

Alcohol Detection, GPS Tracker and Smart Messaging System for Two Wheelers

Kolliboina Samba¹, Irfan Mansuri², Sunny Kumar Singh³, Raushan Kumar⁴ and Anumeha⁵

Department of Electrical Engineering^{1,2}, Department of Electronics & Communication Engineering^{3,4,5}
National Institute of Technology Jamshedpur, India^{1,2,3,4}, Government Womens Polytechnic Jamshedpur⁵

E-mail:- samba24052001@gmail.com¹, mansuri4638@gmail.com², 1999sunnykumarsingh@gmail.com³,
raushankumar2306@gmail.com⁴, anehanitjsr@gmail.com⁵

DOI: - <https://doi.org/10.47531/MANTECH/ECC.2021.27>

Abstract

In this paper, we have implemented the recent trends in developing Smart helmet system and accident alert system. Drinking and driving is the major cause behind the road accidents in today's world. It is found out that more than 60% of road accidents are happened due to drunk driving. Drinking and driving not only affects the person who is drunk but also the ones sitting in the same vehicle or the people and vehicles on road. So we are taking an initiative to stop these accidents. The research also helps us to understand the smart helmet system and accident alert system evolved over the period and currently by using the technology like Internet of Things (IoT). The helmet makes use of a microcontroller STM32F103C8T6 and SIM7000e module (which is capable to get GPS locations). If the accident occurs then the vehicle sends our location to fixed number to get response immediately.

Keywords— Smart helmet; location tracking; collision sensing; alcohol sensing; Internet of things.

INTRODUCTION

Safety and security are the major aspects in our life. Now days many persons lost their life and many people became physically challenged due to accidents on roads. More than 40 percent of accidents are due to alcohol consumption [1]. The many lives in accident may be saved if they wear helmet while they are driving [2-5]. For every 4 minutes one death is reported in India. It is important to wear helmet for all two wheelers to avoid accidents. Many deaths are causing in India due to late hospitality or due to lack of immediate treatment for them. So we are focusing in this point.

Bike rider's hesitate to wear helmets just because of that helmets are generating high temperature. Even though government kept that helmet is mandatory but riders are ignoring it.

Table 1: Statistics of Accidents

Reasons	Total Number Accidents in 2016		
	Accidents	Killed	Injured
Alcohol	14,894	6,131	11,648
Exceeding Speed Limit	2,68,341	73,896	2,82,870
Two Wheeler	1,62,280	44,366	1,53,060

Currently in the existing system, the alcohol checking is done only when there is police checking. But it is not sufficient we need to create a device which only starts when the driver doesn't drinks alcohol.

Internet of Things (IoT) can provides the communication between smart devices and people over a network [5-8]. So we have come up with this idea of IoT based smart helmet which ensures the safety of the rider while riding [9].

This idea is proposed to increase the chance of saving life of rider. the proposed system won't allow the rider to start if he didn't wear helmet. This system will not allow driver to ride if he had consumed alcohol.

The device is able to send the GPS locations of the vehicle [10] and when it faces an accident to a particular number and we developed our device such that it is able to send its location and speed and drivers alcohol level continuously to some server so that the Indian traffic system has a huge facility to observe traffic at any time and it will be very helpful to them to avoid accidents

LITERATURE REVIEW

Now days the safety of helmet that can be checked is accreditation on helmet is dot certified or not .these type of helmets are having any smart features which increase the chances of saving lives. There are many start-ups in the recent past that have been trying to come up with next generation helmets that are a step ahead than the currently using normal helmets.

Many researches are going on and many papers were published on the smart helmet [1-2]. A paper by AISSMS’ IOIT, SPPU, Pune, India, they used radio frequency transmitter which activates the vehicle to start its ignition system if he doesn’t drink and they used toggle switch which is placed in helmet to check whether the helmet is worn or not their transmitter is able to send data up to 3 KHz. They opted radio frequency transmitter and receiver to communicate vehicle and helmet [3].

Another paper presented by Vimal Jyothi Engineering College, Kannur, India, have implemented the collision detection using an Arduino Uno(ATMEGA328P) and they are able to send a message delivered using a Router and GSM modem. They mention their device contains a GPS module, vibration sensor, GSM module, Arduino UNO, buzzer and power supply. Arduino is the heart of their system, which controls all other modules (GSM, GPS) in this system. They also mention that their device can takes the value of latitude and longitude from the GPS receiver and transfer it to the pre-programmed mobile number via SMS through GSM modem. And it operates the audio alarm."[4]

As a paper presented by Divyasudha N, Arulmozhivarman [9] they have showed the messaging system when accidents occurs and a smart surveillance system which records the video they worked on raspberry pi.

