SMART-HELMET SYSTEM

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Abstract—**An accident is an unexpected and unintended event. The avoidance of Traffic Rule and carelessness of driver are the major factors for occurrence of Vehicle accidents which cause harm to human being as well the environment. Nowadays most of the countries are making it mandatory to wear helmet and avoid drunken driving. But still the rules are being violated. In order to overcome this problem, A GSM Based Smart-Helmet can be introduced as an intelligent system, which checks whether the person is wearing the helmet and has a non- alcoholic breath before driving. If any of these conditions are not met, the bike does not start and a message is sent to the concerned person. A transmitter on Smart-Helmet generates a signal on the basis of two mentioned conditions with the help of a switch and an alcohol sensor and then sends it to the receiver on the bike through the RF transmitter. Now, the receiver decodes the signal and the microcontroller, according to decoded signal, takes the required action. In case alcohol is detected the GSM module attached to the receiving unit sends message to a registered mobile number.**

Keywords— Helmet; Drunken Driving;Rules violated; GSM;

I. INTRODUCTION

In today's world road accidents stand among the leading cause of human death. According [1] to the World Health Organization, road traffic injuries caused an estimated 1.24 million deaths worldwide in the year 2010, slightly down from 1.26 million in 2000. That is one person is killed every 25 seconds. Only 28 countries, representing 449 million people (7% of the world's population), have adequate laws that address all five risk factors (speed, drink–driving, helmets, seat- belts and child restraints). According [2] to the first ever Global Status Report revealed by the World Health Organization (WHO), road accidents have earned India a dubious distinction. With over 130,000 deaths annually, the country has overtaken China and now has the worst road traffic accident rate worldwide. The report pointed to speeding, drunk driving and low use of helmets, seat belts and child restraints in vehicles as the main contributing factors. Every hour, 40 people under the age of 25 die in road accidents around the globe. According to the WHO, this is the second most important cause of death for 5 to 29 year olds. The total number of deaths every year due to road accidents has now passed the 135,000 mark, according to the latest report of National Crime Records Bureau (NCRB). The NCRB report further states that drunken driving is one of the major factor for road accidents. The fatal accidents that occur outside the cities are due to drunken driving and there is no check on this kind of drunken driving. Unfortunately, drivers think they are fully armed to drive on the roads when they are fully drunk! Until and unless this country comes up with a new method of checking drunkenness on the road, these fatalities cannot be lessened. Campaigns [6] against drunken driving have not proved effective. The Indian Motor Vehicle Act [4] mandates a legal limit of 30 mg / 100 ml and recommends fines and/or imprisonment for transgression. Implementation is poor, however, and the little enforcement that takes place is non-random in geographical coverage, non-visible, and non-uniform. There has been very little attention given to the aspect of early detection and brief intervention at the level of primary health care providers, emergency room personnel or the police.

Application of electronics in the automobile field is very much popular now. People usually prefer motorbikes to buy over 4 wheelers because of the lower prices of the components used and various varieties available in the market. Hence road safety becomes a major issue of concern. Therefore it becomes necessary to implement such a technique which is not easy to bypass the basic rule of wearing helmet and to avoid drunken driving. Here we designed a system which checks the two conditions before the engine of the bike is turned ON. Our system includes an alcohol sensor and a helmet sensing switch. The switch is used to detect whether the biker is wearing helmet. Alcohol sensor is used to detect if the biker is drunk, the output is fed to the MCU. Further if the biker is drunk, a GSM module sends a message to the concerned person regarding his drunken condition. If any of the two conditions are violated the engine will not turn ON. Both the switch and the alcohol sensor are fitted in the helmet.

Alcohol sensor MQ6 is used here for detecting the alcohol concentration present in the driver's breath. Sensor provides an

Analog resistive output based on the alcohol concentration. For switching purpose we used two wires. When the helmet is properly placed, the wires are short circuited and the engine turns ON. MCU is the controller unit, which controls all the functions of other blocks in this system. MCU takes or read data from the sensors and controls all the functions of the whole system by manipulating these data.

II. MODELLING OF THE SYSTEM

The main focus is on avoidance of drunken driving. Hence this system will not turn on the vehicle, when the user is in drunken condition or the helmet is not worn properly.

