RESEARCH ARTICLE

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Integrating Different Safety Methods for Helmet

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ABSTRACT

Results of a road accident are mostly fatal, so the safety of motorcyclists is important. Protecting the head is the rule of thumb while driving. Having this motivation in mind we are proposing a helmet that is integrated with different sensors to ensure the safety of the driver. A force-sensing resistor [8] will ensure the bike will not start unless the driver wears the helmet also a vibration sensor [9] is installed to detect the accident. We have developed an android application [13] that is used to intercept and send messages. The application is used to send the location of the bike to the ambulance, home, etc. If the accident happened by sending a simple code from your home mobile phone you can receive the current location of the bike. Developed Application will ensure the reliability of the entire system to convey the information.

Keywords: Smarthelmet,Wireless control Helmet, Motorcyclist safety.

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INTRODUCTION

As per the data released by the Government of India [7] in 2012 approximately more than 12 lac two-wheelers suffer from road accidents in different states of India. As per the industries are concerned various smart helmets are coming into the market [10] but most of them are providing solutions for media data streaming, Bluetooth calling,360-degree vision, head camera, augmented reality for navigation, etc. Sena [5] is one of the companies which works on smart helmets. Various solutions have been proposed related to the smart helmet in various research journals [1][2][11][12] at all places GSM and GPS modules are used for sending and intercepting messages. The size and cost of the GSM/GPS module cause an additional burden on the project. To address the above issues, we are proposing a software-based solution that involves the development of an android based application. the proposed helmet provides the following features.

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Conflict of interest : None

1) Accident detection and sending accident location information to hospital and home.

2) Obtaining the location of bike from any where and from any phone just by typing simple SMS.

3) Stopping ignition unless driver wears helmet to ensuresafety.

4) Theft prevention.

Following Fig.1 shows a block diagram of the overall system grouped according to their physical location of a component.

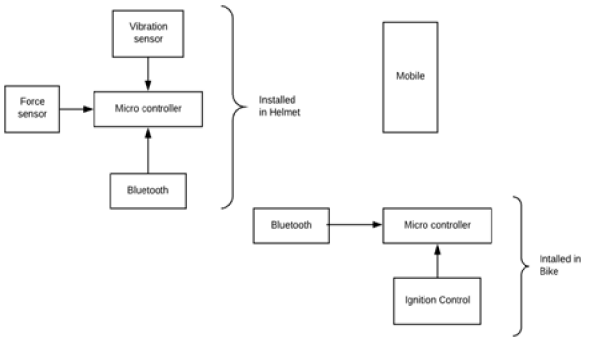

Figure 1: Block Diagram

HARDWARE CONSIDERATION

Vibration Sensor

Minisense-100 is a cantilever beam type low-cost vibration sensor having a mass at the tip and to add sensitivity to the device as shown in Fig.2 there is a hole provided at the tip you may add external weight to it to gain additional sensitivity. A vibration sensor is used to detect accidents. whenever vibration crosses a threshold limit it will send the signal to the microcontroller indicating that an accident has happened. From Fig.4 output is decaying sine wave hence in Fig.3 source is modeled as AC source.

Figure 2: Minisense100

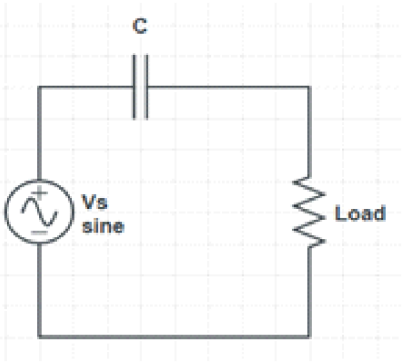

Figure 3: Equivalent Circuit
Figure 4: CRO output

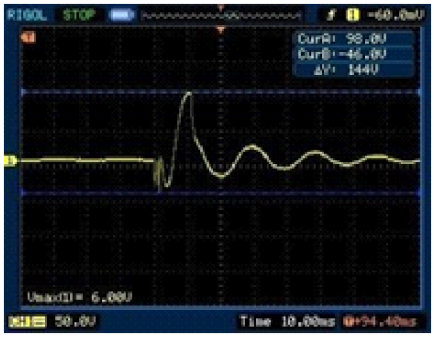

Figure 4: CRO output

As soon as we connect some load at the output it will become a high pass filter. Vibration is governed by the formula, where R is the load resistance. It clearly shows if we want to measure low-frequency vibration then the value of resistance should be as high as possible.