Although the system we proposed is helmet with BLUETOOTH enabled [11-12] and is able to sense the alcohol level and will send to our vehicle and the vehicle has an electronic lock .lock and helmet will communicate with Bluetooth.

SYSTEM LAYOUT

Here below figure will show the layout of the helmet.

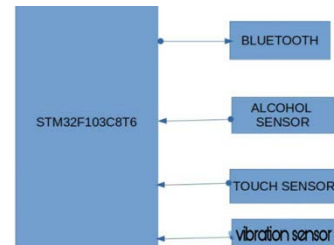


Fig. 1: Layout of helmet

Here next image will give the layout of vehicle.

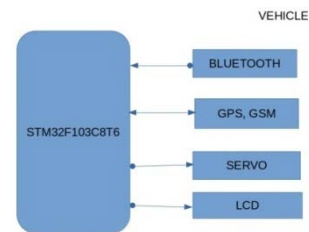


Fig. 2: Layout of vehicle

A. Components used

STM 32F103C8T6



Fig. 3: STM32F103C8T6

This microcontroller is of 20kb ram and 64 kb flash memory. It is very fast compared to many microcontrollers like Arduino Uno etc. Its CPU frequency is 72Mhz. Its operating voltage is 2.7 to 3.6 V. It is a 16-bit microcontroller having 37 GPIO (general purpose input-output) pins and 12 PWM (pulse width modulation) pins.

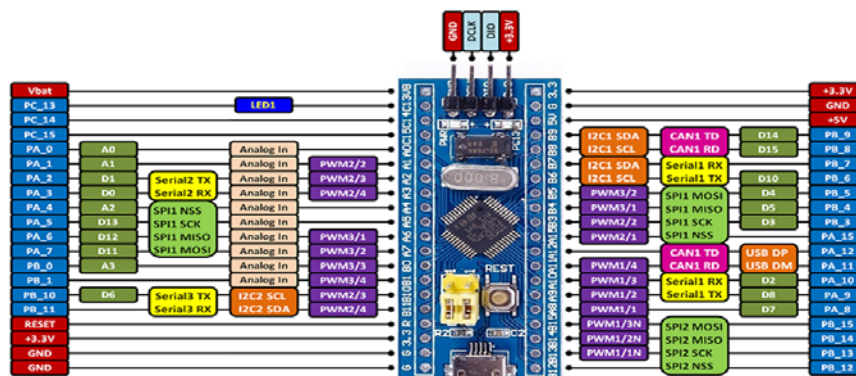


Fig. 4: STM 32F103C8T6 pin out diagram

SIM7000E

The SIM7000E is Tri-Band LTE-FDD. We used this module because it is capable of receiving GPRS signals and GPS signals too.



Fig. 5: SIM 7000e module

GPS Antenna

We use GPS antenna to receive and amplify the signals from GPS satellite the output of GPS antenna is sent into a GPS receiver which can compute the position [13].



Fig. 6: GPS antenna

This GPS antenna is more help full to receive GPS coordinates very quickly.

MQ-3 (Alcohol) Sensor

We use MQ3 sensor to know that the rider take alcohol or not .it is an analog sensor it gives out put which varies from 0-1023 as STM 32F103C8T6 micro controller. It also give digital output through digital pin out in sensor and we need to calibrate sensitivity of sensor [12].

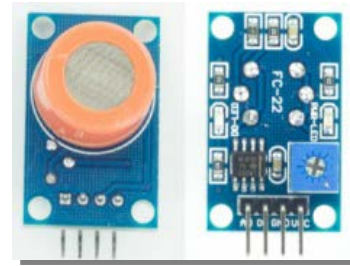


Fig. 7: MQ3 sensor

LCD Screen

In general LCD screen used to display output .LCD screen they are commonly called as display devices. Here we chosen 16x2 LCD screen as it is sufficient for our need.



Fig. 8: LCD Screen

Bluetooth Module

Bluetooth is a wireless technology used for communication. Power consumption in this communication is also quite low [11].

Here we choose HC-05 module for our communication between helmet and vehicle.

