

# IOT Based Automatic Vehicle Accident Alert System

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**Abstract**—The concept of detecting car accidents is not fresh and the automobile industries have made tremendous progress in optimizing the technology. This paper is an try and make a contribution in that location of generation. Here we are seeking to stumble on accident through the Accelerometer as it facilitates in identifying the vicinity and if the values of x, y and z parameters are extra than the defined values than it's going to set situation to proper and the code written for initiating the intimation and SMS alert gets executed. With this method the accident location can be detected easily and the information of the accident location can be sent via the GPS to the emergency offerings for assistance.

**Keywords**—accident detection, accelerometer, alert system, GPS.

## I. INTRODUCTION

Over the last few years , the automotive industry worldwide has shown considerable progress in its production. With the growing technology, rate of vehicle production is increasing and parallelly it can be concluded that the rate of accidents is also increasing. Road accidents leads to the high risk of people's life. This is because our country lacks the best emergency facilities [6]. This paper proposes an automated detection and alerting system for automobile accidents. This system helps in detecting the accidents in very less period of time, basically within a few seconds, send the basic information to the first aid center in a message including the time and location of the accident [2]. The alert message helps in locating the location so that the medical services can be provided on time and this way the precious lives can be saved. If in case there is no casualty and assistance is not required then you can terminate the message sending process using the switch provided in the device [16]. The message is transmitted via the GSM module, and the location of the accident is identified using the GPS module [3]. With the help of the Accelerometer sensor the accident can be precisely detected [11]. The angle of the car's rolls over can also be known through the accelerometer via the message. This application provides in the most feasible way the optimal solution to the poor emergency facilities provided for road accidents [18].

## II. HARDWARE IMPLEMENTATION

### A. Integration of GPS module

In the first phase each module is tested independently with arduino to checking the working principle of the modules. Later on all the modules are integrated with the

Arduino UNO. Each module has some input and output port for serial communication. GPS Module Tx pin is connected with the pin number 10 of Arduino and Rx is not connected as it is hybrid mode, all the communication is done with serial pin number 10 of Arduino [17]. We have used the NMEA sentence \$GPGGA string. The sentence provides time, coordinates and many other required information and prefix for it is \$GPGGA [1].

We have extracted the coordinates from \$GPGGA string. After getting the string \$GPGGA then it is stored in array [10]. Longitude and Latitude are fetched after four and two commas respectively using \$GPGGA and are stored in different arrays [19]. \$GPGGA String and the description:

\$GPGGA,104534.000,7791.0381,N,06727.4434,E,1,08,0.9,510.4,M,43.9,M,,\*47

\$GPGGA,HHMMSS.SSS,latitude,N,longitude,E,FQ,NOS,HDP,altitude,M,height,M,, checksum data [19].

### B. Integration of GSM module

The GSM module is integrated to Arduino UNO on Pin number 2 and 3 and GND pin to GND pin of Arduino UNO as shown in "Fig. 1" and is used to send the accident alert message.

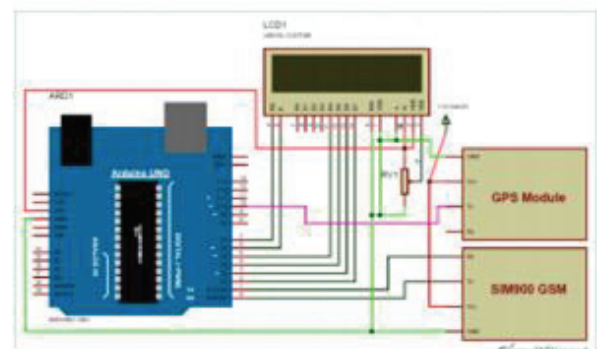


Fig. 1. Working module of IOT based automatic vehicle accident alert system.

It is powered by a 12v Power supply. With the help of AT (ATTENTION) commands of GSM module, we have programmed the Arduino to initiate the GSM module and send SMS on receiving accident alert from Accelerometer circuit. Working of GSM module is very simple, it responds with OK for each successful AT Command.

### C. Integration of Accelerometer(ADXL335)

Accelerometer is the component which is used to initiate the circuit. Accelerometer gives us x, y, and z direction coordinates value in Hz [10]. If on the detection of any jerk, i.e. accident, and the movement of the vehicle is more than the defined value in the code, then it will set condition to true and the code written for initiating the intimation and SMS alert gets executed [4].

### D. Integration of 16x2 LCD Display

The functioning of the circuit is displayed using the 16x2 LCD display [13]. We have shown all the functions output on the LCD Screen in Table 1. The connection of LCD pins is given in the circuit diagram Fig. 1.

