



Development of IoT based Safety and Security Mechanism for Bikers

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Abstract. This paper is an initiative to make motorbike driving safer and secure than its previous condition. This technology works on the Global system of mobile communication. This paper works with the application of various sensors connected with a microprocessor so that they can work with better coordination. When the driver crashes, all the sensors get activated by a microprocessor with the help of an accelerometer sensor that detects the accident. After getting a signal from the accelerometer, the microcontroller sends a signal to GSM and GPS so that they can send a message to the medical emergency team so that they could react early. The objective of this paper is to decrease every chances of accidents and also prevent vehicle theft. Our helmet work with the coordination with a special circuit called transmitter and receiver and a processing device, which have a coded software. Now we circuit with the sending unit, receiving unit, and a microprocessor with all sensors.

Keywords: Helmet, IoT, GPS, GSM, ZigBee, Microcontroller, ARM, LPC 2148, Relay.

1 Introduction

In current world, especially among the young generations, riding bike is quite common and becoming a craze. Most of the people now aiming to buy bike as compared to car or any four-wheel vehicle because of price related issue. Because of this the bike's number is increasing day by day on the road which increase the chances of accident on the road [1-2]. With all these, if accident happens and the emergency response team will become late then the life of rider is on stake and hence an immediate alert is very important. The two wheeler bike have made following issue very problematic like rush driving, crazy driving, drink and drive etc. This paper makes sure that the driver must wear the helmet and follow the rules and regulation given by governmental organizations or traffic department [3].

1.1 Objective

- To make a smart and autonomous system which ensure that the motor biker wears the helmet while driving.
- Must detect the alcohol and any other chemical things which make drivers unconscious.
- Autonomously to send alert SMS with specified location with coordinates.

2 Disadvantage of Existing Technology

Lacking of the streaming method is the dependency on the driver and not having any autonomous technology and it is very difficult for the traffic police to locate or find such people who neglect this law [4]. These are some lacking point of method at present:

1. Generally, in the village area or in the region where tracking is not possible people does not care about wearing helmet.
2. People in India only wear helmet when they found police checking is happening in that area.
3. It is very easy to trick to ignition patch in the vehicle and theft the vehicle.

Blood alcohol test for every rider is not possible in India as it is a very populous country and also it is very dangerous for transmitting of sexual disease or chronic disease. [5-6]

3 Block Diagram

There are two main part of our design unit which is as shown in the Figure1 and Fiure2. These units are:

- i. Helmet side
- ii. Bike side

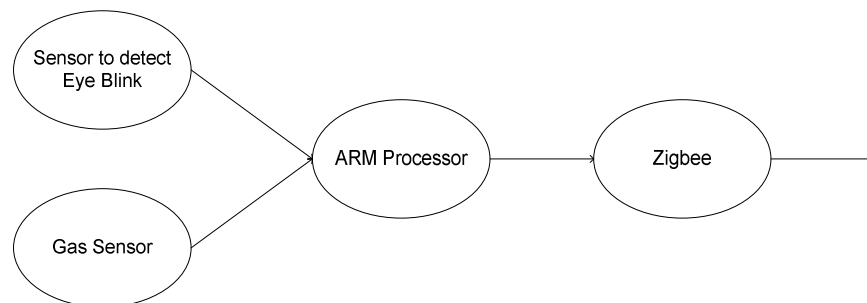


Figure1: Helmet Side Block Diagram

3.1 Helmet Side

Helmet side is consisting of two basic sensors that is Eye blink sensors and Gas sensors. Both sensors work with the coordination of the Microprocessors. Whenever the alcohol sensors sense the input of alcohol in the driver breathe, it sends the signal to the Arm processor[9] so that it can turn off the ignition and the main work of eye blink sensor is to sense the wearing of helmet by reading the cornea of the eye. This works on the frequency of the cornea and sends signal to microprocessor that driver is wearing the helmet. Both the part is connected to each other by using ZigBee module which generate its own radio frequency to connect to each other.