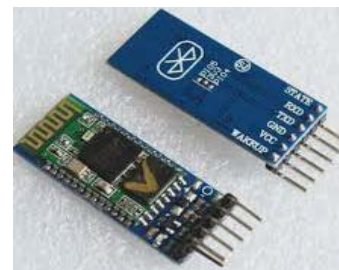


Fig. 9: HC-05 Bluetooth module

Servo Motor

The main mechanism of servo motor is we can rotate the servo shaft up to which angle we want it to turn. Servo motor shaft has more torque.



Fig. 10: Servo motor

Here we choose micro servo 9g motor and its torque is 1kg per cm. we need to connect the data

pin of servo motor to PWM pin of STM 32F103C8T6 micro controller.

Touch Sensor

Touch sensor works similar to a switch. When we touch it, by pressure or force they get activated and act as a closed switch.



Fig. 11: Touch sensor

Crash sensor

Crash sensor is used to send data to our micro controller when there is any crash occurred in the area where the sensor is present.

Crash sensor also acts as switch, when the crash happens the sensor acts as closed switch.

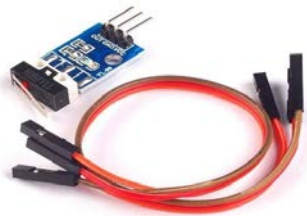


Fig.12: Crash sensor

Software used

Arduino is an open-source software used to program in STM 32F103C8T6 [14].

B. Mechanism in helmet to detect alcohol

- We will place MQ3 sensor under the chin place of helmet so that it is able to sense the alcohol and we will connect it to STM32F103C8T6 microcontroller and once it will decide the if the person is high in alcohol or not [12].
- Our micro controller is connected to Bluetooth module and it will send the alcohol data to the micro controller in the bike.
- As the helmet is not directly connected to vehicle while driving so we need to make circuit such it takes less power so that it will last for long time.

C. Locking system in vehicle

- We will use one servo motor. We will attach our key to that servo, and that servo will able to rotate, and the main advantage of the servo is we can rotate the shaft of servo how much we want.

D. Mechanism proposed by us to find whether the rider wear helmet or not

- We used a touch sensor to find whether the riders wear helmet or not. We will place a touch sensor under the helmet on the top side, and when we wear helmet, it detects a touch so that we will confirm that the rider wear helmet.
- The touch sensor is connected to STM 32F103C8T6 in the helmet, which is connected to Bluetooth to communicate with a microcontroller.
- The microcontroller in the helmet will send the touch sensor reading to microcontroller in the vehicle via Bluetooth.

E. Locking and unlocking with microcontroller

- We will connect that servo with the PWM (pulse width modulation) pin of the STM32F103C8T6 microcontroller.
- We used Arduino ide to program STM32F103C8T6.
- We can lock or unlock using servo as it is connected to the key of the vehicle.
- The lock and unlock of the vehicle are based on the data sent by the microcontroller in the helmet.
- The alcohol sensor in the helmet reads alcohol level higher than the limit then sends the value alcohol level to the microcontroller in the vehicle.
- Similarly, from the helmet microcontroller, the vehicle receives the data of the touch sensor. If the rider wears a helmet and the alcohol level is less, the controller in the vehicle gives a command to the servo to rotate.
- Hence the servo is connected to the key so that the vehicle starts.

F. Mechanism to detect the crash and sending the msg

- When the vibration sensor detects more vibration, it will decide it is a crash, it gives the output 1 (high), and the output is connected to STM32F103C8T6 of the helmet.
- Then the microcontroller sends that data to the vehicle microcontroller via Bluetooth.
- Then the microcontroller of the vehicle sends the GPS coordinates to the ambulance number (toll-free number, and we must save the number while coding).

WORKING OF HELMET

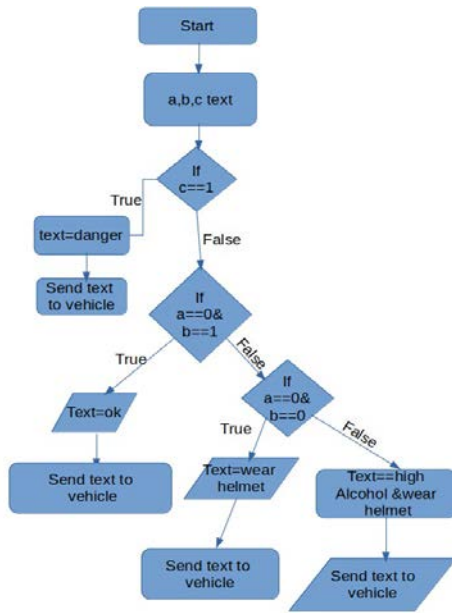


Fig.13: Flowchart of working mechanism in helmet

We will use digital output of alcohol sensor and we will calibrate it such that it gives **High** when detects high alcohol and gives **Low** when detects low or no alcohol.

