ARDUINO BASED DIGITAL FUEL GAUGE AND VEHICLE MONITORING SYSTEM

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Abstract-Design and implementation of digital fuel gauge which measures the accurate level of fuel adding while fuel filling process. Now-a-days all fuel bunks having types of digital displays unit in order to display the value of fuel adding to the vehicle. But we don't know whether they adding accurate value or not. By fixing the pressure sensor below the fuel tank, at any point of time it will continuously measures the level of fuel with the help of processor and displays the value in the digital numeric form in the display unit. Hence, the measured values and location of fuel added is sent to the owner mobile through GPS and GSM and vehicle owner is aware of the fuel consumption through SMS services. In this project a system is also proposed to develop a low cost system which provides solution to the existing automotive control issues. This system has seat belt warning system and records the relevant details about a vehicle such as Engine Temperature and detects Alcohol content consumed by the driver with the help of alcohol sensor and temperature sensor. Collision sensors are also provided to detect the accident and through GPS and GSM the location of accident is sent to the owner

Keywords – fuel gauge, GPS, GSM, pressure sensor, alcohol sensor, temperature sensor, collision sensor.

I. INTRODUCTION

A fuel level detector (fuel gauge) is a device inside of a car or other vehicle that measures the amount of fuel still in the vehicle. This type of system can be used to measure the amount of gasoline or some other type of liquid. It will typically consist of a sensing or sending unit that measures the amount of fuel actually left and a gauge or indicator that relays this information outside the fuel container. A fuel gauge can be designed in a number of different ways and many gauges have several flaws that can make the readings less than accurate. The two parts of a fuel gauge are the sensing or sending unit and the indicator or gauge. A sensing unit is the part of a fuel gauge found within or connected to the actual fuel storage container on a vehicle. On a vehicle these days, for example, the sensing unit will consists of a float inside the fuel tank, which is connected to a metal rod that runs to a small circuit. The float raises or lowers depending on the Amount of fuel in the fuel tank.

The fuel level detector presented here digitally displays the level of liquid inside the tanks using pressure sensor and can be used for measuring the level of any other type of liquid. The fuel (liquid) level is automatically detected by the weighing Mass of the liquid by pressure sensor and displaying the output on a Display device (LCD). The input of the system is the weight applied on the pressure sensor. Pressure sensor produces electrical signal corresponding to the weight and the output signal is amplified by the amplifier. The amplified signal given to the ADC which generate digital output given to the microcontroller.

The vehicle accident is a major public problem in many countries, particularly India. Despite awareness campaign, this problem is still increasing due to rider's poor behaviours such as speed driving, drunk driving, riding without sufficient sleep, etc. Therefore, with the help of alcohol sensor, temperature sensor, collision sensor and seat belt sensor, a warning system is developed to prevent vehicle from the accidents.

In 2014 Nitin Jade, Pranjal Shrimali, Asvin Patel and Sagar Gupta developed “modified type intelligent digital fuel indicator system” and achieved an accuracy level of 95% - 98% in measuring the fuel digitally [1].

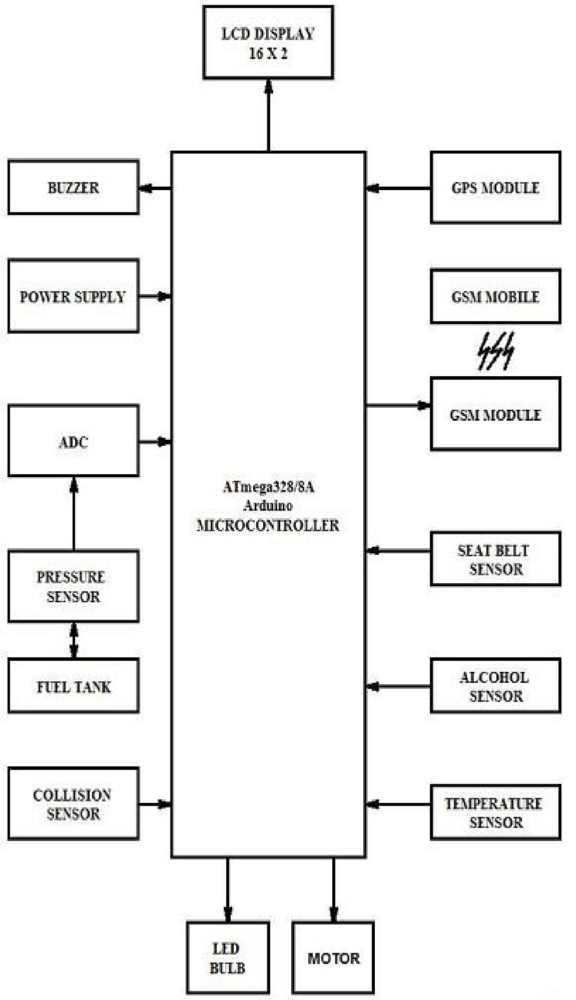
In January 2014 Vinay Divakar developed “Fuel gauge sensing technologies for automotive applications” and achieved a smart fuel gauge system [2].

