Designing and Implementation of DeInformer – Two Wheeler Accident Detector and Informer

Yathish D P[1], Nandini S[2]
[1]GITAM School of Technology, INDIA, yathi0509@gmail.com
[2]GITAM School of Technology, INDIA, nandinis1801@gmail.com

ABSTRACT

India, the second-largest country in the world. As the population is more, the number of people using their own vehicles for traveling is also more. The more and more they are using two-wheelers for personal transportation the more we are facing security issues in the market cannot indicate regarding the accidents, due to this reason the person met with the accidents in two-wheelers will remain unidentified in most of the cases and the victim won't get proper treatment on time. Because of this delay in getting notified, many are losing their lives daily. In order to avoid these disasters, we are proposing an DeInformer system which makes use of internet of things(IoT) technology to inform the hospitals and any medical centers about the accident occurred. The DeInformer system makes use of components like GPS module, Buzzer, GSM module, LCD display panel, Keypad and Triple axis accelerometer sensor, all the components are integrated to detect and inform about the accident, thus saving precious life of many humans. The DeInformer can able to detect and inform the accident by considering the sudden change in speed detected by GPS module initially, followed by detection of any tilt identified by the Triple axis accelerometer sensor, after detecting the accident, the same will be shared to family members and to hospitals using GSM module[12]. The location of the accident will be identified by using GPS module[11]. The buzzer in the system is used to alert the nearby people who may help the accident victim.

Key words : Accident, Arduino Uno, Buzzer, Triple Axis Accelerometer Sensor, GPS Module, GSM Module, Two Wheeler

1. INTRODUCTION

The overall population of our country is about 1,380,004,385 with more number of youngsters. As the population of the country is more the number of peoples using their own two-wheeler vehicles for their transportation is also more. The number of two-wheelers across India is about 187,091,000. In India, everyday 1214 road crashes will occur and two-wheelers are the reason for 25% of total accidents which occurs on roads. An average of 20 children under the age of 14 is facing death every day due to two-wheeler accidents [13]. The reason for these deaths is not only because of accidents, the other main reason for these deaths is that the person met with an accident in unmanned places is not getting notified and treated in proper time so they are losing their lives. To avoid these disasters in this paper we are proposing a cost-effective DeInformer system. In this system, we are using Arduino Uno [9] with ATmega328P [9] as a microcontroller to control the different components of the system like GPS module, Buzzer, GSM module, LCD display panel, Keypad and ADXL 335 Triple axis accelerometer sensor. If a person met with an accident then the speed of vehicle will change suddenly to zero this will be identified by GPS module, after the accident the vehicle will fell down and this will be detected by ADXL 335 Triple axis accelerometer sensor. If there is a sudden speed change detected by GPS module it will check the Triple axis accelerometer sensor value because if a drastic change in the speed from maximum to minimum we can ensure that accident has occurred. Once there is a change in both the sensor values, sensors will send a trigger to Arduino. On receiving the trigger, Arduino will activate the GPS module, GSM module[12], and buzzer. GPS module on activation will identify the exact location of the accident and the GSM module will include the location generated by the GPS module [10] in the message and broadcast the same to predefined receivers. The buzzer in the system will be used to create a noise so that the pedestrians or any person who is nearby to the accident location can help the person in danger so that he can be treated in a timely manner. The keypad is used to reset the system if the person met with accident is safe.

2. RELATED WORK

In [1], the Accident Detection Server (ADS) unit is used for sensing and generating the accidents. In this system, the sensor is used for sensing the beneath of the road with a threshold value. GPS is used to monitor speed, position, and time. If the threshold value is higher or the sensor is OFF, it indicates an accident has occurred, and hence through GPS, coordinates of the location will be sent to the predefined number. The major drawback here is, until the ambulance or concerned person arrives, the victim's survival rate may decrease which can be solved by the proposed system.

In [2], the authors have proposed the intelligent system for not wearing the helmet and also alcohol sensor is used to detect the alcoholic-driver for two-wheeler. In this, the system first checks whether the person is wearing a smart helmet and has non-alcoholic breath while driving. If the vehicle faces an accident, then through the GSM module an alert message will be sent to the predefined number. But in this system, there is no detection of location and hence it's difficult to locate

accident location. The solution to this problem is given by using a GPS module in the proposed system.

In [3], the authors have used mainly two sensors i.e, Vehicle Mounted Sensor to know the vehicle information which is mounted on to the vehicle. Also, Wearable sensors used to provide the health information of the passenger. If an accident occurs either due to vehicle collision or due to health issues, the message will be sent to the predefined number. But no exact location is determined in this system which is a problem identified and the solution to this problem is given by giving a GPS module in the proposed system.

In [4], the authors have used the system where with the help of GPS and GSM technology accidents can be located and send an alert message. Here, based on the speed value the system sends the alert message. The drawback here is, if the speed decreases gradually even without an accident, the false message may be sent. This drawback can be solved in the proposed system as we are using a tilt sensor along with the accelerometer sensor.