3.2 Bike Side

The Figure describes the outline of processes when signal is sent to Vehicle side.

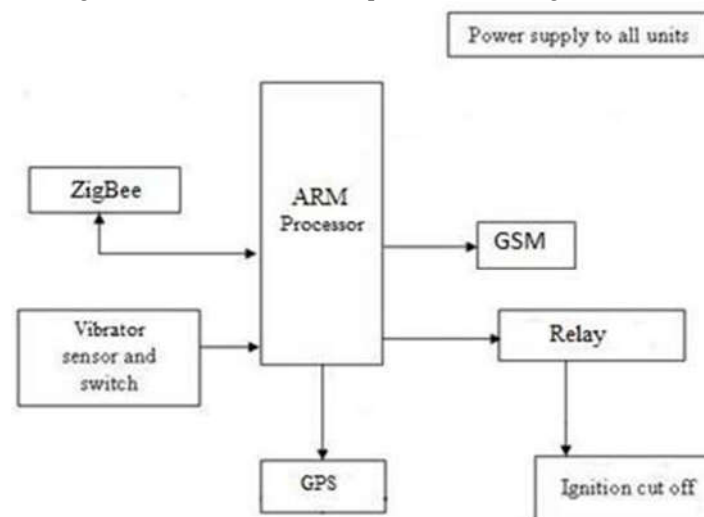


Figure 2: Bike Side Block Diagram

When vehicle unit finds the signal from the helmet part then only it turns on the ignition and start the vehicle. The vehicle has the vibration sensors which have detects the accidents on the basis of frequency of the bike. These sensors have minimum tolerance level if the frequency over cross it then it turns off the ignition switch and turn off the vehicle. And if the accident detection happens by mistake then rider can turn off it manually.

3.3 Schematic Diagram of Helmet Unit & Vehicle Unit

The schematic diagram of IoT based Smart Helmet is shown in the following Figure3 and Figure4. For Zigbee module it requires 5V power supply and also for the various sensors to work autonomously. Pin description is very important in any microprocessor and it provide information about the correct connection. ARM processor have pin and port assigned to various sensors and input units.

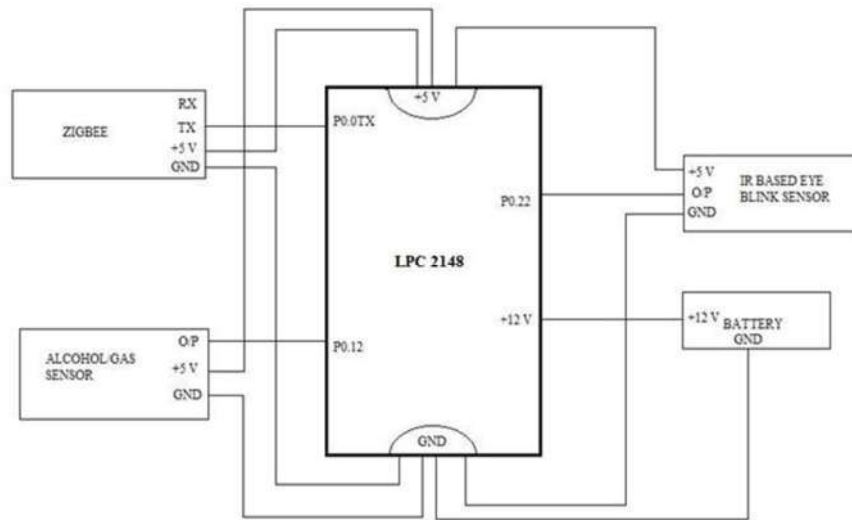


Figure 3: Helmet Unit Schematic Diagram

Battery of the Project is connected to the PCB board which have a voltage regulator to regulate the voltage at the required level. For Zigbee module it requires 5V power supply and also for the various sensors, ignition control to work autonomously. Pin description is very important in any microprocessor and it provide information about the correct connection. ARM processor have pin and port assigned to various sensors and input units. LCD display is connected to pin to show the important information on the screen.

