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Engineering

# DESIGN OF DIGITAL DISPLAY TYPE FUEL GAUGE FOR AUTOMOBILES

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**ABSTRACT** Now-a-days all of us are using only analog fuel gauge for the intimation of fuel level or quantity of fuel present in the fuel tank. No one is preferring digital fuel gauge to indicate quantity of the fuel. The major problem in digital fuel gauge is fixing of sensor. Controlling of fuel oscillation is not possible still now. That's why everyone is preferring analog fuel gauge. In this project it is focused to overcome these problems and design the digital display fuel gauge for the intimation of the quantity of the fuel present in the tank.

**KEYWORDS :** Arduino UNO, Float sensor, 16X2 LCD display, Fuel quantity, Digital fuel gauge.

## INTRODUCTION

Nowadays, in this modern and fast running world everything is going to be digitalized to be easily understandable and also to give exact calculation in all the over field. People already aware that modern vehicles display the amount of fuel in the fuel tank by the means of analog indicators, which oscillates between E (empty) and F (full) at its extreme ends or by digital bars running through E (empty) and F (full) indicators. A digital fuel gauge is an instrument used to indicate the quantity of fuel inside a tank, commonly used in most motor vehicles. Vehicle user could not be able to know that how much fuel is present in the fuel tank. We can get only approximate level of fuel. So this problem is taken into consideration in this project work for developing the Digital (numerical) display type fuel indication system for automobiles which shows exact quantity of fuel in terms of litre or millilitre. This project is to monitor the level of the fuel in the vehicle fuel tank and to indicate the fuel quantity information digitally in numerical value through LCD display. This paper address the digital type display fuel gauge for automobiles.

## LITERATURE SURVEY

[1] Said that in recent day's world has become digitized, if we make fuel meter in the vehicle also digital it will help to know exact amount of fuel present in fuel tank. In their Project they made digital fuel meter. Here, they are indicating amount of fuel present in tank digitally. That value is in numerical digits (ex: 1lit, 1.5 lit, 2lit etc).Fuel thefting is also measure problem all over the world. In their project whenever there is fuel thefting, due to the noise of burglar alarm people are aware of the fuel thefting and also during fuel thefting a text message delivered on mobile to the owner of the bike. This is real time occurring process. The previous vehicle system don't have such a functionality that there is no display gear level whatever may be the condition though the bike is running or not. Disallows any new person on bike to adjust the gear level. But in their system they can overcome above problem by using digital meter which show the gear level in steady state or running state of vehicle.

[2] It's found out that a proper solution for indicating the accurate availability of fuel in the tank digitally. A sensor and a microcontroller is used to find out the fuel level which is economic and also accurate. This paper focuses on the study of various fuel level measuring sensors suitable for their project. Some issues with respect to the existing level measurement techniques are identified and so a better alternate digital sensing technology has been suggested, described and justified.

[3] Said that in the present work, a study has been made to analyze the fuel measurement technique. This study reveals about the fact that as a customer what they are getting in terms of fuel quantity is less than what they are paying for it. This study focus on the problem related to existing methods for fuel measurement and future scope of improvement.

[4] Said that they don't get the exact amount of petrol as shown by the filling machine. The amount of petrol they get is somewhat less than the amount we should actually get. In today's modern and digital world, if the fuel indicator in the vehicles is made digital, then it will help us to know the exact amount of fuel available/filled in the tank. The above fact is considered as their project. The exact amount of fuel available in the tank will be displayed digitally by making the use of Ultrasonic sensor. The ultrasonic sensor is a non-contact sensor, with low power requirement and good accuracy. It overcomes the problems faced by other gauges and is suitable for the non-contact measurement of the fuel inside the tank. This project mainly concentrates on the digital indication of fuel in vehicle's tank

[5] Said that today's world need digital techniques for measurement of any quantity conventional fuel meter are analog so that they are trying to make it digitized to show the fuel value digitally. In their project they show the amount of fuel present in fuel tank digitally i.e. 1lits, 1.5lits, 2lits etc. Also fuel theft is measure problem in all over world. In our project if fuel gets theft then text message will send to owner of bike also buzzer makes noise so that owner of bike get aware. In traditional vehicle system such kind of system not implemented like display fuel availability digitally & fuel theft of bike can be avoided.