In [5], the authors have used a tilt sensor and heartbeat sensor to know the accident occurrence. If the tilt sensor value changes and the heartbeat value increases, it indicates the seriousness of the accident and alerts the GSM [11] and GPS module [10] to send the alert message along with the location. But the communication between these two modules is done through Bluetooth. Also, the buzzer is used to alert the nearby passengers to get the medical assistance from the nearby fellow people. In the proposed system accelerometer sensor is used to detect the change in the speed along with the tilt sensor.
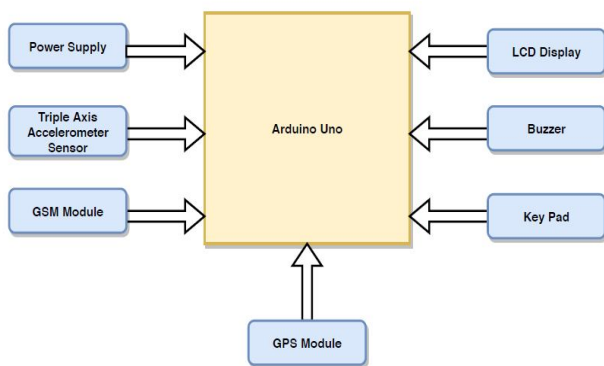
3. SYSTEM ARCHITECTURE

Figure 1: System Architecture

Figure 1 shows the system architecture of accident detection and notification system for two-wheelers. In this Designing and Implementation of DeInformer– Two Wheeler Accident Detector and Informer, we are using Arduino Uno with ATmega328P as a microcontroller to control all the other components. The power supply for working for all these components will be taken from the battery which is present in the two-wheelers itself. In this system, we are using NEO-6M

GPS module to check the sudden change in vehicle speed, because if a vehicle without any movement fell down means there will be a change in the sensor values which cannot be considered as an accident. We are also using ADXL 335 Triple axis accelerometer sensor [12] sensor for detecting any variations in the position of the two-wheeler by using the X-axis, Y-axis, and Z-axis values. The threshold values for the entire axis will be set initially; if there is any change in the values of all the three-axis then tilt variation of the vehicle is identified. Upon title value variation, so once variations in all three axes are identified speed variation of the vehicle is checked. If both the speed and tilt conditions are true then the system will generate a trigger signal to Arduino. On receiving the trigger, Arduino will activate both the GPS NEO-6M module and GSM SIM800L with buzzer. Once the GPS module is activated it will generate the exact location of the accident and the GSM module [11] will add the location generated by GPS module [10] into the alert message and broadcast the same to predefined receivers. The buzzer in this system will be used to alert the nearby peoples to help the person in danger. In this system if the rider is safe after accident he can reset the system by typing the secret code using keypad so that the alert will not be sent unnecessarily to relatives and hospitals. The maximum time user will get to reset the system has been set to 120 seconds.
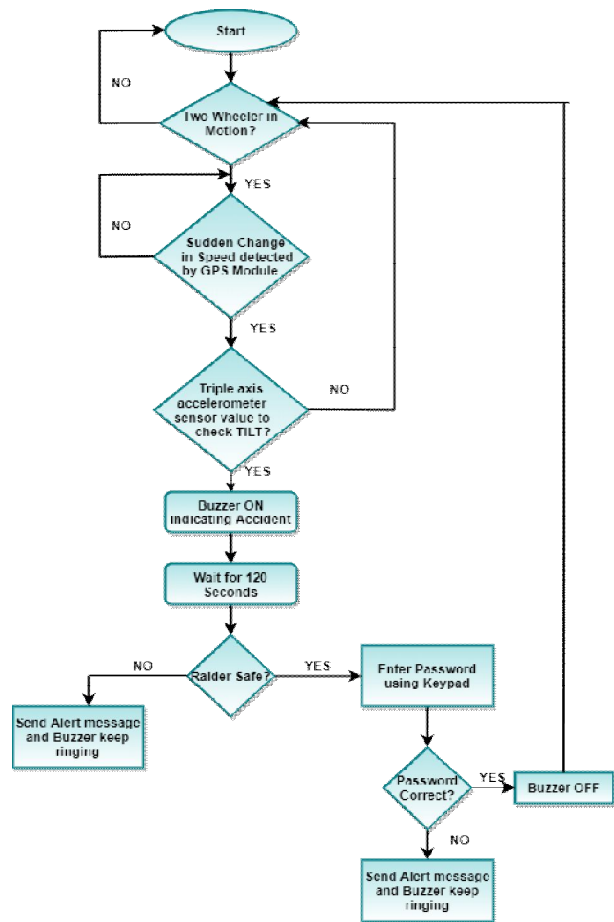
4. WORK FLOW

