Development of Smart Helmet For Safety And Accident Detection

E.K.Arulkarthick[1], Jeba Androes.R[2], Kavin Kumar.K[3], Ranjith Kumar.S[4], Sree Sabitha.S[5]
[1]Assistant Professor, Dept of Electronics and Communication Engineering
[2, 3, 4, 5]Dept of Electronics and Communication Engineering
[1, 2, 3, 4, 5] Nandha Engineering College (Autonomous), Erode, Tamilnadu, India.

Abstract- *Road accidents are increasing day by day nowadays. This is because the riders are not using the helmet and due to consumption of alcohol. In order to avoid this situation, smart helmet is designed. The main target of the project is designing a smart helmet for obstacle alert and alcohol detection. The Limit switch checks if the person is wearing the helmet or not. The Gas sensor recognizes the alcoholic substance in the rider's breath. If there is any obstacle on the rider's left and right, it will be intimated through buzzers. If the person is not wearing the helmet and consumes alcohol, the bike will not start. If there is no sign of alcoho lic substance present and helmet is used, then only the bike will start. At the point when the rider met with an accident, an emergency alert will be sent to the hospital and an SMS alert will be sent to the neighbour through GSM.*

Keywords*:* Accidents, Helmet, Alcohol Detection, Tracking.

I. INTRODUCTION

An embedded system may be a controller programmed and controlled by a real-time OS (RTOS) with a fanatical function within a bigger mechanical or electrical system, often with real-time computing constraints. it's embedded as a part of an entire device often including hardware and mechanical parts. Many devices in common use today which are controlled by Embedded systems. Ninety-eight percent of all microprocessors manufactured are utilized in embedded systems. Embedded systems are found in consumer, industrial, automotive, medical, commercial and military applications. Telecommunications systems employ numerous embedded systems from telephone switches for the network to cell phones at the top user. Consumer electronics include MP3 players, mobile phones, computer game consoles, digital cameras, GPS receivers, and printers. Household appliances, like microwave ovens, washing machines and dishwashers, include embedded systems to provide flexibility, efficiency and features.

The smart helmet is an idea to provide reliability and soundness on the helmet to the bikers against road accidents. A wise Helmet is innovative recommendation which make motor cycle driving safer than before; this is often performed using GSM Modem and GPS receiver technology. The one more supremacy is to know the alcohol level of drunken motorcyclist who is sitting on the bike. An embedded kit which consists of microcontroller, and sensors are incorporated in the helmet which monitor whether the biker is drunken or not and also limit switch to check the wearing of helmet. The alcohol level is determined and displayed on a LCD display. Whenever the alcohol is detected by the alcohol sensor in the helmet, the vehicle won't start. In today's world vehicle accidents are one of the main causes for increase in the death. This death rate can be reduced by forwarding a message and the location of the accident to the victim's family and hospital who can take the necessary action in a timely manner. In many cases the delay in giving the appropriate medical treatment is the major cause of death after an accident. The project has a GPS and- a GSM module is embedded within the helmet which may provide the precise location of the accident. The proposed smart helmet is able to provide display status of key ON/OFF condition, helmet wearable status, and alcohol detection, and accident detection, engine ON/OFF condition and obstacle detection. When accident occurs intimation is done by the SMS (short message service) over the GSM network. Factually at present, wearing of helmets is not able to monitor all the time, so our proposed smart helmet is highly deserved for implementation.

II. RELATED WORKS

Jesudoss A, Vybhavi R and Anusha B state that due to the huge increase in road accidents the smart helmet is designed to avoid accident and alcohol detection. IR sensor senses and checks whether helmet is wearied or not. Gas sensor senses the alcoholic substances in the person's breath. If both the conditions are satisfied then only the bike will start if not it won't start. During travel if any accidents occur then the sensor checks the condition and reports. Through GPS the location of accident will be sent to the hospitals.

Divyasudha N, Arulmozhivarman P , Rajkumar E.R states that the mining industry accident detection by saving the workers in mining from dangerous events and alerting about

dangerous gas emissions inside mining. For this the internet of things is used. This also informs about the rear big truck or buses for avoiding collisions.

Muthiah M, Aswin Natesh V, Sathiendran R K states that headlights for safety of motorcyclist. The intelligent headlamps are placed which reacts to the facial movement of rider. It uses accelerometer and other sensors to drive small motor to turn on headlight. It also monitors and alams the rider when they fall asleep. Without helmet the rider can't move the bicycle.

