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# Human safety system for two wheelers- A microcontroller based prototype

**Pushkar Shukla[1], Shehjar Safaya[2], Shashi Kant [3]**

Bachelor of Technology, Department of Electronics and Telecommunications, College of Engineering Roorkee, Roorkee, India [1]

Bachelor of Technology, Department of Electronics and Telecommunications, College of Engineering Roorkee, Roorkee, India [2]

Bachelor of Technology, Department of Electronics and Telecommunications, College of Engineering Roorkee, Roorkee, India [3]

**Abstract**: Every year in India a large number of deaths occur due road accidents. Drivers on two wheeler contribute significantly to these numbers. In a large number of two wheeler accidents, deaths occur because no preventive actions have been taken beforehand by the driver or those sitting in the two-wheeler. As greater risk is involved in riding a two wheeler therefore, it becomes essential to use protective guard while riding the vehicle. In our paper we propose one such security systems that makes it mandatory for the user to wear a protective guard or helmet before riding a two wheeler. This system reduces the probability of a severe injury or death during an accident. We also take into consideration a prototype that has been developed for motor cycle riders.

**Keywords**: Human safety system, road accidents, wireless sensor network, Infra –Red sensors, wireless communication.

## I. INTRODUCTION

There has been a sharp rise in the total number of deaths that occur due to road accidents in the past few years. Reckless driving, ignorance of traffic rules and absence of a protective shield have been some of the most important reasons for these deaths. The driver must have a line of defence in case an accident occurs.A survey performed in India confirmed that there were a total of 1,34,513 deaths due to road accidents in India in the year 2014. The number increased to 1, 42,485 in the year 2011. Figure 1 gives a graphical analyses of the road accidents, injuries and deaths in India from 2002- 2009.

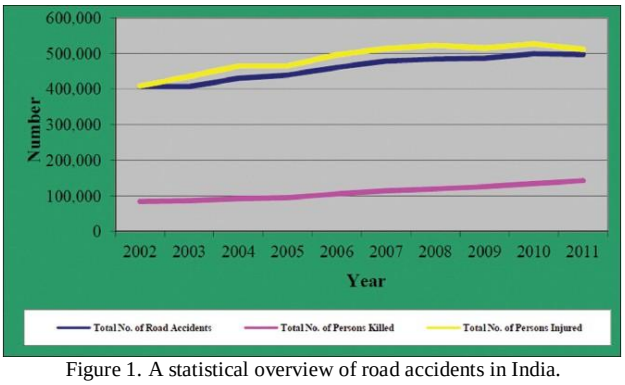


Figure 1. A statistical overview of road accidents in India.

Accidents involving two wheelers are more dangerous due to the absence of protective guards like air bags and the direct interaction of the user with the environment. It becomes utmost essential for the user have a line of defence in case they encounter an accident. Fatal injuries to the brain are an important reason behind deaths due to the road accidents. Therefore, a person riding a two wheeler must wear a helmet in order to protect his skull. Riders wearing a helmet have a greater probability of survival during an accident.

Many riders however do not prefer to wear helmets due to insignificant reasons. The traffic rules also do not affect these riders much. In our proposed safety system for two wheelers, we have proposed an approach that makes it compulsory for the user to wear a helmet. The two wheeler would not start until the user wears a helmet and rides the two wheeler. We were successful in implementing a prototype for this human safety system.

## II. SETUP

We developed a prototype for our proposed solution. The prototype consisted of two parts. The protective guard or the helmet that was worn by the people that were sitting on the two wheeler and the receiver section that initiated motion as soon as the helmet was worn by the user. The main idea behind our proposal was to prevent a driver from riding a two- wheeler unless he/she does not wear a helmet.

### *A. THE HELMET*

The helmet was a normal driving helmet that had been instilled with 4 infra-red sensors that were connected to an Atmega 16 development board. This development board also had a CC-2500 wireless receiver/transmitter attached to it. The Atmega16 was the brain of this section of the setup and was concerned with the transmission of messages to the receiver part as soon as the helmet is worn by a human being. A MAX-232 IC is used for conversion of data to RS-232 protocol.

