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Smart Helmet with Active Voice Control

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Abstract - *Nowadays we see many accidents which are unexpected and unintended event. Breaking the traffic rules and carelessness of driver are the major factors which leads to the increased number of accidents and deaths. Many accidents are caused by drunk and driving. In this project we are using IR sensors, alcohol sensor and voice module. This system is designed in such a way that IR sensor and alcohol sensor will check whether the person is wearing the helmet and has a non-alcoholic breath before driving. In this new type of module we are using is voice module which leads to security as well as act as a smart helmet. If any of these conditions are not met, the bike will not start.*

Key Words: **IR sensor, Alcohol sensor, Voice module**

1. INTRODUCTION

According to National Crime Records Bureau, Ministry of Road Transport & Highway, Law commission of India, Global status report on road 2013 states that one serious road accident in the country occurs every minute and 16 die on Indian roads every hour. 1214 road crashes occur every day in India. Two wheelers account for 25% of total road crash deaths. 20 children under the age of 14 die every day due to road crashes in the country. 377 people die every day, equivalent to a jumbo jet crashing every day. Studies have shown that most of the severe injuries and death case can be prevented to more than 50 percent if a person wears a helmet and avoids driving after drinking alcohol. Even after being aware, people tend to ignore these simple rules of safety and tend to incur fatalities or even death to themselves or others.

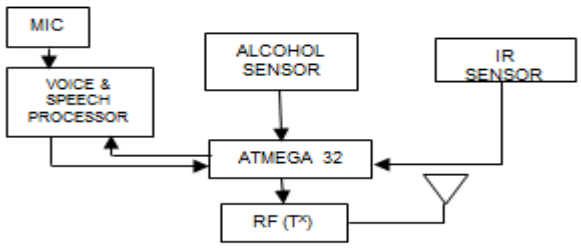
Only 28 countries, covering 7% of the world's population, have comprehensive road safety laws on five key risk factors: drinking and driving, speeding, and failing to use motorcycle helmets, seat-belts and child restraints. So, to overcome from this problem this smart helmet is being introduced which helps to reduce number of accidents that takes every day and also helps to reduce death ratio.

On the other hand world has seen an increase in the sale of two wheelers over the years especially in countries like India where the rate of growth of two wheelers is 20 times the rate of population growth. This scenario had led to the increased number of accidents and deaths. In countries like India rules are violated, many people carry the helmet but are not interested to wear it. Even though government has made it compulsory to wear the helmet but this rules are neglected by people and this causes the accidents.

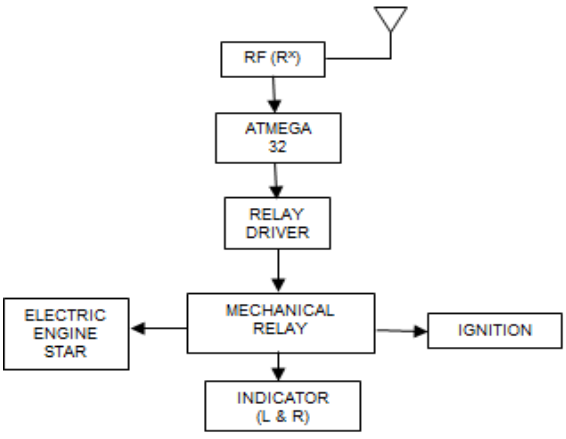
This has thrown light on the importance of forcing the rider to wear helmet to reduce the extent of impact. The project focuses on the methods that can be implemented to reduce the impact of road accidents. In this project, we propose building a system that can be implemented by installing it on a bike which works with the helmet that is being warn to make the rider to wear the helmet before riding the bike. The idea is that the vehicle will not start unless the rider wears a helmet and also passes the alcohol test by the help of IR sensor to detect the person's head and alcohol sensor for alcohol test. In this new type of module we are using is voice module which leads to security as well as act as a smart helmet. If any of these conditions are not met, the bike will not start.

2. METHODOLOGY

2.1 Block diagram of transmitter section within the helmet :



2.2 Block diagram of receiver section within the bike :

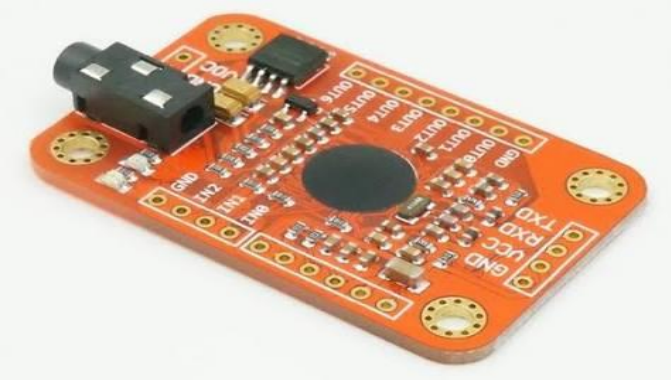


3. WORKING

3.1 TRANSMITTER SECTION

As we can see from block diagram our helmet side consists of 5 main working blocks, first voice Processing module, second alcohol sensor, third proximity sensor, fourth a microcontroller (AT mega 328P) and fifth is RF transmitter.

