ROAD CRASH DETECTION & EMERGENCY STATE ACTIVATION SYSTEM

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Abstract

The fallacious conversation of information between the accidental region and the emergency assist line centre has played a major role for the large range of accidental deaths. If the exact place where the accident has happened and required records could be shared then the precious human existence can be saved with minimal accidental effects on the human body. Vehicle tracking is one of the technological improvements which can be used to monitor the activities of the vehicle[1], [2]. While a person is riding his/her vehicle, meets with an accident, there's a danger that the guy who has met with the accident might be afflicted by a severe damage or expire instantly if there is no person round to rescue him. The proposed gadget delivers the perfect for this problem. The gadget acts as an emergency state identity and alert system. It gathers the statistical data such as geographical location of the accidental spot and vehicle details so that it can be sent to the emergency assist line, nearest police station and to the pre-registered cell numbers, if any accident has been detected. As a consequence, the proposed device will assist the needy to reach the solution on time.

Keyword: Accelerometer, Arduino, GPS, GSM, Proximity sensor, Ultrasonic sensor

1. INTRODUCTION:

Mishaps have grown to be a day to day happening everywhere[3]. The coincidence of vehicle happens every now and then, some ends in demise and in most of the instances it effects with few serious accidents. The major factors or causes of accidents are being careless while driving, drunken drive and use of cell phones while driving[4]. A detailed accidental report has been made by a daily magazine TOI which has stated that for the past three years the human deaths on road has been increased twice the count than before which can be mostly due to the improper communication between the mishap happened place and the emergency help centre mostly in the case of spotting the exact location of where the mishap has taken place can't be spotted and conveyed in a right manner to the help centre so these makes a invariant time delay in the arrival of help for the person who has met with accident. So the proposed system will eliminate the human intervention in the process so that improper communication of data can be eliminated.

2. PROPOSED SYSTEM

The block diagram of the device is as shown in Fig. 1. It consists of input and output devices connected to the microcontroller Arduino Uno board. The arduino is powered by the battery of the vehicle which acts as the primary power supply and a lithium ion battery is connected to the board for backup purpose which makes the system highly reliable. The system has both input and output gadgets which have been related to the arduino board for processing the enter gadgets usually accommodates of sensors, keypad, GPS.

The sensors play a critical role in the proposed system. The 3 fundamental sensors used are accelerometer, Proximity sensor and ultrasonic sensor. Each and every sensor has its own personal characteristics and range of operation. The accelerometer sensor is used to measures the acceleration of the vehicle, acceleration can be described as the rate of change of pace so that the acceleration of the automobile along the 3-d axis can be sensed using the accelerometer. The ultrasonic sensor is used to detect the space between the neighboring automobiles if the gap tends to be less than the threshold value then it can be said that a collision has occurred[5].

The proximity sensor is used to detect the presence of the nearby object without any physical contact with the object so that it is used to find the rpm of the vehicle which can be

Fig. 1: Block diagram of the system

used to calculate the speed of the vehicle later. Switch is used as a manual emergency state activation in order that we need not rely upon the sensors always. The GPS tool will update the current geographical location of the automobile in a periodical manner in the form of latitude and longitude points.

The output of the proposed system comprises of four components they're GSM, IoT router, LCD display and a buzzer. The GSM stands for Global System for Mobile Communications it is used to send text based alert to the programmed numbers [7]. The IoT router is used to connect the proposed system with the internet so that the data can be transferred instantaneously to the server. The LCD plays a major role it displays the current status of the proposed system [11]. The buzzer is turned ON once the accident has been detected.

3. SIMULATION

The virtual simulation was made using the Proteus simulation software and the programs have been developed with the help of arduino library files. Proteus is one of the widely used software simulation tool for electrical circuit simulations. The proteus simulation tool is a "what-if" based analysis, can also be used to find the unexpected phenomenon behavior of the system and in most of the cases the results are accurate than the analytical modeling.

The simulation is completed totally based upon the labeling approach in order that the proposed system will be neat complex wire connections can be eliminated while we use labeling technique. The whole circuit of the system looks so neat & compact one as shown in the Fig.2. The arduino board is inserted using the arduino library files. Instead of the proximity, ultrasonic & accelerometer sensors three variable potentiometers has been used for the simulation purpose. As GSM &GPS can't be used in the simulation software, so that virtual terminals are used to show their outputs.

