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Embedded System Controlled Smart Bike

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ABSTRACT: The aim of this paper is to minimize the risk of accident and if any accident happens then this intelligence system take corresponding steps. This system follow some steps before the rider start his journey. Initially the system inside the bike check whether the rider placed helmet on his head or not, if he had placed helmet then the system checks for the presence of alcohol presence in the drivers exhaling air[6]. If both conditions are met then only the bike will start. While riding, the system continuously records the speed of the vehicle and this recorded value [3], is accessible through the serial port of the system which can be useful for the police men to identify whether the vehicle had violated the rules or not. If any accident occurs then the intelligence system sends the location details to the nearby police station as well as nearby hospital for the emergency service. Along with this, the system also sends a message about the incident to pre-defined mobile number as well.

KEYWORDS: Embedded system, Global positioning system(GPS), Universal Synchronous Asynchronous Receiver transmitter

I.INTRODUCTION

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 [1]. This has been revealed by the World Health Organization (WHO) in its first ever Global Status Report on Road Safety. The report pointed to speeding, drunk driving and less use of helmets, seat belts and child restraints in vehicles as the main contributing factors. 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 or NCRB. The NCRB report further states that drunken driving was a major factor of road accidents and mostly they are due to bike accidents .It's growing day by day because liquor is a state subject and its happening everywhere in the country, The time for action is now: Road deaths increased by nearly 40 percent between 2003 and 2008 in India and the more progressive and developed states like Andhra Pradesh, Maharashtra and Tamil Nadu are the ones most affect [1].

To prevent or to reduce these road accidents we introduce the SMART BIKE. At the present scenario, we know that motorcyclists are at high risk in traffic crashes. Our project SMART BIKE aims to increase the rate of road safety among motorcyclists and to reduce the increasing number of fatal road accidents over the years. It also reduces the road accidents caused due to alcohol consumption. The motorcyclist cannot start the vehicle unless he wears the smart helmet. Alcohol sensor senses if the driver has drunk. The ignition turns on only when alcohol test is negative and helmet sensor result is positive. There will be two sections, one will be in helmet and the other one is in vehicle. Both these sections communicate by means of a wireless technology, ZIGBEE. Also when an accident occurs, the information will be passed to concerning officials and individuals through mobile sms.

II. PROJECT DESCRIBTION

SMART BIKE is designed with the **Embedded System based Microcontroller unit** that forms the brain of this system. The system offers no room for any sympathy, mercy or any compromise. Inside the helmet an alcohol sensor, PIR sensor, ZIGBEE unit and IR transmitter and receiver are placed. 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 [2]. PIR sensors allow you to sense motion, always used to detect whether a human has moved in or out of the sensors range. IR transmitter and receiver will also provide to check the presence of helmet. The bike consists of a ZIGBEE unit, vibration sensor and IR transmitter and receiver. IR transmitter and receiver monitor the bike speed when riding it continuously and checks the speed. If the speed is above the limit permitted by the government, it will be recorded in the microprocessor and can be retrieved using computer. When an accident occurs the vibration sensor turns on and

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informs the concerned officials and individuals with the position of the bike that we get from the GPS unit attached in the bike module.

III. HELMET SECTION

1. AVR Microcontroller

   It has 16 bit timer, 10 bit Analog to Digital Converter (ADC), Universal Synchronous Asynchronous Receiver Transmitter (USART), Serial Peripheral Interface (SPI), Inter Integrated Circuit (I2C), 256 bytes of Electrically Erasable Programmable Read Only Memory (EEPROM) memory, 32 Kbytes of flash program memory and speed of program execution of about 1 microsecond or 10 MIPS (10 Million Instructions per second). However, compared to other microcontrollers it is fast and very easy to program in C language. The special IDE named AVR Studio IDE is available for its code generation

2. Max 232

   The MAX232 is an IC, first created in 1987 by Maxim Integrated Products, that converts signals from an RS-232 serial port to signals suitable for use in TTL compatible digital logic circuits. The MAX232 is a dual driver/receiver and typically converts the RX, TX, CTS and RTS signals. The drivers provide RS-232 voltage level outputs (approx. ± 7.5 V) from a single + 5 V supply via on-chip charge pumps and external capacitors. This makes it useful for implementing RS-232 in devices that otherwise do not need any voltages outside the 0 V to + 5 V range, as power supply design does not need to be made more complicated just for driving the RS-232 in this case.

