Smart Helmet for Safe Ride

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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- Alcohol sensor, GSM, RF-transmitter & piezoelectric transducer

I. INTRODUCTION

In today's world road accidents stand among the leading cause of human death. According 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 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 against drunken driving have not proved effective. The Indian Motor Vehicle Act 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 sensor and a helmet sensing switch(piezoelectric transducer). 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 thebiker 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 MQ3 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 turnsON. 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[1].
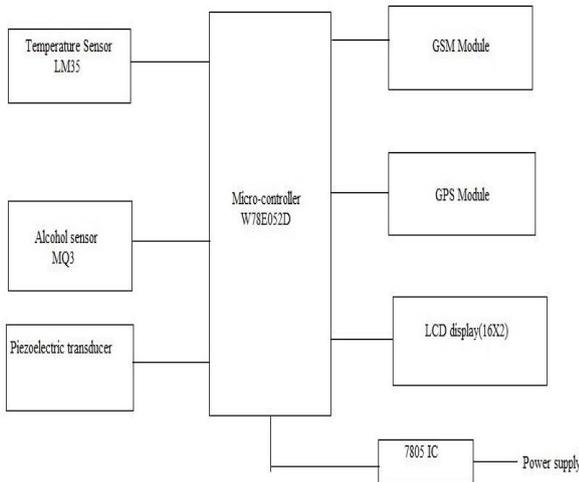
II. COMPONENT DESCRIPTION

Fig.1- Block diagram of Hardware

2.1 W78E052D Microcontroller

The W78E052 is a low-power, high-performance CMOS 8-bit microcomputer with 4K bytes of Flash Programmable and Erasable Read Only Memory (PEROM). The device is manufactured using NUVOTON high density nonvolatile memory technology and is compatible with the industry standard MCS-51™ instruction set and pin out. The on-chip Flash allows the program memory to be reprogrammed in-system or by a conventional nonvolatile memory programmer. By combining a versatile 8-bit CPU with Flash on a monolithic chip, the NUVOTON W78E052 is a powerful microcomputer which provides a highly flexible and cost effective solution to many embedded control applications.[2]

2.2 Alcohol Sensor

This alcohol sensor is suitable for detecting alcohol concentration on your breath, just like your common Breathalyzer. It has a high sensitivity and fast response time. Sensor provides an analog resistive output based on alcohol concentration. The drive circuit is very simple, all it needs is one resistor. A simple interface could be a 0-3.3V ADC.[3]

2.3 GSM Modem

GSM/GPRS RS232 Modem is built with SIMCOM, SIM900A Quad-band GSM/GPRS engine, works on frequencies 850 MH, 900 MHz, 1800MHz and 1900 MHz. It is very compact in size and easy to use as plug in GSM Modem. The Modem is designed with RS232 Level converter circuitry, which allows you to directly interface PC Serial port. The baud rate can be configure from 9600-115200 throughAT command.

Initially Modem is in Auto baud mode. This GSM/GPRS RS232 Modem is having internal TCP/IP stack to enable us to connect with internet via GPRS. It is suitable for SMS as well as DATA transfer application in M2M interface. The modem needed only 3 wires (Tx, Rx, GND) except Power supply to interface with microcontroller/Host PC. The built in Low Dropout Linear voltage regulator allows you to connect wide range of unregulated power supply (4.2V -13V). Using this modem, you will be able to send & Read SMS, connect to internet via GPRS through simple AT commands[4].

2.4 LCD display

LCD (Liquid Crystal Display) screen is an electronic display module and find a wide range of applications. A 16x2 LCD display is very basic module and is very commonly used in various devices and circuits. These modules are preferred over seven segments and other multi segment LEDs. The reasons being LCDs are economical easily programmable have no limitation of displaying special &alphanumeric characters A 16x2 LCD means it can display 16 characters per line and there are 2 such lines.[5]

2.5 Piezoelectric Transducer

Based on piezoelectric technology various physical quantities can be measured; the most common are pressure and acceleration. For pressure sensors, a thin membrane and a massive base is used, ensuring that an applied pressure specifically loads the elements in one direction. For accelerometers, a seismic mass is attached to the crystal elements. When the accelerometer experiences a motion, the invariant seismic mass loads the elements.

The main difference in working principle between these two cases is the way they apply forces to the sensing elements. In a pressure sensor, a thin membrane transfers the force to the elements, while in accelerometers an attached seismic mass applies the forces.

Sensors often tend to be sensitive to more than one physical quantity. Pressure sensors show false signal when they are exposed to vibrations. Sophisticated pressure sensors therefore use acceleration compensation elements in addition to the pressure sensing elements. By carefully matching those elements, the acceleration signal (released from the compensation element) is subtracted from the combined signal of pressure and acceleration to derive the true pressure information[6].

