Emergency Services Notification Alert System (ESNAS)

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***Abstract*- There is no denying that no matter how efficient measures have been taken or the number of advanced technologies been implemented to surpass accidents, people still lose their lives. With this insane increase of road accidents in India, it can be a great rescue if we are actually able to save the lives suffered by accidents 'in time'. In the majority of the cases, long delays or no treatment at all is the reason why people die. In the middle of the night specifically, there is hardly anyone to acknowledge the accident to provide timely needed treatment.**

The time between the occurrence of an accident and the medical facility received by the victim is an important factor in the survival rates after the accident. By reducing that particular time, mortality rates could be decreased a lot more.

One approach to eliminate that delay is to have an Accident Detection system which could detect if the accident has occurred and immediately notify the emergency services, which are ambulance services and police stations. It would send them the notification regarding the exact accident location, vehicle number and the name of the person. Also, in the case of a false notification, that is, the vehicle has been hit but the person inside is not injured, there is a reset switch for a window of 60 seconds to confirm no fatal accident has occurred.

Keywords— Accident detection, Accident Notification Alert system, GSM, GPS, Arduino for road accidents, Location detection and alert, emergency services

I. INTRODUCTION

In this modern era of transportation and commuting with autonomous vehicles in transit, we are prone to accidents costing human lives. Road accidents are so common in India that there is a loss of life every minute, and we all know this. Also, there have been a lot of implementations in the new and advanced technologies to regulate, manage or control the accidents. And yet, they do happen and are going to happen. If we look closely, we tend to think that the major cause is the accident itself that it was too huge or serious that the victim died on the spot. This is the very least case if we go by the figures. People actually die because they could not be provided with timely needed help. Moreover, the accidents are acknowledged after 3-4 hours usually when the person is no more and that too when any passer-by informs, which is neglected at the earliest in our country. In a lot of situations where the injury is on the head or limbs, the time factor matters a lot for saving the life of the victim. And the rate of people surviving an accident that too during the night is the lowest.

Considering this particular scenario, we have designed an IoT based notification alert system which could do the same, and if accidents are going to happen anyway, how are we able to get the timely needed medical observation and treatment. This emergency services alert and notification system informs if the accident has occurred and immediately notifies the emergency services, which are ambulance services and police stations. It sends them the notification regarding the exact accident location, vehicle number and the name of the person. Alert message is sent on the basis of multiple triggered conditions viz disposal of seat belt, speed, opening of airbags etc. In this system initially the GPS takes continuous input from the satellite, stores the values in longitude and latitude form and then, in order to track the vehicle or car, it needs to send the message to GSM device for the activation. It also gets activated by detecting the accident on the vibration sensor connected to the micro controller. Upon activation, the GSM receives the last position value of longitude and latitude, thereby sending the message to the emergency server as predefined in the program.
In case of a false notification, that is, the vehicle has been hit but the person inside is not injured there is a reset switch for a window of 60 seconds so as to confirm no fatal accident has occurred.

In this way, we can track if a certain accident has occurred a little faster and provide them with timely help from nearby ambulance services and police stations.

Facts and Figures

• ● India has 1% of the world's vehicles yet represents 6% of the world's street traffic mishaps.

• ● In 2018, India had 467,044 detailed street mishaps, an expansion of 0.5% from 464,910 in 2017, as per the street service's information.

• ● Even COVID-19 mortality till now is only 20% of Road accident's mortality.

II. MOTIVATION

In our country, many accidents happen which do not even receive any medical attention at the time of need. There have been cases reported where people were acknowledged to be alive at the site of the accident for almost 2-3 hours, but it took so much time for the ambulance and police to come that the victim died there waiting for help. Also, nobody is held responsible. This feels so shameful and it is a pity that we can't even save lives even on having so much time. By this IoT based notification alert system, we can have proper records and have cops as well as ambulance services accountable for their actions so that they would not show any negligence when it comes to cooperation and have stricter management in terms of accident cases.

III. OBJECTIVE

The objective of this IoT based system is very simple, which is reducing the reach time delay of emergency services at the location of the accident.

For this, the aim is to try to reach the emergency services which are police stations and ambulance services or hospitals as soon as the incident has occurred and not to wait or rely on if any passer-by informs.

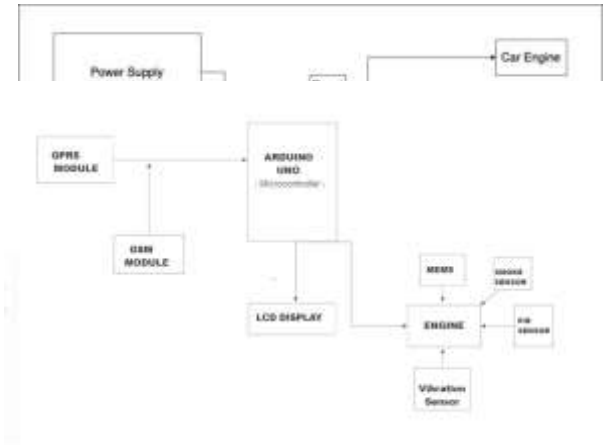
Within minutes of the occurrence of the accident, the nearest police station and ambulance are informed about the exact location of the accident along with a family member of the victim. In case of serious injury, blood loss could be stopped as soon as possible. Thus, the time to provide medical attention is way higher if no such thing is done in such a case and there are higher chances of saving the life of the victim.

