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An Intelligent Helmet System for Detection of Alcohol

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ABSTRACT

In this paper a survey on detection of alcohol using a smart helmet system is presented. Recklessness on the part of driver plays a major role in accidents. The law and order give a lot of instructions to the vehicle users, but many of them are indifferent to the rules. Many countries are strictly enforcing the laws making the vehicle users wear the helmet and prevent the usage of helmets when the person is in inebriated condition. To prevent such accidents happening, an survey of an Smart helmet intelligent system is presented in this paper which detects whether the user is wearing the helmet and has non- alcoholic breath while driving the vehicle.The system can be divided into two halves: A transmitter section and a receiver section. There is a switch placed on the helmet, which powers the helmet and the pressure sensors placed to ensure the proper wearing of helmet on the head. An alcohol sensor MQ3 is placed near to the mouth of the driver in the helmet to detect the presence of alcohol. The vehicular engine should not started, if any of the two conditions is violated. Microcontroller Unit(MCU) controls the function of relay and thus the ignition, it control the engine through a relay and a relay interfacing circuit.

Index Terms: Accident, Inebriated, Smart Helmet, MQ3 alcohol sensor, MCU

1. INTRODUCTION

A traffic accident can be termed as any vehicle accident occurring on a public highway (i.e. originating from, terminating on, or involving a vehicle partially or completely on the highway). These incidents include head-on collisions between vehicles and animals, vehicles and peoples, or vehicles and fixed obstacles. In developed countries, road traffic [1] accidents are already among the rise giving a dubious statistics as a top five main causes of disease burden in 2002 as measured in DALYs (disability-adjusted life years). In Indian scenario, widening of the road is not an viable solution to avoid traffic accidents in cities and metros [2]. The problem with drunk driving can be solved in many approaches. The most viable solution will involve various techniques: Delegating authority and responsibility in society and organizations at all levels, from national to international, because drunken driving control [6] requires concrete action at each and every levels. They operate under public scrutiny, use the electronic and print media to report on problems and solutions.These approaches will not give instant solutions based on a single action but rather will take steady steps towards long-term improvement. And they will establish mechanisms for identifying and solving problems rather than attempting to apply one-size-fits-all methods.

Usage of electronics in the field of automobiles is very much in vogue now. Because of the low prices and various varieties available in the market Public prefer motorbikes over four wheelers, therefore Road Safety has become a major issue of concern. Therefore it becomes absolutely imperative to implement a complete system which is difficult to bypass the basic rule of wearing helmet and to prevent and avoid drunken driving. Here we designed an intelligent system which checks the two scenarios before turned ON, the bike engine. This system includes an alcohol sensor MQ-3 [8] and a helmet sensing pressure sensor. A sensor detects whether the biker is wearing helmet. Alcohol sensor is used to detect whether

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the biker is inebriated and the output is fed to the MCU. Both the pressure sensor and the alcohol sensor MQ-3 are fitted in the helmet. If any of the two conditions are not satisfied, the engine will not turned ON.

Alcohol sensor MQ3 is used here for detects the alcohol concentration in the driver's breath. This Sensor provides an analog resistive output based on the alcohol concentration. MCU takes or read data from the sensors and controls all the functions of the whole system by manipulating these data. Alcohol sensor is interfaced to the MCU through an interfacing circuit and the helmet sensing switch is directly connected to the MCU. MCU receives data from these sensors and it gives a digital data corresponding to the output of sensors to the encoder only if the two conditions are satisfied.

Most of the accidents occur outside the cities are due to drivers driving in inebriated condition and no standard testing methodologies have been is adopted to avoid these fatalities in highways. Motorists parking their vehicles in No- parking areas increase the rate of traffic in the metropolitan cities. In Indian road system, widening of the road is not an viable solution to avoid traffic in such a cities.

