Bike Location and Road Obstacle Tracking Using Smart Helmet

Er. Nitin Agarwal[1], Parul Saxena[2], Priya Pathak[3], Aman Sharma[4], Vishnu Kumar[5]
[1] Assistant Professor, Electronics & Comm. Engg., R.B.S. Engg. Technical Campus, bichpuri, Agra, UP, India
[2345]Students, Electronics & Comm. Engg., R.B.S. Engg. Technical Campus, bichpuri, Agra, UP, India
agarwal_nitin88@rediffmail.com
saxenaparul602@gmail.com
pathakpri1996@gmail.com

Abstract: In India, most of the people prefer two wheelers compared to other form of vehicle due to simplicity and low cost. One important problem is bike riders suffer from inadequate roads and bad driving conditions. Other important problem with biker is that most of the time they don't like to wear helmet which could be fatal when accidents happen. Since in India the usage of two wheelers is more as compared to four wheelers, it requires more attention as far as safety is concerned. Motorcycles have high rate of fatal accidents than automobiles or trucks and buses. According to some statistics serious head injuries can happen even in low speeds. Ninety percent of head injury cases are due to road traffic accidents, about 72 percent are youngsters in the age group of 18 to 40. So to overcome this problem we have introduced a smart helmet with additional features like road hazard warning, bike authentication.
In the previous research work that focuses on the point that the bike will not get start if the rider is not wearing helmet, so we modified this feature and make ones bike secure at crucial time especially when one is away from the bike and somebody is trying to steal it. So, we recapitulated the above features and introduce the project with some more unique characteristics.
The main aim of this project is to introduce the smart interactive robotic helmet with features such as road obstacle identification, bike authentication, would help the rider in detecting important traffic sounds like fire siren or horn and the smart helmet would warn the rider when hazard is ahead. In this research work, the helmet is designed in such a way that it would provide more security to the rider hence the user is attracted towards the helmet because of its peculiar characteristics. If the rider runs on the bad intersection path, he could record for the present and upcoming road obstacle which is saved in mp3 format and can play that recording by pressing the button when he goes on same path again.

***Keywords**: Accident, GPS, GSM, ATmega2560 microcontroller, helmet.*

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I. INTRODUCTION

The rate at which number of two wheelers in India is rising is 20 times the rate at which human population is growing. In such scenario fatalities are only going to increase if things do not change fast. The risk of death is 2.5 times more among riders not wearing a helmet compared with those wearing a helmet. To avoid accidents and to encourage people to wear helmet a project is to be introduced that includes smart interactive robotic helmet with features like road hazard warning, wireless bike authentication and traffic adaptive mp3 playback.
If rider runs into a blind spot or an intersection path hole in the road, he can activate the microphone by pressing the button and then record 'bad intersection or dangerous hole'. Of course the rider could also record anything like favorite shops, schools, food courts, malls to remind him again. The GPS tracks that particular location and gives location in terms of coordinates. The recorded audio files will be available in the dashboard graphical display and the rider has the option to delete it at any time. The helmet unit has wireless communication capability so that bicyclist would be warned when the bike is started without wearing helmet. Although this is simple authentication it could act like an object password and gives additional protection from theft. The dashboard will show the list of mp3 files
stored in the memory card and will play the file that is selected by the rider. When detecting important traffic sounds like fire siren or horn sound it mutes music automatically and when there is no traffic sound the music volume will gradually raise. Thus the helmet establish communication between rider and the environment and create a kind of virtual city or augmented reality city that is used to improve the rider comfort and safety. This helmet will warn the rider when road hazard is ahead, helmet will also communicate with rider if he is not wearing it and will perform wireless bike authentication that act as prevention from theft.