3.1.1 VOICE PROCESSING MODULE



It is built around dedicated DSP Processor for voice recognition and speech recognition. It consists of 2 ports Analog Processing Port and Digital Processing port. Analog processing port has a Amplifier and Analog to digital converter when voice which is sampled through MIC is feed to amplifier which amplifies and conditions the received signal from MIC, then this signal sample is fed to A to D converter (ADC) which transforms it to digital format. This digital signal then processed by CPU which identify Amplitude, tone, pitch, and other parameters and saves it in memory, this process happens when module is in recording mode, here voice samples are recorded and stored in 3 groups of 7 memory slots. When module is in recognition mode voice samples are processed continuously till current voice sample is matched with the recorded voice sample whenever the match is positive it sends memory location address and data on that memory location as output through serial port or via serial communication which is received some through serial port by microcontroller.

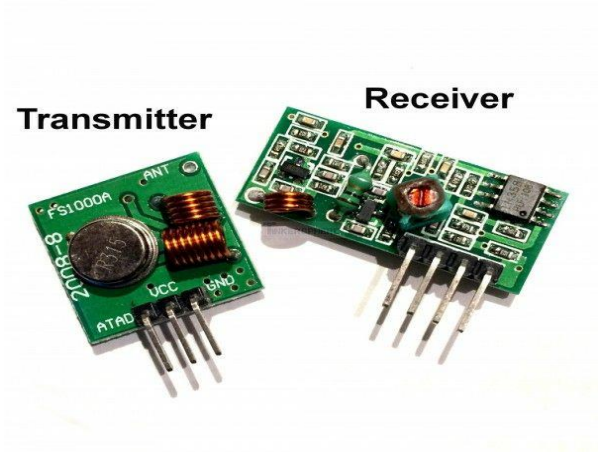
3.1.2 ALCOHOL SENSOR

Alcohol sensor is a analog device which is constructed on a semiconductor layer. This device work available capacitance, there is SnO2 layer between two electrode between two electrode as a dielectric medium which reacts with the air module present around the sensor. Whenever SnO2 reacts with alcohol molecules its electrical properties changes as a result if present between two separated electrodes changes capacitance between them capacitance of this device is directly proportional to the alcohol molecules present around it. This variation in its capacitance results in varying voltage across it which is then measured on the analog pin of the microcontroller.

3.1.3 PROXIMITY SENSOR

It consists of IR emitter and detector, emitter emits the IR light which gets reflected by the surface obstructing the path of light, this reflected light is detected by IR detector. Amount of light detected by the detector depends on what is the distance between the emitter detector pair and obstructing surface. Further the surface lesser the energy detected by the detector. According to the photos or light particle received by the detector voltage varies across it which is then used to find the proximity surface to the sensor.

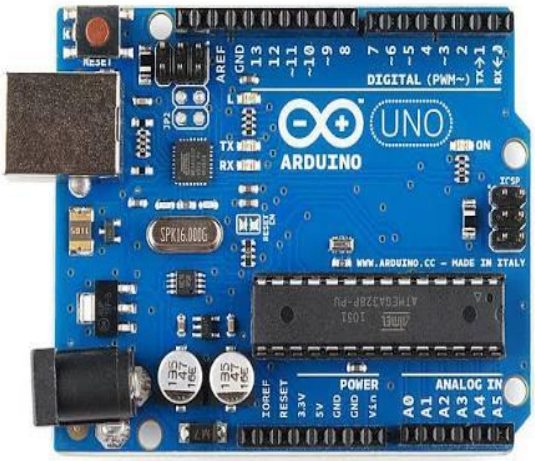
3.1.4 RF TRANSMITTER



When the data is processed by the microcontroller which is all the data received by the sensors and voice processing module is processed a new data is generated representing a

row one is feed to the RF transmitter serially which transmits it to the receiver pair wirelessly.