2. BLOCK DIAGRAM

This paper primarily focuses on preventing drunken driving. Hence this system will not start the vehicular ignition when the user is in inebriated condition. In addition to this, it will not allow the user to park the vehicle in the no parking zone respectively. The proposed system will send a short messaging service to the friends or relatives when an incident occurs. Our system consists of two major parts. They are 1) Helmet Section and 2) Vehicle Section as shown in fig.1 & 2.

This research describes the design of an effective security system for a bike, in order to avoid accidents and other incidents of severe magnitudes. Vehicular accidents due to the usage of alcohol are increasing

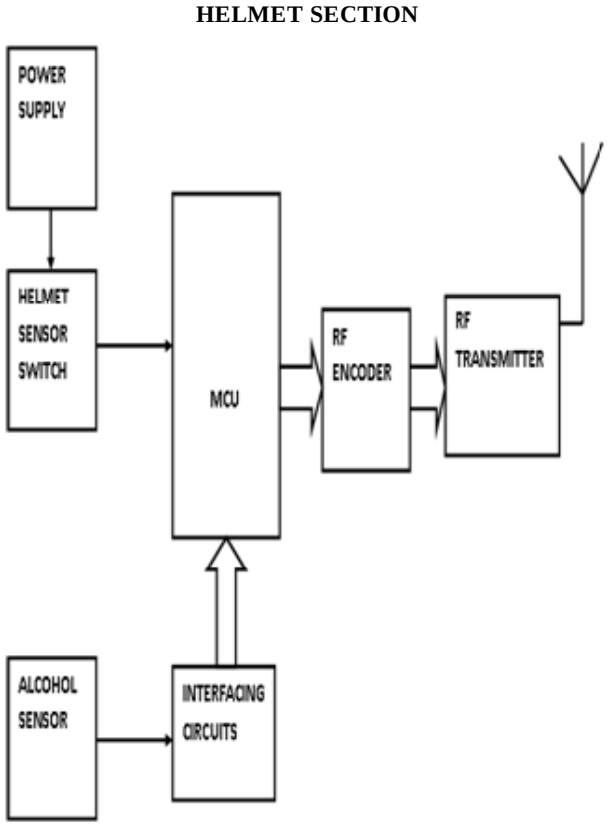

Figure 1: Set up of Helmet Unit.

nowadays and the helmet wearing reduces significantly the severity of the accidents. In this research two aims are combined in a single embedded system.

This unit consists of an alcohol sensor, helmet sensing switch, MCU, encoder and an RF transmitterHere the switch and the alcohol sensor are fitted in the helmet. MCU reads data from the sensors, detects if the driver has non-alcoholic breath and helmet sensor switch is in closed position and gives corresponding digital output to an encoder only if the two conditions are satisfied. It encodes one of the active inputs to a coded binary output. RF transmitter transmits this coded binary output from the encoder. Here, ASK modulation technique is employed . Here in this RF system, the digital data is represented as variations in the amplitude of carrier wave.

The receiver section is placed on the two-wheeler; consisting of an RF receiver, RF decoder, MCU, audio and visual indications. RF receiver receives the coded binary data transmitted by the RF transmitter and given to the RF decoder. RF decoder decodes the input and gives four bit digital data to the MCU only if the address bit of encoder and decoder matches. MCU operate the engine of the vehicle when it receives digital data from the transmitter section, it operates the engine through a relay circuit but it cannot operate the relay directly, so a relay interface is also used here. The system is provided by the motor vehicle department to avoid abnormal situations.

