International Journal of Recent Technology and Engineering (IJRTE)
ISSN: 2277-3878, Volume-8 Issue-3, September 2019

An Effective IoT based Fuel and Cost Monitoring System

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***Abstract**: As vehicles count increases day by day, the fuel consumption is also increasing. With this tremendous increase in fuel consumption, fuel price is also increasing rapidly. By taking this as an advantage, fuel bunkers are stealing fuel and this cannot be noticed by users because we have no control over the machine. A monitoring system is required to track the fuel level. So, we are proposing a system that helps to indicate the quantity of fuel for the amount we have paid. A petrol level sensor that receives real time information about tank's fuel level is used which is directly connected to the Arduino mega. A webpage is created to get the petrol cost. The page provides the user with an Admin username and password. The petrol cost is updated only through that webpage. Once the petrol cost is updated, then the IOT module used to receive the petrol cost and transmit it to the Arduino mega. For enabling the cost displaying feature, we have to provide a signal to the controller indicating the need for displaying the petrol cost that is to be added. Now once the switch is in pressed state, the 2.4 TFT display is used to display the petrol cost and when the key is denounced, the cost is reset to zero.*

***Keywords** : Petrol level sensor ,2.4 TFT display, IOT, Arduino MEGA.*

I. INTRODUCTION

With the increasing count of vehicles day by day, the fuel consumption is also increasing. We are already aware that motor vehicles display the amount of fuel in the fuel tank by means of some indication like bars running through the E(empty) and F(full) indicators, this specification that each bar maps to the corresponding liters of fuel approximately. Due to this every one of us might have experienced the problem with the improper estimations of the current fuel level in the tank with the existing bars representation system. As the world is getting digitalized, we are representing the fuel level in digitalized form. As fuel prices are rising, there are some issues people are facing about fuel theft at petrol pumps. To avoid this, we are implementing such system which monitors current fuel level by using fuel level sensor, this sensor will collect the information about the amount of fuel added into the tank and give it to the Arduino Mega.

Manuscript published on 30 September 2019
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A webpage is created to upload the cost of the fuel, IOT is used to collect the information from the webpage and give it to the Arduino. According to the values updated in the Arduino the amount of fuel added and the corresponding cost of the fuel is displayed in the 2.4 TFT display.

II. RELATED WORKS

In general fuel level is measured by using sensors but there are many errors associated with it. So, a model [1] has been developed to measure fuel level accurately in which it adopts the threshold, time quantum to get fuel data and errors are corrected by linear interpolation. Another system [2] has been developed which deals with the reliability issues of a diesel-powered fuel cell. The system integrates an auto thermal diesel reformer and a proton exchange membrane. One half of the system contains electronic hardware and other half contains control techniques. Because of this the life time and the dependability of the fuel can be increased.

A system that involves the measurement of speed and acceleration of a vehicle to know the fuel level was devloped. The fuel level estimation is done by data collected from the Oak Ridge National Laboratory. But the accurate level is obtained when the inputs are independent variables. This system is combined with integration microscopic simulator to extend it further to the transportation profession and GPS to evaluate fuel levels in operation field.

In the existing system sensors display the level of petrol inside the petrol tank in analog form which cannot be easily understood by user and also the amount of petrol which is currently added cannot be identified. The cost for the corresponding fuel level added cannot be known by the user, in this way the vehicle users can be easily cheated by the fuel bunkers. So, the proposed system is designed with a goal to overcome all these limitations.

III. PROPOSED MODEL

In this paper we are using Arduino Mega. Here we are using petrol level sensor by which we can easily get the idea that how much amount of petrol we get. This petrol level sensor is directly connected to the Arduino Mega and we use here LCD TFT Display to give the details about the petrol amount in the fuel price fuel. This is connected to the microcontroller. Through the help of the IOT we can get the current rate of fuel. Through this method we cannot be cheated by the fuel bunkers. A web page is created to get the petrol cost. The page provides the user with an Admin username and password. The petrol cost is updated only through that web page. The user needs to enter the credentials to update the petrol cost. Once the credentials are matched, then the user is allowed to update the petrol cost on the web page designed. Once the web page is entered with petrol price, then the IOT module used receives the petrol cost and transmits it to the Arduino MEGA module.

