Fabrication of Smart Helmet Lock System Including Safety Measures

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Abstract **- This paper focuses on implementing Microcontroller based "Smart locking system". Programmable Microcontrollers are used in order to perform required operation. The research survey includes the current technology scenario of locking system. This helmet locking system is implemented to assure that the rider wears a helmet before rides the bike. Just in case the user takes out the helmet from the lock but does not wear it, the helmet is installed with two-step verification by implementing a limit switch in the helmet and communicate with the system wirelessly. It also assures that the bike speed does not cross a threshold limit and if at all the speed exceeds the pre-set limit there is an intimation and the rider is asked to slow down. Ultra-sonic sensor, limit switch sensor, speed sensor, rotary sensor and LCD are used as components. As a result, the bike ride becomes safer than before. Wearing a helmet can reduce accident. There are many countries enforcing a regulation that requires the motorcycle's rider to wear a helmet when riding on their motorcycle, Malaysia is an example. A smart helmet is a special idea which makes motorcycle driving safer than before. This is implemented using GPS technology. The working of this smart helmet is very simple, vibration sensors are placed in different places of helmet where the probability of hitting is more which are connected to microcontroller board. It also has an alcohol detector sensor which detects whether the person is drunk and switches off the engine if the sensor output is high.**

1.INTRODUCTION

In recent times helmets have been made compulsory in Maharashtra State. Traffic accidents in India have increased year by year. As per Section129 of Motor Vehicles Act, 1988 makes it required for every single riding a two-wheeler to wear protective headgear following to standards of the BIS (Bureau of Indian Standards). In India drunken drive case is a criminal offence of The Motor Vehicle act 1939. Which states that the bike rider will get punish. In existence bike rider easily get escaped from law. These are the three main issues which motivates us for developing this project. The first step is to identify the helmet is wear or not. If helmet is wear, then ignition will start otherwise it will remain off till helmet is not wear. For these we use FSR sensor. The second step is alcohol detection. Alcohol sensor is use as breath analyzer which detect the presence of alcohol in rider breathe if it is exceeds permissible range ignition cannot start. It will send the message to register number.

The aim of this project is to make a protection system in a helmet for a good safety of bike rider. The smart helmet that we made is fixed with sensors which act as to detect wear helmet or not. There are two different microcontrollers is used in this project. Each unit has used a separate microcontroller, for bike unit we use Arduino Lilypad and for helmet unit we use ARM7 lpc2148. Signal transmission between the helmet unit and bike unit is using a RF concept.

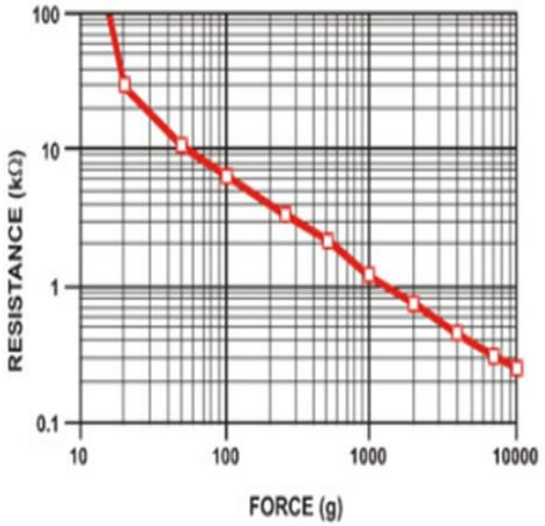
2. TECHNICAL STUDIES

2.1 Force Sensing Resistor (FSR):

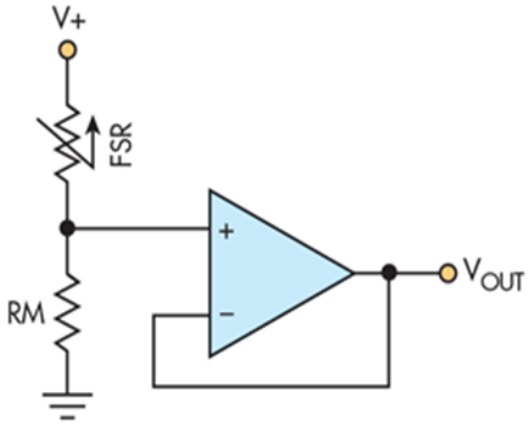
Force Sensing Resister [2] is placed at inside the helmet where the actual human touch is sensed. It determines by helmet unit that whether helmet is worn or not. If this condition will satisfy or not satisfied, then it sends the signal to bike unit. Force Sensing Resistors, or FSRs, are strong polymer thick film (PTF) devices that resistance is inversely proportional to force applied to the face of the sensor. This sensor is used as human touch control in various applications. Such as medical systems, automotive electronics and in robotics and industrial applications. The force vs.