RECEIVER SECTION

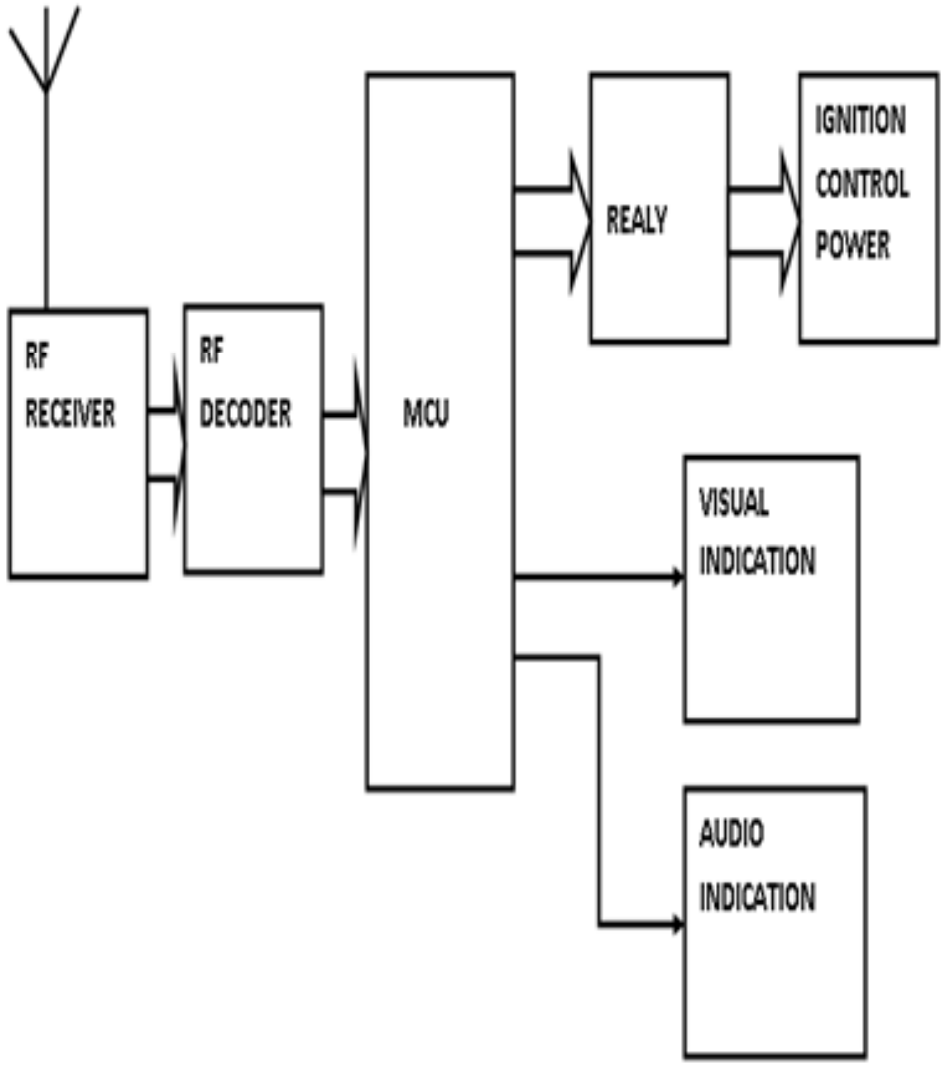

Figure 2: Set up of Vehicle Unit

2.1. Flow Chart

2.2. Working Principle

MQ-3 gas detector (alcohol sensor) is best suitable for detecting alcohol content from the breath.. The surface of the sensor is sensitive to various alcoholic concentrations. It detects the alcohol from the rider's breath; the resistance value drops leads to change in voltage (Temperature variation occurs).Generally the illegal consumption of alcohol during driving is 0.08mg/L as per the Motor vehicle act. Except for demonstration purpose, we have a tendency to tweak the alcohol limit as 0.04 mg/L.An ear lobe detector sense that is fitted with the helmet unit senses the blood flow within the ear lobe region.Here the wearing of helmet is confirmed by this system and similarly alcohol sensor fitted in the mouth piece of the helmet detects the alcohol within the breath and sends the amount of alcohol to the controller. If both of the criteria's are satisfied in an appropriate manner then the two control signals are sent from the helmet unit to the vehicle control unit. The decoded RF signal is distributed to the controller within the vehicle unit shown in fig. two to start out / stop the vehicle. If the signal from the ear lobe region and no control signal from alcohol sensor is detected then the vehicle can begin, otherwise the vehicle won't begin.

