A Simulation of Car Accident Tracking and Detection System

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Abstract -- With the increasing cases of automobile accidents, the measure of casualties is increasing. Due to the absence of any mechanism, that could act promptly at the time of the accident the injuries are turning to casualties. To reduce the number of casualties in road **accidents** our project introduces a way to prompt an alert about the happening and we can expect a prompter **response** from emergency services.

Here we will come to know what the fundamental modules are, but for the starters we have a brief introduction and the problem statement. Figure 1 holds a self-explanatory flowchart and that is built on the modulesbased approach and will be helpful in understanding the flow of process. Following which we have DFDs [figure 2] that tells about the data flow. Down the row we will visit modular stages of our project along with the hardware and software components involved. At the end we have the complete circuit at Figure 6.

1. INTRODUCTION

Our former generations had come through plenty of difficulties in travelling to places but later have omitted those with personally owned vehicles. One of them is a car, now a day's cars are not just a means of transport but they have evolved into a smart assistant throughout our journey. It gives a more human-like response to the driver and copassengers. The cars are packed with safety precautions but still, they are missing a mechanism that could promptly react and inform the rescue agencies to get the speediest possible help, so we thought of employing technology to cure the deficiency of an alert system. We propose to alert the emergency services and give them a chance to respond promptly within time.

The situation could be worse than our imagination so we have a foolproof system that could automatically sense the scenario and if finds that accident has occurred than immediately send an alert, but if somehow it is unable to detect then we have a panic button that would wait of a short while to ensure a genuine alert request and then it will send the alert signal.

Once the signal has been sent rest everything is in the hands of the rescue team. We believe our initiative would be able to save some precious lives.

2. PROBLEM STATEMENT

The number of casualties is increasing exponentially and most of the accidents turn into casualties, due to slower response as there is no mechanism to inform the rescue team where to go and whom to treat. A system is needed that could monitor the car's behaviour and determine on its own whether car undergoes an accident or not.

Once situation is determined to be accidental then the system should generate an alert that reaches the emergency operation team (police and ambulance), rest is up to the rescue team. The alert message must contain information necessary enough to guide the rescue team towards accident spot and recognise the victim and car to operate.

We also need a web portal were all the sensors data could be seen and alert messages are shown, in order to keep track of vehicles accidental history.

3. THE FLOW



Figure 1: Flow Chart

4. ACCIDENT DETECTION

As the name, Automatic Car Accident Detection and Tracking, suggests before sending the alert, there are two primary operations: accident detection and tracking the spot. The former is conducted under the assistance of sensors and microcontroller (Arduino)^[1] and the later is dealt with the help of GPS^[2].



Figure 2 (a): Level-0 DFD





Figure 2 (b): Level-1 DFD

detection For various like sensors, Flexiforce^[3], vibration sensor^[4], and collision sensor^[5], are used which continuously keeps a track of amount of force applied at the surface of car, vibration car feels, and checks whether some sort collision as occurred. This data is collected in the microcontroller ^[2]: the microcontroller is in a loop of collecting the set of values and checking whether the consolidated values depict an accident. The set of values collected belongs to the same time slot. Let us suppose, the set contains force HIGH, vibration CRITICAL, and collision TRUE; it is obvious to predict that accident has occurred. Let us consider another set where Force is LOW, vibration is CRITICAL, and collision's value is FALSE; here the car may has rushed over the speed breakers or the car is off-road^[10].

If accident is detected then the other phases, like tracking the spot and initiating response, comes into play and job of this phases is accomplished. Otherwise this loop is continued. The system goes into the loop since the ignition and remains in this unless the car is parked and shut ^[5].



Figure 2 (c): Level-2 DFD

5. ACCIDENT TRACKING

Tracking of the accident is based on resulting values that come from multiple sensors, which activate the overall circuit with the help of a microcontroller. Microcontroller continuously fetches data from vibration sensor, Flexi force sensor, and impact sensor these all once reach favorable conditions, probably their activate these all together at that time of instant system will trigger the Arduino to respond accordingly to GSM unit for delivering the alert message to the relative, Ambulance[9] and Nearby police station message contain multiple information like user vehicle number, longitude-latitude by which location is traced easily by anyone and reduces the chances of Sevier causality. In this system NodeMCU will work as wifi to transfer data from Arduino to the server and represent these values of the different sensors also reflect on the mobile application and web portal for understanding and awareness of the system is on working mode, values from the sensor are continuously measured. If once the accident is reached the system will

automatically reset after 30sec and again work as it was working before.

6. **Response System**

Sensors continuously capture values and transfer to the microcontroller it will also fetching the real time location of the vehicle. In the form of longitude^[6] and latitudes which further use as for knowing the current status of the vehicle to delivering the response to user family preference and emergency system^[12].

Vibration Sensor

Vibration sensor module is for a variety of vibration trigger function, reported the ft alarm, smart car, electronic building blocks and so on. Please note that normally open vibration sensor module in the induction of a small vibration where lay, some of the information display can be directly connected to the relay module, the actual use of ineffective.



Figure 3 : Vibration Sensor

Flexi Force

The A401 has a 2-pin connector. This is our standard sensor with the largest sensing area: 25.4 mm (1 in.). A401 sensors are available in one force range: 111 N (0 - 25 lb). The force ranges stated are approximations. The dynamic range of this versatile force sensor can be modified by changing the drive voltage and adjusting the resistance of the feedback resistor.



Figure 4 : Flexiforce Sensor

Collision Sensor

The crash collision sensor impact Switch Module for Arduino is leading installation module of the collision. This is low output module, no high output clash. M3 License Module Easy fix hole, small car fix. With the power switch there is a collision, fire, no lightning bumps.



Figure 5 : Collision Sensor

Fig A prototype of Pin Diagram of combined units to microcontroller

Actually, in response system alert notification and server notification working has been done to represent the detailed information about the value which are fetched by sensors and that all need to be useful for user point of view^[7].



Figure 6 : Complete Circuit

When an alert get generated from all of three sensor compiled together and here the GSM module start coming into the role of data delivery and NodeMCU^[8] which was withstand for initially will also getting information and transfer it to the server which will be further represented in the web App & Mobile Application for better user interface understanding.



Figure 7 : A pictorial representation of our project which shows the detail of sensor and GSM Module.

7. CONCLUSION

The cost of developing this device is low as different modules like GSM, GPS Module are already available in the vehicle so it can be said that as far as the power consumption and money saving aspects are considered it is in turn a low power consuming and a much cost effective device which in turn has no negative effect on the vehicle's performance and is easily deployable in it. Hence this device can become a boon in Transportation systems as this can bring down the mortality rate in turn effectively. Government can make this device as a mandatory safety measure to be opted by every vehicle manufactures which will solve this problem more efficiently. Hence, this device acts like a enhancement to the vehicle's capability and makes the user more secured in today's scenario which is full of increasing death rate in road accidents caused due to lack of immediate^[6] medical help on the spot of the accident. Apart from all the strengths of this device like its reporting and accident detection efficiency there are also some weakness of this device which can be removed with the help of some future works like the user must have to possess a Smartphone with him with the required app installed in it and also have a problem of sending the emergency message to the number already registered previously which means if the new driver comes he have to save his new information again in the device for the device to work for his safety.

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