TWO UNITS OF SYSTEM

1. Bike dashboard unit

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2. Remote helmet unit

Bike dashboard unit

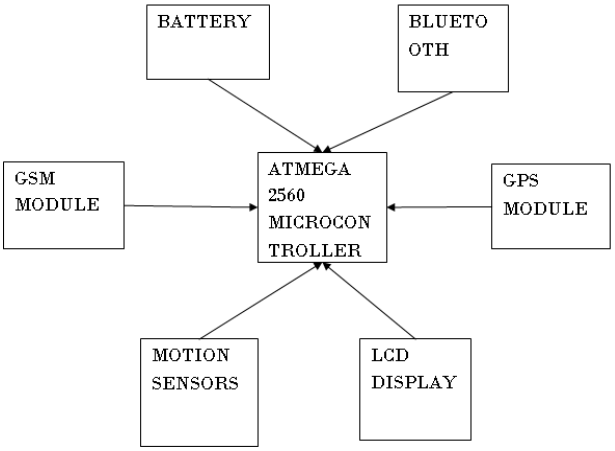

Fig.1 Bike Dashboard Unit

WORKING OF BIKEDASHBOARD UNIT

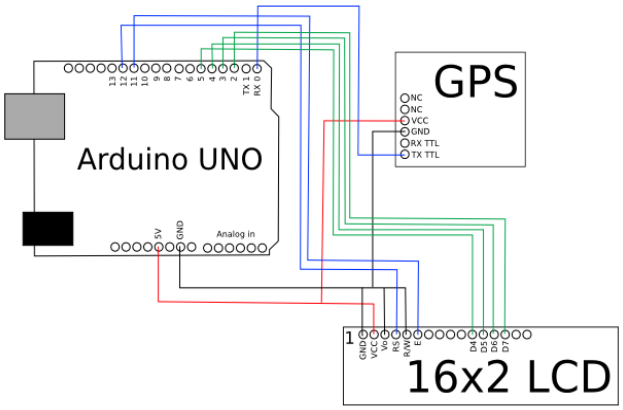

Fig.2 GPS and LCD are connected with ARDUINO

One of the units is bike dashboard unit which consist of components like motion sensors, GPS module, GSM module, ATMEGA2560 MICROCONTROLLER, Bluetooth, LCD display. GPS receivers use a constellation of satellite and ground stations to compute position and time almost anywhere on earth. Here, GPS is used to track the location of the rider and gives the location in terms of coordinates. The GPS also tracks the location of hole and plays the recording when he goes on the same path again. He can also record for the things like shops, malls, cinemas etc.

The Arduino mega is interfaced with GPS and GSM modules for finding the location of the rider and is helpful in finding the bad intersection or hole, due to which rider can identify the hole. GSM is used for authentication purpose if the bike is stolen with helmet, the user sends the code to the GSM. With the help of GPS, the location of bike is tracked and it can be saved from theft. And if an unauthorized person doesn't have helmet and take the bike away from authorized user then motion sensors starts working which helps to find the location of the bike so it prevents from theft also. The motion sensor acts as a linchpin of the security system. Bluetooth is used to communicate helmet unit wirelessly with the bike dashboard unit.

ATmega2560 is high performance, low power microchip 8 bit RISC based microcontroller combines 256kb flash memory, 8Kb SRAM, 4kb EEPROM, 86 general purpose I/O lines. The operating voltage ranges from 1.8 to 5.5V.The LCD used is of 16*2 bit and the battery which is used in this unit is bike's battery.

If the bike is in off state then to make it start, user must wear helmet then IR module will detect that the helmet is mounted on the head of the user or not then it would send signal to the Dashboard unit through the bluetooth, it would automatically turns the relay ON and activate the motion sensor through which GPS and GSM are activated. In case, if the theft occurs then Dashboard Unit continuously send signal to the Helmet unit and in case if the Helmet is not getting any message within 30sec then wait for the user to get the specific message, after getting the message from the user, it automatically stops the bike and send its location.