Now as per the cost details received by the Arduino, the cost for the petrol is displayed. For enabling the cost displaying feature, we have to provide a signal to the controller indicating the need for the displaying the petrol cost that is to be added. Now once the switch is in pressed state, it displays the petrol cost. Once the key is denounced, the cost is rest to 0.

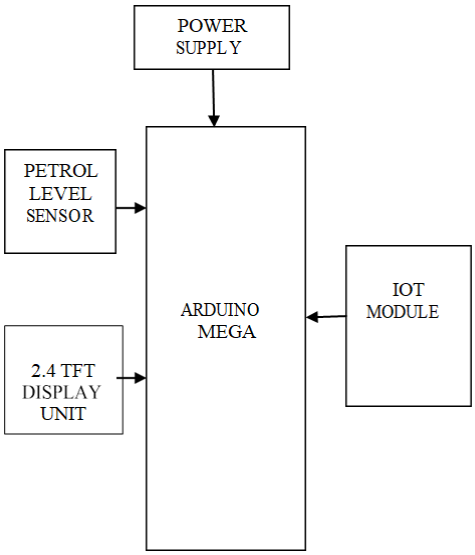

Fig 1: Block Diagram

The hardware components used in the system are as follows:

A. *POWER SUPPLY*

The potential transformer will step down the power supply voltage (0-203V) to (0-6V) level. Then the secondary of the potential transformer will be connected to the precision rectifier, which is constructed with the help of op-amp. The advantage of using precision rectifier is it will give peak voltage output as DC, rest of the circuits will give only RMS output.

B. *ARDUINO MEGA*

Mega 2560-CORE is a small, complete and breadboard-friendly board base on the ATMega2560. So, we can use it as a Arduino Mega2560 development board. In a different place, it lacks only a 6-foot download port and reset switch. Reducing the hardware circuit that can be reduced the power consumption and the cost. Mega 2560-CORE has a matching download line and the other end of the download cable is a USB interface, so it is very convenient for use. External (non-USB) power can come either from an AC-to-DC adapter or battery. The adaptor can be connected by plugging a 2.1mm center positive plug into the board's power jack.

Fig 2: ARDUINO MEGA

C. *TFT LCD DISPLAY*

The most commonly used character-based LCD are based on Hitachi's HD44780 controller or other compatible with HD445580. In this tutorial, we will discuss about character-based LCDs which can give a new look to your application. Most LCDs with 1 controller have 14 pins and LCDs with 2 controller has 16 pins (two pins are extra in both for back-light LED connections).

D. *IOT MODULE*

In internet of things objects are equipped with microcontroller/microprocessor and sensor devices and various software applications. Basically, a little network computer is attached to a thing, allowing information exchange to and from that thing.

E. *PETROL LEVEL SENSOR*

A water level sensor made of plastic floats in the petrol tank to sense the level of petrol and it is connected to the microcontroller. When the petrol tank is full the floating level sensor will reach the top edge which is used to indicate that the petrol is full. In the similar manner, when petrol is low in the tank it reaches the bottom indicating the microcontroller that petrol is low. All the data will be sent to the particular person through GSM which is programmed in our microcontroller.

The software parts used in the systems are:

A. *EMBEDDED C*

Embedded C Programming Language, which is widely used in the development of Embedded Systems, is an extension of C Program Language. The Embedded C Programming Language uses the same syntax and semantics of the C Programming Language like main function, declaration of datatypes, defining variables, loops, functions, statements, etc. Embedded C based on DSP-C allows the design of fixed point data types and named address spaces.

B. *ARDUINO MEGA SOFTWARE*

Extract the necessary files to program Arduino IDE Software. To program Arduino we need to Download the Arduino software in the system (PC), and the programming language used is the Embedded C