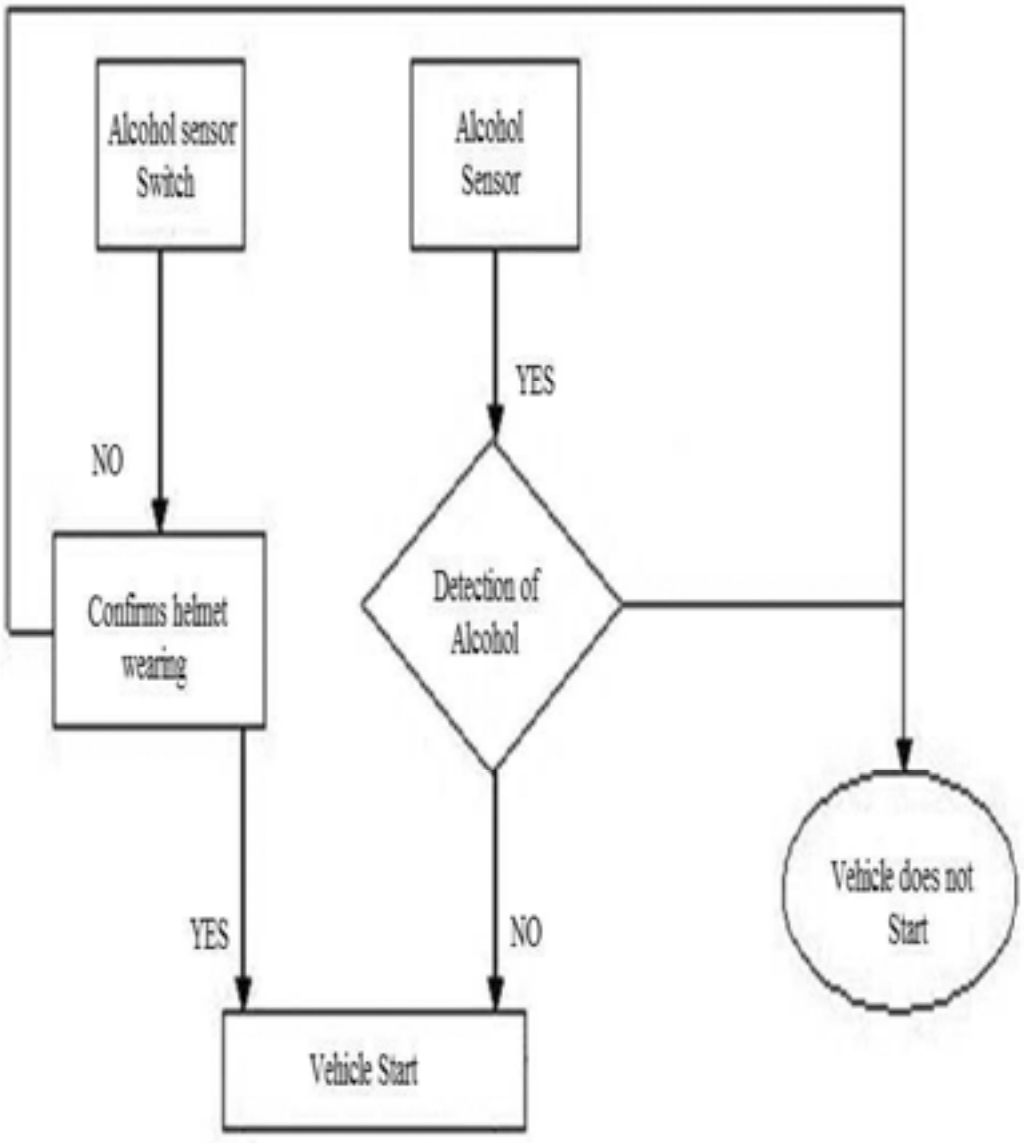

Figure 3: Flow chart of electronic smart helmet system.