IV. ANALYSIS

The work plan is divided into two parts:

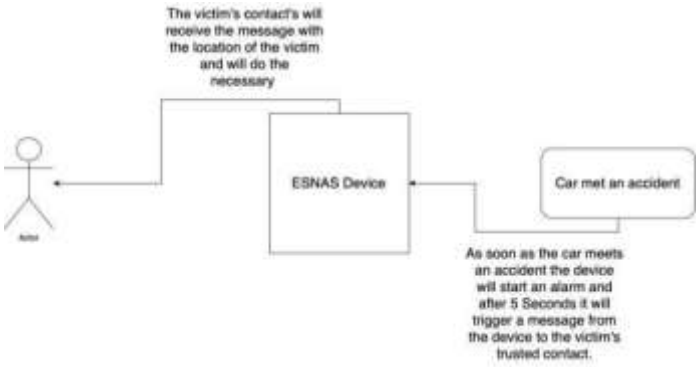
1. Circuit Designing
2. Hardware and Software Configuration

The prototype of Emergency services notification and alert system is designed as such the Arduino board, which is the micro controller is the main system fixed on the car, which is combined with the sensors: MEMS, PIR sensor, vibration sensor, smoke sensor etc which help in triggering the conditions for the occurrence of the accident. The Arduino board is connected with the lcd display which the screen on the car. The GPRS and GSM modules on the Arduino board are responsible for tracking the exact location coordinates and sending it to the ambulances and police stations nearby as programmed.



As soon as the vehicle meets an accident, that is, follows all the defined conditions for the occurrence of accident which are disposal of airbags, opening of the dashboard, smoke or fire detected through the sensor, or if there is a negative retardation, alarm will trigger which will immediately stop the Engine and in 60seconds the GSM Module will send a message with the GPS coordinates to the nearby police stations and ambulance services.

In case there is a false notification, there is a reset switch for a window of 60 seconds so as to indicate there has been no fatality.



It is also integrated with the registered phone's emergency contact so any family member of the victim is sent with the location and notification of the accident as well.

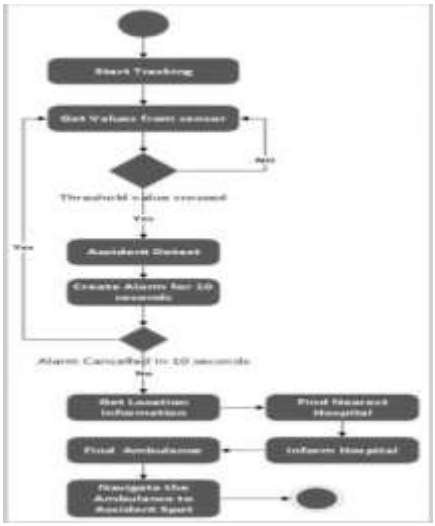
All of this is achieved by making proper integration of hardware and software, which is uploaded through the board and programming is done using C language which is very powerful, efficient and fast. Every sensor is coded to output what we really need, so the hardware and software are configured with precision.

IV. EXISTING SYSTEM

The existing system of this model have the notable limitations which have been covered by our proposed system: They are very expensive and do not have the feature to inform the family member of the victim. They are actually manual and there is a need for the victim confirmation of accident, which is not possible if the victim is seriously injured or has already fainted. Integration features are also not reliable. The location detection and its accuracy rely on the phone network and its battery, so in case the phone has no battery or is damaged during the accident, it can be located. Also, they are so much expensive that major population would not integrate in their vehicle and thus the main purpose of this system is not fulfilled.

V. PROPOSED WORK

The proposed strategy is to make a gadget which will be fit for sending the location of the area before the casualty meets a mishap and will help in saving his/her life.
We propose a gadget which can detect pressure from a hit on the vehicle, and if the vehicle is hit, there is surely a retardation along with various sensors to trigger other conditions in order to detect the accident efficiently.



VI. IMPLEMENTATION

The basic idea of the model is-
Occurrence of accident is triggered with the accelerometer causing retardation of the vehicle, opening of the airbags, collision, pressure sensor, smoke sensor and various other sensors and conditions which are defined in the program. Airbag deployment leads the dashboard to open which is detected with beeping of buzzer and if the driver is alright then in a window of 60 seconds, he/she can press the reset switch. Else, the coordinates of the location detected through the GPS and GSM module will be sent to the emergency services and a registered number, which is conditioned through programming.