Prof. Shikha Gupta ,Kashish Sharma, Nihar Salvekar, Akshay Gajra states that the riders location can be tracked for the emergency situation. Collision sensor will sense when the accident occurs and sending SMS. The accident footage will also be recorded.

Prashant Ahuja, Prof. Ketan Bhavsar states that the occurrence of accident using sensor and indicate it to the responsible person through voice message by using GSM. They can also track down the person by using GPRS. The idea was developed to save the person if the accident occurs at the place where no one is present. For this, they have used the Arduino as the microcontroller.

Sreenithy Chandran, Sneha Chandrasekar, Edna Elizabeth N states that the accident detection system send the accelerometer values to the processor continuously for monitoring when the accident happens, the data are sent to the contacts by using a cloud based service. In this, the technology is used is cheap to develop and it provides more safety to the motorist.

Sayan Tapadar, Arnab Kumar Saha, Dr. Himadri Nath Saha, Shinjini Ray,Robin Karlose states that the detection system uses the onboard sensors for over speed detection. And the breath analyzer for alcohol detection if the user consumed alcohol more than the legal consumption level the user is reported. The accident detection can be made by using pressure sensor and from the data collected from the accelerometer. This information are send to the application programming interface (API) and the smart helmet can be connected via Bluetooth to communicate with AI.

Rashmi Vashisth, Sanchit Gupta, Aditya Jain, Sarthak Gupta, Sahil, Prashant Rana states that the smart helmet ensures that the rider is wearing a helmet by using two modules on the helmet and the bike for synchronization. It also detects the over speed by using piezo-electric buzzer and limits the speed. It also comprises of alcohol lock system to avoid drink and drive scenario and it uses fog sensor to increase the visibility for the user when there is fog. Meanwhile, when the accident occurs, the indication can be given to the contacts using GSM.

Agung Rahmat Budiman, Dodi Wisaksono Sudiharto, Tri Brotoharsono states that the proposed system indicates whether the rider wears the helmet or not by using strap lock detection and it also indicates the over speed when the rider passes the speed bump. The location of the rider can also be tracked using GPS with the speed of 3.3kg/hour and the average response time is 1.4 seconds for the helmet usage detection.

Dangeti Anu Preetham , Mukundala Sai Rohit, Arun. G. Ghontale,M. Jasmine Pemeena Priyadarsini states that the smart helmet uses the alcohol sensor to ensure that the driver is not drunken to that the possibility of accident can be reduced. At the same time, it uses Viola-Jones coupled with SVM for the face detection to reduce the theft of the vehicle. When the face is not matched, the ignition system does not work. Different faces can be uploaded for using the vehicles. When all the conditions are matches then only the vehicle can be started.

III. PROPOSED SYSTEM

The proposed system is aimed to design a prototype which helps to avoid accidents. This helps the riders to drive safely. It mainly checks the helmet wearability, alcohol consumption, vibrational detection and obstacle alert. If the key is ON it displays in the LCD. If the person wears the helmet the limit switch is pressed and the motor becomes ON and it shows light indication also. If the Alcohol sensor recognizes the alcoholic substance in the rider's breath, then the motor becomes OFF and he cannot able to start the bike. If any obstacle on the rider's left and right will be intimated through buzzers and vibration plates can be worn on the person's hands by using gloves. when the rider met with an accident , the location will be sent to the hospital and neighbor through GSM.

BLOCK DIAGRAM OF THE SMART HELMET

The Figure 3.1 shows the block diagram of the proposed system. It consists of a ATMEGA microcontroller which is interfaced with GSM and LCD to send and show the status. The GSM is a digital mobile network used by mobile phone users around the world. GSM digitizes and compresses the data, then sends it down the data to the hospital and rider's neighbor.