3. ANALYSIS OF SYSTEM

In this hardware setup, the transmitter and receiver sections, the transmitter sections have alcohol sensing element, microcontroller unit, encoder and transmitter, controlling switches are here. The receiver section consists of decoder and receiver, microcontroller unit, ignition control switch, electrical device, audio and visual indication, power supply etc.

Alcohol sensing element: The alcohol sensing element used here is MQ-3 kind sensor, the facility offer to the alcohol sensing element is controlled through a NPN power electronic transistor TIP122 by the microcontroller unit. The bottom terminal of the voltage divider is connected to MCU through 1K resistance, from RC0 . The output of alcohol sensing element is connected to a voltage divider using 100K and 470 K variable. The output of the resistor is fed to op-amp's non-inverting voltage divider supported LM358. Output of non-inverting electronic equipment is fed to RA0/AN0 of the microcontroller. The presence of alcohol is detected by the microcontroller through this pin. During this system MQ3 is employed as LPG sensing element. This LPG/ alcohol sensing element is appropriate for detection terribly tiny presents of LPG in its surroundings. It's a high sensitivity and fast response. Sensing element provides analog resistive output depends on alcohol concentration. The drive circuit wants a resistance solely. a straight forward interface may well be a 0-3.3V ADC. Resistance worth of MQ-3 is distinction varied to numerous sorts and various concentration gases. Once exploitation of this element, sensitivity adjustment is extremely necessary. once accurately activity, the correct alarm purpose for the gas detector output to be determined and considering the temperature and humidness influence.

PIC16F73 is employed as the MCU. MCU gets power only the helmet is secured on properly. It additionally checks the output of alcohol sensing element whether or not alcohol is present in the user or not. If the alcohol is present, then MCU communicates to the RF transmitter through the RF encoder circuit.