In April 2013 Jaimon chacko Varghese and Binesh Ellupurayil Balchandran developed “Low cost intelligent real time fuel mileage indicator for motorbikes” and measured the probable distance that can be travelled by the vehicle corresponding to the amount of fuel in the fuel tank can also be estimated [3].

In 2012 Deep gupta, Brajesh Kr. Singh and Kuldeep panwar of H.M.R. institute of technology and management developed “A prototyping model for fuel level detector and optimizer” and achieved the measurement of fuel so the accuracy level was 96.36% - 98% [4].

II. IMPLEMENTATION OF THE SYSTEM

The below figure 1 shows the design of system hardware where it consists of Arduino microcontroller (ATmega328/8A), pressure sensor, ADC, 16x2 LCD display, GPS Module, GSM Module, Temperature Sensor, Seat belt Sensor, Alcohol Sensor, collision sensor, motor and a LED bulb.



Alcohol Sensor, collision sensor, motor and a LED bulb.

Figure 1: Design of system hardware

Initially the microcontroller is initialized and the fuel level in the tank is measured, if the fuel level is low then it is indicated on the display and fuel is filled into the tank and if the fuel is full then the pressure is sensed and the analog value is converted into digital form by the microcontroller and displayed in numeric digital form on the LCD display. After digitally displaying the fuel level in the tank, with the help of GPS and GSM modem the location of fuel filling place is sent to the owner's cell phone to avoid any fraud. Then with the help of seat belt, alcohol and temperature sensors, alcohol content present in driver is measured and wearing of seat belt is authenticated then the engine temperature is measured for nominal degree in Celsius if all these tests are passed by the driver then only the engine of the vehicle can be started. Collision sensors are provided to detect if any accident occurred. If, collision sensor is pressed or ON it indicates accident occurred and sends the location of accident to the owner through GPS and GSM modems and this is shown below.