### E. Integration of Piezo Buzzer

Buzzer used to play a beep sound before sending the SMS alert so that in case of no damage victim can stop to send any alerts to respective persons [8].

### F. Integration of 10K Potentiometer

Variable 10K pot is used to adjustment the brightness of the LCD Display and providing the power to the LCD as per the requirement [7].

## III. ALGORITHM FOR ACCIDENT DETECTION AND ALERT

Flowchart mentioning the various functions of the system proposed as shown in the “Fig. 2”.

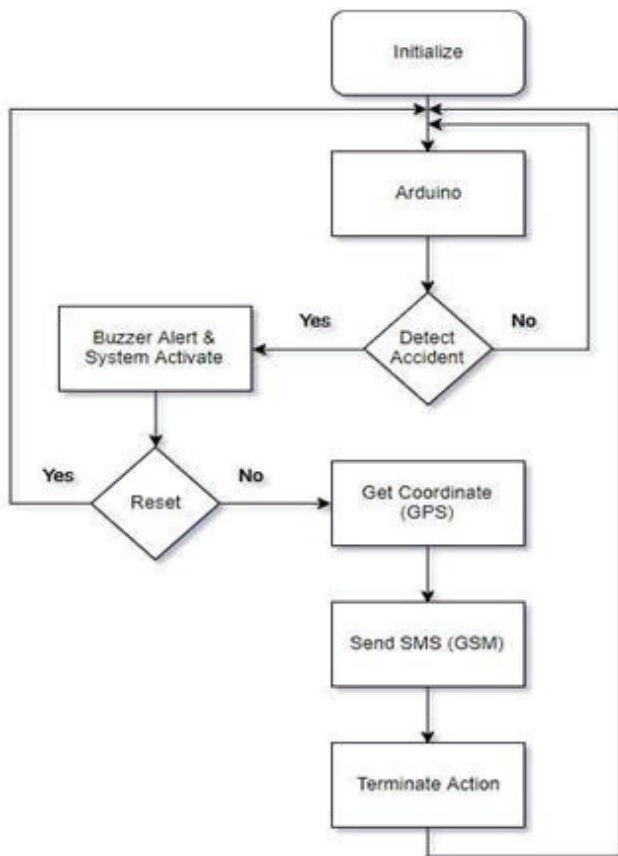


Fig. 2. Flow chart of the Accident Detection and Alert System

### A. Working Explanation

In this paper as shown in “Fig. 3”, Arduino is used with GPS Receiver and GSM module to control the entire

process. GPS Receiver helps in detecting the coordinates of the vehicle [9]. The detected coordinates are then sent to the rescue team via SMS using the GSM module [20]. The accelerometer ADXL335 is used in any axis to detect accidents or sudden changes. It displays coordinates or status messages via 16x2 LCD [12].

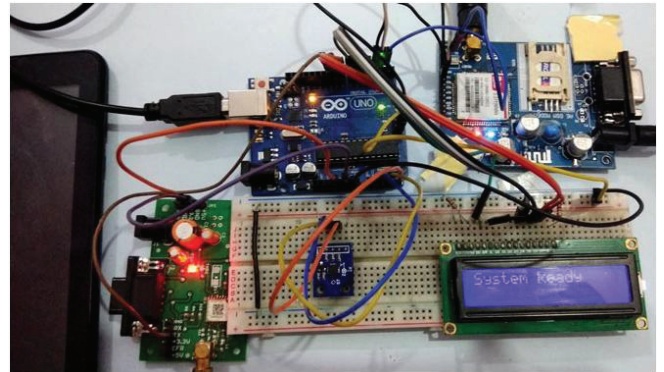


Fig. 3. Interfacing of the controller with other modules

The Arduino then read the changed values and compares with the predefined values in order to identify the axis change, if there any [5].

If there is a change in the axis values then Arduino read coordinates through \$GPGGA from GPS module records and informs the rescue team with accident location by sending SMS [15]. This way the affected person can be rescued by the rescue team with in the minimum time and can be provided with the required medical support [14].

