Int. Conf. on Signal, Image Processing Communication & Automation, ICSIPCA

Smart Helmet

Aishwarya U[1], Hemanath G[2], Hitesh Kumar V[3], Kavitha R[4] and Nataraja N[5]
[1234]Undergraduate Students, Dept of E&CE, Atria IT, [5]Dept of E&CE, Atria IT, Bengaluru
{aishradhya,hemanthbanty,hiteshk893,kavithasonu7}@gmail.com, nataraja@atria.edu

***Abstract*— Bike riding is a lot of fun, but accidents happen. People choose motorbikes over car as it is much cheaper to run, easier to park and flexible in traffic. In India more than 37 million people are using two wheelers. Since usage is high, accident percentage of two wheelers are also high compared to four wheelers. Motorcycles have high rate of fatal accidents than four wheelers. The impacts of these accidents are more dangerous when the driver involves in a high speed accident without wearing helmet. It is highly dangerous and can cause severe deaths. So wearing a helmet can reduce this number of accidents and may save the life. This project aims for avoidance of accidents and develop helmet detection system. The proposed system is an intelligent/safety helmet. A module affixed in the helmet, such that, the module will sync with the module affixed on bike and will also ensure that biker has worn Helmet. Additional feature of accident avoidance detection module will be installed on the bike.**

***Index Terms*— Vehicle, Helmet, Alcohol detector, Sensors, RF Transceivers.**

I. INTRODUCTION

The project aims to provide total safety for bike riders. Recently helmets have been made compulsory, but still people drive without helmets. Pune City has approx. 35 lakh two-wheeler riders, which includes 500-600 accidents every year out of which 300-400 are fatal. Pune ranks first in the city when it comes to two wheelers riders. In the last few years, there has been rapid increase in number of road accidents. Due to rise in road accidents, it has now become necessary to generate a system to limit accidental deaths.With respect to vehicle safety; India meets only two out of the seven vehicle safety standards by the World Health Organization (WHO). Two wheelers account for 25% of total road crash deaths. Nearly 75%motorcycle riders involved in accidents continued to wear helmets, crash records show. The main cause of these fatalities is people riding two wheelers under the influence of alcohol results and violation of traffic rules which later on results in serious accidents. “The likelihood of survival of fatalities wearing helmets is high as compared to those not wearing helmets”.

In this project sensor module will be placed in the helmet to detect weather a person worn helmet are not, once the person wear the helmet the signals gets transmitted. The module in the bike allows the rider to start the vehicle once the module receive signals from helmet unit and RF transmitter will be placed in sign boards across highways so that the driver get prior intimation about obstacles earlier through voice output.

In case of helmet lost android app is provided to ignite the vehicle through password for 3 times, again after receiving signals from helmet unit the count in android app goes zero so that again 3 chances will be provided to ignite vehicle during helmet lost. So wearing a helmet can reduce this number of accidents and may save the life. This project aims for avoidance of accidents and develop helmet detection system. The

Grenze ID: 02.ICSIPCA.2017.1.68

proposed system is an intelligent/safety helmet. A module affixed in the helmet, such that, the module will sync with the module affixed on bike and will also ensure that biker has worn Helmet. Additional feature of accident avoidance detection module will be installed on the bike.

II. ARCHITECTURAL DESIGN FOR PROPOSED SYSTEM

A. Existing System

The main problem is motor vehicles invented for making human life better but it affect adverse on human being in the form of accident. Road accidents take place mostly by motor vehicles and motor vehicle is only a human made device if it causes badly in the form of road accidents. Accidents on roads cause harmful injuries to the biker. Mostly death occurs due to collision at brain of biker. This happens due to avoid the helmet while driving. In the accidental condition primary treatment to the victim is generally delayed. This leads to increasing number of deaths in road accidents.

The vast majority of children and youth between the ages of 5 and 14 ride bicycles, with estimates of 70% (Sacks, Kresnow, Houston, & Russell, 1996). Although cycling confers significant health benefits, the bicycle is associated with more injuries than any other consumer project with the exception of motor vehicles (Wilson, Hoover, Baker, Teret, Shock, & Garbarino, 1991). Data from the National Highway Traffic Safety Administration (2008) indicate 698 bicyclists were killed and 44,000 were injured in 2007 and 15% of those killed and 29% of those injured were under the age of 16. These data also show the 10 to 15 year age group had the highest fatality and injury rates, with fatality rates 46% and injury rates 162% more than the average rate for all bicyclists. Bicycle fatality rates are highest in the state of Florida.

Head injuries account for 75% of bicycle related deaths and more than two thirds of bicycle related hospital admissions (Brewer et al., 1995; Rivara et al., 1998). Bicycle helmets have been documented to reduce the risk of head injury by 85% and brain injury by 88% (Thompson, Rivara, & Thompson, 1996). Another study by Thomas, Acton, Nixon, Batttistutta, Pitt, & Clark (1994) examined crashes in children and found a 63% reduction in the risk of head injury.. Foss and Beirness (2000) found that helmet misuse in the 6 to 15 age group was more than double the level observed in the 16 to 30 age group.

