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Smart Helmet for Accident Prevention and Safety of Bikers

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ABSTRACT: The rise in the number of accidents have led to loss of life so it is necessary to provide safety. Drunk driving is one of the reason where the driver's condition becomes unstable and cannot keep control of the vehicle and cause accidents. Nowadays motorcycles are used in large numbers and many motorcycles accidents are recorded. To overcome this problem smart helmets have been introduced. In this paper a system is designed which detects the alcohol presence in the breath of the driver, predicts the possibility of accident to occur and warns the driver, also the driver should wear the helmet else he cannot access the motorcycle. If the driver does not pass all this condition then ignition will be turned off. GPS can be used to locate and GSM to send messages to the authorized person or relative in case of any accident or mishap. So that necessary aid can be provided if the bikers is caught in an accident.

KEYWORDS: MQ3 sensor, accelerometer, buzzer, GPS, GSM.

I. INTRODUCTION

The number of accidents on roads are increasing day by day. In 2019, total 4,37,396 road accidents were recorded in India in which 1,54,732 people were found dead and others remaining were injured according to the National Crime Record Bureau (NCRB) data. There are many rules and regulations made by the government for people to follow so as to reduce the accidents. But people do not follow them strictly and cause harm to themselves and the people around them. Nowadays people use motorcycles in large numbers and many motorcycle accidents are recorded. The major reasons for accidents are because the rider is drunk or the person is not wearing the helmet. Sometimes the person does not get immediate proper aid after the accident and may die if help is not provided in time. There is a law under section 129 of the Motor Vehicle Act, 1988 the law says that it is compulsory for the motorcyclist to wear a helmet while riding the bike. Also traffic police are assigned to keep watch on people and make them wear the helmet. But in remote areas where no traffic police are available people do not care to wear the helmet and the traffic management team cannot keep an eye the whole time. So to avoid this 'Smart Helmet' can be used as an effective way to prevent accidents and make the people wear their protective gear i.e their helmet. The system will firstly check if the helmet is worn or not, secondly it will check the alcohol content from the breath of the rider using the MQ3 gas sensor. Then the accelerometer connected to the helmet will look after the tilt of the helmet along the three axis and if there is sudden change in the tilt then it will alert the rider about being cautious or might get caught in an accident. The bike will start only if the helmet is worn and if there is no consumption of alcohol found in breath. If an accident occurs then a message will be sent to the relatives and to the emergency number using GSM. Also through GPS the location of the rider will be sent so that the rider can be easily traced and necessary medical aid can be provided. GPS will help track the person if in a quiet area with less mob and notify the relatives and nearby hospital to provide him immediate aid.

II. OBJECTIVE

- A) To prevent the road accidents caused due to drunk driving.
 - B) To make the people wear the helmet to prevent any head injury and provide them safety by alerting them if there is a chance of an accident.
 - C) To provide immediate medical help to the rider if he is caught in an accident.
- These objectives will be achieved by analysing the survey based on the following mentioned hypothesis:
1. H1: "Smart Helmet can prevent accidents caused due to drunk driving and alert if an accident is bound to happen."
 2. H2: "GPS and GSM can provide immediate aid to the biker after the accident."

III. PROPOSED SYSTEM

A system can be designed that checks whether the motorcyclist has worn the helmet or not using the FSR(Force Sensitive Resistor) sensor. When the rider wears the helmet, force will be exerted on the sensor and the sensor senses this and analyses if the helmet is on the rider's head or not. MQ3 gas sensor can be used to detect the alcohol content in the breath of the rider. The sensor can be placed inside the helmet near the mouth. If both these conditions are satisfied then only the ignition will be turned on or else the rider cannot access the vehicle. Accelerometer can be placed on the sides of the helmet to check the inclination and vibration while riding. The accelerometer can predict the occurrence of an accident and will alert the rider by ringing the buzzer. The buzzer will not only alert the rider but also other people on the road so that they can maintain safe distance from the vehicle. If an accident occurs then the GPS module will send the location of the rider to the nearby hospitals and relatives. GSM module will send a message to the hospital informing about the accident and to provide immediate medical help to the person. The emergency contact will already be saved in the SIM card. The sensors, accelerometer and modules can be connected to the Arduino Uno board. The components can communicate with each other using cloud.



Fig. block diagram of the proposed system

IV. LITERATURE REVIEW

In a study published by S.Tapadar, et.al. [1] in 2018, the proposed system detects the presence of alcohol, accident prediction using SVM and detects if the person is wearing the helmet. Sensors like flex sensors, impact sensors, MQ3 sensors are used. The helmet also has an accelerometer to measure the tilt while riding the vehicle. The helmet can communicate with any smart phone through Bluetooth and send messages to relatives.