The touch sensor gives digital output and it gives output when it reads a touch is 1 HIGH and LOW when it didn't receive any touch.

The vibration sensor also connects to STM 32F103C8T6 and the sensor gives the information about crash or accident happens or not.

Every update of the sensors will send to the vehicle's micro controller through BLUETOOTH.

- a = output of alcohol sensor
- b = output of touch sensor
- c = output of vibration sensor

In figure 13 it clearly mentioned the mechanism in the helmet.

WORKING OF OUR DEVICE IN VEHICLE

- We were planned to arrange a microcontroller and SIM7000e module with a GPS antenna under the seat.
- Our microcontroller STM 32103c8t6 has 3 serial ports, and we will communicate with the SIM7000e module with one hardware serial port with USART (Universal Synchronous Asynchronous Receiver Transmitter) communication and in another hardware serial port is connected to Bluetooth module.
- We will communicate with SIM7000e with commands; this module needs 5v to work, and STM 32F103C8T6 also needs 5v to work.

- The communication between microcontrollers, i.e., helmet and vehicle, is always in an active state.
- If the microcontroller receives the data, such that the driver is drunk, then the vehicle doesn't start, and in the LCD screen, it shows don't drink and drive.
- If the micro controller receives the data, such that the driver is not wearing a helmet and he was not drinking alcohol, then also the vehicle doesn't start, and in LCD, it prints wear a helmet.
- If the microcontroller receives the data, such that the driver is not wearing a helmet and is drunk, then also the vehicle doesn't start, and in the LCD screen, it prints use any public transport.
- If the microcontroller receives the data, such that if he wears a helmet and didn't drink alcohol, then the vehicle starts and in LCD screen it prints happy journey.

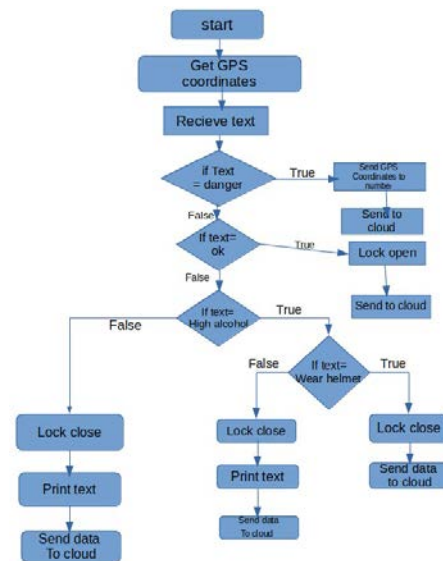


Fig. 14: Flow chart of working mechanism in vehicle

When the vehicle starts, the IoT plays a major role as it will send every data of the vehicle, including its location coordinates, and from the SIM7000E module, we will be able to receive the location as well as speed. It also sends the data reads by the alcohol sensor, and the microcontroller takes the responsibility to ON or OFF the engine, so we have that data too, and it can store that data and send that to the cloud.

When the helmet detects a crash, then it will sense by the microcontroller, and immediately, the microcontroller initiates the SIM7000e to send the message "we are in danger" to a fixed number and send the GPS coordinates of the accident spot.

FUTURE PLANS

- To build a web server for govt. of INDIA in which all details of vehicles like speed and location can easily be tracked.
- To make a machine-learning algorithm to assist the riders how to increase the efficiency or mileage of biked as we have data of speed and distance covered by them.

CONCLUSION

From the statistics in table 1, we understand that the victims of road accidents are high in case of two wheelers. Smart helmet can reduce the accidents rate and the instant messaging system can reduce the deaths due to accidents. This device is a great initiative to avoid accidents and if the accident happens then it provides necessary assistance in form of GPS location of spot.