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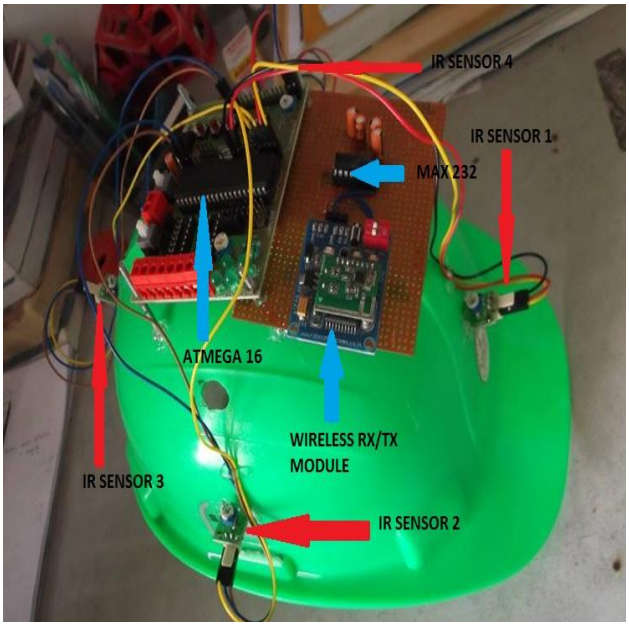


Figure 2. The helmet along with all its components

Figure 2 displays the helmet along with the various components that were attached to the helmet.

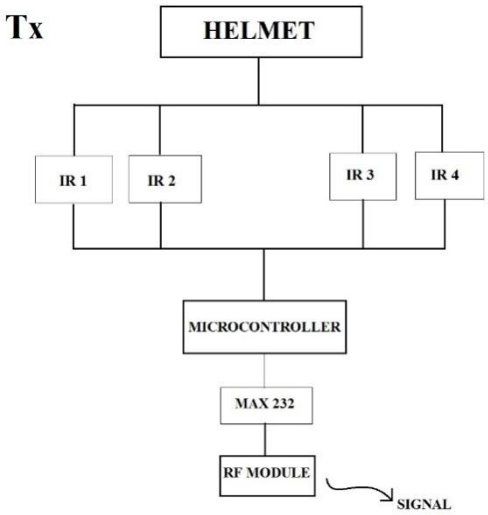


Figure 3. The basic components that are attached to the helmet.

Figure 3 outlines the basic components that are attached to the helmet and their order of working.

### *B. THE RECIVER SECTION*

The receiver section consists of a 60 rpm motor, a 16*2 alphanumeric LCD, a CC-2500 wireless receiver/transmitter module connected to an Atmega16 which again serves as the brain of this section. As the proposed approach is implemented on the prototype level therefore we used a 60 rpm motor instead of actual two wheeler for our prototype. A max 232 IC is used for conversion of RS 232 logic to logic levels of the microcontroller.

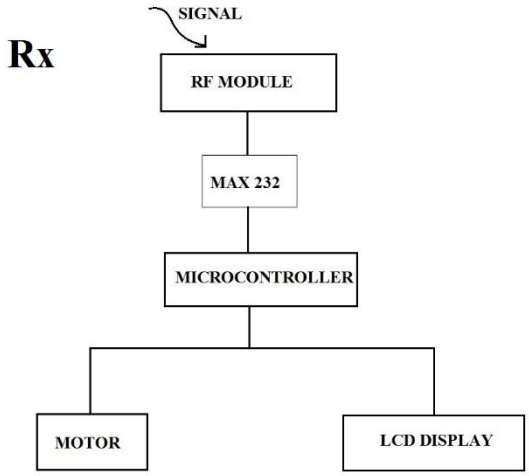


Figure 4. Block diagram representation of the various components of the receiver section.

Figure 4 gives a diagrammatic representation of the receiver section and how information is processed in the receiver section.

## III.APPROACH

The figure given below outlines our approach in order to develop such a system.