In a study published by Kessari Shrivya, et.al. [2] in 2019, the system detects alcohol, detects if an accident has occurred and makes it mandatory for the rider to wear the helmet. The ignition of a bike will fail if the helmet is not worn. If an accident occurs then the location of the rider is sent to the registered number.

In a study published by Yogita Chandrawanshi, et.al. [3] in 2019, a smart system is proposed that checks whether a helmet is worn by a rider and checks if alcohol is consumed. A transmitter is fitted on the helmet and receiver on a bike. RF module communicates between transmitter and receiver. The switch is present which sees if the helmet is worn and detects alcohol through a sensor. If both conditions fail then the ignition is stopped and a message is sent.

In a study published by A. R. Budiman, et.al. [4] in 2018, the system ensures that the driver wears the helmet and locks the straps of the helmet. It warns the driver if an accident is likely to happen due to over speed and detects the obstacles

on the road and tells them to avoid accidents.

In study published by D. A. Preetham, et.al. [5] in 2017, the author developed the system into two parts; firstly the system detects the alcohol and checks if the rider is wearing the helmet, secondly the system detects if the person is an authorized person using face detection. The algorithm used for face detection is Viola-Jones coupled with SVM.

In a study published by Praveen Dhulavvagol, et.al. [6] in 2018, in this proposed paper a smart helmet has a MEMS sensor that detects accidents and an MQ3 sensor detects the presence of alcohol. The GPS tracks the location of the accident and sends messages through GSM to the concerned people. The data generated by sensors is stored in the cloud so that it can be easily accessed anytime.

In a study published by Snehal Chorge, et.al. [7] in 2016, the system detects the presence of alcohol through an MQ3 sensor and detects helmets using IR sensors. The RF module gets the data from sensors and converts into machine readable format. The motor ignition will be stopped if the alcohol is detected and the rider is not wearing the helmet.

In a study published by Jesudoss A, et.al. [8] in 2019, the system checks whether the helmet is worn using an IR sensor. A gas sensor is used to detect alcohol. The vibration sensor detects whether an accident has occurred or not and MEMS sensor checks on accident occurrences. Load sensor checks the number of people on the bike. Here PIC microcontroller is used. GPS sends the location of the accident to the nearby hospital.

In a study published by Priya Parameshwari, et.al. [9] in 2018, the system ignition is turned ON only if the alcohol is not detected and the driver is wearing the helmet. The system checks the speed using an accelerometer to predict if there is a possibility of an accident to occur or not.

In a study published by Rajathi N, et.al. [10] in 2019, helmet detection done using pressure sensor and alcohol detected using MQ3 sensor. The ignition will start only if the helmet is worn and the driver is not drunk. A MEMS accelerometer is inserted into a mobile phone that determines whether accidents have occurred or not. The message is sent to the emergency contacts using the MIT app inventor. Also the location of the accident is sent to nearby hospital for assistance from the driver.

In a study published by P Koteswara Rao, et.al. [11] in 2020, the proposed system aims at preventing road accidents for two wheeled vehicles. The two conditions for vehicles to start are that the driver should wear the helmets and the driver should not be in a drunken state. GPS sends the location and GSM sends the message to emergency contacts. The internet for communication takes place using Wi-Fi.

In a study published by Hardik Boghara, et.al. [12] in 2017, in this proposed system there are two units one is helmet unit and the other bike unit. The RF transmitter and receiver carry out the communication between the two units. The system first detects the helmet using the vibration sensors and alcohol sensors checks whether the driver is under the influence of alcohol. The ignition of the vehicle depends on the vibration and alcohol sensor. GPS sends location and GSM sends messages.

In a study published by Mangesh Jadhawar, et.al. [13] in 2016, the system checks alcohol using MQ3 sensor and helmet using IR and PIR sensor. The bike will not start if any of the data given by the sensor is negative. GSM sends the message to authorized people. Accelerometer will detect the tilt in the vehicle when the vehicle is likely to fall.

In a study published by Sreenithy Chandran, et.al. [14] in 2016, the IoT based system is developed that detects accidents and sends notification through emergency contacts. An accelerometer is used that checks the head tilt and on getting the sudden change in movement it calculates the value and sends an alert about the accident. The message is sent to emergency contacts over the cloud.

In a study published by P.Dharani, et.al. [15] in 2020, the system first checks whether the helmet is worn or not using FSR, secondly the MQ3 sensors detects the alcohol content in the breath of rider and the motor starts only if this both conditions are satisfied. The system then detects if an accident has occurred or not using vibration sensors also led strips are used on the helmet so that the rider can ride the bike efficiently at night time. NodeMCU sends the location of the rider when an accident is detected.

In a study published by Sanjana K. D. S. Jayasinghe, et.al. [16] in 2020, the system is divided into two units: helmet unit and bike unit. Helmet unit will check if the driver is drowsy using the EEG system and whether alcohol is consumed by the rider or not. The signal is sent using Bluetooth to the bike unit. Bike unit will take this signal and stop ignition if the rider is drunk and will ring an alarm if the rider is found drowsy. The GSM module will send a message about the rider being in danger.