II. WORKING OF REMOTE HELMET UNIT

It is a main unit of the system which is assembled in the Helmet itself as shown in the figure. Helmet unit will communicate wirelessly with the bike dashboard unit. when the rider is riding on specific path and if any road obstacle comes on his way then the rider would press either left, right or center button, after all these calculations, user will send information for recording to the helmet and a minimum 5s length recording is supposed to be done then this recording could be saved by the user in multimedia card reader and again the information is send to the dashboard unit by bluetooth that the recording has been done. The components that are present in helmet unit are IR Module, battery, ARM microcontroller, bluetooth and the multimedia card reader.

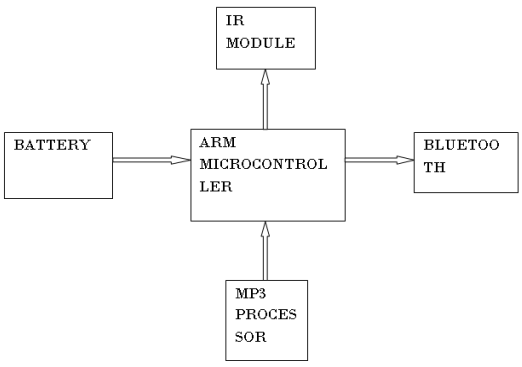

Fig.3 Helmet Unit

In remote helmet unit, various components are used such as IR module, Bluetooth, multimedia card reader, battery, microphone and speaker.

IR module is an infrared receiver, or IR receiver, is hardware that sends information from an infrared remote control to another device by receiving and decoding signals. In general, the receiver outputs a code to uniquely identify the infrared signal that it receives.

The IR module is used to detect whether the user is wearing helmet or not if user is not wearing helmet then bike will not start. Bluetooth is used for wireless communication with the bike dashboard unit. Battery is used to supply the remote helmet unit which is in the range of 9-12 V. Speakers and microphones are used to record and listen recording respectively. Multimedia card reader is used to record the audio in mp3 format and plays whenever required.

III. RESULT

Finally, we have designed the project in which bike only starts when the bike is near to the helmet and if and only if the user is wearing helmet. And if, an unauthorized person tries to start the bike then his location is tracked by the GPS and the location is sent to the authorized user's mobile phone by the GSM technology.

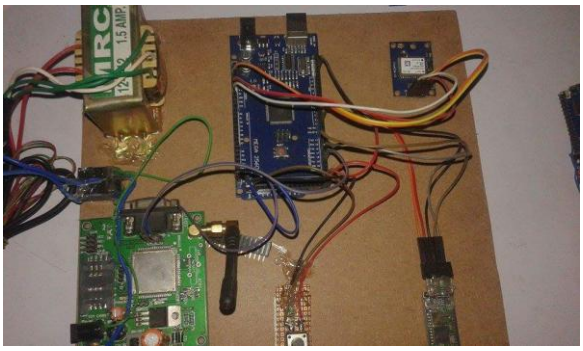

Fig.4 Hardware of Bike Dashboard Unit

Bike dashboard unit consist of a GPS, GSM, Bluetooth, ATMEGA 2560 and switch buttons to ON/OFF the bike. GPS is used to track the location of the rider, GSM is used for bike authentication purpose and Bluetooth is used to communicate wirelessly with the remote helmet unit. The proposed system senses the obstacles or static objects in front of the vehicle so that the accidents due to static obstacles could be avoided.

Fig. 5 Hardware Design of Remote Helmet Unit

In helmet unit, IR module, Bluetooth, ARM microcontroller used in which Bluetooth is wirelessly connected with bike dashboard unit, IR detector is used to sense that whether the rider is wearing helmet or not.

IV. CONCLUSION

The main aim of this project is to encourage people to wear helmet so that lives of thousands of people can be saved. Bike location and road obstacle track using smart helmet has been designed wirelessly so that the helmet unit can connect with bike dashboard unit due to which bike is start as well as the obstacles within the path will also be tracked.

V. FUTURE SCOPE

Commercially, if government provides legal permission to implement such system in bike as well as in helmet then it would be extremely helpful in reducing the rate of accidents. The accuracy of the coordinates is upto 2 decimal places, we need more satellites to connect with the GPS to overcome this problem and to enhance the system's accuracy.

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