Automatic Accident Alert System (AAAS)

C.H. Sreekrishnan, Siddhant Jain, Pratishtha Singh
Guide: - R.Jayaraj

Abstract*: The paper presents a design for an Arduino-Android based accident alert system. The system consists of an Arduino module which interfaces with Android OS using native Application. The system is developed to alert close relatives and concerned emergency services in case an accident occurs. By this project, we also aim to make transportation safer by giving timely intimation for medical assistance. The Arduino module will get readings through various sensors when a collision occurs and then transmit it to mobile via Bluetooth which will alert the preset contacts or authority.

***Index Terms*: Arduino, Android, Application**

I. INTRODUCTION

The "World Health Organization (WHO)" has revealed in its first ever Global Status Report on Road Safety that more people die in road accidents in India than anywhere else in the world [3]. The statistics for India are worrying. Road safety experts say the real numbers could be higher since many of these accident cases are not even reported [4].

AAAS is a system developed for automobiles. This project aims to bring ease to the immediate next of the kin or moreover the Emergency Services by alerting them about the accident faced by the victim. This is done with the help of Arduino combined with sensors. The sensors measure the set value parameters and then send an SOS signal via the app.

The main objectives of this utility are:

1. To reduce the Human Death Ratio due to road accidents in India.
2. If an accident takes place, quick transmission of the message to preconfigured contacts or required authorities to intimate about the victims for timely assistance.
3. To provide maximum assistance even in unpopulated areas.

II. OVERVIEW

The system consists of an Arduino Module which can be sourced very easily and is affordable. The Arduino module has been connected to various sensors such as accelerometer, voltage regulator and Bluetooth module via connecting wires.

The Arduino module and Mobile phone will interface with each other using Bluetooth and native android app.

The sensors will read the data and send it to the Arduino module. The Arduino module will transmit the data to the Android app via Bluetooth. If the reading crosses the threshold limit, a preset message which also includes the location of the incident via phone GPS will be sent by the app to the emergency contacts and nearby authorities.

III. MODULE

The Module consists of an Arduino Uno board in which is connected to various sensors – accelerometer (ADXL 335), Vibration sensor (Piezoelectric sensor), Bluetooth module (HC-05). The module also consists of small parts such as resistors and voltage regulators. The module can get power from either its own lithium-ion battery or from the battery of the vehicle. Below is the schematic of the module. It consists of all the connections of Arduino and the sensors. This schematic is designed in software called "Fritzing". The Module will be enclosed in metal or fiber casing to avoid interference of any foreign object as well to protect it from the impact of any eventual accident

Figure 1: System Design

Revised Manuscript Received on May 05, 2019.

C.H. Sreekrishnan, Department of Information Technology, SRM Institute of Science and Technology, Chennai, India
Siddhant Jain, Department of Information Technology, SRM Institute of Science and Technology, Chennai, India
Pratishtha Singh, Department of Information Technology, SRM Institute of Science and Technology, Chennai, India

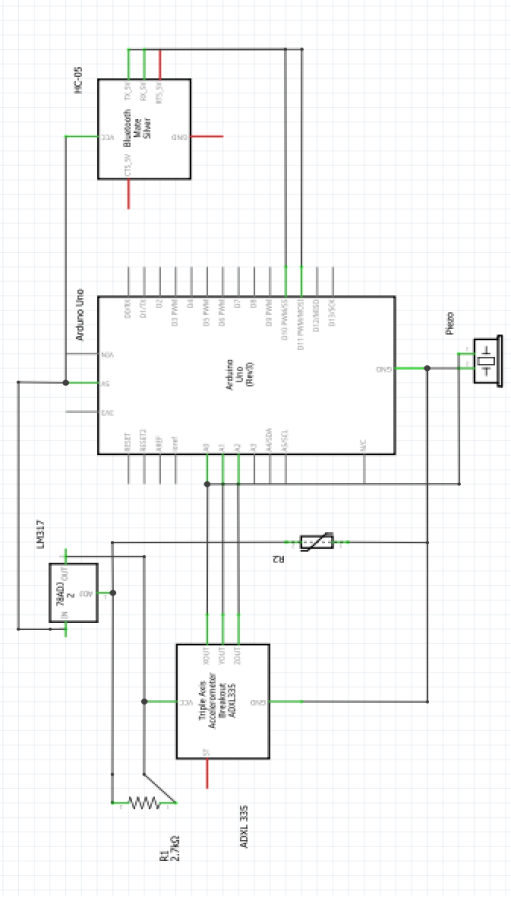

Figure 2: Schematic of module

IV. ADXL-335

ADXL-335 is a small, low power, full 3-axis accelerometer with signal conditioned output voltage. The sensor measures acceleration with a minimum of ±3g [1]. It can measure the static acceleration of gravity in tilt-sensing applications, as well as dynamic acceleration resulting from shock, motion or vibration.

ADXL-335 consists of Cx, Cy, and Cz pins which takes the value from every axis and calculates them to give the g values.