TABLE I. UNIT TEST CASES & RESULTS

Modules	Test case id	Test case name	I/P	Expected Outputs	Results
GSM	GSM_T 1	Checking the circuit with giving power as per given instruction in the module description	12v Power Supply	Module should ON and power LED should glow	Pass
	GSM_T 2	Checking the working of GSM modules on inserting the sim and calling on that sim number.	Any working Sim with incoming able	number should be ring on calling.	Pass
	GSM_T 3	Verifying that the module should be respond to the Arduino UNO on connecting the GSM module with the Arduino UNO	Giving connection with the help of connection wires on GSM pins Tx,Rx, GND & Power supply	GSM module should respond to Arduino UNO	Pass
	GPS_T 1	Checking the circuit with giving power as per given instruction in the module description	12v Power Supply	Module should ON and power LED should glow	Pass

GPS		tion			
	GPS_T 2	Verifying that the module should be respond to the Arduino UNO on connecting the GPS module with the Arduino UNO	Giving connection with the help of connection wires on GPS pins Tx,Rx, GND and Power supply	GSM module should espond to Arduino UNO	Pass
ACCELEROMETER	ACC_T 1	Checking the circuit with giving power as per given instruction in the module description	+5v supply, and GND	Module should ON and power LED should glow	Pass
	ACC_T 2	Verifying that the module should be respond to the Arduino UNO on connecting the GPS module with the Arduino UNO	Connect input of X, Y, Z from Arduino A1,A2,A3. and GND pins	Accelerometer should provide the X,Y and Z direction value by running a sample program	Pass
16x2 LCD	LCD_T 1	LCD module shouldpowerON by giving power supply	+5v Power supply from Arduino UNO	LCD should display text on connecting it with Arduino as per giveninputsinCircuit Diagram	Pass
PIEZO_BUZZER	PZB_T 1	Check whether the buzzer make sound on giving the power.	+5v supply, and GND	Buzzer should make sound on giving power supply	Pass
	PZB_T 2	Verifying that the buzzer is make sound on getting the value of X,Y and Z direction more than the fix value	Direction value in Hz given by Accelerometer	Buzzer should make beep sound.	Pass
10K_POT	POT_T1	verifying that the power supply is passing through the Potentiometer after connecting it as per given circuit diagram	+5 power supply and inputs from Arduino UNO	Power supply should be available through the potentiometer.	Pass
	POT_T2	Verifying that the Potentiometer is able to increase and decrease the resistance from 0- 10k	+5v Power Supply	Variable power supply depending upon the resistance value of potentiometer	Pass

Accident Alert circuit	TC_0 1	Verify that the circuit is Power ON after apply the Power supply to the circuit	9Volt to 12 Volts power supply	all the connected module should be Power ON	Pass
	TC_0 2	Verify that the GSM module initialized successfully and respond with OK AT Command		OK output should show on Arduinoterminal	Pass
	TC_0 3	Verify that calling is enabled on SIM after initialization of GSM module.	Calling tosimcontact Number	User should be able to call on number	Pass
	TC_0 4	Verify that GPS module is initialized successfully and provide the current coordinate of the location		GPS module initialized successfully message should show	Pass
	TC_0 5	Verify that LCD Display is Power ON and Respective Message should be display as per code		Configured messages should display as per code	Pass
	TC_0 6	Verify that LCD Display brightness should be adjustable by 10K pot		LCD display text should be display normally	Pass
	TC_0 7	Verify that on tilting the Object(CAR) Accelerometer should initiate the Piezo buzzer and it should make the Beep sound for intimation		Beep sound should be blow for 5 sec	Pass
	TC_0 8	Verify that if Reset button is pressed before 5 Sec than Circuit should be reset and no Intimation should be take place.	Press Reset button by User	Circuit should be reset and no intimation should initiate	Pass

	TC_09	Verify that on tilting the object(CAR) accelerometer should initiate the GPS module and GSM module	enough force to tilt the object	GPS module should get the current coordinate and speed in Knots	Pass
	TC_10	Verify that on tilting the object(CAR) accelerometer should initiate GSM module		Sending Message should display on LCD Screen and Message should be sent to given Mobile number	Pass
	TC_11	Verify that after sending the SMS Circuit get reset to initial stage.		System Ready messages should display after circuit reset.	Pass

#### IV. CONCLUSION

The main purpose of this system is to increase the chances of life of a person met with an accident. This device helps the paramedics to reach to the accident location within the minimum time frame as it provides the alert message as soon as the accident occurs. So, it also helps in minimizing the communication delay and the person met with the accident can be treated timely. It plays a very important role in identifying the accident locations that occurs in midnights.

#### V. FUTURE SCOPE

The proposed program deals with detecting incidents and warning paramedics to reach the specific location by taking them to the nearest hospital and providing the medical services to the person affected by the incident. This can be extended through providing the victim with medication at the spot of the accident. We can also avoid accidents by increasing the technology and using warning systems that could really stop the vehicle to conquer them.

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