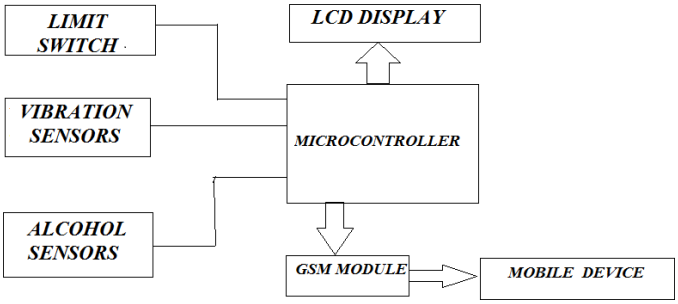

Figure 3.1 Block Diagram

HARDWARE DESCRIPTION

ATMEL

The AT89S52 provides the subsequent standard features : 4K bytes of Flash,32 I/O lines, two 16- bit timer/counters,128 bytes of RAM, a full duplex serial port,on-chip oscillator, five vector two-level interrupt architecture and clock circuitry. In addition, the AT89S52 is meant with static logic for operation right down to zero frequency and supports two software selectable power saving modes. The Idle Mode stops the CPU while allowing the RAM, timer/counters, interface and interrupt system to
continue functioning. The Power Down Mode saves the RAM contents but freezes the oscillator disabling all other chip functions until subsequent hardware reset.

VIBRATIONAL DETECTOR

The sensor for vibration detection is called as vibration detector (or shock sensor), the detector produces a mechanical displacement to get the alarm signal. This sensor uses the piezoelectric effects while measuring the changes within acceleration, pressure, temperature, force otherwise strain by changing to an electrical charge. It is suitable for other systems together , to stop intruders break in from wall is shown in figure

3.2. How to use the vibration detector in correct application is extremely important. It is often wont to provide protection during a special object where protected area that with staff's activities.

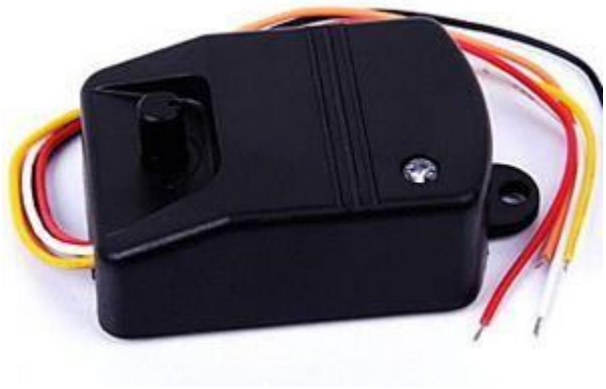

Figure 3.2 Vibrational detector

GLOBAL POSITIONING SYSTEM

Figure 3.3 GPS

The GPS satellites transmits navigational signals which encode a spread of data including satellite positions, the state of the interior clocks, and therefore the health of the network. These signals are transmitted on two separate carrier frequencies that are common to all or any satellites within the network. Two different encodings are used: a public encoding that permits lower resolution navigation, and an encrypted encoding employed by the U.S. military. This is shown in the figure 3.3

GSM (Global System for Mobile communication)

GSM is a circuit switched network employed globally. GSM uses a variation of some time Division Multiple Access (TDMA) and is that the foremost generally used of the three digital wireless telephony technologies: TDMA, GSM and Code-Division Multiple Access (CDMA). GSM is used for digitizing and compressing data, then sends it down through a channel. GSM operates on 900 MHz and 1800 MHz in most parts of the planet.

LIQUID CRYSTAL DISPLAY

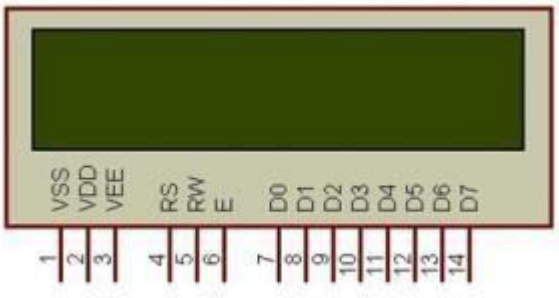

Figure 3.4 Liquid Crystal Display

A microcontroller needs to send two information to operate this LCD module, Data and Commands Data represents the ASCII value (8 bits) of the character to be displayed and Command determines the opposite operations of LCD such as position to be displayed. Data and Commands are sent through the same data lines, which are multiplexed using the RS (Register Select) input of LCD. When it's HIGH, LCD takes it as data to be displayed and when it's LOW, LCD takes it as a command. The interface between this LCD and Microcontroller are often 8 bit or 4 bit and therefore the difference between them is in how the info or commands are send to LCD. In the 8bit mode, 8bit data and commands are send through the info lines DB0 – DB7.