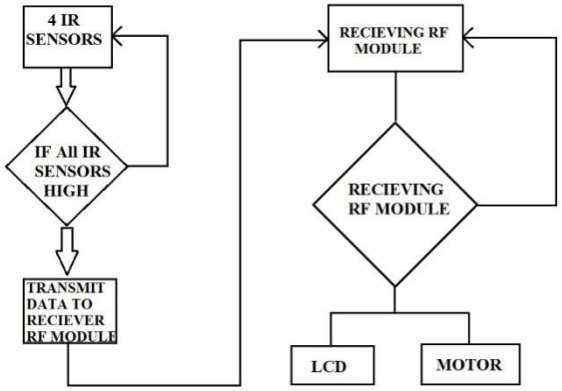


Figure 5. A block diagram representation of our proposal

### *A. DETECTION*

Four Infra-Red sensors have been embedded in the helmet. These sensors have a low logic level when there is no object present in their sensing range and change their state to a high logic level as soon an object is present in their range. These sensor when instilled in a helmet can be used for determining the presence of a human head inside the helmet. All the sensors will be high if a human head is present inside the helmet. The sensors are attached to an Atmega16 microcontroller that continuously monitors the logic levels of these sensors. The microcontroller signals the receiver section to stop the motor if all the sensor are not high. When all the sensors are high, the microcontroller sends a message to the receiver section to keep the motor moving. In case of real time

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implementation of the prototype the message can be to start the vehicle only if all the sensors are high.

Figure 6. The detection of the presence of the user by the helmet

Figure 6 displays a user wearing the helmet. As soon as the user wear the helmet the change is acknowledged by the microcontroller and an appropriate message is sent to the receiver.

### *B. SIGNAL RECEPTION AND VEHICLE ACTUATION*

The message send by the transmitter is decoded by the receiver section with the help of the wireless module and MAX 232. It must be noted that in the actual implementation of the approach this receiver will be attached to a two wheeler and will be responsible for starting or stopping the two wheeler. However, in the prototype we the receiver section actuates a 60 rpm motor depending on the message that has been sent by the transmitter. The Atmega 16 signals the motor to start once it receives the message that all the sensors are high. Otherwise, it signals the motor to stop.

## IV. FUTURE PROSPECTS

We were successfully able to implement the safety system on the prototype level. Certain additions that can be applied to this system have been discussed below

### A. *IMPLEMENTING THE SYSTEM ON AN ACTUAL TWO WHEELER*

Our initial aim is to implement this security system on an actual two wheeler, so that the security system may function in a real time environment. The receiver section can be used for switching the start button of a two wheeler and can be attached to the two wheeler.

### B. *INCORPORATING AN ALCOHOL METER*

A large number of road accidents occur due to excess alcohol consumption of drivers. Adding an extra alcohol meter to the helmet would ensure that the vehicle does not start if the driver has consumed a large amount of alcohol. Even if the vehicle starts its speed is restricted to a threshold in order to minimize the chances of accidents.

### C. *ADDING AN EMERGENCY GPS CUM GSM SYSTEM*

In case an accident does occur, there is need for the installation of an additional GPS cum GSM security feature that notifies the nearest hospital and police station about the location of the place where the accident has taken place.

### D. *USE OF A SPEED RESTRICTOR*

In case the helmet is broken or lost, there is a need to incorporate a speed restrictor in the two wheeler that prevents the driver to drive at a high speed.

## V. CONCLUSION

A helmet may not be a full proof but is definitely the first line of defence for the rider in case of an accident to prevent a fatal brain injuries. Therefore it is extremely vital for the people on a two wheeler to wear helmets. Our proposed approach makes it mandatory for the rider to use this protective guard in order to drive a two-wheeler vehicle. This system ensures the safety of the human brain and therefore reduces the risks of brain injuries and deaths in case of an accident.

## ACKNOWLEDGMENT

We are extremely thankful to Shailesh Bisht and Hitesh Tripathi, department of Electronics and Telecommunication, College of Engineering Roorkee, 2010-2014 batch for their contributions in the development of the prototype.Without their help and support the project would not have been possible.

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## BIOGRAPHIES

**PushkarShukla** is an Electronics and Telecommunication Engineer who completed his engineering in the year 2014 from College of Engineering Roorkee. He is a robotics enthusiast and loves making robots. Apart from robotics he is also interested in embedded systems, machine learning, probabilistic graphical models and digital image processing.

**Shehjar Safaya**is an Electronics and Telecommunication Engineer who completed his engineering in the year 2014 from College of Engineering Roorkee. His field of interests are Wireless Communications and Radio Frequency. He aspires to be an RF engineer one day

**Shashi Kant**is an Electronics and Telecommunication Engineer who completed his engineering in the year 2014 from College of Engineering Roorkee. His field of interest is VLSI. He has a great affinity for electronic gadgets.