A number of studies indicate that helmet use is lower among young teens than younger children (Schieber et al. 1992; Dannenburg et al., 1992). A number of studies have attempted to determine why middle school aged children are less likely to wear helmets or respond to education programs and helmet giveaways then elementary aged students.

One factor that appears in many studies is lack of peer support and unappealing helmet design (Lajunen, T., & Rasanen, M., 2001; Liller, Morissette, Noland, & McDermott, 1998). Another study (Loubeau, 2000) conducted focus group discussions with young adolescents who reported that bicycle helmets were uncomfortable because they were difficult to fit, and made them “feel dumb,” “like a nerd,” “you’re a loser,” “your mother makes you,” “your mother is over protective.”

B. Proposed System

One technology which can be used for this purpose is compulsion of wearing the helmet to the bikers as well as a prior intimation about obstacles in highways to the biker. This needs a system which can be applied on vehicles. The ignition system of bike must not start without receiving the signal from transmitter at the helmet. Thus helmet must be wearied by the biker. This system must be the user.

III. BLOCK DIAGRAM

A. Vehicle Module

The fig 4.1 represents the basic module affixed on the bike, such that, it will sync with the module affixed in the helmet and will also ensure that biker has worn Helmet. Additional features are accident detection module, signboard detection module and temperature sensor will be installed on the bike. Once the person wear the helmet the signals gets transmitted. The module in the bike allows the rider to start the vehicle once the module receives signals from helmet unit. RF transmitter will be placed in sign boards across highways so that the driver get prior intimation about obstacles earlier through voice output through speakers and display on LCD screen. In case of helmet lost android app is provided to ignite the vehicle through password for once, again after receiving signals from helmet unit the count in android app goes zero so that again one chance will be provided to ignite vehicle during helmet lost. Temperature sensor is used to detect the

temperature of the engine to avoid overheating of engine. Once temperature comes to normal working condition temperature sensor will be turned off.
Accident detection system sends the location of the accident occurred to the predefined number and alerts the surrounding people for help through voice output.

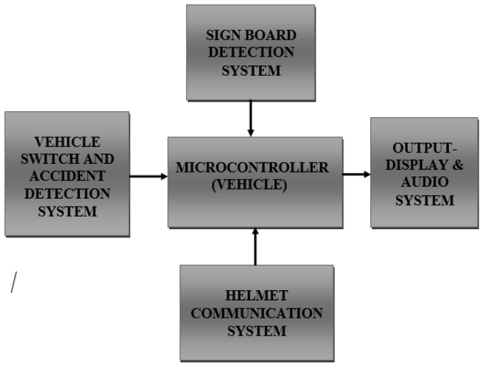

Figure 4.1 Vehicle module

B. Sign Board Detection Model

The fig 4.2 represents the basic block diagram of sign board detection module which consists of keys, RF encoder and RF transmitter. RF transmitter will be placed on sign boards along with predefined key values indicating various sign boards across highways, cities etc., This is done to get prior information about the sign boards placed on roads to rider and react to the traffic control laws.
Once the microcontroller detects the sign board at a distance it will be decoded and given to the display system along with audio system as output.

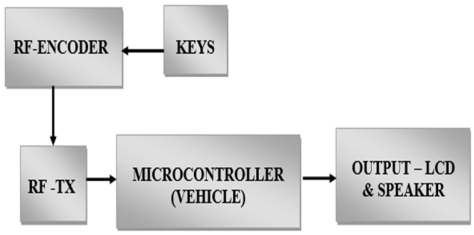

Fig 4.2 Block diagram of sign board detection model

C. Accident Detection Model

If a rider meets with an accident due to unavoidable circumstance, this module turns off ignition of the bike and sends the location to the predefined numbers which will be saved in the memory of the microcontroller. In addition, this module also gives audio alert to attract people nearby for help. One peculiar feature of this system is the ability to distinguish between major and minor casualties. In case of minor casualties, rider can press an emergency switch to turn off sending message to predefined numbers. In case of major, if that switch is not pressed at a given time message is sent. Thus a switch can distinguish between major and minor casualties.

D. Helmet Communication System

The fig 4.3 represents the helmet communication system which includes helmet module, RF receiver, RF decoder and microcontroller. The main objective of this project is to detect whether the helmet is worn or not which comes under this module. If the helmet is worn, helmet module sends the digitally encrypted data to RF receiver which decrypts the data and gives to the microcontroller which is affixed on bike on validation the system gives access to start engine. Validation conditions are switch and IR sensor should be logically one which suggests helmet is worn. Addition to it, if the driver is drunken alcohol detector will be logically zero. As a result driver cannot access the system. If alcohol detector is logically one driver can access the system.