The system contains a set of IR sensors, LED lights combined with buzzer to make sound if and when any vehicle crosses the sensors and these are installed on the side of the road. It uses two sensors, which are on the either side of the hairpin bend. The sensors are such that they are mutually exclusive. Based on the output of the sensors, position of the vehicles on the either side of the bend is detected with the help of LEDs. For different conditions appropriate LED is triggered thereby prioritizing the vehicle's movement.
Even after the warnings, in case any accident occurs, inside a car there is an end switch placed on the right side of the car bumper. When the other car hits the bumper the switch will be triggered and it will send the information to the Arduino. Also, if there is any condition such as opening of seatbelts, disposal of dashboard, retardation of the vehicle, according to the conditions programmed, the information will be sent to the Arduino. There is a programming as such containing a number of receivers and using that, it will send the information to the GSM module and from there it will send the message to the number given in the code. As soon as the message is sent to the nearby hospital and ambulance services and police stations, the location of the message would be received by them.

Booting the GSM module: Before starting of the this whole model, GSM module needs to be booted. A sim card is needed to be inserted and locked. Then connect the adapter to the GSM module and switch it on. LED will be blinked as showing the status in a while. Once the connection is successfully established, led will blink continuously every 3 seconds. To confirm it further whether the connection is established or not, a call can be made to the mobile number of the sim inside the GSM module. If a ring is heard back, the GSM has been successfully installed.
Connecting GSM module to Arduino : There are two ways of connecting the GSM module to the Arduino. First method is that the Rx and Tx pins of the Arduino are connected to the GSM module of Rx and Tx pins respectively and GND pin of Arduino be connected to the GND pin of the GSM module. And the second method is making use of digital pins 9,10 or Arduino as Rx and Tx and thereby connecting to the GSM module. The second method would be preferred because every time when the program needs to be burn to the Arduino, Rx and Tx pins are needed to be removed and it is a little hassle.
After all of the connections, booting and set up being done, the Arduino IDE is used to program and code according to the things we want to get done, which is to list out the various conditions will be checked to trigger the occurrence of the accident, following the disposal of seat beat, opening of the dashboard, taking inputs from the various sensors installed with the device, and as soon as those conditions are triggered , the coding is done to perform a particular task, which is sending the notification and alerting the emergency services and a family member. The code then is burnt to the microcontroller using the connected wires from the laptop/pc to the Arduino board.

VII. SYSTEM CONFIGURATION

The first step is to design the circuit of the model in the way we want it to work, that is, tracking the location with the help of coordinates in the form of latitude and longitude and then sending it to the desired system/person.
GPS module is directly connected to the digital pin number 10 of Arduino and by using software serial library here, we have allowed serial communication on pin 10 and 11, and made them Rx and Tx respectively and left the Rx pin of the GPS module open. By default, pin 0 and 1 of Arduino are used for serial communication but by using software

serial lib, serial communication on other digital pins is also allowed. 12V supply is used to power the GPS module.

GSM module's Tx and Rx pins are directly connected to pin D2 and D3 of Arduino. For GSM interfacing software serial library is again used. GSM module is powered by 12V supply as well. LCD's data pins D4,D5,D6 and D7 are connected to the pin number 6.7.8 and 9 of Arduino. Command pin RD and EN of LCD are connected with pin 4 and 5 of Arduino and RW pin is directly connected with ground. An accelerometer is there for detecting the accident, which will measure the retardation of the vehicle and its x,y and z-axis ADC output pins are directly connected to Arduino ADC pins A1,A2 and A3.

Then, all the connections being done, The Arduino IDE is used to program and code according to the conditions we want to trigger and get the things done, all of the code is finally uploaded to Arduino board using the connecting wires from the laptop or pc.

VIII. Conclusion

This system gives a very important factor needed to save the life of a person, which is time. To be more appropriate, it gives time reduction in the arrival of medical help to anyone suffered an accident and need a medical observation and treatment. There is no reliability on the information of any spectator. Moreover, there would not be any negligence where a person dies waiting for help and his family members have no idea.
Interest of Things has been proved as a boon in increasing the quality of life and helping in various ways which were impossible to have been though of before. By using it efficiently, the detection of accident is way easier and maintenance is very simpler. As this system is based on Arduino Uno, this is very affordable too.
Thus, saving a precious human life is made time efficient as well as economical.

IX. Future Scope

We believe that our framework has a really good scope of change and advancements. One suggested addition of feature would be the integration of an android app with this IoT based emergency services and notification alert system where all the details of the victim like medical history, current medication, blood group etc would be saved and would be used by the ambulances services if required. Also, the family would be able to track the location using that app. One other additional feature can be using a voice integration with our notification system where the ambulance services or cops could connect to the victim if there is a need for more information or anything as such. Also, the victim in the car would be able would be able to record his/her voice to describe the accident or injury. In case the victim faints before the arrival of help, it could be of very good help.

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