

# IoT Based Black Box Device for Vehicle Tracking

## <sup>1</sup>Manjunatha B G, <sup>2</sup>Nataraj Urs H D, <sup>3</sup>K S Ranjith kumar, <sup>4</sup>Karthik R O, <sup>5</sup>Kiran

<sup>1</sup>School of Electronics and Communication Engineering, REVA University, Bengaluru, India <sup>1</sup>manjunath.bg1999@gmail.com

<sup>2</sup>Assistant professor, School of Electronics and Communication Engineering, REVA University, Bengaluru, India, <sup>2</sup>natrajurs.hd@reva.edu.in

<sup>3</sup>School of Electronics and Communication Engineering, REVA University, Bengaluru, India <sup>3</sup>ranjith.kumar0599@gmail.com

<sup>4</sup>School of Electronics and Communication Engineering, REVA University, Bengaluru, India <sup>4</sup>vrokarthiknayaka@gmail.com

<sup>5</sup>School of Electronics and Communication Engineering, REVA University, Bengaluru, India <sup>5</sup>kiranbellary681@gmail.com

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Abstract

The main objective of this project is to develop a prototype of a device which can be installed in any vehicle. It plays a key role in investigation. The inputs from victims, eye witness and police reports may not determine the reason properly if it is a problem internally. That's why it is important to have a data what goes on in a vehicle at the time of accident. This device can be built using minimum hardware components. This device sends a SMS (Short Message Service) which consists of a data like Speed at which vehicle was travelling, Pressure at which collision happen, Temperature of the engine while collision, All these parameters are used in vehicle crash investigation. This is sent to a registered number to prevent delay in rescuing the victim by providing the medical emergency at proper time to prevent from any causalities happening.

Keywords: Arduino, GNSS, Black box, FPR

### 1. Introduction

According to WHO (World Health Organization) there are around 1.3million deaths due to road accidents. At the time of accident the data related to the accident is expected to discover the reason of the accident. During an accident majority of the data will be lost and hence we may not be in a condition to determine the reason of the accident and investigation becomes difficult. So in order to react to the scenario the Black Box system has been developed which collects the data like Temperature, Speed and the pressure of the vehicle which helps in Investigation or determining the factor through which accident has occurred. It also alerts the driver through an alert message which contains the parameters like Temperature, Speed and Pressure of the vehicle along with the Real time Location of the vehicle. The

message is also sent to predefined number which helps in tracking of the vehicle. In case if the accident occurs the message can be used to track the location of the accident and rescuing the victim. The data can be later used for investigation.

#### 2. Problem Statement

The data required in vehicle motor cash investigation is lost and also inputs taken from eye witness, victims and police reports may not be accurate to state the cause of an accident. The death rate due to an accident on roads can be reduced by minimizing the delay in rescuing operation. In order to claim insurance detailed information is a prerequisite that how accident took place.



There are many efforts made to reduce the rate of accidents and prevent causalities by providing a medical help by reducing the time in order to prevent any causalities using various approaches. J Naskath [1] have used ARM hardware platform for vehicular monitoring and tracking road accidents. The system consists of ARM&TDMI-S processor which employs a unique architectural technology Thumb having a key feature of Super Reduced instruction set. It uses GNSS( Global Navigation Satellite System) and Single emergency number 112 under the European Safety initiative. Inspite of this there is a drawback as 112 is used in 12 states of European States out of 27 states and the e-call devices are implemented in only those car which are manufactured after September 2019. Varsha Goud [2] have proposed a vehicle accident detection and remote Alarm device which has a switch to have control over the message to be sent on the basis of medical emergency required or not and is decided by type of accident occurred that is either major or minor type of accident. Inspite of this there is drawback as if the major accident occurs even though scanning of switch takes place and the time of scanning is not mentioned. V. Sagar Reddy [3] have designed and developed an accelerometer based system for safety by detecting accident through MEMS (Micro Electro Mechanical system) capturing of image through webcam and Wi-Fi module over which images are sent whenever the vibrations are high and driver is intimated through the speakers. Inspite of this there is a drawback because the cost of device is high and separate memory is required. T Kalyani [4] have a solution for overspeeding accidents. Due to overspeeding some technical reasons and some advance techniques may fail at certain time. The solution to this is analert system which sends message to assigned mobile number with the current location. Pooja dharani [5] have proposed a system which shares the driving skills of the driver to another vehicle which is approaching nearby, which helps in preventing accidents. Additional ten seconds before and after the event are recorded if the accident occurs to have complete analysis of the scene. Inspite of this the drawback is the implementation of this system is time consuming.