Fig.2- Receiver Section

Fig.3- Helmet Transmitter Section

III. WORKING PRINCIPLE

The whole system consist of two sections namely transmitter and receiver. The transmitter section is placed in the helmet. The transmitter section consist of RF-transmitter, temperature sensor, alcohol sensor, Controller IC.

When rider wears a helmet the temperature sensor sense the human temperature and gives signal to the controller IC. The threshold value of the signal can be selected by varistor. The alcohol sensor takes the breath sample and gives signal to the relay controller IC. If the alcohol concentration is above the pre-set value(0.08 mg/l). Now the RF-transmitter will send signal to the RF-receiver section.

The RF-receiver section, consist of RF-receiver, microcontroller, GPS and GSM module, LCD display, piezoelectric transducer, and DC-static relay. RF-receiver, receive the signal from the RF-transmitter. Piezoelectric transducer senses the jerks in the case of accident. It's threshold value is again pre-set by a varistor. All these controlling signals are fed to the relay via microcontroller. In case of emergency vibration sensor will send the signal to the microcontroller. Microcontroller will activate GPS and GSM. Now message and the position coordinates will send to the feeded Mobile no. and to the Ambulance. The DC-static relay will trip the relay in case of emergency as well as in case of drunk driving.

3.1 Radio Frequency module

In electronics and telecommunications a transmitter is an electronic device which generates a radio frequencyalternating current. When a connected antenna is excited by this alternating current, the antenna emits radio waves.

In addition to their use in broadcasting, transmitters are necessary component parts of many electronic devices that communicate by radio, such as cell phones, , Bluetooth enabled devices, garage door openers, two-way radios in aircraft, ships, spacecraft, radar sets and navigational beacons. The term transmitter is usually limited to equipment that generates radio waves for communication purposes; or radiolocation, such as radar and navigational transmitters. Generators of radio waves for heating or industrial purposes, such as microwave ovens or diathermy equipment, are not usually called transmitters even though they often have similar circuits.

An unrelated use of the term is in industrial process control, where a "transmitter" is a telemetry device which converts measurements from a sensor into a signal, and sends it, usually via wires, to be received by some display or control device located a distance away.

3.1.1 Description

A transmitter can be a separate piece of electronic equipment, or an electrical circuit within another electronic device. A transmitter and a receiver combined in one unit is called a transceiver. The term transmitter is often abbreviated "XMTR" or "TX" in technical documents. The purpose of most transmitters is radio communication of information over a distance. The information is provided to the transmitter in the form of an electronic signal, such as an audio (sound) signal from a microphone, a video (TV) signal from a video camera, or in wireless networking devices a digital signal from a computer. The transmitter combines the information signal to be carried with the radio frequency signal which generates the radio waves, which is called the carrier signal. This process is called modulation. The information can be added to the carrier in several different ways, in different types of transmitters. In an amplitude modulation (AM) transmitter, the information is added to the radio signal by varying its amplitude. In a frequency modulation (FM) transmitter, it is added by varying the radio signal's frequency slightly. Many other types of modulation are used. The antenna may be enclosed inside the case or attached to the outside of the transmitter, as in portable devices such as cell phones, walkie-talkies, and garage door openers. In more powerful transmitters, the antenna may be located on top of a building or on a separate tower, and connected to the transmitter by a feed line, that is a transmission line.[7]

3.1.2 Working of Transmitter

A radio transmitter is an electronic circuit which transforms electric power from a battery or electrical mains into a radio frequency alternating current, which reverses direction millions to billions of times per second. The energy in such a rapidly reversing current can radiate off a conductor (the antenna) as electromagnetic waves (radio waves). The transmitter also impresses information such as an audio or video signal onto the radio frequency current to be carried by the radio waves. When they strike the antenna of a radio receiver, the waves excite similar (but less powerful) radio frequency currents in it. The radio receiver extracts the information from the received waves. A practical radio transmitter usually consists of these parts:

- A power supply circuit to transform the input electrical power to the higher voltages needed to produce the required power output.

- An electronic oscillator circuit to generate the radio frequency signal. This usually generates a sine wave of constant amplitude often called the carrier wave, because it serves to "carry" the information through space. In most modern transmitters this is a crystal oscillator in

which the frequency is precisely controlled by the vibrations of a quartz crystal.

• A modulator circuit to add the information to be transmitted to the carrier wave produced by the oscillator. This is done by varying some aspect of the carrier wave. The information is provided to the transmitter either in the form of an audio signal, which represents sound, a video signal, or for data in the form of a binary digital signal.

IV. CONCLUSION

As the concluding part of this project, Wewould like to say that-- "Without proper action at proper time, danger awaits us with a bigger face." We must act on time when a person is injured. We must take care of person the way it is meant. Otherwise, a valuable life might be lost .We need to understand how precious lives of people are and what importance first-aid carries in saving these precious lives.

If this project imparts this idea in even one person, We would think that the project will be successful.

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