resistance characteristic shown in Fig. Provides a general idea of Force sensing resister typical response behavior. For convenience, the force vs. resistance data is plotted on a semi-log format. Force sensing resister is two-wire sensor with a resistance that changes on applied force. The resistor RM is selected to maximize the required force sensitivity range and to limit current. Here we use 10 kΩ of measuring resister. The output voltage is described by mathematical equation:

$$Vout = \frac{RmV +}{Rm + Rfsr}$$

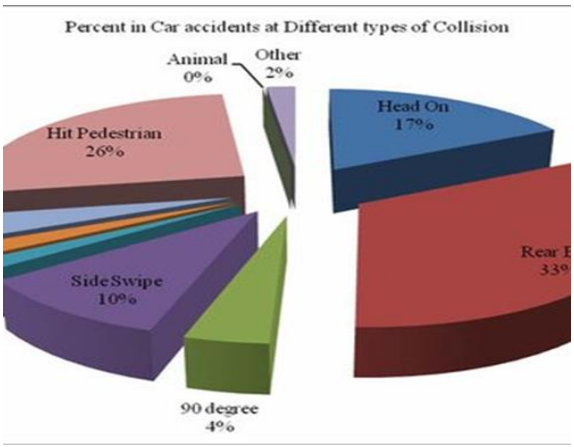


Resistance vs Force



Circuit diagram of FSR

As a result, incidents of road accidents, traffic injuries and fatalities have remained unacceptably high in India. Graphic presentation of the percentage share of different vehicle types in road accidents during 2017



Various types of Vehicles met with Road Accidents.

2.2 MQ-3 Alcohol Sensor:

MQ-3 gas sensor [2] is right for identifying the alcohol content from breath. It can be positioned just front of the face. The sensor is responds to various gases. It determines by helmet unit that weather the rider is drunk or not. MQ-3 sensor has potentiometer to adjusting different concentration of gasses. We calibrate the detector for 0.4mg/L of Alcohol concentration in air and use value of resistance is 200 KΩ. MQ-3 has supports for both analog and digital. MQ-3 has a 4 pin namely GND, VCC, Aout, Dout. Here we use digital output of this sensor which is gives output in terms of high or low. It decided by our helmet unit weather rider is drunk.

2.3 RF Communication circuit:

Helmet unit and Bike unit are connected by wireless link of RF. RF communication circuit contains encoder and decoder circuit. Encoder is on helmet side which is using to convert parallel data into serial data. The encoder is capable of encoding massage which contains of 12N data bits and N address bits. Each address/data can stay set to with two logical states. [3] The oscillator frequency is selected by Rosc. We choose oscillator frequency is 3 kHz, with Rosc of 1M ohms. Minimum transmission of data is 4 words. Decoder is on bike side, it used to decode serial data. It converts this serial data in to parallel. The decoders are capable to receive data that are spread by an encoder and understand it. The first bits period use as addresses and last 12N bits as our desired data, where N is stands for address number. In this decoder circuit oscillator frequency is 50 times greater than FOSCE

(encoder oscillator frequency). FOSCD is 150 kHz, which is select by value of Rosc. Rosc is 1k ohms.

PRESENT HELMET LOCKING SITUATION:

There are various types of helmet locking system are available in the market at present [4]. Some will lock it to handle, some will lock it to rear handle and some people prefer it to lock to crash guard with the help of wire lock.

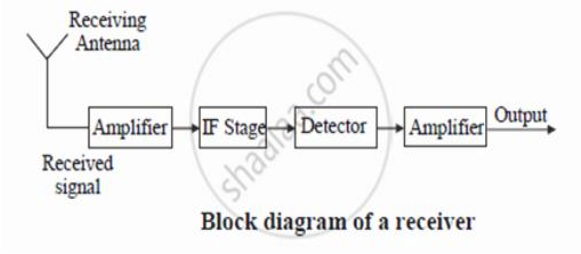
PROPOSED SYSTEM: [4]

The idea of this work is that a biker must remove the helmet from the lock in order to start his bike, otherwise the bike will not start and will alert in the LCD display to wear helmet and a wireless communication is established between the helmet and the locker system so as to confirm if the user has worn the helmet after removal [5]. This is satisfied by using the limit switch in the helmet which will sense whether the rider as wore helmet or not also in case of not wearing the helmet, the bike senses it. Hence the speed of the bike is limited to 40 KMPH, if the biker exceeds threshold speed. There is an intimation using buzzer which indicates over speeding. A fabrication of the locking system is considered with high priority of simple to use and automatic working and also secures enough to lock. The electronic locking is used in the system to have a closed loop feedback system and also will have automatic functioning which cannot be satisfied with the mechanical locks. The modeling of the same is done in CATIA V5 mechanical design software.

