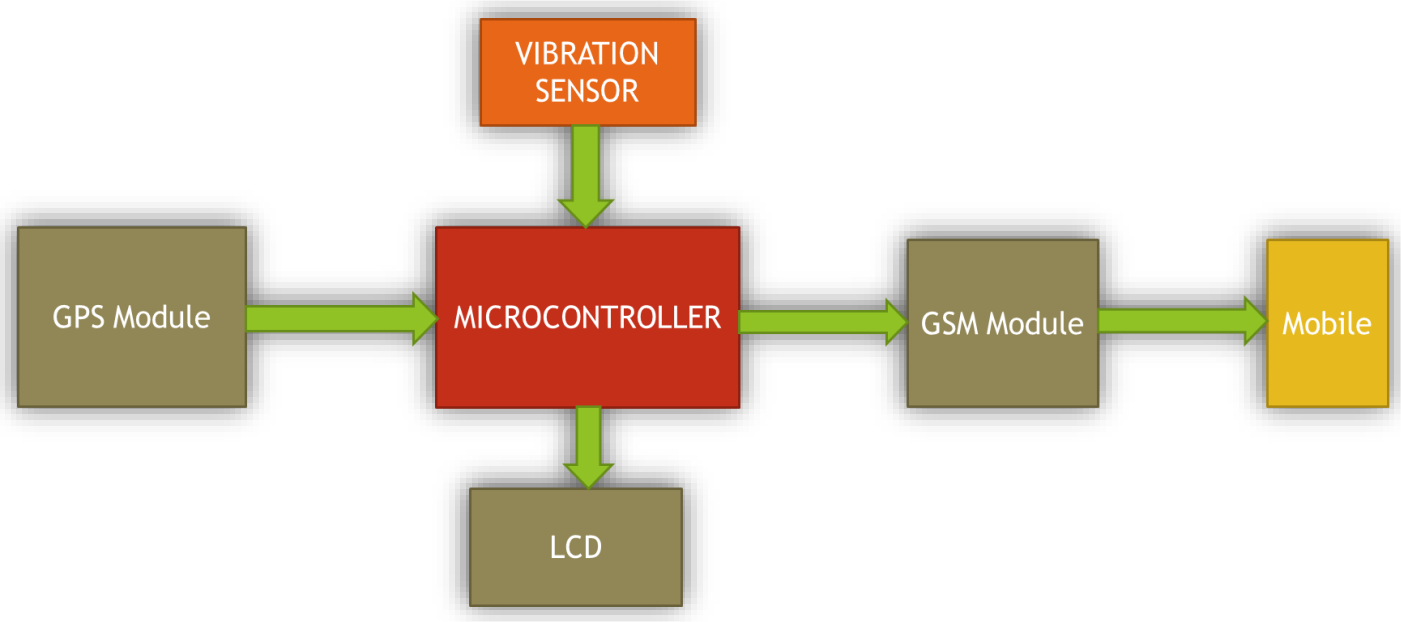
4. **ImprovedSafety**:
   Improve passenger safety by enabling faster medical intervention and assistance after an accident. This can be life-saving, especially in remote or high-risk areas.
5. **DataCollection**:
   Gather critical accident-related data (e.g., impact force, speed at the time of the crash, location) for post-accident analysis, which can help with insurance claims, safety improvements, and accident prevention.
6. **Cost-Effective**:
   Automating accident detection can lead to lower insurance premiums, fewer legal issues, and reduced costs related to damage control and accident investigations.

IntegrationwithSmartSystems:
The system may also be integrated into a broader vehicle or city-wide smart infrastructure, enabling features like adaptive traffic lights or routing to avoid congestion around accident sites.

4. Working

The accelerometer will notify the Arduino during the impact of the accident. Arduino will then fetch the latitude and longitude from the GPS module. Arduino will send the latitude and longitude of the accident spot to the GSM module. GSM module will send a SMS containing the latitude and longitude of the accident spot to the pre-registered mobile number. The user of that mobile number can then ask the authorities for help. In this way, help can be provided in time.

