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Accessing System for Two Wheeler and Improved Road Safety (ASTIR)

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***Abstract*— Accessing system for two wheeler and improved road safety (ASTIR) is a prototype designed to improve the features of two wheelers. The main feature is to indicate the amount of fuel present in the vehicle digitally i.e., an alpha-numeric fuel indicator and calculate the approximate distance the vehicle would travel using that fuel. In the modern world we encounter number of road accidents which leads to demise of a person especially due to severe brain injuries. Despite the fact that the helmets are made compulsory to be worn, most people neglect it. In this paper we introduce a prototype which has a helmet module that is upgraded to monitor the rider's access to it. The prototype also contains GPS (Global Positioning System) locking system, alcohol detector.**

***Index Terms*—Alpha-numeric fuel indicator,Gas sensor, GPS&GSM, Load cell, Proximity sensor.**

I. INTRODUCTION

In the present scenario we come across many problems faced by two wheelers. Fuel theft, vehicle theft, accidents due to alcohol consumption by rider and non-wearing of helmet, etc. Most people preferably use two wheelers over four wheelers but a survey in India 2013 on road accidents indicate that over 1.37 lakh were killed in road accident and 25% of the accident contributes to two wheelers.

The hike in the fuel price has led to fuel thefts in the recent days. Vehicle theft is another major problem. These two problems are overcome by using GPS (Global Positioning System) module which alerts the two vehicle owner by messages.

The alpha-numeric fuel indicator helps to get an accurate information about the fuel amount and calculate approximate distance that the vehicle can travel using the fuel present.

Increase in accidents without helmet is an problem due to negligence which is monitored using the proximity sensor to make sure the rider wears the helmet during his ride.

Thus in this paper, we discuss two prototype modules – helmet module and vehicle module – that improve the system accessing and improve road safety.

II. LITRATURE SURVEY

The paper entitled "bike rider's safety using helmet," by author Monali Jhadhav[9] and group proposed a system which can be integrated with the ignition system thus allowing only sober people to handle the motorbike.MQ-3 gas sensor (alcohol sensor) is suitable for detecting alcohol content from the breath. So it can be placed just below the face shield and above the additional face protection. The surface of the sensor is sensitive to various alcoholic concentrations.

The paper entitled "development and fabrication of alphanumeric fuel level indicator for two wheelers" by author Mr. Shakib Javed S. Sheikh[3] gave a concept on Fuel indicator system that consist of float with variable resistance, ADC (Analog to Digital Convertor), Microcontroller uC, LCD (Liquid Crystal Display) display. All these components performtogether to indicate the amount of fuel in tank. A float [4][5] with variable resistance is installed in the tank at the base. Initially with no fuel in tank the float is at its lowest position. 5V supply from transformer is given to float rheostat. When float is at its lowest position, rheostat offers maximum resistance and no current passes. As we start filling fuel in tank float starts rising up. One end of the float is attached to the rheostat, as float rises up results in varying resistance, as resistance decreases flow of current increases. The output current from the rheostat is ananalog signal which is feed to theanalog to digital converter i.e., ADC. ADC processes these analog signal into digital pulses. Output from ADC send to the microcontroller, uC further processes digital signals and send to the LCD display in the form of voltage. This output voltage is calibrated in terms of volume of petrol filled in tank in terms of litre or millilitre.

The paper entitled "digital fuel indicator in two wheelers" by Awadesh Kumar[11] proposed a system that uses a load cell to show the quantity of fuel present in a fuel tank of a vehicle. The main function of load cell is to convert force into a measurable output, means the load cell allows us to weigh items accurately.In more simple words we can say, a load cell is an element which supports the load and strain measuring element which give the deflection amount due to the load.

III. System Modules

The prototype contains two units – vehicle unit and helmet unit.

A. *Vehicle unit:*

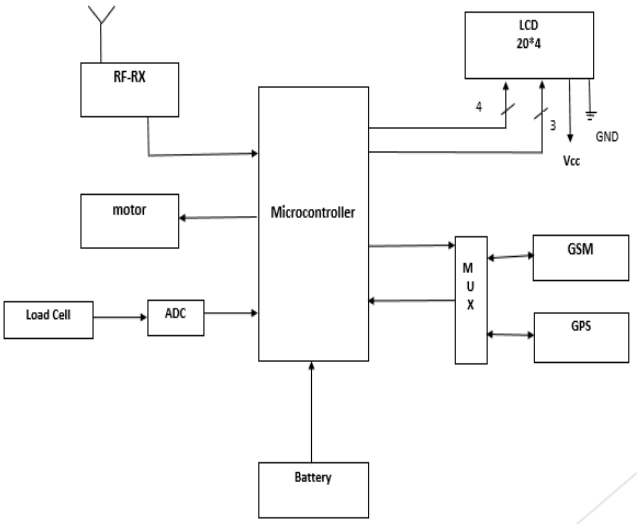

Fig. 1: Vehicle unit

1) Alpha-numeric fuel indicator:

Up until now the accuracy of the fuel level measurement [1] has not been of great importance. The purpose of measuring the fuel level has been to present the information on the dashboard with a fuel level meter. Instead of accuracy the two most important things have been to avoid rapid changes in the fuel level displayed and the meter must indicate that the tank is empty when the fuel level is below a predefined level. This system is not capable to provide the exact value of fuel in the fuel tank. Also such system cannot protect us from getting cheated at petrol pumps and this cost more for less amount of fuel so filled. So it becomes necessary to develop such a system which gives exact (numeric) value of fuel in fuel tank.

1.1 Load Cell:

Fig. 2: Load cell

A load cell[2] can translate force or pressure into electrical signals. The load cell can measure the electrical resistance that changes in response to the force or pressure applied to it. With the use of a load cell one will be able to tell just how heavy an object is. With the help of the load cell implanted with the fuel tank, one can get to know how much quantity of fuel is present in the fuel tank.

1.2 Analog to digital converter:

In this project we use ADS1230 is a precision 20-bit analog-to-digital converter (ADC). With an on-board low-noise Programmable Gain Amplifier (PGA), on-board oscillator, and precision 20-bit delta-sigma ADC, theADS1230 provides a complete front-end solution for bridge sensor applications including weigh scales, strain gauges, and pressure sensors. The low-noise PGA has a gain of 64 or 128, supporting a full-scale differential input of ±39mV or ±19.5mV, respectively. The delta-sigma ADC has 20-bit effective resolution and is comprised of a 3rdorder modulator and 4th-order digital filter. Two data rates are supported: 10SPS (with both 50Hz and 60Hz rejection) and 80SPS. The ADS1230 (Analog to Digital converter for Bridge sensor) can be clocked by the internal oscillator or an external clock source. Offset calibration is performed on-demand, and the ADS1230 can be put in a low-power standby mode or shut off completely in power-down mode. All of the features of the ADS1230 are controlled by dedicated pins; there are no digital registers to program. Data are output over an easily-isolated serial interface that connects directly to the MSP430and other microcontrollers. The ADS1230 is available in a TSSOP-16 package and is specified from –40°C to +85°C.

2) GPS and GSM module

2.1 GPS:

The GPS (Global Positioning System) is a space based navigation system that provides information on location anywhere on this earth. It makes use of 24 satellites that orbits the earth to get the location. The GPS receivers we use today are extremely accurate.

2.2 GSM:

Fig. 3: GSM module

The GSM (Global System for Mobile) is used to send/receive messages and make/receive calls just like a mobile phone by using a SIM card by a network provider. It is done by plugging the GSM module into a board and then plugging in a SIM card from an operator that offers GPRS coverage.

3. RF module:

Fig. 4: RF module

An RF module (Radio Frequency module) is a (usually) small electronic device used to transmit and/or receive radio signals between two devices. In an embedded system it is often desirable to communicate with another device wirelessly. This

wireless communication may be accomplished through optical communication or through Radio Frequency communication. For many applications the medium of choice is RF since it does not require line of sight. RF communications incorporate a transmitter and/or receiver.

B. *Helmet unit:*

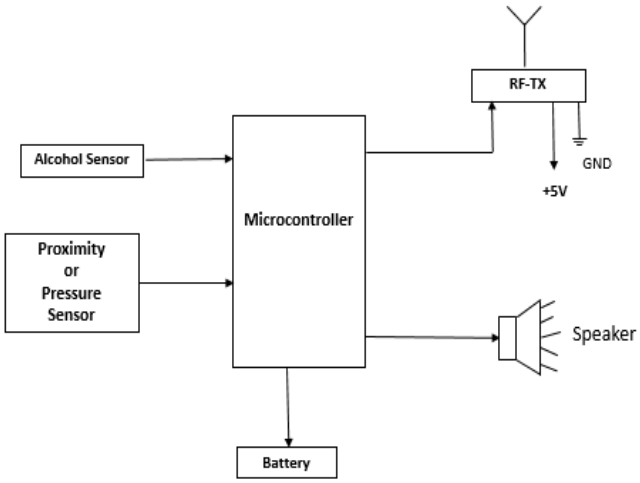

Fig. 5: Helmet unit

1) Proximity sensor (IR sensor):

Fig. 6: Proximity sensor

A proximity sensor [7] is used to sense the presence of nearby objects without any physical contacts. A beam of electromagnetic radiation is emitted by the sensor, and notes the changes in the return signal. The object being sensed is often referred to as the proximity sensor's target. Different proximity sensor [8] targets demand different sensors. The maximum distance that this sensor can detect is defined "nominal range." Some sensors have adjustments of the nominal range or means to report a graduated detection distance.