3. Alcohol Sensor

   Alcohol sensor is suitable for detecting alcohol concentration on your breath. It is Similar to common breathalyser. It has high sensitivity and fast response time. Alcohol Sensor provides an analog resistive output based on alcohol concentration.

4. PIR Sensor

   PIR-based motion detector is used to sense movement of people, animals, or other objects. The sensor detects the change in the infrared radiation and triggers an alarm if the gradient of the change is higher than a predefined value. The field does not have to be broken by an object with a different temperature in order to register change, as highly sensitive sensors will activate from the movement alone.

5. Vibration Sensor

   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 according to Newton's second law of motion F=MA. The main difference in the working principle between these two cases is the way forces are applied to the sensing elements. In a pressure sensor a thin membrane is used to transfer the force to the elements, while in accelerometers the forces are applied by an attached seismic mass [7].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. IR Transmitter and Receiver

   The infrared transmitter & receiver are designed to sense the presence or absence of partitions such that lighting functions change to accommodate the appropriate size space.

7. ZIGBEE

   ZigBee is a specification for a suite of high level communication protocols used to create personal area networks built from small, low-power digital radios. ZigBee is based on an IEEE 802.15 standard. Though low-powered, ZigBee devices often transmit data over longer distances by passing data through intermediate devices to reach more distant

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ones, creating a mesh network i.e., a network with no centralized control or high-power transmitter/receiver able to reach all of the networked devices.

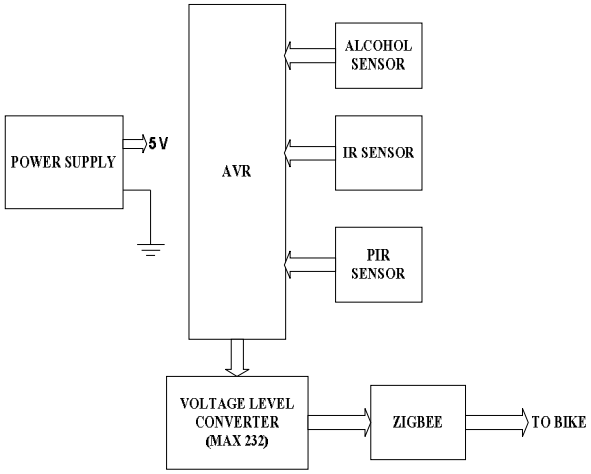

Fig.1 – Helmet part block representation

IV.BIKE SECTION

1. GPS

The GPS module calculates the geographical position of this module. This helps in detecting the location/position of the bike [5]. The GPS system functions on the basis of NMEA protocol. The NMEA protocol has output messages and input messages. The module outputs data like Global positioning system fixed data, Geographic position – latitude/longitude, GNSS DOP, GNSS satellites in view and the recommended minimum specific GNSS data. Global Positioning System is based on satellite navigation technology. A GPS Receiver provides the accurate location of an object in terms of latitude and longitude. Accurate time calculation with respect to GMT can also be done by using GPS. Here a PIC microcontroller has been interfaced with a GPS module to extract its position information.