4 Hardware and Software used

Different hardware and software modules used in this IoT based safety and security mechanism for bikers are Sensors- MQ-5 Alcohol sensor, IR based Eye-Blink Sensor, Vibration Sensor, ZigBee Module based on IEEE 802.15 quality.

Further, LPC 2148 ARM Processor [8], GPS, GSM Module, Relay Module, LCD, Ignition Switch Software- Kiel micro-v4 (Microcontroller Programming Simulation) are also used. A detailed flow chart is discussed in the next section.

5 Flow chart

Figure 5, flow chart clears the logic behind the system, that how it makes decisions based on various inputs from the sensors. This gives a short description on the use and the process of working various sensor and microprocessor in co-ordination to make a decision to operate on various conditions like alcohol detection etc. [7-9]

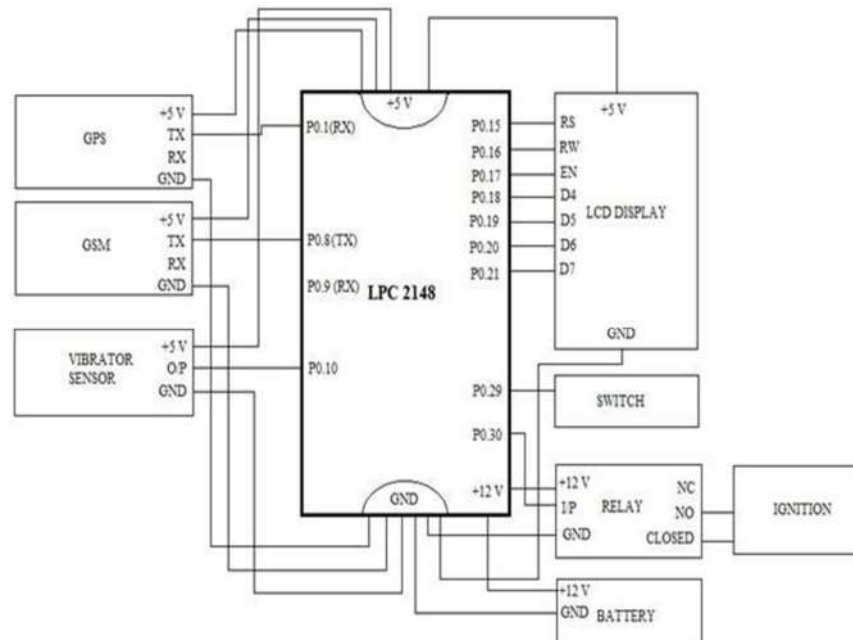


Figure 4: Vehicle Unit Schematic Diagram

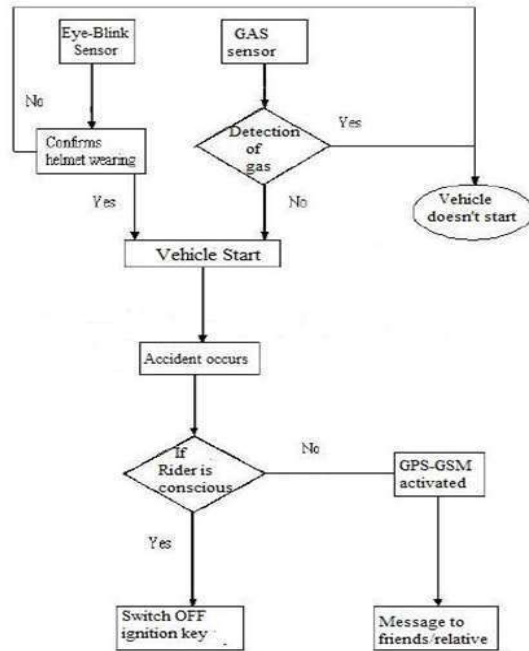


Figure 5: Flow Chart of Integrated System

6 Result and Discussion

In this section, various IoT based safety and security Mechanism for Bikers are discussed. Firstly, condition of the motor-biker with helmet is elaborated. Then alcohol testing method is also discussed. Further, mechanism has been made more smart by introducing mechanisms for Accident Detection which can also detect Accident location. Each one of these mechanisms are discussed in the following sections.