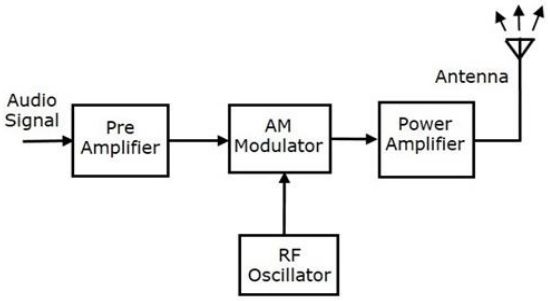
LOCKING SYSTEM DESIGN: [6]

The helmet acts as the second key to a biker. Besides, it also incorporates the advanced technologies of to ensure the rider rides at limited speed when not wearing the helmet and will always wear helmet when travelling at higher speed. The smart locking system will also make rider easier to carry the helmet and do not have to worry about the complex locking process to deal with, as every other rider does it now. The smart helmet consists of four main modules:

1. Transmitter Module
2. Receiver Module
3. Helmet Sensing Module
4. Speed Sensing Module
5. LCD Module Working of the Receive



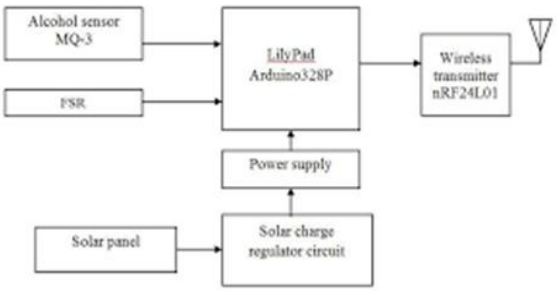
Block diagram of a receiver



Block diagram of a transmitter

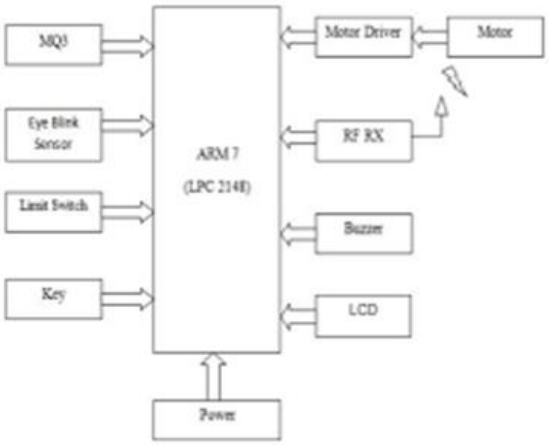
3. CONSTRUCTION: [7]

We already mentioned that we divide a project in two units namely helmet and bike. In helmet unit, the force sensing resister is placed on inside upper part of the helmet where actually head was touched with sensor surface. And alcohol sensor is placed on in front of rider's mouth. It can sense easily. Solar panels are mounted on upper side of helmet which is in direct sunlight. And the battery and regular circuits was fixed inside the helmet. Secondary controller and RF transmitter circuit was also placed on inside the helmet, antenna is located outside the helmet.



Helmet unit

The bike unit is mounted on actual bike. Accelerometer was fixed on bike, for the fall detection. Our main controller is positioning into storage case of bike. And decoder circuit is placed on in handle of bike. We also stick a keyboard on the petrol tank. So, we can easily type the password.



Bike Unit

4. ADVANTAGES, APPLICATION AND FUTURE SCOPE: [8]

4.1 Advantages:

- Detection of accident in remote area can be easily detected and medical services provided in short time.
- Simply avoiding drunken drive by using alcohol detector. it will reduce the probability of accident.
- Operates on solar as well as battery supply.
- If helmet was stolen, then we can start the bike by the password.

4.2 Application:

- It can be used in real time safety system.
- We can implement the whole circuit into small module later.
- Less power consuming safety system.
- This safety system technology can further be enhanced in car and also by replacing the helmet with seat belt.

4.3 Future Scope:

- We can implement various bioelectric sensors on the helmet to measure various activity.
- We can use small camera for the recording the drivers activity.
- It can be used for passing message from the one vehicle to another vehicle by using wireless transmitter.
- We have used solar panel for helmet power supply by using same power supply we can charge our mobile.

5.CONCLUSION

The outcomes of the project have showed that the bike ignition will start if the helmet is worn. So, it will automatically decrease the effect from accident, and it can avoid bike from being stolen. Arduino lilypad is good in controlling all the system and the sensors. Executing the wireless system which Radio Frequency Module to send signal from helmet unit to the bike unit. Due to this wireless connection is better than wired link.

6. ACKNOWLEDGEMENT

We would like to express our special thanks of gratefulness to Dr. D.S BankerHead of Department of Electrical Engineering for their able guidance and support for completing my research paper. I would also like to thank the faculty members of the Department of Electrical Engineering would help us with extended support.

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