Below are the Axes and orientation of the sensor:

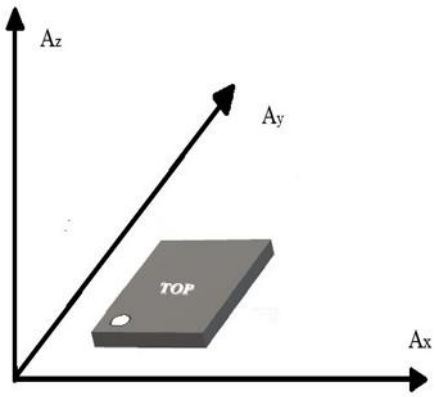

Figure 3: Axes of Acceleration Sensitivity; Corresponding Output Voltage [1]

Increases When Accelerated Along the Sensitive Axis

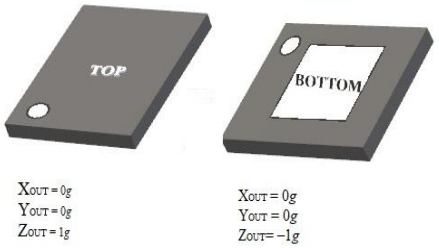

Figure 4: Orientation to Gravity [1]

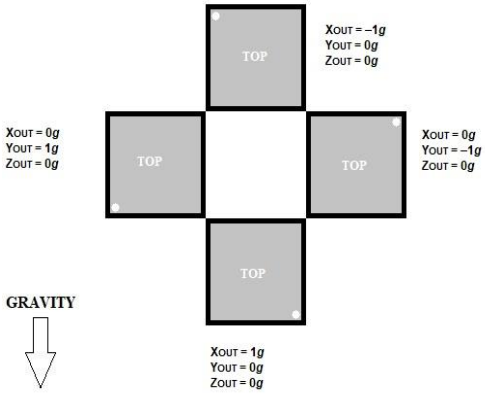

Figure 5: Output Response [1]

The force experienced by a normal accelerating car is around 0.5-0.8g. If brake is applied, a car normally experiences up to -0.4g but anything beyond -1.0g indicates that something has happened, potentially a crash.

The ADXL-335 gives raw value (digital reading) of X, Y, Z axis which is then converted to g values. We have to convert these raw values to the g value using the formula.

g = {((volt reading*Vs)/1023)-(Vs/2)}/sensitivity

Where g is acceleration by gravity
1023 is voltage in digital value
Vs is the voltage supplied to the sensor

V. SOFTWARE

AAAS is all about alerting your kin and nearest responsive authorities in case of accidental emergencies. The app enables the user to look up nearby Bluetooth devices and pair with them. The initial screen requests the user to feed in the information of family members whereas the emergency contacts are preset. For those interested, the app also shows the readings taken by the module and when this reading reaches a threshold value, the application is designed to send the preset text and the current location to the contacts allocated. The software uses android classes such as getLocation() and Bluetooth adapter.

The user has to provide emergency contact numbers along with permission to use the device location so that it will be easier to locate and provide help, this information will be saved in the person's device. The data recorded from the module will also be stored using SQLite database locally in the person's phone.

VI. IMPLEMENTATION

The main component of AAAS system is an Arduino module with numerous ports for connecting various different modules required for this system to function. The modules namely the ADXL335 (accelerometer) and HC-05 Bluetooth module are connected to A5 - A1 port and Rx and Tx ports of the Arduino module respectively. The ADXL335 is favored as it has 3 axis accelerometers hence providing us the g values along with rotation angle values. The Bluetooth module when connected to the device will provide the necessary input to the application in the person's smart phone preferably android. The app interface is built using java and xml in which java is helpful to create the working part of the app and xml for the user interaction. JAVA coding consists of headers (import functions) which are required to run functions like Bluetooth GPS etc. If there occurs an anomaly say an accident the module will first get a reading from the accelerometer and check with the default threshold g value, if the value is higher than the threshold value then it sends the signal to the Bluetooth which relays it to the mobile device which later on sends the automated message along with the location to the necessary authorities. The Module will be installed inside the vehicle where the center of gravity vehicle is at the most balanced point i.e. in middle of the vehicle to get accurate reading. It will be enclosed in a fiber or metallic box so that it stays undamaged in case of an accident.

VII. CONCLUSION

This project is the need of the hour in the automobile industry and in daily life. It aims to help the common man in situations where he is unseen and unheard by the passer-by on the road. The prime focus of the application is on any vehicle including two-wheelers. The module can be produced at a very low cost and will be minimized in terms of size in the near future. The project is still in the prototype phase. Even though the project requires vigorous testing but it can be implemented. This project is meant to revolutionize the safety norms of the automobile industry similar to the black box of an air craft. In future, this module may even become as a statutory safety gadget in any basic vehicle.

REFERENCES

1. ADXL-335 datasheet analog.com
2. Simple angle meter using ADXL335 accelerometer electronicsblog.net
3. Global Status Report on Road Safety 2015 by World Health Organization (WHO)
4. Accidental Deaths and Suicides in India by National Crime Record Bureau (NCRB)

AUTHORS PROFILE

C.H. Sreekrishnan, Department of Information Technology, SRM Institute of Science and Technology, Chennai, India

Siddhant Jain, Department of Information Technology, SRM Institute of Science and Technology, Chennai, India

Pratishtha Singh, Department of Information Technology, SRM Institute of Science and Technology, Chennai, India