#### 4. Methodology

The main objective is to collect the information regarding the accident, Through which factor has accident took place and to use it for investigation. If the vehicle has met with an accident or not is determined by considering two factors:

- Accelerometer readings
- FPR (Force Pressure sensor) values

When even one of the value exceeds the threshold then the alert message has to be sent to the family members in order to provide medical help. The Figure 1 represents the Block diagram used. Working: Arduino uno is a open single board microcontroller used to build digital devices. It is the major control unit of the device. It acquires all the sensor readings and continuously monitors the values. The sensors used in the device are GPS, GSM, Accelerometer ADXL335, FPR (Force Pressure sensor), Speed sensor LM393, Temperature and Humidity sensor DHT11. GPS stands for Global Positioning System developed by US which is used to find the location on the Earth. GPS- SIM28ML is the hardware used GSM stands for Global System for Mobile communication.



Figure 1: Block diagram.

GSM stands for Global System for Mobile communication. The SIM900A is the hardware used which has allocated mobile number and helps in interfacing GPS and GSM. It is triband network which is used to send the message.

Accelerometer (ADXL-335) is an electromechanical device used to measure acceleration force. The triaxis(X-axis, Y-axis, Z-axis) accelerometer measures the acceleration in all the three directions.

The FPR sensor is a sensor used to measure Force and Pressure. The Force Pressure sensor resistance changes when force or mechanical stress is applied to it. Force applied on the FSR is inversely proportional to the resistance.used to find the Pressure and Force at which the accident has took place.

The speed sensors (LM393) is used to find the speed of the vehicle, It is an optical sensor which is used to calculate the speed of the vehicle. One column contains IR LED which emits the lights and another contains phototransistor which collects the light rays from the LED. When the wheel rotates in between the two columns, the lights transmitted from the led passes through the slot, it is detected by phototransistor which is in the form of series of pulses which is decoded and the relative speed is calculated.

The Temperature sensor (DHT11) is more accurate to find the temperature of the vehicle engine. It act as a resistor if the resistance changes the temperature additionally changes. The resistance is reciprocally proportional to the temperature. It is knows as



NTC(Negative Temperature Co-efficient). If the temperature of the engine varies due to excess heat the engine gets seized to keep track on the temperature of the engine we are using the temperature sensor.



Figure 2: Hardware implementation.

Arduino along with Accelerometer and FPR sensor forms the Accident detection system. All the above mentioned sensors are interfaced with Arduino uno. The Arduino continuously monitors the values. When one of the value exceeds the threshold value then the message is generated through the GSM module. The message generated consists of all the sensor values mentioned above along with the GPS location having a Google Map link.

Whenever the speed sensor experiences high speed or rashness in driving then the alert message is sent to the in charge or owner of the vehicle.

#### Flow diagram



#### 5. Results and Discussion

The Figure 4 represents the message bearing all the sensor readings which can be used to track the location of the vehicle and also the same message can be used for investigation and for claiming insurance.

Latitud	de:13_02 longitude:77_51
Speed	:0_30rps temperature in C:28
pressu	ire :
1008h	ttp://maps.google.com
/maps	?&z=15&mrt=yp&t=k&q=13
.01792	26+77.514694

#### Figure 4: Result

This paper provides a prototype of a Black Box which plays a key role in vehicle crash investigations. The Figure 5 shows the detailed information of how the message is generated.