3.1.5 MICROCONTROLLER



It is a AT mega microcontroller of series mega328 The high-performance Microchip 8-bit AVR RISC-based microcontroller combines 32KB ISP flash memory with read-while-write capabilities, 1KB EEPROM, 2KB SRAM, 23 general purpose I/O lines, 32 general purpose working registers, three flexible timer/counters with compare modes, internal and external interrupts, serial programmable USART, a byte-oriented 2-wire serial interface, SPI serial port, 6-channel 10-bit A/D converter (8-channels in TQFP and QFN/MLF packages), programmable watchdog timer with internal oscillator, and five software selectable power saving modes. The device operates between 1.8-5.5 volts. By executing powerful instructions in a single clock cycle, the device achieves throughputs approaching 1 MIPS per MHz, balancing power consumption and processing speed.

3.2 RECEIVER SECTION

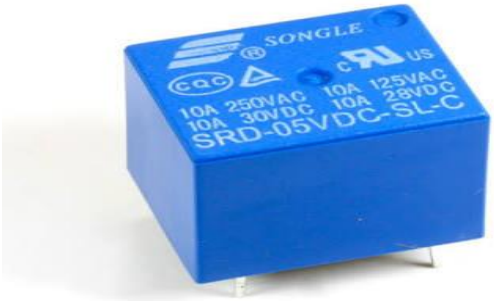
3.2.1 RF RECEIVER

An RF receiver module receives the modulated RF signal, and demodulates it. There are two types of RF receiver modules: superheterodyne receivers and super-regenerative receivers. Super-regenerative modules are usually low cost and low power designs using a series of amplifiers to extract modulated data from a carrier wave. Super-regenerative modules are generally imprecise as their frequency of operation varies considerably with temperature and power supply voltage. Superheterodyne receivers have a performance advantage over super-regenerative; they offer increased accuracy and stability over a large voltage and temperature range. This stability comes from a fixed crystal design which in the past tended to mean a comparatively more expensive product. However, advances in receiver chip design now mean that currently there is little price difference between superheterodyne and super-regenerative receiver modules.

3.2.2 MICROCONTROLLER

The high-performance Microchip 8-bit AVR RISC-based microcontroller combines 32KB ISP flash memory with read-while-write capabilities, 1KB EEPROM, 2KB SRAM, 23 general purpose I/O lines, 32 general purpose working registers, three flexible timer/counters with compare modes, internal and external interrupts, serial programmable USART, a byte-oriented 2-wire serial interface, SPI serial port, 6-channel 10-bit A/D converter (8-channels in TQFP and QFN/MLF packages), programmable watchdog timer with internal oscillator, and five software selectable power saving modes. The device operates between 1.8-5.5 volts. By executing powerful instructions in a single clock cycle, the device achieves throughputs approaching 1 MIPS per MHz, balancing power consumption and processing speed.

3.2.3 RELAY



Relays are switches that open and close circuits electromechanically or electronically. Relays control one electrical circuit by opening and closing contacts in another circuit. As relay diagrams show, when a relay contact is normally open (NO), there is an open contact when the relay is not energized. When a relay contact is Normally Closed (NC), there is a closed contact when the relay is not energized. In either case, applying electrical current to the contacts will change their state.

Relays are generally used to switch smaller currents in a control circuit and do not usually control power consuming devices except for small motors and Solenoids that draw low amps. Nonetheless, relays can "control" larger voltages and amperes by having an amplifying effect because a small voltage applied to a relays coil can result in a large voltage being switched by the contacts. Protective relays can prevent equipment damage by detecting electrical abnormalities, including overcurrent, undercurrent, overloads and reverse currents. In addition, relays are also widely used to switch starting coils, heating elements, pilot lights and audible alarms.

Relay 1 -- Ignition
Relay 2 -- Electric start
Relay 3 -- Right indicator
Relay 4 – Left indicator

1. When “wait” is received only relay 1 is turned ON.
2. When “Start” is received only relay 1 and 2 are turned ON with delay of $ to % seconds to ensure that engine is started properly.
3. When “right” is received relay 1 and 3 are turned ON.
4. When “left” is received relay 1 and 4 are turned ON.
5. When “stop” is received all the relays are turned OFF with the delay of 4 to 5 seconds to ensure that vehicle is completely turned OFF or engine is completely turned OFF

4. APPLICATIONS

a. Remote controls.
b. Automation system.
c. Wireless security system.
d. Sensor reporting.
e. Car security system.
f. Remote keyless entry.
g. Supports all wireless applications using 8051/AVR/PIC/ARM Microcontroller.

5. RESULT

6. CONCLUSION

This project is very effective in the safety of the rider who is riding the bike and also it ensures that the helmet is worn by the rider. Keeping in mind the safety rules the aim of the project is achieved.

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