International Journal of Advance Research in Science and Engineering
Volume No.07, Issue No.12, December 2018
www.ijarse.com
IJARSE
ISSN: 2319-8354

Radio Frequency Driven Helmet and Ignition System

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ABSTRACT-Even after strict obligation of helmet isimposed by the government, some bike riders don't wear helmet leading to the lethal accidents. To avoid these mishaps and to increase the safety of a rider this proposed system makes compulsion for a rider to wear a helmet. This system is divided into two working sides; helmet side and bike side. In helmet side switches are placed which actuate transmitter and this is simply read by the receiver placed at the ignition circuit. So, bike will not start unless rider is wearing the helmet. This system uses wireless communication through Radio Frequency(RF) technology.

Keywords-*Arduino Nano, RF Transmitter, RF Receiver, SPST relay, Limit switch.*

I. INTRODUCTION

The major contributors to deadly accidents are two wheelers. To avoid this, helmet is made mandatory for all the bike riders. This, however, hasn't been effective because the system doesn't oblige rider to wear the helmet. Around 17.6 million two-wheelers were sold to domestic customers in 2016/17, making it the most popular vehicle category sold in India. Two-wheeler vehicles include scooters, motorcycles and mopeds. Being the most dominant vehicle in the market two wheelers are also responsible for the majority of the deadly accidents in India.In the year 2016, Two-wheelers accounted for the highest share in total road crashes (1,62,280), contributing 33.8% of the total [1].Considering all these facts government made stringent laws regarding wearing a helmet, nevertheless, 67% Indians do not wear the helmet while riding across the country. The same could be made mandatory if system call for a helmet and without that bike would not start.

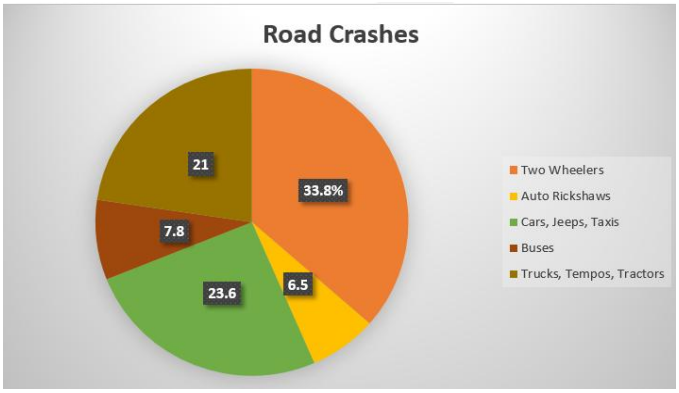

Fig. 1 Road crash statistics based on vehicle type

II. LITERATURE REVIEW

There have been many attempts in the similar field of work in order to serve the purpose. The central part of thesystem is the wireless communication between the helmet and ignition part of the bike. Varieties of technologies are preferred

to fulfil the purpose such as Wi-Fi technology, Bluetooth, Infrared Radiations and Radio frequency.

The paper published in March 2016 titled as 'smart helmet' with prime objective of the paper was to force a rider to wear a helmet to reduce the possibility of accidents. The system used ArduinoNano, RF module and ultrasonic sensor. The system, however, is power consuming and has significant delay in its actuation.Also use of ultrasonic sensors in the helmet may give rise to some health issues [2].

Intelligent helmet published in March 2016 describes a prototype in which a module is affixed in the helmet, such that the module will sync with module affixed on the bike and will also ensure that biker has not consumed alcohol. Additional features of accident detection module will be installed on the bike, which will be able to detect accident and will be able to notify quickly the accident to police control room and in case if the accident is minor, rider abort message sending by pressing abort switch[3].

Power consuming moduleswas the main aspect of each of the prototypes and hence it would exhaust battery soon, to avoid this component with minimum power requirements is selected. Selection of these components does not hinder other parameters.

III. RADIO FREQUENCY

Out of all the available technologies, Radio Frequency is the most convenient and less harmful than any other. Due to its sophisticated use and facile interfacing with Arduino modules, we have used the same for our project.

The electromagnetic waves which are oscillation of electricand magnetic fields that travel at speed of light through vacuum. Its position within the electromagnetic spectrum is characterized by its frequency of oscillation or its wavelength. The electromagnetic spectrum includes Radio frequency within the range of 20kHz to 300GHz. Higher the frequency, higher is the propagation efficiency, greater immunity to some forms of noise and impairments. Hence Radio frequency finds many applications in a wider range. There are RF modules available in different sizes, shapes. It includes PCB, transmitter circuit, receiver circuit, antenna and serial interface for communication with host processor. Performance specifications for RF modules include sensitivity, output power, communication interface, operating frequency,

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www.ijarse.com
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resolution and maximum transmission distance. RF has following applications in various fields:

- Vehicle monitoring
- Remote control
- Telemetry
- Wireless meter reading
- Access control systems
- Small range wireless network
- Wireless home security systems
- Industrial data acquisition system
- Wireless data terminals
- Wireless data transmission