ALCOHOL SENSOR

The Alcohol Gas Sensor MQ3 module is shown in figure 3.5. It may detect the presence of alcohol gases at concentrations from 0.05 mg/L to 10 mg/L. This sensor uses the sensitive material SnO2, whose conductivity is lower in clean air. Its conductivity is directly proportional to the concentration of alcohol gases. It has high sensitivity to alcohol and features a good resistance to disturbances thanks to smoke, vapor and gasoline. This module provides both digital and analog outputs. MQ3 alcohol sensor module are often easily interfaced with Microcontrollers, Arduino Boards, Raspberry Pi etc.

This alcohol sensor is suitable for detecting alcohol concentration on human's breath, which is similar to common breath-analyser. It has a high sensitivity and fast reaction time. Sensor provides an analog resistive output supported alcohol concentration. The drive circuit is extremely simple, all it needs is one resistor. A simple interface could be a 0-3.3

Figure 3.5 alcohol sensor

SOFTWARE DESCRIPTION

EMBEDDED C

If programming is done using embedded C then it has following advantages Knowledge of the processor instruction set isn't required. The memory structure of the 8051 CPU is desirable. Details like register allocation and addressing of the varied memory types and data types is managed by the compiler. Programs get a proper structure (which is imposed by the C programming language) and may be divided into separate functions. This contributes to ASCII text file reusability also as better overall application structure. the power to mix variable selection with specific operations improves program readability.

Also the keywords and operational functions that more nearly resemble the human thought process may be used. If embedded C is used the programming and program test time is drastically reduced. Existing program parts are often more easily included into new programs due to modular program construction techniques. The language C may be a very portable language (based on the ANSI standard) that enjoys wide popular support and is definitely obtained for many systems.

KEIL COMPILER

The features of keil compiler are

- Nine basic data types.
- Interrupt functions may be written in c.
- Full use of the 8051 registers banks.
- Complete symbol and type information for source-level debugging.
- Use of AJMP and ACALL instructions.

IV. RESULT AND DISCUSSION

The working of Smart helmet was tested and the resultant output was studied. Once the system is tested it can be integrated in a helmet and the bike. The first part was to test whether the key is ON. If the key is on it checks whether the biker is wearing the helmet or not. The system does not allow the biker to take vehicle until he has worn the helmet. As soon as the biker wears the system displays a message on the LCD screen as shown in the fig 4.2. Whenever the biker has consumed the alcohol the system does not allow vehicle to start and will send the message ALCOHOL CONSUMED in LCD display and if any vibration detected it is also displayed in the LCD display. The obstacle alert is displayed as left or right showing as L or R.

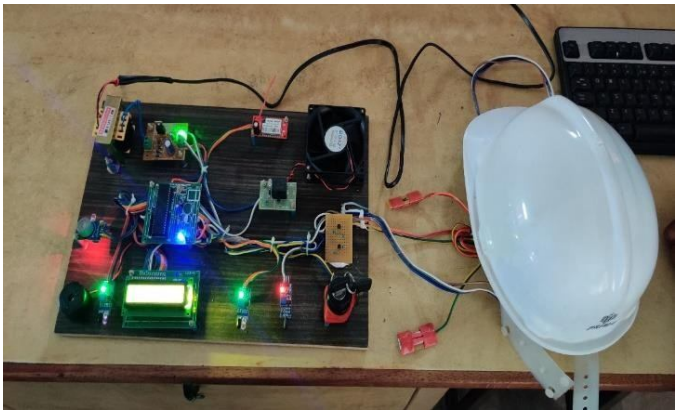

Figure 4.1 Hardware kit

Figure 4.2 LCD Display output

Whenever biker met with an accident the vibrator sensor senses it and sends accident intimation to the number that is registered by a latitude and longitude values which gives the location of the accident as shown in the fig 4.3 and 4.4