We are in this project considering R as 330 M

$$(2\pi \times 330 \times 106 \times 244 \times 10 - 12)$$

$$f = 1.97\ Hz$$

So, using this value of R we can sense vibration up to 1.97 Hz. The next stage of this will be the buffer stage if we use Op-amp 741 then it will cause a loading effect because of the low input resistance of it so we need to choose op-amp which is having a low input biased current. There are so many options available to it, in this project, we are using LMP7221 op-amp IC having 3 feta ampere input bias current.

Force Sensor

Force sensing resistors are the polymer thick film (PTF) components. PTF is a conductive polymer and having the characteristic property of a decrease in resistance in a predictable manner as we apply the force on the surface of it. It works on two basic principles namely quantum tunneling and percolation [4]. We are installing it inside the helmet so that it can detect pressure due to the head. once the driver wears the helmet it will send the signal to the microcontroller to hand over ignition control to the motorcyclist. Following Fig.5 shows the change in input resistance with respect to g, where g is the acceleration due to gravity.

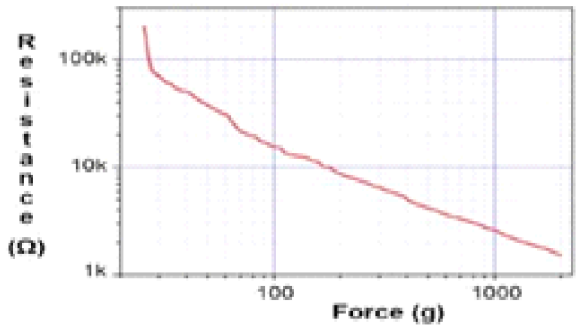

Figure 5:

Figure 6: FSR

Force sensing resistor is as shown in Fig.6. It has continuous(analog) force resolution with force sensitivity ranges from 0.2 N to 20 N. FSR is a two-terminal component one of the terminals is a reference voltage terminal known as driver voltage. If you want to measure large force, then you need to apply lower driver voltage and larger feedback resistor e.g. -0.26 Volt. Performing number experiments, we found that driver voltage of 0.8 Volt gives the desired result.

Circuit Diagram

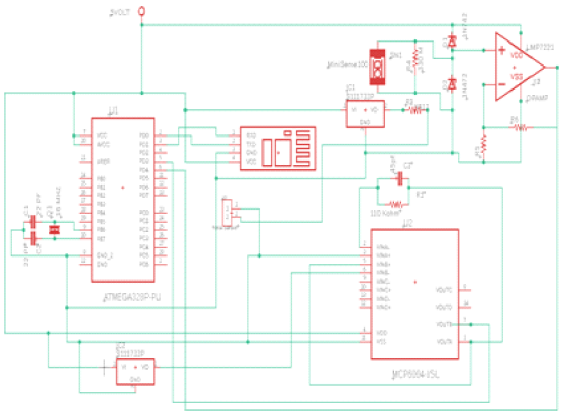

Figure 7: Helmet Circuit

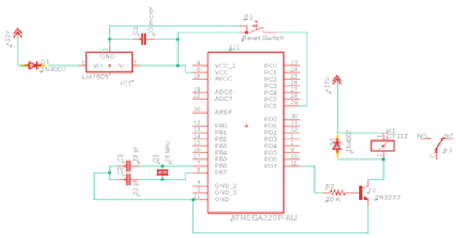

Figure 8: Ignition Control Circuit

SOFTWARE CONSIDERATION

B4A has all the features which are needed to develop almost any type of application. It is used by big companies like IBM, NASA, HP.

Code Flow

Following Fig.9 shows Flow diagram. This application is simultaneously connected with two Bluetooth devices at the same time.

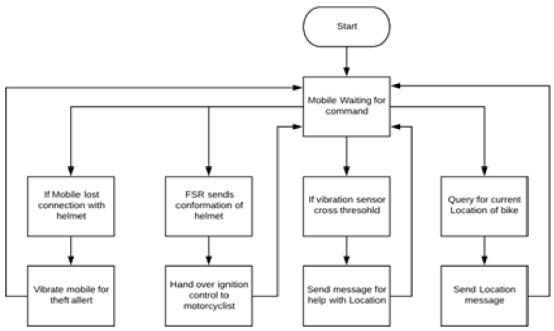

Figure 9: Flow Diagram

Steps involved in android code

Step 1: Define the variable which is needed to initialize only once e.g. GPS, Sms Interceptor in Process global module and general-purpose variable e.g. variable used for latitude and longitude, Timer in the global module.