A. FLOW CHART REPRESENTATION:

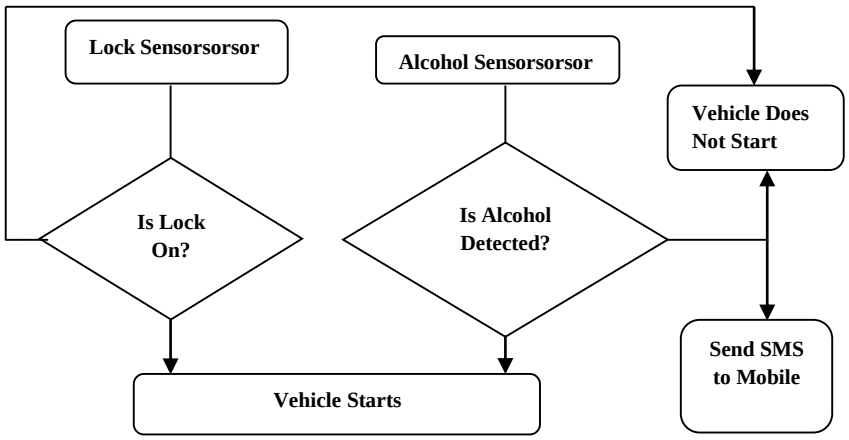

Fig. 1

B. HELMET UNIT :

This section consists of an alcohol sensor, helmet sensing switch, MCU, encoder and RF transmitter [5]. The switch and the alcohol sensor are fitted in the helmet. The analog output of alcohol sensor is fed to comparator which acts as ADC. The output from the comparator and lock sensor are encoded to binary signals which are transmitted through RF transmitter. The block diagram is as shown in Fig. 2.

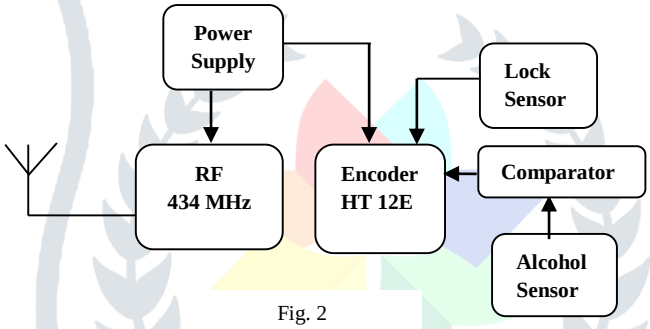

Fig. 2

C. BIKE UNIT :

This section consists of the signal reception and control part. Receiver section is placed on the bike; it consists of an RF receiver, RF decoder, MCU, GSM module, LCD as indicator, DC Motor. RF receiver receives the coded binary data transmitted by the RF transmitter and gives 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 DC motor through motor driver IC L239D when it receives digital data from the transmitter section. In case alcohol is detected by the sensor, the GSM module gets activated and a message is sent to the mobile number of a concerned person or police man, so that proper action on drunken person can be taken by the authority. The block diagram of the system at the bike is shown in Fig.3.

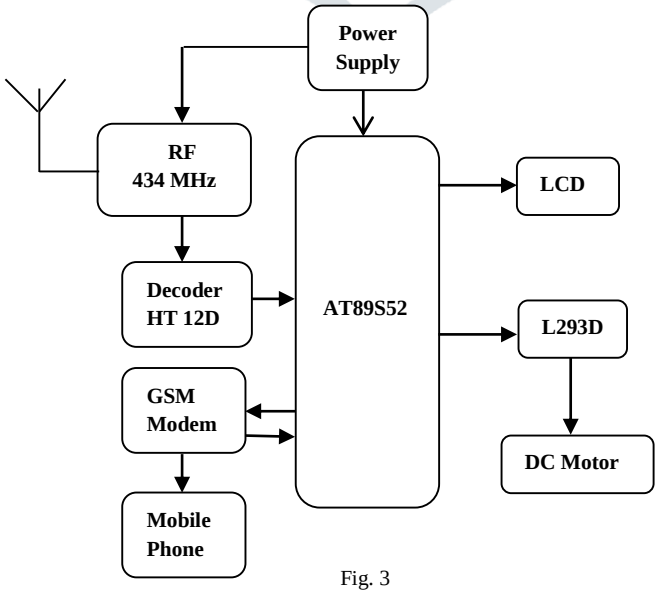

Fig. 3

D. WORKING PRINCPLE :

The circuit uses a gas sensor (MQ-6) [7] which can detect the presence of LPG, propane, methane and other combustible materials. The sensor is made up of SnO2 which has lower conductivity in clean air when concentration of LPG, Propane or Butane increases in air near sensor, its conductivity increases so it can be placed just below the face. The surface of the sensor is sensitive to various alcoholic concentrations. It detects the alcohol from the rider's breath. The resistance value drops which leads to a change in voltage. This changed voltage is fed to comparator which compares the changed voltage with a predefined voltage which corresponds to alcohol concentration below the illegal consumption level. If the voltage from the sensor exceeds the predefined voltage comparator output goes high and microcontroller takes action accordingly. Generally the illegal consumption of alcohol during driving is 0.04mg/L as per the government act. The blood alcohol content (BAC) [8] legal limit is 0.03% or 30 µl alcohol in 100 ml blood. In order to confirm the proper wearing of helmet two wires are used which only when short circuited produce logic 0 which is sent to microcontroller thereby causing the motor to start. So the wearing of helmet is confirmed by the system and similarly alcohol sensor fitted in the mouth piece of the helmet detects the alcohol in the breath and sends the amount of alcohol to the controller. If both of the criteria are met in an appropriate manner then the 2 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 to start / stop the vehicle.