2. GSM

Global system for communications, originally group special mobile, is a standard set developed by the European telecommunications standards institute to describe protocols for second generation (2g) digital cellular networks used by mobile phones [4]. It became the de facto global standard for mobile communications with over 80% market share. GSM is a cellular network, which means that cell phones connect to it by searching for cells in the immediate vicinity. There are five different cell sizes in a GSM network - macro, micro, Pico, femto and umbrella cells. The coverage area of each cell varies according to the implementation environment. Instead of sending commands from the Hyper Terminal, AT commands are sent to the GSM/GPRS module by the microcontroller itself. In this case, the receive (Rx) and transmit (TX) pin of the GSM module‘s RS232 port are connected to the transmit (TX) and receive (Rx) pin of AT89c51‘s serial port, respectively. This system had eliminated the role of computer and just the controller‘s circuit provides a complete user interface for the module.

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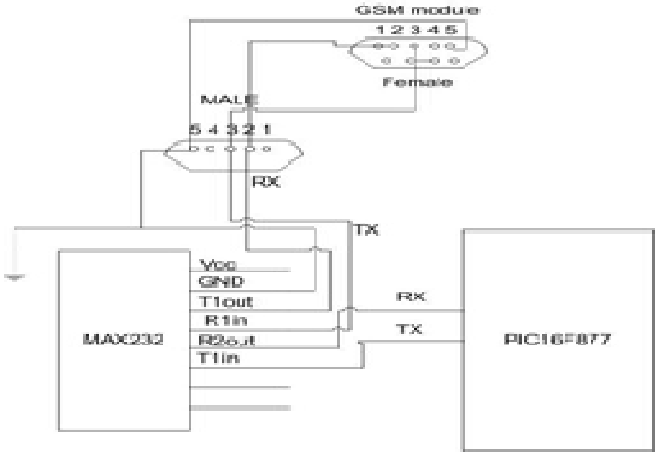

Fig.2 – GSM interfacing

3. Relay

A relay is an electrically operated switch. Many relays use an electromagnet to operate a switching mechanism mechanically, but other operating principles are also used. Relays are used where it is necessary to control a circuit by a low-power signal (with complete electrical isolation between control and controlled circuits), or where several circuits must be controlled by one signal. This in turn decides to sart or stops the bike.