Figure 2: Work Flow

Figure 2 shows the workflow of the DeInformer system. In this system first, we will set the threshold value for the ADXL 335 Triple axis accelerometer sensor i.e., we will set threshold values for X-axis, Y-axis, and Z-axis. If there is no change in the values of all the three-axis then vehicles are in normal position. If ADXL 335 Triple axis accelerometer sensor values exceed the threshold value, it indicates that the vehicle has been fallen down then it will check for the GPS module values for sudden change in speed detection. Here we are using two sensors because the ADXL 335 Triple axis accelerometer sensor can only detect whether two-wheeler has fallen down or in a normal position, if the vehicle has fallen down in a normal parking place also it will detect it has an accident only. So to overcome this we are using an GPS module with the help of this we can detect the sudden variation in the speed of the vehicle. If both the sensor exceeds threshold values then it will trigger the Arduino to activate the GPS module [10], GSM module [11], and buzzer. GPS module [11] on activation it will detect the exact location of the vehicle met with accident and GSM module add the location generated by the GPS module [10] into the alert message and the same will be sent to all the predefined receivers. The buzzer in this system is used to alert the nearby pedestrians or peoples with the alarm sound so that they can help the person met with an accident.

5. METHODOLOGY

In the proposed system, the ADXL 335 Triple axis accelerometer sensor and the GPS module are used to predict whether an accident has occurred or not. The ADXL 335 Triple axis accelerometer sensor present in the system will identify about change in the angle or variation of the vehicle, if the vehicle position exceeds the threshold of all the three-axis in the sensor then it will notify that accident has occurred. For further more confirmation it will check with the GPS module, if sudden fall in speed is detected then the accident is confirmed. If both the sensor values exceed threshold then the system will confirm the accident and sends a trigger to Arduino. Once Arduino receives the trigger it will activate the GSM module, GPS module, and buzzer to send the alert message with the location of the person met with an accident

A. Micro Controller

In this system, we are making use of Arduino Uno [9] with ATmega328P as a microcontroller. The main functions of microcontroller in this system are listed below:

1. It will receive the trigger from the accelerometer sensor in order to identify the accident.
2. It will activate the GPS module [10] to generate the sudden change in speed of two wheeler and to detect exact location of the accident.

3. It will activate the GSM module [11] in order to send the alert message with the location generated by the GPS module to predefined receivers.
4. It will turn ON buzzer to alert the nearby people to help the person who met with an accident.

B. Sensors

In this system to detect the accident of the two-wheelers, we are using ADXL 335 Triple axis Accelerometer[12] sensor as a tilt sensor to detect whether tilt or change in the vehicle position has occurred or not.

If vehicle changes from normal position to predefined threshold the sensor will detect it has change in the vehicle position and triggers the Arduino.

C. GPS Module

In this accident detection and notification system, we are using the NEO-6M GPS module to detect the speed of the vehicle and to trace the exact location of the two-wheelers which met with an accident. GPS module [7,11] will be activated by the trigger generated from the Arduino.

D. GSM Module

In this system, we are using SIM800L as the GSM module [8,12]. The GSM module will be used to send the alert message with the exact location generated from the GPS module and broadcast the same to predefined receivers.

E. Buzzer

In this system, we are using a piezo buzzer to generate the alert sound. The buzzer used in this system will be used to alert the nearby person with the help of the sound from the buzzer so that they can save the lives of the person met with an accident.

F. Arduino IDE

In this proposed system we are making use of Arduino[13] IDE as the platform. To develop the code we are using embedded C as the programming language. The code will be dumped into the Arduino board with the help of dumping cable.

6. RESULTS

The result of the system depends on the values read by the ADXL 335 Triple axis Accelerometer and the GPS module. The working model of the system is shown in figure 3.

Figure 3: The DeInformer system

If the value read by these sensors exceeds the threshold values then the sensors will send the trigger signal to the Arduino. On receiving the trigger, Arduino will activate the GPS module, GSM module, and the buzzer present in the system. Once GPS module [10] is activated it will track the exact location of the person met with accident and GSM module [11] on activation will add the location generated by the GPS module in the alert message and the same will be broadcasted to predefined receivers as shown in figure 4.
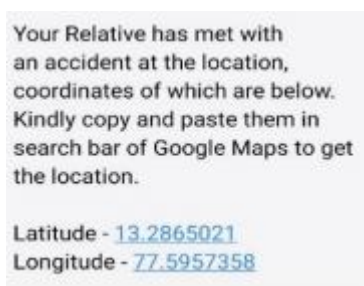

Figure 4: Alert message and location sent to predefined receiver

7. CONCLUSION

In our country, many are losing their lives on roads due to accidents on two-wheelers. In these accidents, many of them are dying because of not availability of in-time treatment. To avoid this problem we are developing DeInformer system. In this system, if a person is met with an accident, will be detected based on the tilt that occurred in the vehicle's position and sudden fall in the speed of the vehicle. The system has been developed in college and tested for bicycles and the results are accurate with the generation of exact location with an alert message based on the sensor values and the trigger generated by the Arduino[13] with buzzer notification sound. With the help of this system, we can ensure that the person met with an accident will be notified on time either with the help of a buzzer or by alert message and he can get treated on time to save lives.

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