© COM25			-		;	<
					Sen	ł
y=24						1
z=26						
27						
x=25						
y=25						
z=25						
1008						
Current humidity = 67.00% temperature = 28 C						
speed=0.30						
17						
Latitude:13.02						i
Longitude:77.51						
Speed(in rps)=0.30						
pressure :1008						
temperature in C:28						
Sending SMS						
SMS Sent						
x=25						1
Autoscroll Show timestamp Newline	~	9600 baud	$\sim$	Clea	r outpu	ł



This can contribute to manufacturing of the safer vehicles, minimizing the delay of rescue system and serving to insurance corporation with the vehicle crash investigations. The prototype provides complete information about the car along with the navigation system collaboration with Google maps and also intimate the family members about the incident that took place. The below table shows the accuracy of the values obtained.

Parameters	Accuracy			
Speed sensor	±1%			
Force-Pressure sensor	±5%			
Accelerometer	±3 g			
GPS module	2.5 meters			
Temperature	$\pm 1^{\circ}$ C and $\pm 1\%$			



#### Applications

- This device can be used in any kind of automobiles to keep track on.
- To prevent uncertain death after accident by intimating to family members in rescuing operation.
- Tracking of the vehicle at the real time environment is a very big advantage.

#### 6. Conclusion

With the current scenario in safety of vehicles and detection of accidents have facing advanced technical issues and ambiguity in providing exact details or information regarding accidents, this paper majorly focused to reach the targets conveniently. Our system plays a key role in providing detailed information about accident by using prototype of Black Box device, in which investigations can be done in a simplified way. Along with the alert systems and navigation system which minimizes the delay of rescue system & also intimate the family members about the incident that has occurred and using the same for serving the insurance corporations with the help of vehicle crash investigations to avoid the confusions between the organization and the customers.

#### 7. Future Scope

The current system can be further extended to send an alert message whenever the speed sensor experiences high speed or rashness in driving to the concerned person. By implementing more sensors detailed information can be collected and also the same can be used for claiming insurance.

#### References

- [1] J Naskath, G. Jaya Bharathi, A. subbalakshmi, "ARM Hardware Platform for Vehicular Monitoring and Tracking in Road Accidents", International Journal for Research in Applied Science & Engineering Technology(IJRASET), Volume 3 Issue IV April 2015.
- [2] Varsha Goud, V.Padmaja, "Vehicle Accident Automatic Detection and Remote Alarm Device", International Journal of Reconfigurable and Embedded Systems (IJRES), Volume 1, No.2, July 2012, pp. 49-54.
- [3] V. Sagar Reddy, Dr. L. Padma Sree, V. Naveen Kumar, "Design and Development of accelerometer based system for driver safety", International Journal of Science Engineering and Technology Research (IJSETR), Volume 3,Issue 12,December 2014.
- [4] T Kalyani, S Monika, B Naresh, Mahendra Vucha, "Accident Detection and Alert System", International Journal of

Innovative Technology and Engineering (IJITEE), Volume-8, Issue-4S2, March 2019.

- [5] Pooja dharani. S, Tharuni. A.P, Viveka. S, "Automatic Vehicle Accident Detection and Messaging System", International Research Journal of Engineering and Technology (IRJET), Volume 06 Issue 04,April 2019.
- [6] Apurva Mane, Jaideep Rana, "Vehicle Collision Detection and Remote Alarm Device using Arduino", International Journal of Current Engineering and Technology, Vol.4, No.3, June 2014.
- [7] Akshay Shinde, Abhishek Jagtap, Uday Tambat, Faiyaz Sayyed, Omkar Dayal "Real Time Rash Driving Detection Using Android Application", International Journal of Innovative Research in Science, Engineering and Technology, Vol 8, Issue 3, March 2019.
- [8] SreekavyaNarahari, Koteswararao, Pavan Kumar "Remote Accident Location Detection and Auto Alarm Device in Vehicles", International Journal of Professional Engineering Studies, Volume 1,Issue 1, DEC 2013.
- [9] Hamid M.Ali, Zainab S,Alwan, "Car Accident Detection and Notification System Using Smartphone", International Journal of Computer Science and Mobile Computing, Vol.4 Issue.4, April-2015.
- [10] DrD.karunkuzhali, D.Madhubala, Y.Nisha, S,Rajeshwari, "Accident detection and monitoring system using iot", International Journal of Innovative Technology and Engineering (IJITEE), Volume-6, Issue-3, March 2019.