5. Block Diagram

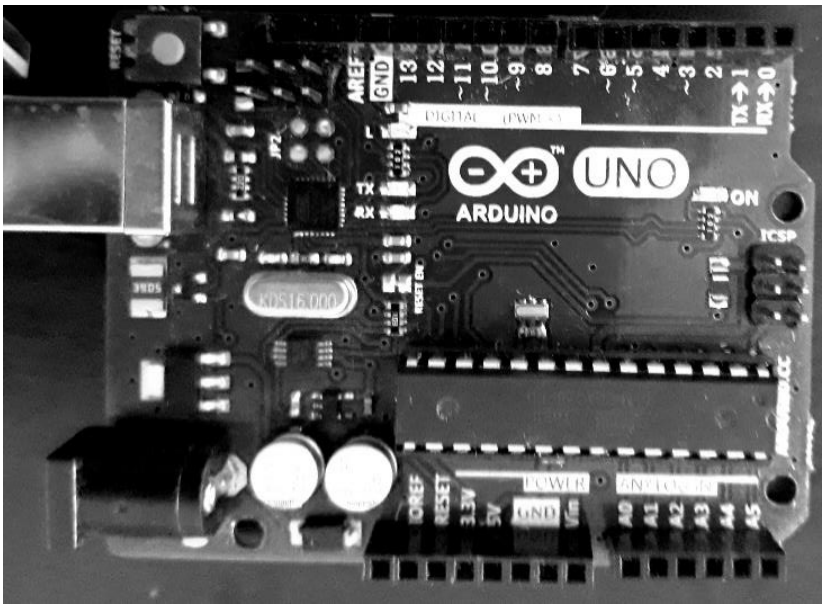


Block Diagram of the Project

6.Modules Of The Project

Arduino Uno

The Arduino UNO is a widely used open-source microcontroller board based on the ATmega328P microcontroller and developed by Arduino.cc. It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz ceramic resonator, a USB connection, a power jack, an ICSP header, and a reset button. It contains everything needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with a AC-to-DC adapter or battery to get started. The Uno differs from all preceding boards in that it does not use the FTDI USB-to-serial driver chip. Instead, it features the Atmega16U2 (Atmega8U2up to version R2) programmed as a USB-to-serial converter.



Arduino UNO

Technical Specifications

- Microcontroller ATmega328
- Operating Voltage 5V
- Input Voltage (recommended) 7-12V
- Input Voltage (limits) 6-20V
- Digital I/O Pins 14 (of which 6 provide PWM output)
- Analog Input Pins 6
- DC Current per I/O Pin 40 Ma
- DC Current for 3.3V Pin 50 mA
- Flash Memory 32 KB (ATmega328) of which 0.5 KB used by bootloader
- SRAM 2 KB (ATmega328)
- EEPROM 1 KB (ATmega328)
- Clock Speed 16 MHz

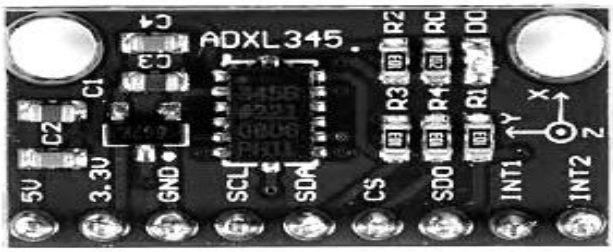
Vibration Sensonsor

The vibration sensor is also called a piezoelectric sensor. These sensors are flexible devices which are used for measuring various processes. This sensor uses the piezoelectric effects while measuring the changes within acceleration, pressure, temperature, force otherwise strain by changing to an electrical charge.

Acclerometer

An accelerometer is an electromechanical device used to measure acceleration forces. Such forces may be static, like the continuous force of gravity or, as is the case with many mobile devices, dynamic to sense movement or vibrations.

Acceleration is the measurement of the change in velocity, or speed divided by time. For example, a car accelerating from a standstill to 60 mph in six seconds is determined to have an acceleration of 10 mph per second (60 divided by 6).



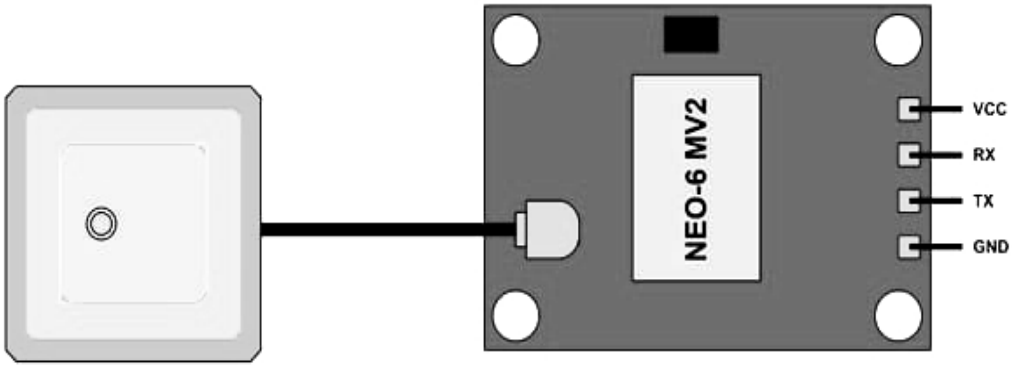
Acclerometer

I2c Protocol

I2C protocol only requires two wires to start off a communication but those two wires can support upto 1008 slave devices. I2C communication is preffered only for short distance communication. I2C allows multi-master multi-slave system i.e. several number of master devices can communicate with several number or slave devices