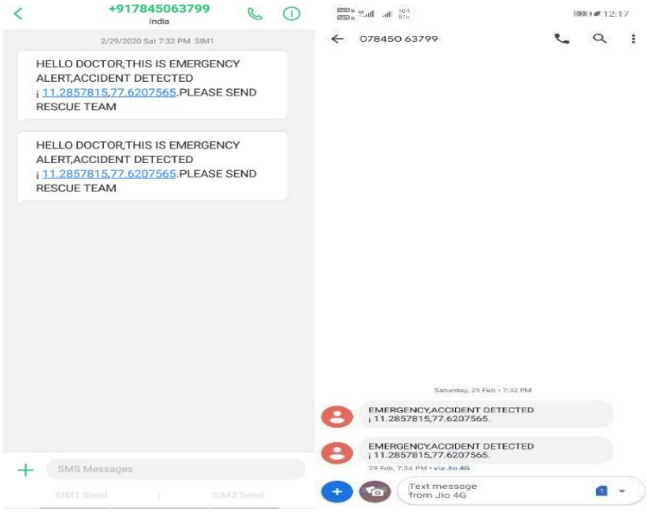

Figure 4.3 Emergency alert to hospital Figure 4.4 Emergency alert to home

V. CONCLUSION

The designed smart helmet ensures the safety of the rider by making it necessary to wear the helmet, and also ensures that the rider hasn't consumed alcohol. If any of those prime safety rules are violated, the proposed system will prevent the biker from starting the bike. The system also helps in efficient handling of the aftermath of the accidents by sending a SMS with the location of the biker to the nearby hospital. This ensures that the victims get proper and prompt medical attention, if he/she met with an accident. The future work involves the implementation of various biometric sensors on the helmet to measure various activities. We can use small camera for the recording of driver's activity. It is often used for passing message from the one vehicle to a different vehicle by using wireless transmitter.

REFERENCES

[1] Jesudoss A, Vybhavi R and Anusha B " Design of Smart Helmet for Accident Avoidance," International Conference on Communication and Signal Processing, April 4-6, 2019, India.

[2] Shikha Gupta, Kashish Sharma, Nihar Salvekar, Akshay Gajra,"Implementation of Alcohol and Collision Sensors in a Smart Helmet," 2019 International Conference on Nascent Technologies in Engineering (ICNTE 2019)

[3] Prashant Ahuja, Ketan Bhavsar A "Microcontroller based Smart Helmet using GSM and GPRS" Proceedings of the 2nd International Conference on Trends in Electronics and Informatics (ICOEI 2018) IEEE Conference Record:# 42666; IEEE Xplore ISBN:978-1-5386- 3570-4

[4] Manish Uniyal, Himanshu Rawat, Manu Srivastava, Vivek Kumar Srivasta "IOT based Smart Helmet System with Data Log System" International Conference on

Advances in Computing, Communication Control and Networking (ICACCCN2018)

[5] Agung Rahmat Budiman, Dodi Wisaksono Sudiharto, Tri Brotoharsono "The Prototype of Smart Helmet with Safety Riding Notification for Motorcycle Rider,"2018 3rd International Conference on Information Technology, Information Systems and Electrical Engineering (ICITISEE),Yogyakarta, Indonesia.

[6] Sayanee Nanda, Harshadajoshi, SmitaKhairnar "An IOT Based SmartSystem for Accident Prevention and Detection," 2018 Fourth International Conference on Computing Communication Control and Automation (ICCUBEA)

[7] Divyasudha N, Arulmozhivarman P, Rajkumar E.R "Analysis of Smart helmets and Designing an IoT based smart helmet: A cost effective solution for Riders," 2017 4th International Conference on Signal Processing, Computing and Control (ISPCC)

[8] SayanTapadar, Shinjini Ray, Arnab Kumar Saha,Robin Karlose,Himadri Nath Saha "Accident and Alcohol Detection in Bluetooth enabled Smart Helmets for Motorbikes,"Computing and Communication Workshop and Conference (CCWC), 2017 IEEE 7th Annual. IEEE, 2017.

[9] Rashmi Vashisth, Sanchit Gupta, Aditya Jain, Sarthak Gupta, Sahil, Prashant Rana "IMPLEMENTATION AND ANALYSIS OF SMART HELMET,"4th IEEE International Conference on Signal Processing,Computing and Control (ISPCC 2k17), Sep21-23, 2017, Solan, India.

[10] MerinMeleet,"Smart Helmet for Accident Detection and Notification,"Shoeb Ahmed Shabbeer," 2nd IEEE International Conference on Computational Systems and Information Technology for Sustainable Solutions 2017.