Step 2: Initialize the Process Global variable when you first start your application in Activity_Create module of code.

You need to initialize the SMS intercepting by providing the highest available priority to the application and the highest priority is 999 also in some devices it is more but for most of the device priority value, 999 work fine.

Step 3: Initialize the timer and define it as Tick_Event which will trigger after a defined period and this will verify for Bluetooth connectivity.

Step 4: As all threads (GPS, SMS, Bluetooth) are working independently as soon as trigger happens actions define for that thread taken.

RESULTS

Following are the results in different conditions.

Fig.10 shows the user interface as soon as the application is opened, on the top status of Bluetooth is shown as disconnected. After clicking on the "connect" button it will get connected to the helmet and in the first indicator, it will show "Helmet is connected" as shown in following Fig.12.

If the helmet is lost/Stole within 4 Seconds phone will start vibrating and the first indicator starts showing "Helmet is missing" as shown in Fig.10.This case is also valid when the mobile phone is not connected to the helmet.

1) The second and Third indicators are used to display the current location of the helmet as shown in "Lat" and "Lon" are used to indicate latitude and longitude respectively shown in Fig.12.

2) Fig.11 shows the current location obtained by sending a specific message i.e."Loc7654" from a mobile phone.

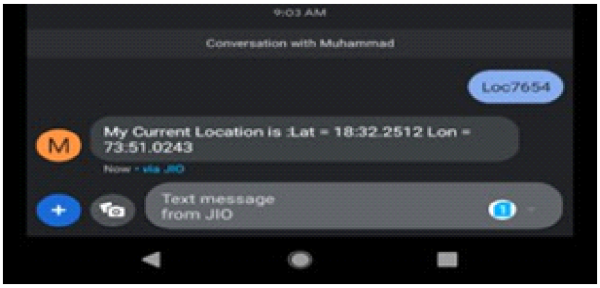

Figure : 10

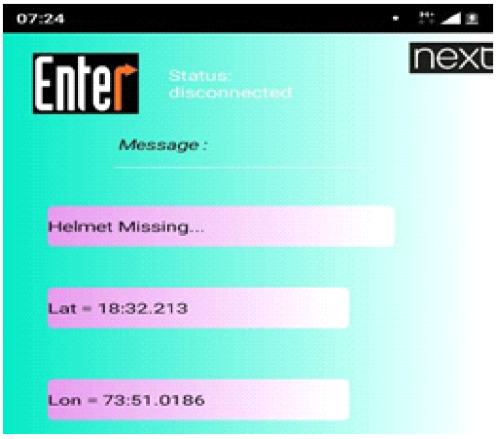

Figure : 11

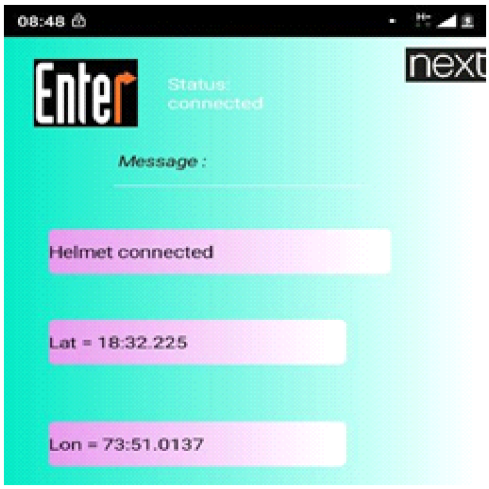

Figure : 12

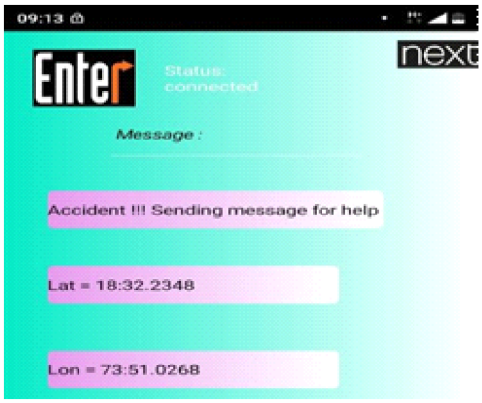

Figure : 13

CONCLUSION

Thus, with the help android application we have reduces the hardware for the GPS/GSM module. Experimentally it is found if you lost your helmet you will be notified within 4 seconds. As there are fewer efforts put by industries in the safety domain our project has successfully shown new directions for safety.

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