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# Voice Controlled Smart Helmet

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***Abstract* – A helmet is a kind of safety gear, which is used by many motorists around the world. It protects the head from the impacts during accidents. According to a survey, many people nearly half die due to the time lag in the treatment that is provided to them after the accident. The reason behind this delay may be due to lack of passage of information, traffic issues etc. It came up with this idea of giving the information about accident as soon as possible and in time. Death due to road accidents can be minimized, if treatment is provided at proper time. The major problem is the lack of passage of information regarding the accidents. Because after all, time matters a lot, if everything is done in time, at least we can half the lives that are lost due to the bike accidents. This work aims in passing the information regarding the accidents and the exact location to the relatives of the victim and also to the nearby hospitals with the aid of GPS and IoT. The system also consists of voice module to control the visor, turn indication, headlights, horn, and also the ignition system, the user is given much more options to control the vehicle rather than getting deviated from driving. Since the user uses voice controls to do the activities, he/she will stay awake throughout the ride.**
***Keywords:*** **Voice Guided Helmet, Smart Automation, Safety Transit Management System, Intelligent Transportation System (ITS), Smart Vehicle Control**

## I. INTRODUCTION

### *A. Motivation for the Project*

A helmet is a kind of a protective gear, which is worn in head by a motorist, to protect their head from injuries. Usually people die due to delay in time of treatment after meeting with any road accidents. Social responsibility led to the development of this project. The reasons for this delay may be due to many reasons such as late arrival of ambulance or no person at place of accident to give information to the ambulance etc,. It came up with this idea of giving the information about accident as soon as possible and in time. Death due to road accidents can be minimized, if treatment is provided at proper time. According to a survey, if 500 accidents occur during a year, nearly half the injured people die due to lack of treatment at proper time.

The major problem is the lack of passage of information regarding the accidents. Because after all, time matters a lot, if everything is done in time, at least we can half the lives that are lost due to the bike accidents. [6] Speaks about the control of vehicle system by using smoke sensors, which has to be incorporated inside the vehicle. In addition to the system, this kind of additional safety measure could be made in order to safeguard the valuable human lives.

### *B. Existing Technology*

Hartunian and S. Nelson proposed integrated electronics providing safety and convenience features. Helmet features includes a global locating system, an environmental interaction sensor, a mobile communications network device, a small display panel, a microphone and at last one speaker [1]. The helmet is aware of the user's location and interactions with the environment. The helmet can provide data to a user, monitor the user's actions and condition, and send information to others about user's location and condition. Faizan Manzoor *et al.* focuses on the importance in wearing the Helmet and the paper also discusses a simple system that monitors the rider and controls the bike's ignition system based on the wear of helmet. It also detects drunk and drive and accidents that may happen.

[3] Proposed one embodiment of the invention, an apparatus for a smart helmet includes a camera, a communication subsystem, and a control subsystem. The control subsystem processes the video data from the camera and the communication subsystem transmits this video data from the smart helmet to a destination device. [4] Proposed the impact when a motorcyclist involves in a high speed accident without wearing a helmet proves it to be very dangerous and can cause fatality.[5] Proposes a system which is used to check for alcohol breath in the rider and is connected wirelessly with the bike's ignition system. It has a limit switch placed inside the helmet to confirm the wearing. [7] Says a system that ensures that the bike gets ignited only after the wear of Helmet.

Alcohol sensor also monitors the breath of the rider and also sends signal regarding the crash with the aid of GSM module. [8,9] Is a similar system that aims in providing the ignition of the bike only after the confirmation of wear of the Helmet. It makes use of RF Transmitter and Receiver to communicate between the helmet and bike. [9] In addition sends SMS to registered mobile number if either Drink and Drive is attempted or fall is detected and also turns of the ignition. [10] Is a review paper that puts forth the importance of using a Helmet in bike riding and proposes a technique to safely ride vehicle after wearing the Helmet. Alcohol detection and Accident detection are added as additional features along with GSM for transmission of

message to the registered user regarding the current situation of the rider. [11, 12] Also proposes the same system that harnesses the ignition system of the vehicle and ensures the bike gets ignited only after wear of the helmet.

*C. Demerits of Prevailing Technology*

Ref [4] speaks about only the impact obtained during an accident, when the rider is not wearing a helmet. It further states that wearing a helmet can reduce shock from the impact and may save a life. [5] Has a disadvantage, when the switch gets failed, the ignition system becomes an open circuit and the bike will not start.

*D. Proposed System*

This project is used to control opening and closing of helmet, turning ON and OFF the Indicator lights and also sharing SMS and location in case of an accident. This Project consists of vibration sensor, voice module, Arduino board, serial WIFI wireless Transceiver module for IoT and DC motor. Voice recognition is received from the rider and it is converted into ASCII Code using voice module. The voice module is interfaced with the Arduino Mega 2560.