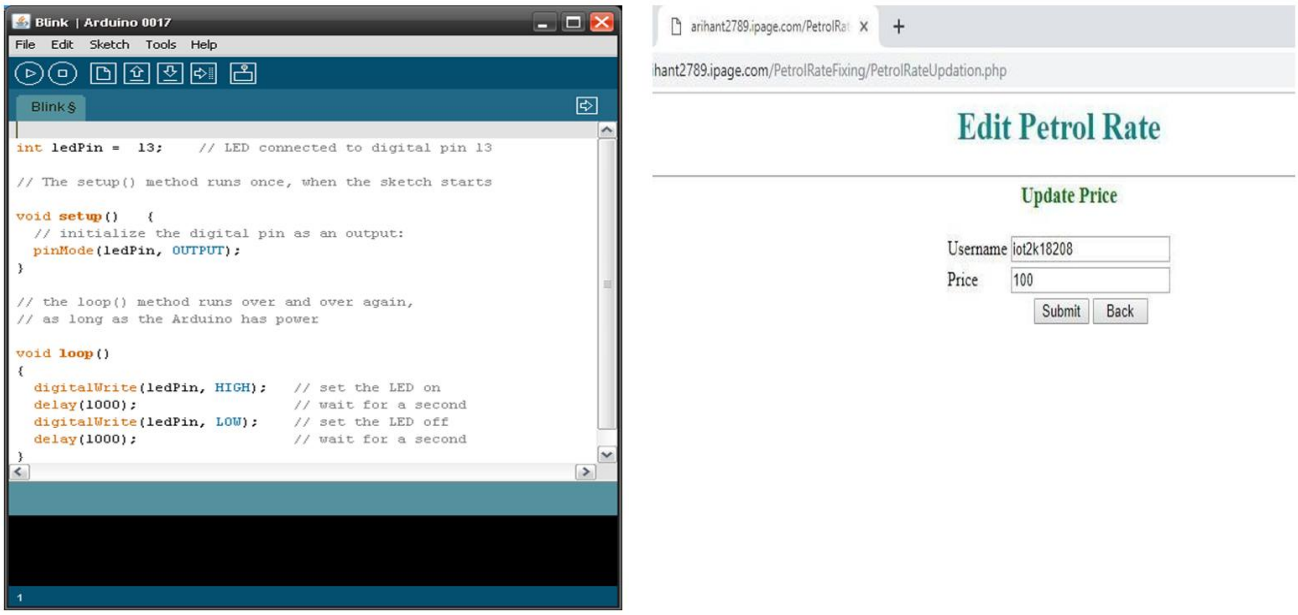

Fig 3: Webpage

When writing a page of memory to the Arduino the Arduino bootloader will erase the existing page and write a whole new page.

In downloading firmware, everything is great as the Erase Address and the loaded Address both start at zero.In writing a user program, we start writing at memory location 0x7000, but the Bootloader erases information starting at location zero because the "Load Address" command doesn't update where to erase.Our modification is to set both the Load Address and the Erase Address so the activity of writing a user program doesn't cause the firmware to be accidentally erased.

Rather than requiring a physical press of the reset button before an upload, the Arduino mega2560 is designed in a way that allows it to be rest by software running on a connected computer. One of the hardware flow control lines (DTR) of the ATmega8U2 is connected to the reset line of the ATmega2560 via a 100 nano-farad capacitor. When this line is asserted (taken now), the reset line drops long enough to reset the chip. This means that the bootloader can have a shorter timeout, as the lowering of DTR can be well-coordinate with the start of the upload.

IV. RESULTS

The government updates the fuel cost in main server. We will create the webpage where we will give our credentials. When we enter all the credentials in the webpage it allows us to know the updated price.

The TFT display in our vehicle will show the fuel cost, total fuel level, fuel filled amount, current filled level and the remaining fuel level.

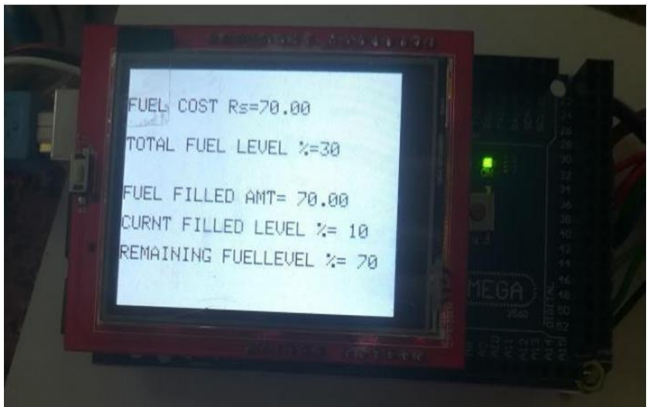

Fig 4: TFT Display

V. CONCLUSION

The final result of the paper is to know the updated fuel cost and to know the amount of fuel added into the fuel tank. In this way the fuel bunker cannot cheat vehicle users. The best advantage of this paper is it shows all the readings in digital form so that the user can easily understand. The fuel price updating will be fast and accurate.

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