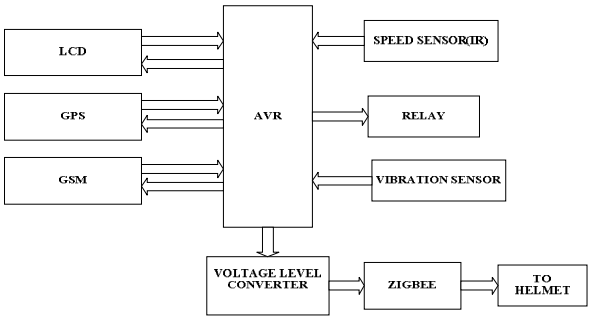

Fig.3 – Block diagram explanation of Bike section

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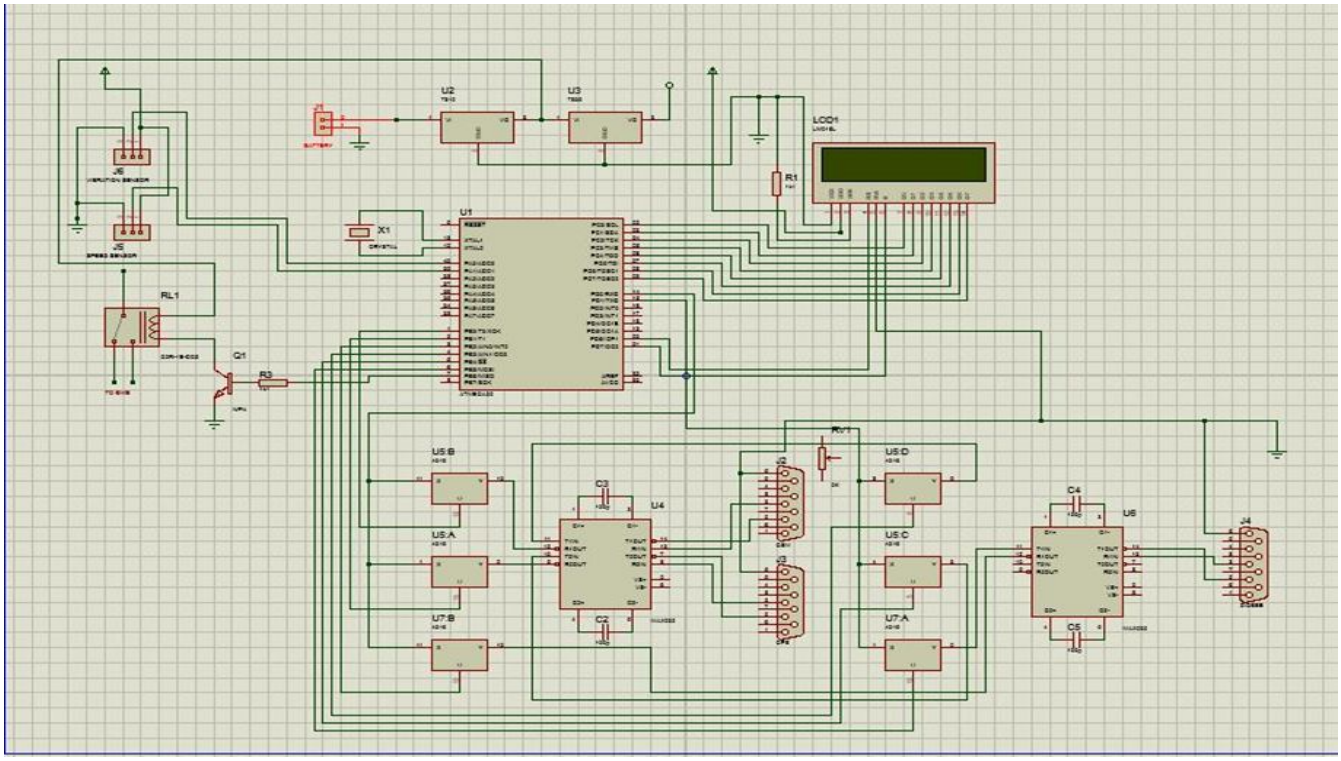

Fig 4: Circuit diagram of helmet side

V. RESULT AND DISCUSSION

Fig 5and 6 shows the performance of alcohol sensor. It requires 5V DC .Operating Temperature: -10 to 70 degrees C Heat consumption: less than 750mW.

Symbol	Parameter name	Technical condition	Remarks
V_c	Circuit Voltage	5V ±0.1	Ac or DC
V_h	Heating Voltage	5V ±0.1	AC or DC
R_l	Load Resistance	200 KΩ	
R_h	Heater Resistance	33Ω ±5%	Room temp.
P_h	HeatConsumption	Less than 750 MW	

Fig.5 Standard working conditions

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Symbol	Parameter Name	Technical Condition	Remarks
R_s	Sensing resistance	1 MΩ – 8 MΩ	Detecting Concentration scope: 0.05 mg/L – 10 mg/L Alcohol
a (.4 mg/L)	Concentration slope rate	≤ 0.6	
Standard detecting condition	Temp:20°C ±0.1 Humidity:65±5%	V_c:5V±0.1 V_h:5V±0.1	
Preheat time	Over 24 hour		