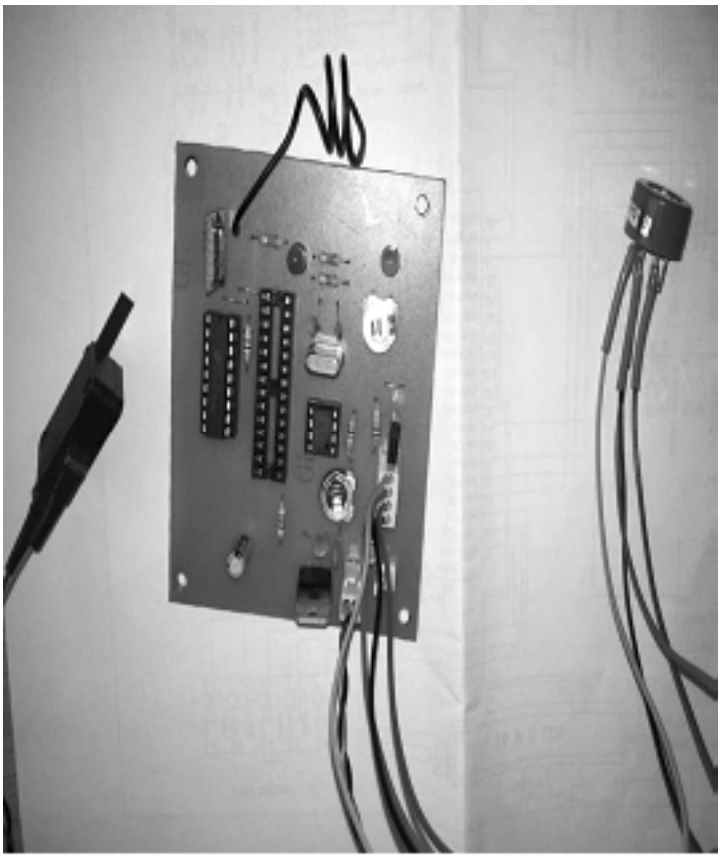

Figure 4: Hardware set up

The PIC16F73 is accessible in twenty eight pin DIP package and have program memory capability of 4Kb and ram of 368 bytes. They're operating in clock speed vary of zero rate to twenty megahertz and therefore the additional operation is totally static also. They have three I/O ports named as passage, PORTB and PORTC. Among these PORT A is half-dozen bit wide and every one alternative port is eight bit wide. Most of the peripheral I/O functions are multiplexed with PORTC pins. The ADC inputs are available in PORT A. The PIC controllers have fourteen bit wide program memory area by that instruction occupies just one memory area. This allows additional program capacity. These are addressed with a 13 bit wide program counter throughout execution.

The program memory is addressed from 0000h to 1fffh and also the reset vector is at 0000h and interrupt vector is at 0004h. The program counter points the address of the memory location to be executed next and increments in every machine cycles. One machine cycle consists of four clock cycles.

Generally they are low power devices and works in voltage range of 2v to5V. They have 13 interrupt sources like external pulse interrupt and serial receive interrupt etc. These chips area unit are in circuit serial programming facility and are flash technology also. The non-volatile storage is re written a thousand times. Speed of operation of MCU depends on the clock provided. In this project 4MHz clock is used with 232 pF capacitors. First pin (master clear) of the IC is connected to +5V through 47K Electrical relay: A relay is under controller that opens and closes underneath the control of another electrical circuit. In the original form, the switch is operated by an electromagnet to open or shut one or many sets of contacts. Because a relay is able to control an output circuit of upper power than the input circuit, it is thought of to be, in a broad sense, a form of an electrical amplifier. A simple electromagnetic relay is an adaptation of an electromagnet. It consists of a coil of wire surrounding a soft iron core, an iron yoke, which provides a low reluctance path for magnetic flux, a movable iron coil, and a set, or sets, of contacts. The coil is hinged to the yoke and automatically linked to a moving contact or contacts. It's control in place by a spring so that when the relay is de-energized there is an air gap in the magnetic circuit. In this condition, one of the 2 sets of contacts in the relay pictured is closed, and the other set is open. different relays may have a lot of or fewer sets of contacts depending on their operate when an electrical current is passed through the coil, the resulting magnetic field attracts the armature and the consequent movement of the movable contact or contacts either makes or breaks a connection with a fixed contact. If the set of contacts was closed when the relay was de-energized, then the movement opens the contacts and breaks the connection, and vice versa if the contacts were open, when the current to the coil is reduced to zero, the armature is returned by a force, approximately as strong as the magnetic force, to its relaxed position. Usually this force is provided by a spring, but gravity is also used commonly in industrial motor starters. Most relays are manufactured to operate quickly. In a low voltage application, this is to reduce noise.

4. RESULT

In this research an attempt has been made to develop an electronic smart helmet system that efficiently checks the wearing of helmet and drunken driving. By implementing this system a safe driving practices can be followed leading to decrease in the head injuries due to accidents caused from the absence of helmet and also reduce the rate of accidents due to drunken driving. Here an advanced sensors techniques and radio frequency wireless communications are included in this research This system efficiently and effectively checks the wearing of helmet and driving in inebriated condition.

5. FUTURE SCOPE

In future we have a tendency to planned to construct our intelligent system during a compact size and additionally as globally acceptable to notify the No entry and No parking areas. Government should enforce laws to install such system in each 2 wheeler. By implementing such mechanism in 2 wheelers,

the deaths attributable to due to driving and alternative road fatalities are often brought to zero p.c. And also indicates No parking area which would reduce the crowd of the vehicle in those areas. No entry area is mainly allocated during the development or repairing of the road, if the rider enters in such area this system would immediately intimate as No entry area and vehicle can stop automatically. in case of any accident it might send the messages to the friends continuously about the location of the accident happened until the first aid reaches the rider. Our system helps to know the location of the vehicle for rescuing in the case of theft incidents.

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