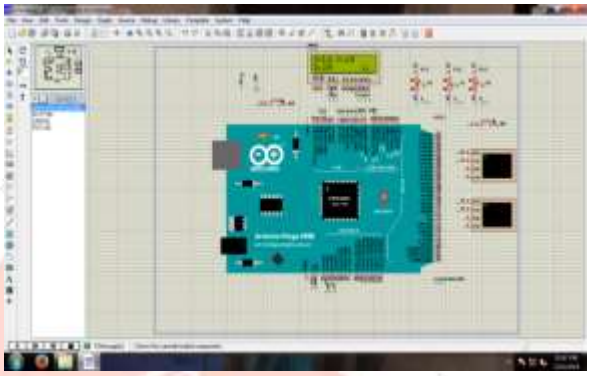

Fig. 2: Simulation Circuit

3.1. SIMULATION RESULTS

The system has two major states they are normal state & emergency state. At normal state the LCD will be displaying the data's from the sensor and within the simulation software the digital terminal of the GPS will be actively displaying while the GSM terminal will not be activated at this state. The simulation of normal state output is as shown in the Fig.3.

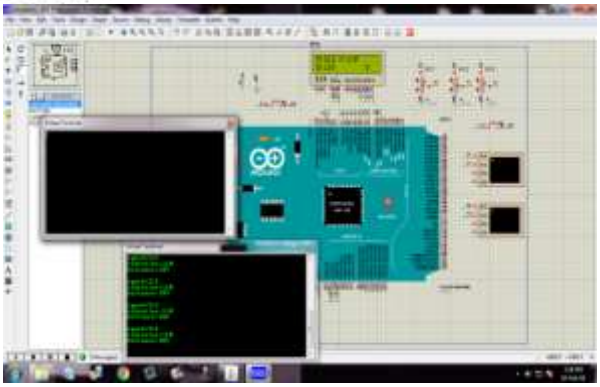

Fig. 3: Output of the system running at normal state

The Fig. 4 shows the simulation output for the emergency state it indicates that a mishap has occurred to the vehicle which is detected by means of the sensors connected to it. The virtual terminals will be activated for both GSM & GPS so that the alert message will be sent to the personals related.

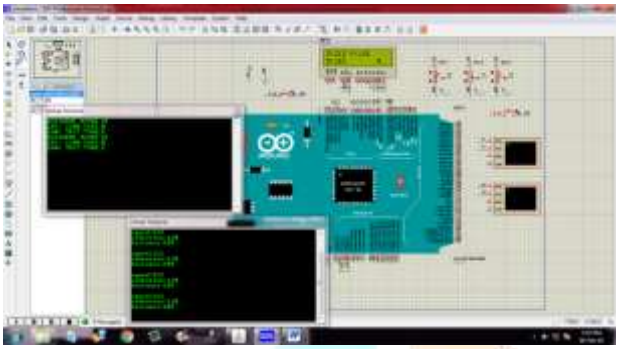

Fig. 4: Output of the system running at emergency state

The Fig. 5 shows the output of the system switch from emergency state to the normal state, while running the program if any false alarm gets activated it can be turned down before it sends any alert message to the emergency assist line with the help of the switch provided in the circuit.

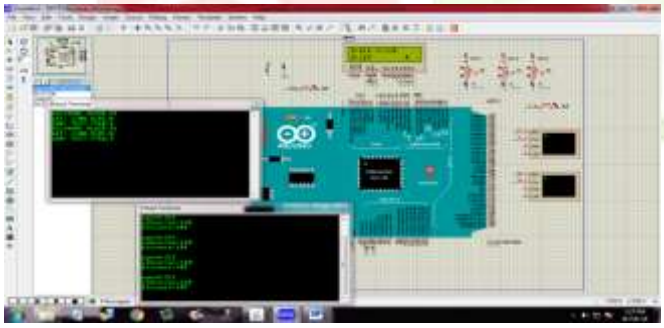

Fig. 5: Output of the system switch from emergency to normal state

Thus the various states of the proposed system are simulated and the expected output for the system is as shown in the above figures. The detailed hardware implementation and the whole working of the systemsare as mentioned below.

4. HARDWARE IMPLEMENTATION

The reliability and working of the system mostly depend upon the hardware framework of the system. For any system whose hardware can't be brought to the expected results then it will be considered as a failure model so the hardware framework and the connection part constitute a lot. Those major segments utilized within the framework of the proposed system are:

1) Arduino (Arduino UNO)
2) Accelerometer (GY61)
3) GPS (NEO M8M)
4) GSM (SIM 800A)
5) Proximity sensor (M12)
6) Ultrasonic sensor (HC-SRO4)
7) Wi-Fi module (ESP 01-R5)
8) LCD (16*2 display)