Fig.6 Sensitivity characteristics

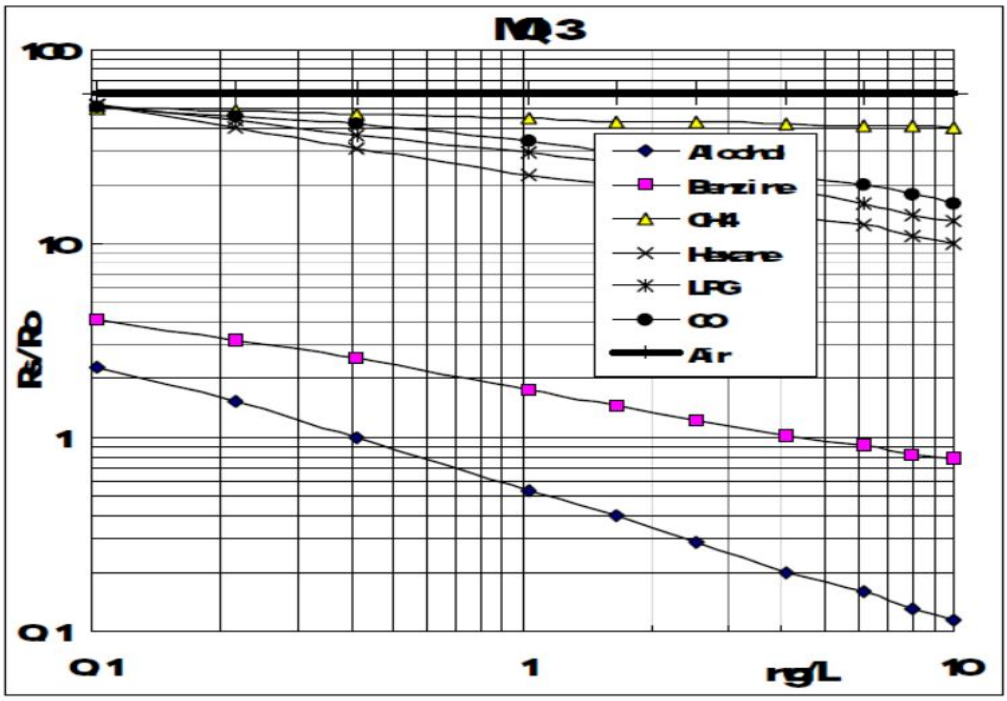

Fig.7 Typical sensitivity characteristics of the MQ-3 for different gases.

In Fig 7, Resistance value of MQ-3 is different to various kinds and various concentration gases. So, when using these components, sensitivity adjustment is very necessary. We recommend that you calibrate the detector for 0.4mg/L (approximately 200ppm) of Alcohol concentration in air and use value of Load resistance that (R_L) about 200 KΩ.

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VI.CONCLUSION

Our system efficiently checks the wearing of helmet and drunken driving. By implementing this system a safe two wheeler journey is possible which would decrease the head injuries during accidents and also reduce the accident rate due to drunken driving. In case of any accident it would send the messages to the friends continuously about the location of the accident happened till the first aid reaches the rider. By implementing this system the road accidents can be reduced to a large amount.

REFERENCES

[1] http://www.easydriveforum.com/f44-share-your-road-experience/road- accidents-in-india-834.html ―Road accidents in India [online] 2007 June 25‖

[2] Yue –Cheng Wu, Yun-qing Xia &, Zhegiang, ―Multichannel reflective PPG earpiece sensor with passive motion cancellation‖ Biomedical Circuits &System, IEEE, 2007, PP 235-2 41‖

[3] Research on Vehicle Traveling Data Recorder,IEEE INSPEC Accessing Number: 10928249

[4] GSM Modem-Based Mobile Auxiliary Learning System INSPEC Accession Number:11033673

[5] Design and development of Gps-Gsm based tracking system with google map based monitoring International Journal of Computer Science, Engineering and Applications (IJCSEA) Vol.3, No.3, June 2013

[6] Advanced Spectroscopic Characterization of Impact of Alcoholic Intake on Variation in Blood-Pulse Waveform,IEEE INSPEC Accessing Number: 12175436

[7] I.S. Jacobs and C.P. Bean, "Fine particles, thin films and exchange anisotropy," in Magnetism, vol. III, G.T. Rado and H. Suhl, Eds. New York: Academic, 1963, pp. 271-350