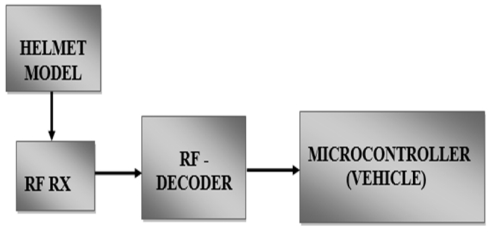

Fig 4.3 Block diagram of helmet communication system

E. Vehicle Switch System

The fig 4.4 represents the vehicle switch system block diagram which consists of developed android application, GSM module, Microcontroller, and output systems. This module come into picture when helmet is lost, during this biker cannot access the system to ignite the bike. So as an alternate path to access the system, a pre-registered login ID is used to access the system. In this application, it consists of registration of number to access. On registration it will send a login success and password message to microcontroller to access the system. This login can be done only once. Thus helmet must be replaced with new module into it. When system is accessed using helmet module the android application is reset to zero.

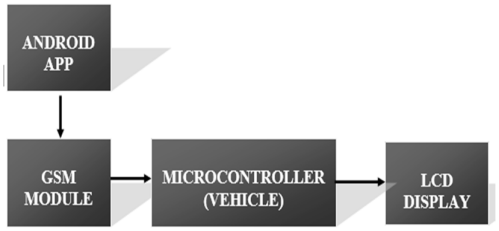

Fig 4.4 Vehicle Switch System

The fig 4.5 represents the helmet module which consists of alcohol detector, switch and IR sensor as input. RF encoder and RF transmitter as communication link with microcontroller.

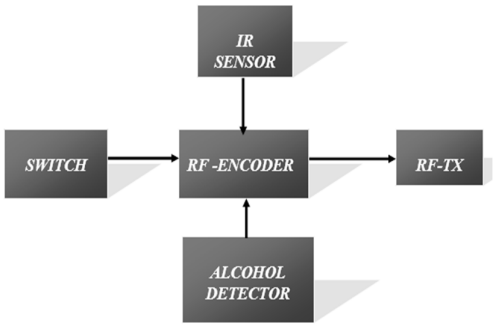

Fig 4.5 Helmet model

IV. RESULTS

A. Output Of Helmet Detection And Vehicle Access Module

Fig 5.2 represents “Helmet Detected” and “Vehicle Access”. This will be displayed on LCD once the switch in the helmet is pressed and IR sensor starts conducting as a result of darkness. By this we can say that, if a person wears the helmet then only, vehicle gains access.

Fig 5.2 Helmet detected and Vehicle access display

B. Output of Alcohol Detetion

If the rider has drunk, the vehicle system cannot be accessed hence it displays “Alcohol Detected” as shown below in Fig 5.3

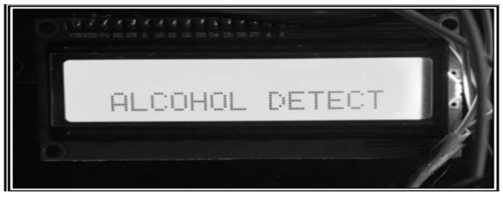

Fig 5.3 Alcohol detection

C. Output Of Sign Board Detection System

Sign board detection is used to give prior intimation about obstacles earlier to the driver through voice output and displayed on the LCD screen as shown in below figures. “HUMP AHEAD” “DANGER ZONE” “SCHOOL ZONE” from fig 5.4

Fig 5.4 Sign Board Detection System

V. CONCLUSION AND FUTURE SCOPE

A. Conclusion:

The project is designed using structured modeling and is able to provide the desired results. It can be successfully implemented as a Real Time system with certain modifications. Science is discovering or creating major breakthrough in various fields, and hence technology keeps changing from time to time.

Going further, most of the units can be fabricated on a single along with microcontroller thus making the system compact thereby making the existing system more effective. To make the system applicable for real time purposes components with greater range needs to be implemented.

B. Future Scope:

For project demo concern, we have developed a prototype module. In future, this project can be taken to the product level. To make this project as user friendly and durable, we need to make it compact and cost effective. Going further, most of the units can be embedded along with the controller on a single board with change in technology, thereby reducing the size of the system. This module can be implemented on cars and bicycles in real times applications.

REFERENCE

[1] The Accident statistics table is referred from "Bengaluru Traffic Police Blog".

[2] Ali, Mohammad, et al."Predictive prevention of loss of vehicle control for road way departure avoidance." Intelligent transportation systems, IEEE transactions on 14.1(2013):56-68.

[3] Chan, Ching-Yao. "On the detection of vehicular crashes –system characteristics and architecture."Vehicular Technology, IEEE Transaction on 51.1(2002):180-193.

[4] Wu, Xinye,et al."Research on vehicle rollover and control. "Advanced Computer Control (ICACC), 2010 2nd International Conference on.vol.2.IEEE, 2010.

[5] Alexander, Lee, and Max Donath."Differential GPS based control of a heavy vehicle." Intelligent Transportation Systems, 1999. Proceedings. 1999 IEEE/IEEJ/JSAI International Conference on IEEE, 1999.

[6] Rasli, Mohd, et al."Smart helmet with sensors for accident prevention."Electrical, Electronics and SystemsEngineering (ICEESE), 2013 International Conference on IEEE, 2013.