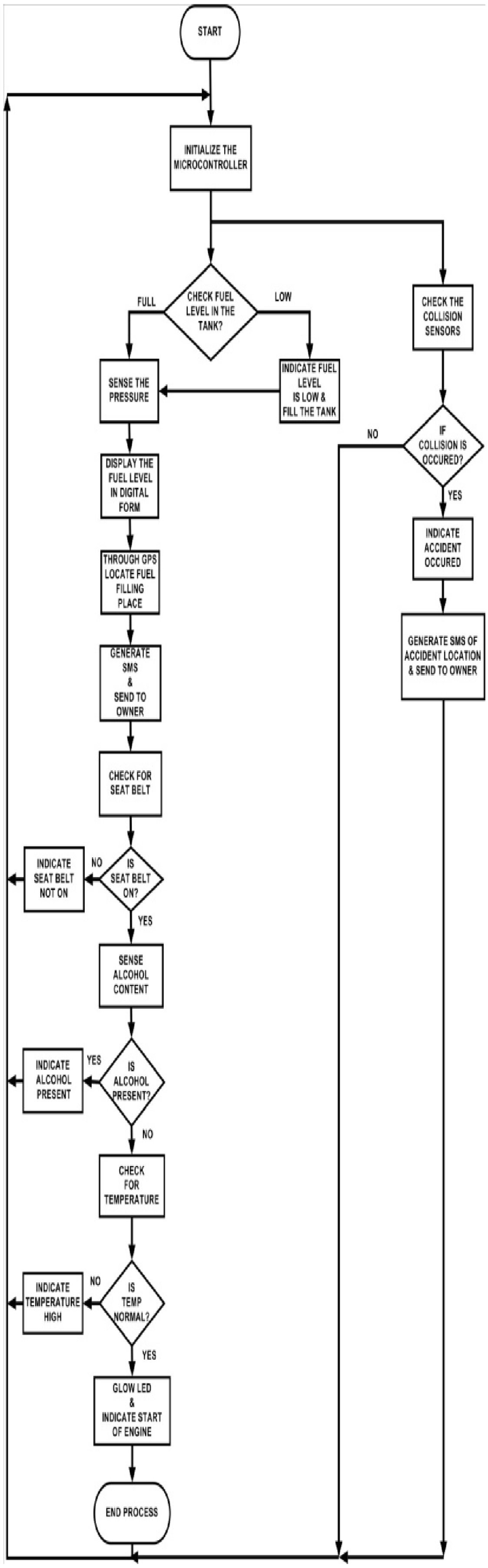


Figure 2: Implementation flow diagram

III COMPONENTS

The main components required for the functioning of the above proposed solution are elucidated below.

A. Microcontroller

The ATmega328 is a low-power CMOS 8-bit microcontroller based on the AVR enhanced RISC architecture. By executing powerful instructions in a single clock cycle, the ATmega328 achieves throughputs approaching 1 MIPS per MHz allowing the System designer to optimize power consumption versus processing speed.

B. Pressure sensor

The MPX10 series devices are silicon piezoresistive pressure sensors providing a very accurate and linear voltage output — directly proportional to the applied pressure. These standard, low cost, uncompensated sensors permit to design and add their own external temperature compensation and signal conditioning networks. Compensation techniques are simplified because of the predictability of Motorola's single element strain gauge design.

C. Temperature sensor

The LM35 series are precision integrated-circuit temperature devices with an output voltage linearly-proportional to the Centigrade temperature. The LM35 device has an advantage over linear Range temperature sensors calibrated in Kelvin, as it is not required to subtract a large constant voltage from the output to obtain convenient Centigrade scaling. The LM35 device does not require any external calibration or trimming to provide typical accuracies of ±¼°C at room temperature and ±¾°Cover a full −55°C to 150°C temperature range. Lower cost is assured by trimming and calibration at the wafer level. The low-output impedance, linear output and precise inherent calibration of the LM35 device makes interfacing to readout or control circuitry especially easy. The device is used with single power supplies, or with plus and minus supplies. As the LM35 device draws only 60 µA from the supply, it has very low self-heating of less than 0.1°C in still air. The LM35 device is rated to operate over a −55°C to 150°C temperature range.

D. Alcohol sensor

MQ303A is semiconductor sensor is for Alcohol detection, It has good sensitivity and fast response to alcohol, suitable for portable alcohol detector.

E. GSM SIM 900

The SIM900 is a complete Quad-band GSM/GPRS solution in a SMT module which can be embedded in the applications. The SIM900 delivers GSM/GPRS 850/900/1800/1900MHz performance for voice, SMS, Data, and Fax in a small form factor and with low power consumption. With a tiny configuration of 24mm x 24mm x 3 mm, SIM900 can fit almost all the space requirements in your M2M application, especially for slim and compact demand of design.

1. SIM900 is designed with a very powerful single-chip processor integrating AMR926EJ-S core.
2. Quad - band GSM/GPRS module with a size of 24mmx24mmx3mm.
3. An embedded Powerful TCP/IP protocol stack.

F. GPS MODULE

The SkyNav SKG13C is a complete GPS engine module that features super sensitivity, ultra low power and small form factor. The GPS signal is applied to the antenna input of module, and a complete serial data message with position, velocity and time information is presented at the serial interface with NMEA protocol or custom protocol. It is based on the high performance features of the MediaTek 3329 single-chip architecture, its –165dBm tracking sensitivity extends positioning coverage into place like urban canyons and dense foliage environment where the GPS was not possible before. The small form factor and low power consumption make the module easy to integrate into portable device like mobile phones, cameras and vehicle navigation systems.

G. LCD

We are using a high quality 16 characters by 2 line display module, with back lighting.