III. HARDWARE ANALYSIS

The hardware setup includes the transmitter and receiver sections. The transmitter section has alcohol sensing element, operational amplifier IC LM358, variable resistors, antenna and a RF transmitter module which contains microcontroller, encoder HT12 E, switches and two wires. The receiver section has a RF receiver module containing antenna, decoder HT12D, microcontroller AT89S52 unit, motor driver IC L293D, DC motor, LCD display, power supply circuit etc.

Alcohol sensing procedure: [3] the alcohol sensing element used here is MQ-6 kind sensor as shown in fig. 4. H-H pins – can be connected on either side of heater with any polarity. The A and B pins can be used for providing 5 V DC or to get output voltage. If the pins A are used (by shorting), pins B (by shorting) act as the output or Vice versa. The output of the alcohol sensing element is connected to a voltage divider using 0-100K variable. The output of the sensor is analog in nature thus needed to be converted into digital equivalent. Op amp here is used as comparator.

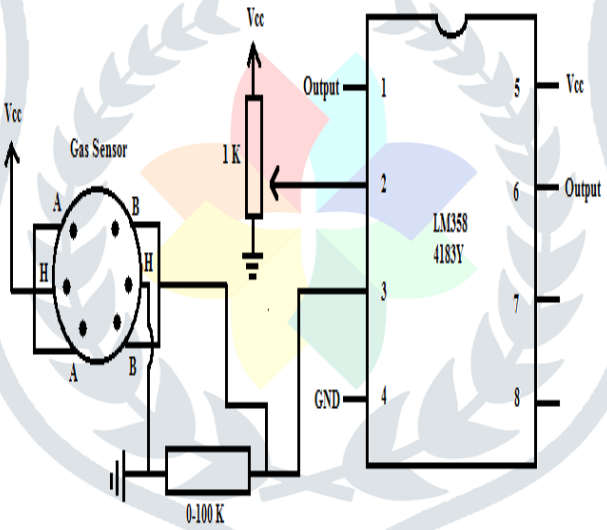

Fig. 4

One of the terminal is connected to the resistive output of the gas sensor while the other terminal to variable resistive network of 1K for setting a threshold alcohol content. Each time the gas sensor output is compared to the threshold value, output of comparator is fed to the MCU and a control signal is generated corresponding to it. The LPG/ alcohol sensing element used is capable of detecting terribly tiny presents of LPG in its surroundings. It has very high sensitivity and fast response. The analog resistive output of the sensor depends on alcohol concentration. Resistance value of MQ-6 is distinctly varied according to different values and various concentrations of gases.

Microcontroller unit: AT-89S552 is the main controlling unit. It checks the output of alcohol sensing element whether alcohol is present or not. If the condition of alcohol is traditional then MCU communicates to the RF transmitter through the RF encoder circuit. It is also responsible for checking whether the two wires used for confirming the wearing of helmet are short circuited or not. Here the favored microcontroller is 8051 from Intel Corporation and this is because of its versatility. The 8051 series is the most popular eight bit microcontroller in the world. They are available in numerous varieties in pin outs, memory capacity and have lots of integrated peripherals like ADCs, SERIAL modules.

GSM Module: The GSM module used here is SIMCOM SIM900A. The connectivity of the GSM is checked by the AT (attention) commands. The microcontroller, having received the information about the alcohol concentration in the breath of the driver and the proper helmet locking, sends it to the GSM. If the helmet is not properly locked or if the alcohol concentration is above the set

value, the GSM sends the message to the registered mobile phone. The functions which are performed by the GSM are transmitted to the microcontroller and the microcontroller sends these messages to the LCD.

IV. CONCLUSION AND FUTURE WORK

Nowadays, most cases of accidents occur by motor bikes. The severities of these accidents are increased because of the absence of helmet or by the usage of alcoholic drinks. This project develops an electronic smart helmet system that efficiently checks the wearing of helmet and drunken driving. The system also efficiently sends message to the police authority in case alcohol is detected which helps in creating a disciplined environment. By implementing this system a safe two wheeler journey is possible which decreases the injuries caused due to drunken driving and absence of helmet.

In future the system can be developed in compact size and can be made globally acceptable by all countries. Government can enforce laws to install such systems in all the two wheelers. In case of any accident it might send the messages to the relatives and friends about the location of the accident till the first aid reaches the rider. This system may also be used to know the location of the vehicle for rescuing in case of theft incidents.

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