In a study published by V.Swarna, et.al. [17] in 2020, the system firstly detects a helmet is present on head using the push button. It checks if alcohol is consumed or not and with the help of an accelerometer predicts if an accident had occurred or not. The bike will start if all conditions are satisfied.

In a study published by Izanoordina Ahmad, et.al. [18] in 2019, the system checks if the rider is drunk if not then the vehicle can be driven if consumed then the engine will be locked and messages are sent via Bluetooth. Buzzer will ring alerting the driver to not ride the bike. The message will be displayed on LCD specifying the driver is drunk.

In a study published by S. S. Ashwini et.al. [19] in 2020, the system first activates all the nodes then the RF module interacts with the data and checks the data continuously. Then helmet detection takes place using the FSR sensor and



detects alcohol using MQ3 sensor. An accelerometer ADXL345 is used to detect if an accident has occurred or not. The RF module takes this data and locks the engine if alcohol is detected and the helmet is not worn. If an accident occurs then a message is sent using the GSM module. Solar panels are attached on the upper side of the helmet to charge the battery fitted inside the helmet.

In a study published by Prashant Ahuja et.al. [20] in 2018 , the system checks whether a helmet is on the riders head or not using IR sensors. Also vibration sensors and tilt sensors are used to know if a rider is caught in an accident or not. NC (Normally Connected) sensor used to ensure that the helmet is connected with a bike or not. The GSM is used to send messages and GPRS sends the location of the place where the rider had met with an accident.

V. METHODOLOGY

A. Participants

This study was conducted through Google forms and circulated among the students asking questions related to the use of helmet and GPS GSM module and opinion about smart helmet helping in prevention of accidents. The form was distributed among the students using motorcycles on a daily basis to get relevant responses. The survey was conducted within Maharashtra. A total of 32 participants were involved in this survey in which 11 were females and 21 males.

B. Procedure

As google forms was a medium for conducting the survey all the responses were given equal priority to avoid any biasness and leniency towards a particular person. Also visited a mechanical shop nearby and studied the various parts available in the system. Also looked after the parts that can be used instead of the parts present in the current system which are cost effective and more accurate.

VI. EXPERIMENT

The test scores of the survey based on the hypothesis were taken into account by performing chi square test with 95% confidence level.. The question which will justify and prove the hypothesis were asked in the survey. To notice the difference in the response values while performing the test gender was considered to be a distinguishing factor. The values were tabulated and a chi square test was performed. The calculated value and tabulated value were compared and then the values did not match specifying that the null hypothesis was rejected and alternate hypothesis was accepted.

The parameters that were considered from the survey to prove the hypothesis are first the smart helmet that provided calculated value of $\chi^2=1.731$ and the second parameter GPS provided calculated value of $\chi^2=1.534$ and the third parameter GSM provided calculated value of $\chi^2=0.0014$. The values were checked with a tabulated value of 3.84 having 95% confidence level.