Gps Module

Global Positioning System (GPS) satellites circle the Earth twice a day in a precise orbit. Each satellite transmits a unique signal and orbital parameters that allow GPS devices to decode and compute the precise location of the satellite. GPS receivers use this information and trilateration to calculate a user's exact location. Essentially, the GPS receiver measures the distance to each satellite by the amount of time it takes to receive a transmitted signal. With distance measurements from a few more satellites, the receiver can determine a user's position and display it.



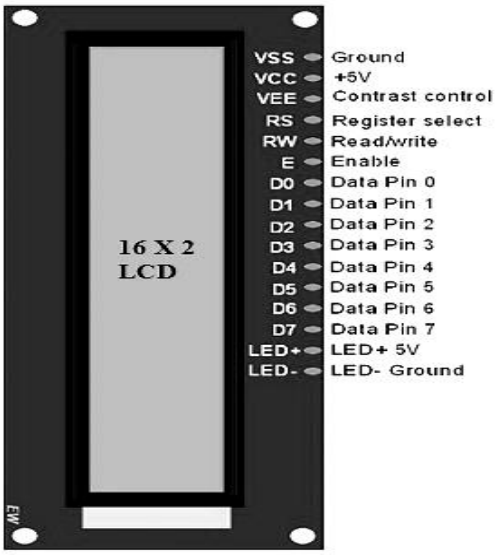
GPS Module

Antenna

An antenna is required to use the module for any kind of communication. So, the module comes with a patch antenna having -161 dBm sensitivity**.** You can snap-fit this antenna to small U.FL connector located on the module.

Antenna
Lcd Display

To display the numbers, alphabets and special characters an LCD module with 16x2 alphanumeric types is used. Using the higher bit data lines of LCD pins such as pin 11,12,13 and 14 are interfaced to digital pins of Arduino such as pin 8,9,10 in 4 bit mode as shown in the below figure. RS and E pins of LCD are connected to pin 12 and 13. To perform the write operation on LCD the read/write pin is connected to ground.