6.1 Condition of the Motor-biker with helmet

The main use of the eye blink sensor is to make sure that the riding without helmet can be avoided. This sensor is based on infrared technology which works on the reading of the frequency of the retina or cornea. A shield detecting screen is shown in Figure 6.



Figure 6: Shield Detecting Screen

6.2 Alcohol Testing Method

Taking alcohol during the driving is a punishable offense but it is not easy to track every person and therefore a method is required to trace this alcohol in the driver blood. Therefore, BAC test is used which used the driver breathe to find the alcohol level in his blood which works on the method of ratio with testing different kits through the breath of the alcoholic person. Government make a permissible limit for the alcohol that is 0.08mg/L. By using this technology, we can change this limit at any time by government agencies. Helmet is now make connection with vehicle (bike) part and display "Driver in Drunken condition" as shown, thereafter ignition will turn down. For better understanding, A drug or chemical detection Screen is shown in Figure 7:



Figure 7: Chemical Detection Screen

6.3 Accident Detection

A series of frequency is tested with vibration sensor for detecting the accident on the road. There is a range of frequency generated during the accident and a sudden change in frequency is happened which read by the vibration sensor and it is forward-

ed to the microprocessor to react as soon as possible. Figure 8 shows the Accident detection result on the screen.



Figure 8: Accident detection result

6.4 Accident location

Now, when the accident gets detected then with the help of microprocessor the GSM and GPS works and the location is send to the friends and family of the bikers and also to the Emergency response team. The ignition of the motorbike is also turned off. Figure 9 shows the location of the accident on the screen.

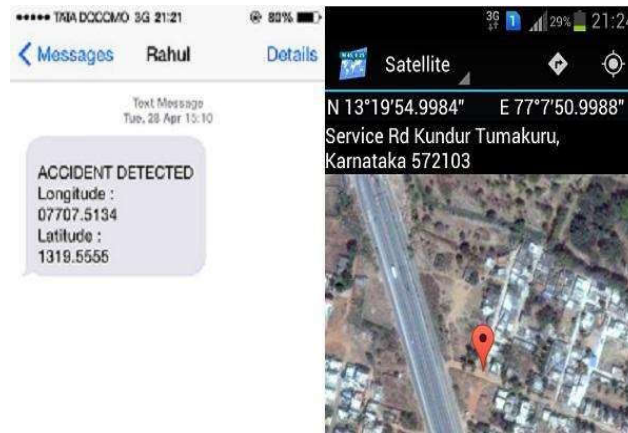


Figure 9: Accident intimation result

7 Conclusion

In this paper, an IoT based smart safety and security mechanism for bikers has been developed. The developed system makes sure the followings efficiently:

1. Either the Rider is wearing his helmet or not?

2. Driver must not have taken Alcohol.
3. Help in detecting the accident and theft of the vehicle.

With this system, journey is made much safer so that it will lower down the injuries, mainly head injuries at the time of accidents and also it reduces the cases of accidents during riding motorcycle cause by taking alcoholic things.

In future, Artificial intelligence can be used to upgrade it to the compact size and hence it helps the government to allow or deny the vehicle from giving various service like parking, servicing etc.

The Governmental Organization can make rule to load this mechanism into the vehicle and make it mandatory to purchase while purchasing the bike itself. With the help of such system in the vehicle, various death due to the Alcoholism, anxiety disorder, sleepiness, or lack of safety measures can be avoided or make it to minimum level.

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