Depends on the ASCII output received from the voice module the Mechanical actuation ( helmet open and close using motor) and Electrical actuation (light control brightness control and left and right indicator ON and OFF ) can be controlled.

Piezo vibration sensor is placed in the helmet. When the accident occurs the helmet receives high mechanical vibration which is converted into voltage by piezo vibration sensor. When it exceeds the trigger limit the SMS will be sent including the location of the accident to relatives by using Internet of Things (IoT).

The system also consists of voice module to control the visor, turn indication, headlights, horn, and also the ignition system, the user is given much more options to control the vehicle rather than getting deviated from driving. Since the user uses voice controls to do the activities, he/she will stay awake throughout the ride.

*E. Concept of the Project*

The overall concept of the working Block diagram is as shown in the Fig 1. The helmet is aware of the user's location and interactions with the environment. The helmet can provide data to a user, monitor the user's actions and condition, and send information to others about user's location and condition.

It also gives indication about the accident through Global Positioning System to the hospitals and relatives. Controlling of vehicle parts like indicators, headlights, ignition system can also be controlled from the helmet.

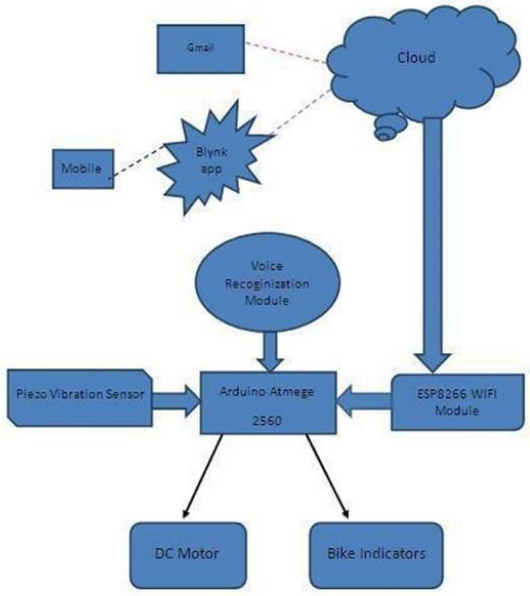


Fig. 1 Block Diagram

## II. COMPONENTS AND ITS PROPERTIES

*A. Arduino MEGA 2560*

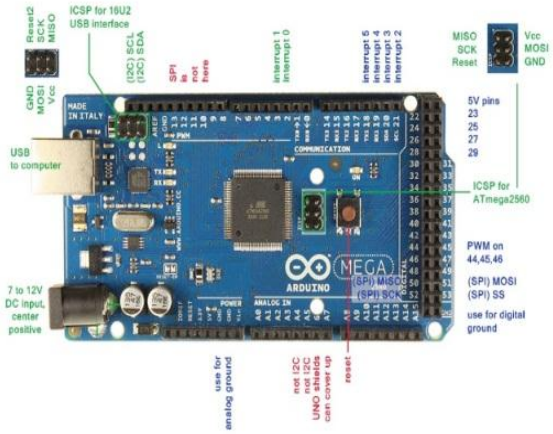


Fig. 2 Arduino Mega 2560

Arduino MEGA 2560, shown in Fig 2 is an RISC architecture based open source microcontroller, which is compatible with most of the sensor modules as well as the output modules. It is preferred for many projects since it is cheap and easily available and has the compatibility. This module has a larger memory of 256KB, to store bulky programs and compatibility to interface audio and WiFi modules.

*B. ESP8266 WiFi Transceiver*

Espressif is the manufacturer of this low power WiFi trans-receiver module. It provides an easier way to interface IoT with the Arduino microcontroller. The ESP8266 module is shown in the Fig. 3.

Fig. 3 ESP8266 WiFi Transceiver

*C. DC Motor*

DC Motor, shown in Fig.4 is coupled with a gear reduction unit delivers the sufficient torque to drive the visor of the helmet. It is a 12V DC motor, which has a peak torque of 8 KG/CM at 30 RPM. It is driven by a motor driven IC L293D, as shown in Fig 5. It is a dual H Bridge, which can run two motors independently at two different directions at a time.

Fig. 4 DC Motor

Fig. 5 L293D Motor Driver

*D. Piezo Crystal*

This basic piezo sensor, shown in Fig. 6 is for Measurement Specialties is often used for flex, touch, vibration and shock measurements. A small AC and large voltage (up to +/-90V) is created when the film moves back and forth.