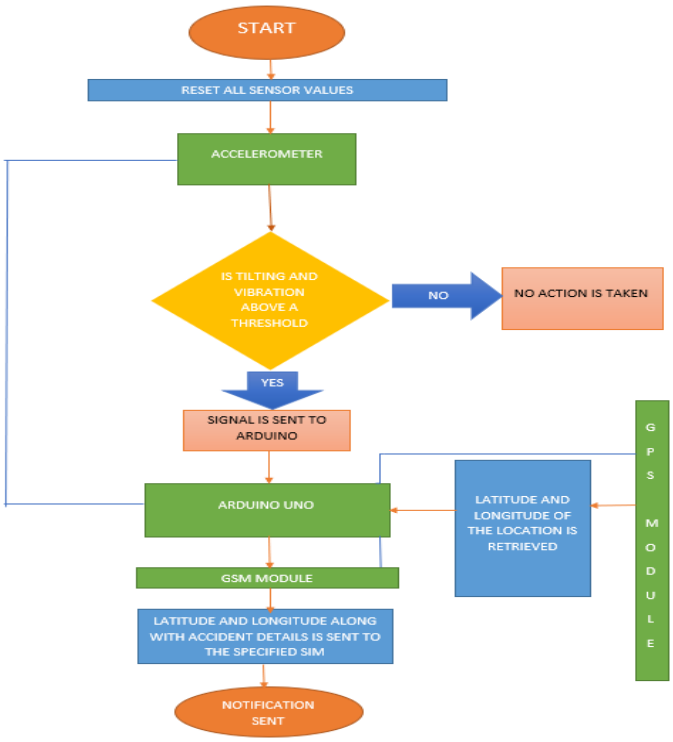


LCD Display

Gsm Module

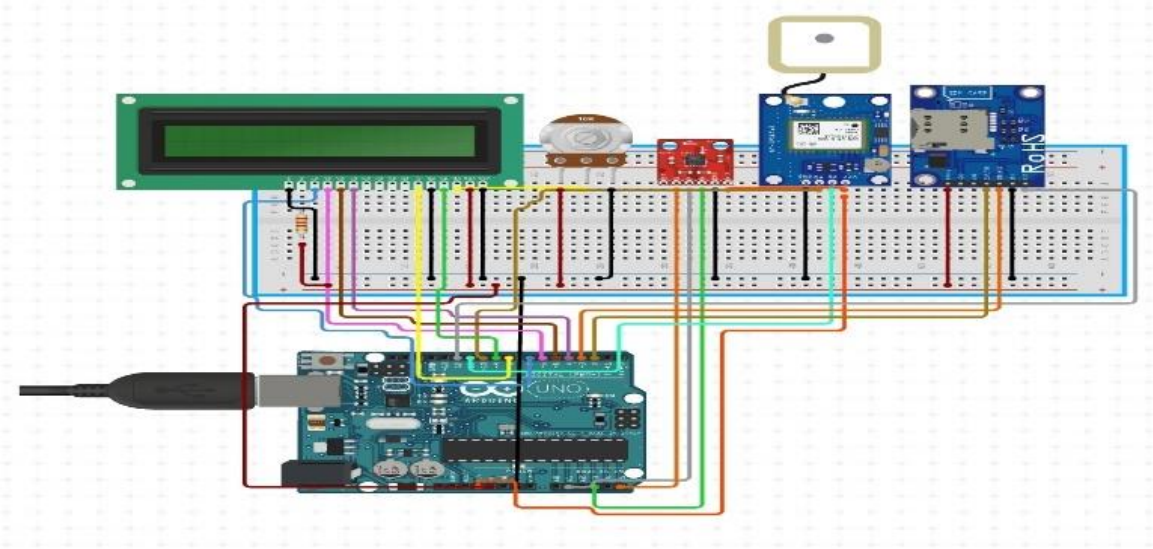
GSM (Global System for Mobile Communications, originally Groupe Spécial Mobile), is a standard developed by the European Telecommunications Standards Institute (ETSI)It was created to describe the protocols for second-generation (2G) digital cellular networks used by mobile phones and is now the default global standard for mobile communications – with over 90% market share, operating in over 219 countries and territories.

7.Flow Chart



8.Result

The accelerometer will notify the Arduino during the impact of the accident. Arduino will then fetch the latitude and longitude from the GPS module. Arduino will send the latitude and longitude of the accident spot to the GSM module. GSM module will send a SMS containing the latitude and longitude of the accident spot to the pre-registered mobile number. The user of that mobile number can then ask the authorities for help. In this way, help can be provided in time.



9.Future Aspect

The proposed system deals with the detection of the accidents. But this can be extended by providing medication to the victims at the accident spot. By increasing the technology, we can also avoid accidents by providing alerts systems that can stop the vehicle to overcome the accidents.

10.Conclusion

The proposed system deals with the accident alerting and detection. Arduino is the heart of the system which helps in transferring the message to different devices in the system. Vibration sensor will be activated when the accident occurs and the information is transferred to the registered number through GSM module. Using GPS the location can be sent through tracking system to cover the geographical coordinates over the area. The accident can be detected by a vibration sensor which is used as major module in the system.

References

1. T Kalyani, S Monika, B Naresh,Mahendra Vucha, Accident Detection and AlertSystem, IJITEE, March 2019(Base paper).
2. Parag Parmar, Ashok M.Sapkal, Real time detection and reporting of vehiclecollision, IEEE,2017.
3. Md. Syedul Amin, Jubayer Jalil, M.B.I.Reaz, Accident Detection and ReportingSystem using GPS,GPRS and GSM Technology, IEEE,2012.
4. Gowshika B, MadhuMitha, G,Jayashree,Vehicle accident detection system using GPS, GSM modem, IRJET,2019.
5. Sayanee Nanda, Harshada Joshi, Smitha Khairnar, An IOT Based Smart System for Accident Prevention and Detection,IEEE,2018.
6. Norsuzila Yaacob, Ainnur Eiza Azhar, Azita Laily Yusofl, Suzi Seroja Sarnin, Darmawaty Mohd Ali and Ammar Anuar, Real Time Wireless Accident Tracker using Mobile Phone,IEEE,2017.
7. S.Sonika, Dr.K.Sathyasekhar, S.Jaishree, Intelligent accident identification system using GPS, GSM modem,DARCCE,2014.
8. Dhruvesh H.Patel, Parth Sadatiya, Dhruvbhai K. Patel, Prasann Barot, IoT based Obligatory usage of Safety Equipment for Alcohol and Accident Detection,IEEE,2019.