IV. PROPOSED SYSTEM

It's a type of telemetry system in which whenever the rider puts on the helmet then only the bike will start. To check whether the helmet is put on or not, Electromechanical switch is incorporated in the interior part of the helmet. The whole system is based on RF module. Once the signal is sent to the transmitter from switch, transmitter sends the control signal to the receiver which later activates the relay which is connected to the bike's ignition circuit. Hence by doing so, the rider has to wear the helmet in order to start the bike. The system will successfully reduce the deaths in motorcycle riding by raising the safety through making it compulsory

4.1. *The Helmet Part (Transmitter section)*

The whole transmitter section is placed inside the helmet with proper cushioning for the protection of electronic parts of the system. The Electromechanical limit switch is the part which comes first in the operation, it is NO (normally open) in nature and whenever it gets pressed, the circuit gets closed and current flows through it. The 1KΩ resistor is placed in line with the COM terminal and later connected to the ground. The NO terminal of switch and Vcc terminal of transmitter is connected to 5V pin of Arduino Nano. Pin 5 and Pin 12 of Arduino is connected to COM terminal of switch and DATA terminal of transmitter. Since helmet is a wearable thing, the processor (Arduino) is externally powered with the help of 9V battery. The transmitter sends the signal to the receiver module wirelessly with the help of radio frequency. The RF module used is 433 MHz for both transmitter and receiver module.

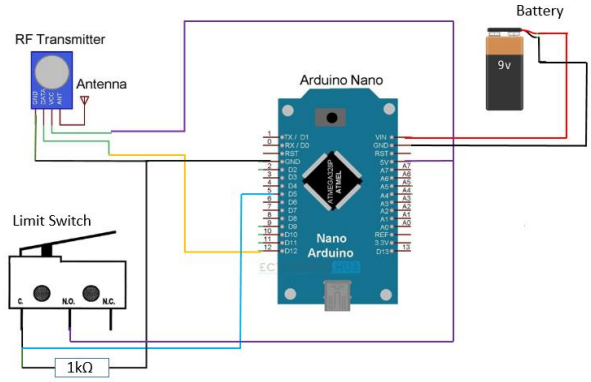

Fig. 2 Block diagram of the transmitter section

4.2. *The Bikes part (Receiver section)*

The receiver catches the signal sent by the transmitter, then the relay energizes, allowing the current to flow through the ignition circuit. Thereby starting the vehicle once, the helmet is put on. Pin no. 9 and 12 of the Arduino is connected to coil terminal of relay and DATA terminal of the receiver respectively. Relay is normally open (NO) and connected to positive terminal of starter motor.

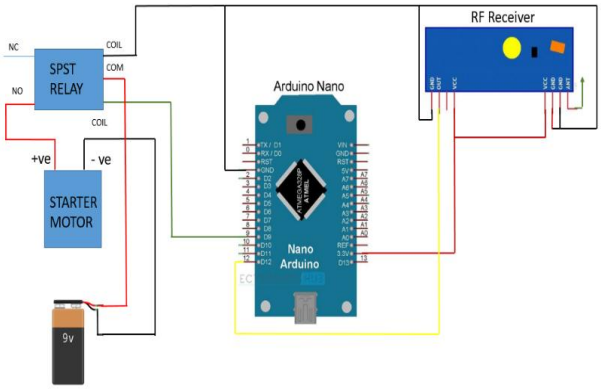

Fig. 3 Block diagram of the receiver section

V. TOPOLOGY

SR. NO.	PART	SPECIFICATIONS
1.	RF Module	Transmitter operating voltage: +5v Transmitter operating current: 9-40ma Operating frequency: 433 MHz Transmission distance: 3 meters
2.	Arduino Nano	Microcontroller: ATmega328 Operating Voltage (logic level): 5 V Input Voltage (recommended): 7-12 V Flash Memory: 32 KB (ATmega328) Clock Speed: 16 MHz
3.	Limit Switch	5A, 250VAC
4.	SPST Relay	Electromagnetic Switch

VI. RESULT

The response of the system when helmet had put on was closely examined. The significant parameters- time delay and power consumed by the modules were analysed and necessary changes had been done till it reached near to the speculated value. The time delay- which was prevalent in other similar prototypes had been reduced considerably. The systemfound not only less power consuming but also efficient and quick in response.

VII. CONCLUSIONS

This system obliges rider to wear a helmet. There is no other way the rider can start a bike than wearing the helmet. The system improves safety of bike rider and with this the rate of deaths in motorcycle accident will be reduced considerably. The negligence of the rider which in most of the cases turns out to be deathly can be completely eliminated by this system.

VIII. FUTURE SCOPE

8.1 Adding alcohol sensor

Incorporation of alcohol sensor discards the possibility of drunk and drive and hence road mishaps are reduced to a greater extent.

8.2 Incorporating GPS-GSM

GPS/GSM security feature that informs the nearest hospital and police station about the location of the place if any kind of accident happens.

8.3 Override feature

In case of extreme emergencies, when the rider has no time to wear the helmet. There can be a provision for certain distance or time that rider can start the vehicle without helmet.

IX. ACKNOWLEDGMENT

We whole heartedly extend our utmost gratitude to Prof. Vinit Goel, Assistant professor, Department of MechanicalEngineering, Rajiv Gandhi Institute of Technology, Mumbai, for his benevolence and support in due course of the project.

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