REFERENCES

1. J. Vijay, B. Sarith, B. Priyadarshini, S. Deepika, "Drunken Drive Protection System", International Journal of Scientific & Engineering Research Volume 2, Issue 12, December-2011 1 ISSN 2229-5518.
2. Ms. Komal Bijwe, Ms Namrata Ghuse, Ms Ranu Tuteja, "Intelligent Helmet for Two Bikers", International Journal Of Computer Science And Applications Vol. 6, No.2, Apr 2013 ISSN: 0974-1011
3. B. Sebastian, K. P. Priyanka, H. Kuttykrishnan, "Smart helmet", International Journal of Emerging Technology and Advanced Engineering Paper ISO 9001:2008 Certified Journal, Vol. 5, Issue 12, December 2015 ISSN 2250-2459
4. Itole, D. Avatirak, O. Kale, N. Deshpande, A. Menon, "Intelligent Helmet", Vol. 17, Number 1, March 2015 ISSN: 2249- 2615
5. J. Kumar, SVS G. Reddy, PNV S. Krishna, and G. Anjan Kumar. "ARM Microcontroller Based Safety and Surveillance System." In Proceedings of the Fourth International Conference on Microelectronics, Computing and Communication Systems, pp. 541-551. Springer, Singapore
6. J. Kumar, and P. R. Ramesh. "Low Cost Energy Efficient Smart Security System with Information Stamping for IoT Networks." In 2018 3rd International Conference On Internet of Things: Smart Innovation and Usages (IoT-SIU), pp. 1-5. IEEE, 2018.
7. J. Kumar, S. Kumar, A. Kumar, and B. Behra "Real-Time Monitoring Security System integrated with Raspberry Pi and e-mail communication link." In 2019 9th International Conference on Cloud Computing, Data Science & Engineering (Confluence), pp. 79-84. IEEE, 2019..
8. Z. Wang, C. Cao, H. Yu and Y. Liu, "Design and Implementation of Early Warning System Based on Dairy Cattle Activity Detection," 2020 International Wireless Communications and Mobile Computing (IWCMC), Limassol, Cyprus, 2020, pp. 2186-2189, doi: 10.1109/IWCMC48107.2020.9148122.
9. N., A. P. and R. E.R., "Analysis of Smart helmets and Designing an IoT based smart helmet: A cost effective solution for Riders," 2019 1st International Conference on Innovations in Information and Communication Technology (ICIICT), CHENNAI, India, 2019, pp. 1-4,
10. A. R. Yadav, J. Kumar, R. Kumar, S. Kumar, P. Singh and R. Soni "Real Time Electric Vehicle Collision Avoidance System under Foggy Environment using Raspberry Pi Controller and Image Processing Algorithm" In Control Applications in Modern Power System, Springer, pp.1-9. Springer, Singapore.
11. Y. Li, Q. Xue, J. He and T. Zhao, "Design of Music Toy Car Based on Smart Phone Via Bluetooth Remote Control," 2018 2nd IEEE Advanced Information Management, Communicates, Electronic and Automation Control Conference (IMCEC), Xi'an, 2018, pp. 1976-1980, doi: 10.1109/IMCEC.2018.8469311.
12. S. Al-Youif, M. A. M. Ali and M. N. Mohammed, "Alcohol detection for car locking system," 2018 IEEE Symposium on Computer Applications & Industrial Electronics (ISCAIE), Penang, 2018, pp. 230-233, doi: 10.1109/ISCAIE.2018.8405475.
13. A. Mubarak, N. Murali and H. Anantharaman, "MCAS : A collision sustenance mechanism for motorcyclists," 2018 International Conference on Smart Systems and Inventive Technology (ICSSIT), Tirunelveli, India, 2018, pp. 66-71, doi: 10.1109/ICSSIT.2018.8748739.
14. J. Kumar, N. Gupta, A. Kumari and S. Kumari, "Automatic Plant Watering and Monitoring System using NodeMCU," 2019 9th International Conference on Cloud Computing, Data Science & Engineering (Confluence), Noida, India, 2019, pp. 545-550, doi: 10.1109/CONFLUENCE.2019.8776956.
15. Modified sliding window algorithm for weather forecasting." In 2016 IEEE Technological Innovations in ICT for Agriculture and Rural Development (TIAR), pp. 175-180. IEEE, 2016.
16. J. Kumar, S. Mishra, A. Hansdah, and R. Mahato. "Design of Automated Irrigation System based on Field sensing and forecasting." International Journal of Computer Applications 146, no. 15 (2016).