The heart of the system is the microcontroller, Arduino UNO. This device uses an ATMEGA328P-PU. The arduino boards are user friendly and easily programmable. In our project the microcontroller, Arduino is used as the device that controls all the happenings that will be done by the receivers and transmitters. The accelerometer used is a three dimension accelerometer. The accelerometer is the one that senses the acceleration in the vehicle. The acceleration measured will be displayed in the LCD that is placed in front of the drivers monitoring board. The GPS is used to sense the location of the system installed vehicle and the location will be updated periodically. Inductive proximity sensors are used for non-contact detection of metallic objects. Their operating principle is based on a coil and oscillator that creates an electromagnetic field in the close surroundings of the sensing surface. The presence of a metallic object (actuator) in the operating area causes a dampening of the oscillation amplitude. The rise or fall of such oscillation is identified by a threshold circuit that changes the output of the sensor. The operating distance of the sensor depends on the actuator's shape and size and is strictly linked to the nature of the material. The output of the proximity sensor will be sent to Arduino. Ultrasonic sensor is the one that senses the distance between the objects. Here when the accident occurs, the vehicle will surely falls left or right side so that the ultrasonic sensor (HC-SRO4) will detect the distance between the ground and the surface of the vehicle during fall.

Fig.6 shows the hardware setup of the proposed system when the vehicle with the installed system runs on road is supposed to meet with any accident then the sensor values will exceed than the threshold values. So that it will be known that the vehicle has met with an accident. Once the accident has detected the buzzer turns ON and the LCD display will show that "accident has occurred". As there are chances for false alarm and to increase the reliability of the alarm from the system, a delay period of 18 seconds has been created. During this delay period the system will be in a wait state so that the emergency help message will not be sent if the switch has been pressed before 18 seconds then the whole session will be aborted and the program will rebooted to the initial state or else if the spectator who has met with accident has not pressed the switch for 18 seconds then the GSM module & IoT router comes into action. The GSM sends text based emergency alert message to the emergency assist line, nearby police station and the important personals. The SMS contains the details of the latitude and longitude points where the mishap has happened along with the vehicle number. The IoT router uploads the same emergency state alert message to the respective websites. Thus by using the latitude and longitude points the exact location where the accident has happened may be easily found by using Google maps.

There may be medical emergencies too such as heart attack, abnormal raise in BP on such cases these emergencies can't be predicted so that in normal running conditions if the spectator needs any emergency assist then if the switch is pressed once it will alert the emergency care center and also inform the personals with the help of GSM & IoT devices so that we need not rely upon the automation always. Fig 7 shows the proposed system connected to a real bike at running condition. Fig 8 shows the GPS

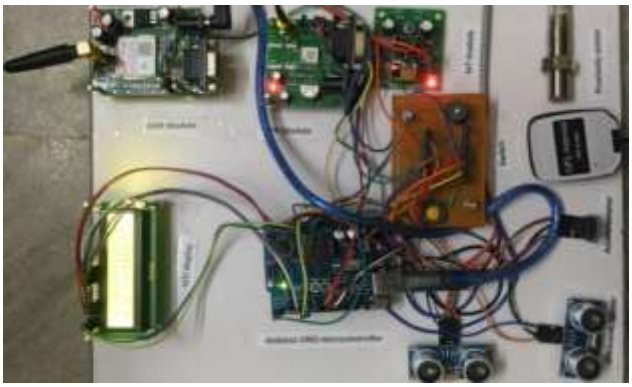

Fig. 6: Hardware setup of the system

antenna attached to the bike to receive the location accurately. Fig.9 shows the proximity sensor connected to the front wheel of the vehicle to sense its speed.

Fig.7 System fixed to the bike

Fig.8 & 9 GPS antenna and Proximity sensor fixed to bike

4.1. HARDWARE RESULT

The hardware result is mostly same as that of expected. It shows that the sensors have high range of accident detection. The emergency message has been properly

communicated through the GSM device to

Fig.10 & 11 SMS received to the phone and Current status of the vehicle uploaded through IoT

the pre-programmed numbers as shown in the Fig.10. The speed and the location of the vehicle are

continuously updated to the server by means of the IoT router which is shown in the Fig.11. The delay time for emergency state activation and the manual alarm switch performs as expected. The hardware output is highly satisfactory except the connectivity problem experienced by the devices while operated in deserted regions.

5. CONCLUSION

The mishap may happen at any critical situations and it is not done wontedly. Prevention is better than cure so to prevent those mishaps before it happens, Government has many rules and regulation that are to be followed by the drivers. The accident which occurs beyond this is the situation where the human life is put into danger. To rescue the human life from being in danger is the main objective of the project. The system that we built was successfully giving the current location, vehicle number and also the recent speed of the vehicle. So that a hope has raised that the proposed system would surely be a lifesaver for the fore coming generations.

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