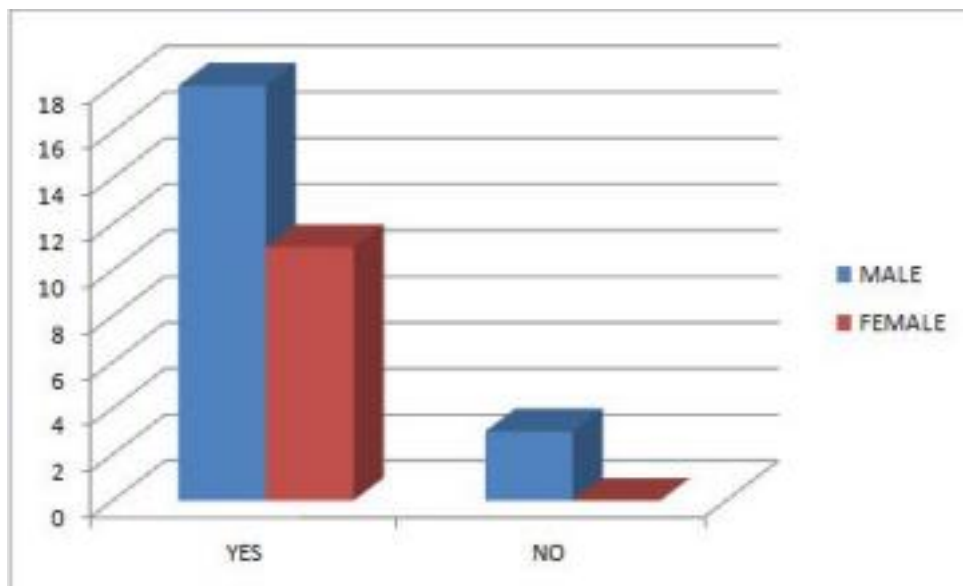


Fig1. comparison of values obtained through survey regarding smart helmet

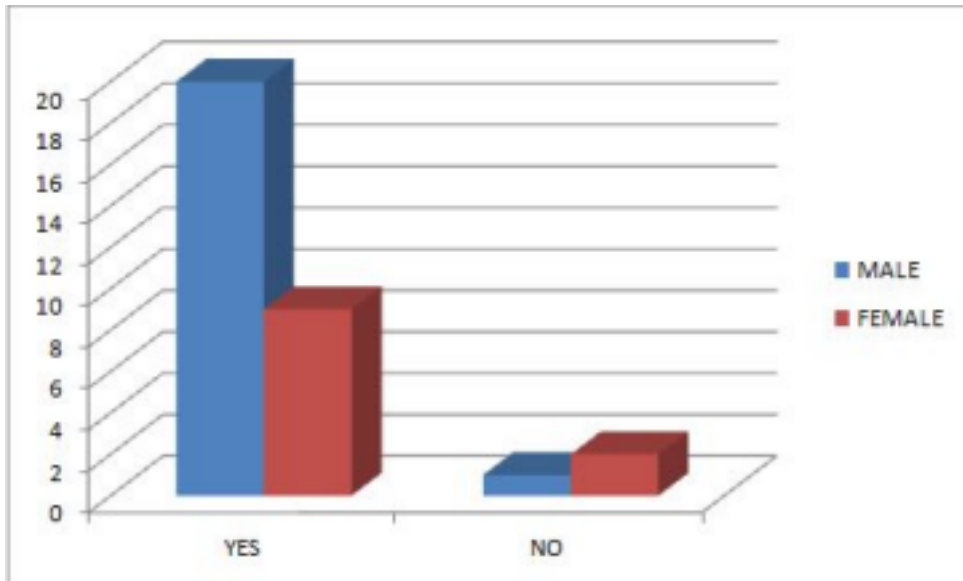


Fig2. comparison of values obtained through survey regarding GPS module

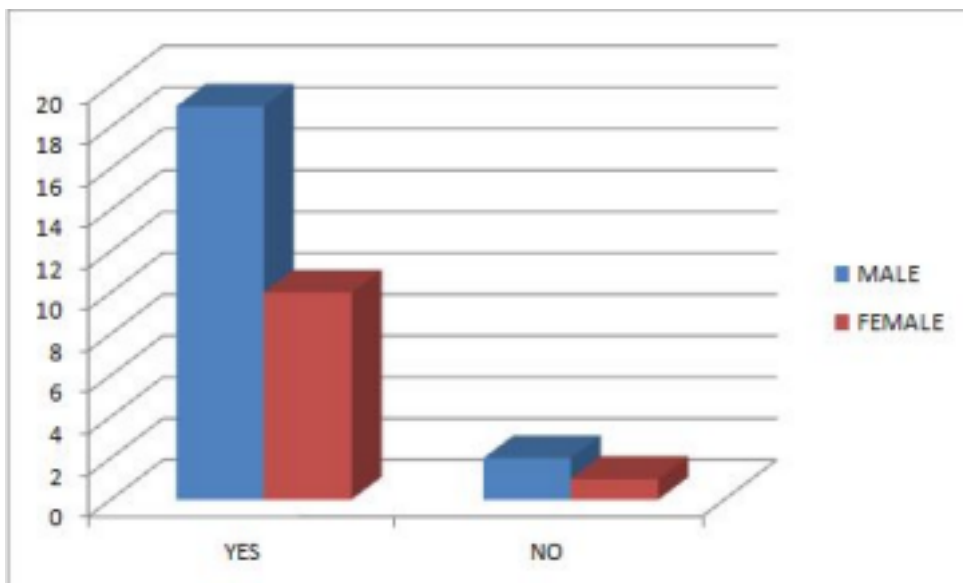


Fig3. comparison of values obtained through survey regarding GSM module

VII. CONCLUSION

To prevent accidents and the factors causing it, a smart helmet can play a significant role. It may protect the biker by alerting about the accident and also prevent their intake of alcohol while riding. It will provide immediate aid if the motorcyclist is caught in an accident and save the life of the person. The GPS will send the exact location of the rider and GSM will send the message to the nearby hospital so that they can provide medical aid to the motorcyclist. So this smart helmet will save the life of both the bike rider and other people on the road.

VIII. LIMITATIONS & FUTURE SCOPE

If the driver gets drunk while driving then the ignition is turned off but if the bike rider is on highways and roads with bad conditions the vehicle will stop immediately and can cause severe accident and can collide with other vehicles on the roads. The system should work efficiently even in the remote areas. The system can be advanced by embedding collision based system to avoid collision between the vehicles on the road.

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