1. 16 Characters x 2 Lines
2. HD44780 Equivalent LCD Controller/driver Built-In
3. 4-bit or 8-bit MPU Interface
4. Standard Type
5. Works with almost any Microcontroller

IV. RESULTS AND DISCUSSIONS

Since in today's real world the fuel level in vehicle (car or motorcycle) is measured analogously, by design and implementation of this project the fuel in the tank of vehicle is measured digitally and displayed on the LCD screen. The pressure sensor present in the fuel tank of the vehicle senses the pressure applied to it by the liquid and the microcontroller internally converts the received analog signal into digital form and displays it on LCD in digital numeric form. Then the GSM module sends the SMS to the owner about the location of fuel added from the received data of GPS module. Then seat belt, alcohol detection and engine temperature test is carried out, if and only if these three tests are passed the motor is started. Collision sensors help in detecting the accident and with the help of GPS and GSM the place of accident is intimidated to the owner of the vehicle.

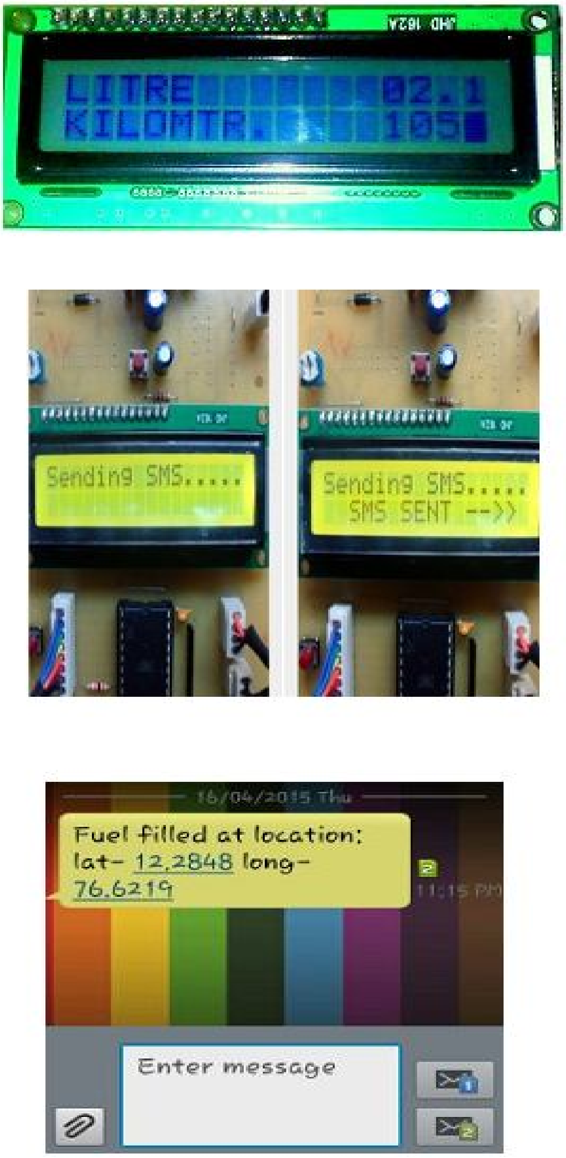


Figure 3: experimental output

CONCLUSION

This project presents a prototype model of Fuel Level Detector. The main component in Fuel level detector is the pressure sensor which generates the signal based on the weight of liquid available in the tank and displays it digitally on the display screen. In the future, the different vehicle company manufacturers will implement this kind of digital fuel gauge system which also provides security for the vehicle owners. Not only will the measurement be more accurate, but, the hard earned money of the consumers also will not be cheated.

FUTURE ENHANCEMENT

Our project can be further enhanced in the future.

1. In case of theft of vehicle, it can be stopped i.e. the engine can be shut down remotely using additional software enhancements.
2. Speed of the vehicle can be limited.
3. Location of the vehicle can be determined at any point of time.

REFERENCES

[1] Nitin jade, Pranjal Shrimali, Asvin patel and Sagar gupta, (2014). “Modified type intelligent digital fuel indicator system”, IOSR-JMCE, e-ISSN: 2278-1684, p-ISSN: 2320-334X.

[2] Vinay Divakar, (2014). “Fuel gauge sensing technologies for automotive applications”, IJARCET, volume 3 issue 1, January 2014.

[3] Jaimon Chacko Varghese, Binesh Ellupurayil Balchandran. April 2013. “Low cost intelligent real time fuel mileage indicator for motorbikes”, IJITEE, ISSN: 2278-3075, volume-2, issue-5.

[4] Deep gupta, Brajesh kr. Singh and Kuldeep panwar, “A prototyping model for fuel level detector and optimizer”, African journal of basic & applied sciences 4 (6): 226-229, 2012 ISSN 2079-2034.

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