Fig.6 Piezo crystal

*E. Voice Model*

Speak (Voice) Recognition Module V3 -Arduino Compatible is a compact and easy-control speaking recognition board. It is a speaker-dependent voice recognition module, shown in Fig 7. It supports up to 80 voice commands in all. Max 7 voice commands could work at the same time. Any sound could be trained as a command. This board has 2 controlling ways: Serial Port (full function), General Input Pins (part of function). On V3, voice commands are stored in one large group like a library. Any 7 voice commands in the library could be import into recognizer. It means 7 commands are effective at the same time is referred through Hartwell, Peter G., and James A Brug (2004).

Fig. 7 Voice model V3

## III. WORKING

*A. Concept of the project*

Fig. 8 illustrates the conceptual design of the project. It explains in detail about the interfacing of inputs and outputs with the microcontroller.

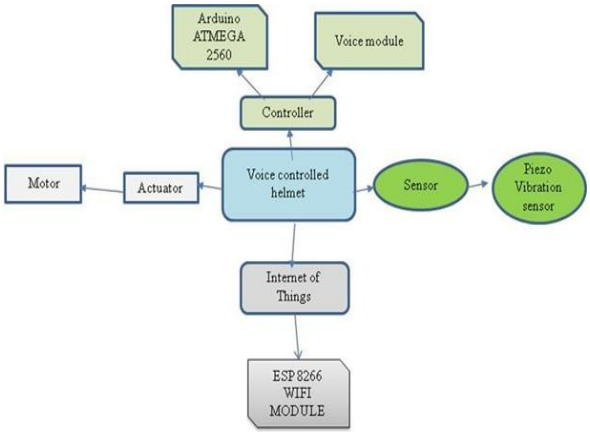


Fig. 8 Conceptual Design

*B. SOLIDWORKS Simulation*

The model is developed by using solid works. It is solid modeler, and utilizes a parametric feature-based approach to

create models and assemblies. Both 2D view and 3D view of the helmet is shown in Fig. 9 and Fig. 10.

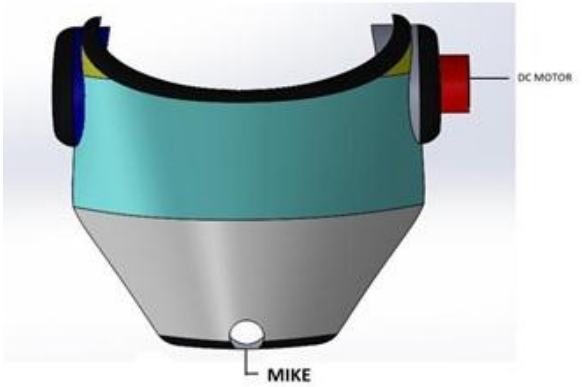


Fig. 9 2D view of Helmet

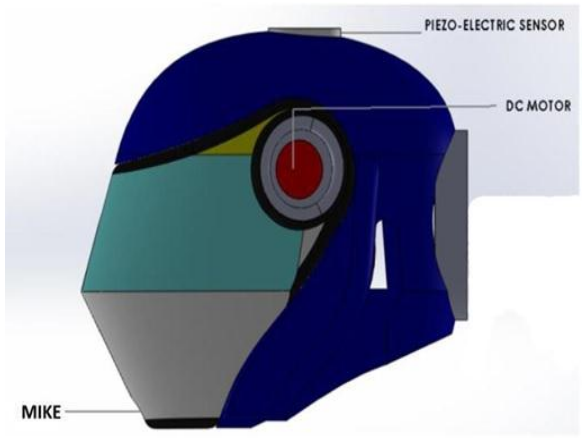


Fig. 10 3D view of Helmet

*C. Calculation for DC motor Torque requirements*

Torque requirements for DC motor to move the visor is calculated below.

Torque = Force x Perpendicular distance
=Mass x gravity x Perpendicular distance
=0.05 x 9.81 x10
Torque = 0.49 Nm

*D. Sequence of Operation*

While driving voice commands are received from the rider and it is converted into ASCII code using voice module. ASCII output is given to Arduino ATmega 2560 to control the opening and closing of helmet with the aid of a DC motor and electrical actuations like indicators. ESP 8266 Wifi module is interfaced with Arduino ATmega 2560. Piezo vibration Sensor is used to convert mechanical vibrations that may happen in the helmet, at the time of an accident into electrical voltage. When the voltage from the Piezo crystal exceeds the fixed limit, the alert message will be sent to the relatives and hospitals along with the location of the accident through GPS module and Internet of Things (ESP8266).