2) Alcohol sensor module:

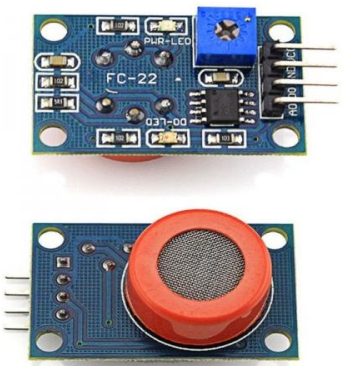

Fig. 7: Alcohol detector

The Alcohol sensor [6] is aGas detection module that detects the concentration of alcohol in a person's breath. It is just like a common breath analyser. It has good sensitivity and fast response to alcohol. The type of gas detected depends on which module you are using. The sensor modules are intended to provide ameans of comparing gas sources and being able to set an alarm limit when the source becomesexcessive.

IV. IMPLEMENTATION

This prototype is designed to improve two wheeler features and its safety during its ride. The entire module provides advancement in terms of fuel details, helmet access, riding without alcohol, and security against fuel or vehicle theft.

The load cell (10Kg) and load cell instrumental amplifier is used to have a detailed information about the fuel present in the vehicle. With the help of load cell, it is possible to display the fuel present in terms of digital values – Alpha-numeric fuel display. The load cell used here is a strain gauge type. The entire measurement of fuel is based on the force applied on the load cell. The force applied is then converted into an understandable digital value using ball mills, electronic amplification and strain gauge. It must be noted that the load cell can be arranged with multiple strain gauges.

Force measurement is as follows. A force is first applied to the mechanical system. Then this mechanical system transfers the force to the strain gauge. Strain gauge is generally an elastic foil. This strain gauge converts the strain or force into an electrical output using an electronic device known as Wheatstone bridge. The electrical output from the strain gauge is generally very small, therefore this electrical output is amplified using an electrical amplifier which make use of an integrated transistor or circuit. The digitally measured output which is w.r.t weight is fed as input to an algorithm in computer. The algorithm converts the weight concerned digital value into a digital value with respect to volume for display action. This measured digital value is the amount of fuel present and is displayed on a LCD display (20x4).

The GPS [10] system present in the vehicle helps to track the vehicle under lock condition against theft. The two wheeler rider is provided with the facility to lock the GPS location of the vehicle during parking. Any variation in the locked GPS location alerts the owner with a message using GSM module. The GSM module with the safe lock system also works against fuel theft. The safety lock system stores the digital value of the fuel at the time of locking and sends an alert message if there is any variation in the fuel level.

Helmet is interfaced with the complete system to monitor its access by the rider and also to monitor the rider's alcohol consumption. Helmet consist of a proximity sensor (IR proximity) placed on the inner side of the helmet in the top portion. This proximity sensor sends a positive signal to the system if the rider wears the helmet which allows the vehicle to start as defined earlier. If the rider does not wear the helmet the vehicle does not start or in other words it remains locked. This proximity sensor also sends a signal if the rider removes his/helmet during the ride. In such condition the vehicle does not stop instead a message is displayed on the LCD display to wear the helmet.

The alcohol sensor (MQ 3 gas sensor) is placed near the mouth within the helmet. The air from the mouth is sensed and the alcohol percentage is calculated. During the sense, if the resistance value drops the voltage value changes which is fed to the comparator. This value is compared with the predefined threshold level (permitted level). If the value exceeds the predefined threshold level, comparator output goes high and the microcontroller takes action accordingly.

The entire communication between the helmet and vehicle part is done using RF transmitter and receiver. Thus starting or stopping the vehicle or also displaying the alert messages on the LCD display.

V. Conclusion

This project thus has additional features for two wheelers that help access the vehicle in a better way. The vehicle has alpha-numeric fuel display which also display the distance that the vehicle could travel using the fuel present. It has locking system which helps overcome theft of fuel and vehicle (by locking the GPS location). The helmet that is interfaced with the vehicle,monitors the rider helmet access and also stop rider riding with alcohol consumption.

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