## IV. MERITS AND DEMERITS

*A. Merits*

1. Reliable and sustainable
2. Cheap and robust automation
3. Minimizes accidents
4. Complete voice control for the bike electricals

*B. Demerits*

1. Electronic components may fail occasionally
2. Accuracy depends on voice strength

## V. FEASIBILITY STUDY

*A. Economic Feasibility*

The cost estimation of the project is □8375 as shown in the Table I, which is quite low, where the accuracy of the project is also high and hence it proves to be economically feasible.

TABLE I COST ESTIMATION

| S. No | Component | Price (INR) |
|---|---|---|
| 1. | Voice Model | 3200 |
| 2. | Arduino MEGA 2560 | 1430 |
| 3. | Piezo electric sensor | 530 |
| 4. | DC Motor and Drive | 420 |
| 5. | ESP8266 WFi module | 345 |
| 6. | Other components | 950 |
| 7. | Helmet | 1500 |
| | Total | 8375 |

B. *Technical Feasiblility*

The product uses cheap and open sourced components, which are readily available in the market. It uses a technology, which can easily be configured. Hence it proves to be technically feasible.

*C. Operational Feasibility*

Operation of the entire model can be achieved by using the host controller (Arduino), electrical actuators, sensors, controller circuit and mechanical system. DC Motor is used to control the visor of the helmet. Since the Voice model is used, there is no need to use the hand to control the basic bike electrical functionalities. The controller gives the sequence of programming for the required operation to be done.

## VI. CONCLUSION

The developed design for the helmet reduces difficulties in traffic conditions and intends people to use this helmet for safety driving. It minimizes the death in road accidents by alerting the hospitals and family members which helps people who met with an accident. By using this helmet, riders will be conscious, since they are giving voice commands to control the basic bike functionalities.

## VII. FUTURE SCOPE

The helmet can be further developed by adding additional features like

1. Wireless transmitter and receiver.
2. Providing the route for the rider.
3. Password for unlock the bike.

## REFERENCES


[1] Hartunian and S. Nelson, "The Economics of Safety Deregulation: Lives and Dollars Lost Due To Repeal of Motorcycle Helmet Laws", *Journal of Health Politics, Policy and Law*, Vol. 8, pp.76-98, 1983.

[2] Faizan Manzoor, Shah Asif Bashir, Aaqib Manzoor, Zain Ashraf Wani and Shahid Mohi Ud Din, "Faaz Smart Helmet", *International Journal of Computer Science and Mobile Computing*, Vol. 6, No. 6, pp. 332-335, 2017.

[3] Hobby, Kenleigh C, Brendan Gowing, and David P Matt, "Smart Helmet", U.S. Patent No. 9, 389, 677, 2016.

[4] Rasli, Mohd Khairul Afiq Mohd, Nina Korlina Madzhi and Juliana Johari, "Smart Helmet with Sensors for Accident Prevention", *Electrical, Electronics and System Engineering, Int. Conf. on IEEE*, pp. 21-26, 2013.

[5] Vijayan and Sudharsana, "Alcohol Detection Using Smart Helmet System", *International Journal of Emerging Technology in Computer Science & Electronics*, Vol. 8, pp. 190-195, 2014.

[6] R. Prashanna Rangan, "Vehicle Speed Sensing and Smoke Detecting System", *International Journal of Computer Science and Engineering,* pp. 27-33, 2017.

[7] Ayush Garg, Swati Gupta and Harpreet Kaur, "Smart Helmet", *International Journal of Computer Applications,* pp. 19-22, 2016.

[8] Nitin Agarwal, Anshul Kumar Singh, Pushpendra Pratap Singh, Rajesh Sahani, "Smart Helmet", *International Research Journal of Engineering and Technology*, Vol. 2, No. 2, pp. 19-22, 2015.

[9] P. P. Chitte, S. Salunke Akshay, N. Thorat Aniruddha and T. Bhosale Nilesh, "Smart Helmet and Intelligent Bike System", *International Research Journal of Engineering and Technology,* Vol. 3, No. 5, pp. 483-487, 2016.

[10] Indranil Nikose, TusharRaut, Reena Bisen, Varsha Deshmukh, Ashwini Damahe and Pranoti Ghotekar, "Review Paper on Smart Helmet using GSM and GPS Technology", *International Journal of Advanced Research in Computer and Communication Engineering*, Vol. 6, No. 2, pp. 288-290, 2017.

[11] Ravi Nandu and Kuldeep Singh, "Smart Helmet for Two-Wheelers", *Advances in Automobile Engineering*, Vol. 3, No. 1, pp. 1-2, 2014.

[12] K. Saravana Kumar, B. S. Anjana, Litto. Thomas and K. V. Rahul, "Smart Helmet", *International Journal of Science, Engineering and Technology Research*, Vol. 5, No. 3, pp. 660-663, 2013.