## DEVELOPING PROTOTYPE

### ARDUINO UNO:

In this project Arduino UNO is used as a mother board. It is also act as microcontroller. All input signals and output signals are through Arduino UNO board is shown in figure 1. It needs 5V supply and the supply from the laptop is more enough for the power supply. The board is investigated with the supply voltage of 5V from the laptop.

- The A0 pin act as the input signal for the total circuit from the sensor to the LCD display
- 5V pin is connected to the positive of the LCD (2nd pin) display
- 3.3V pin is connected with the positive of the sensor interface
- Gnd pin is connected with the negative of the sensor interface
- Another Gnd pin is connected with the common Gnd of the LCD (1st, 5th, 16th pin) display
- The pin 12, 11, 5, 4, 3, 2 is connected with the LCD display


**Figure 1. Arduino UNO**

**FLOAT SENSOR:**

Sensor used in this project is a "Variable Resistor" which the value is 100Ω is shown in figure 2. For this variable resistor 100Ω resistor is used in sensor interface board. The float sensor is having two terminals positive and negative. Both the terminals are given to the sensor interface board.

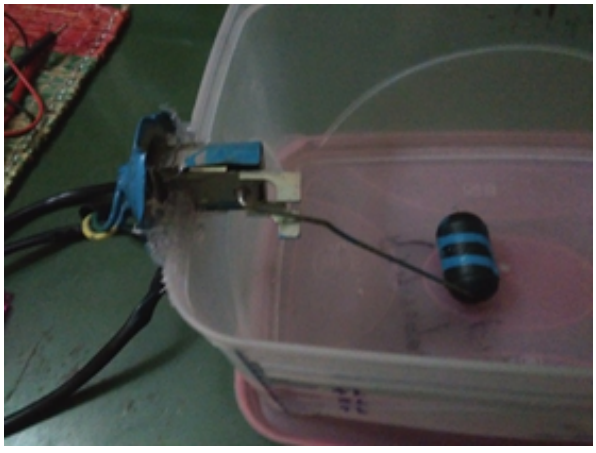

**Figure 2. Float sensor**

**Sensor interface:**

The sensor interface will help to calibrate values from the variable resistor by varying the resistance by the action of float. From the sensor interface three terminals are taken and given to the Arduino UNO is shown in the figure 3. The three terminals are positive, negative and input signal. The positive terminal is connected with the 3.3V pin in the Arduino UNO. The negative terminal of the sensor interface is connected with the ground (Gnd) of the Arduino UNO. The input signal from the sensor to the Arduino through the sensor interface is connected to the A0 pin of the Arduino UNO

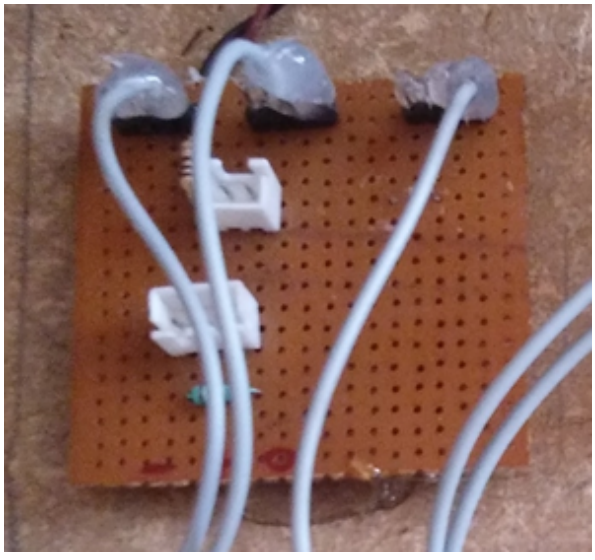

**Figure 3. Sensor interface**

**LCD DISPLAY:**

16X2 LCD is used in this project is shown in the figure 4. It mean 16 column and 2 row display. The pin description is shown in the table 1.


**Figure 4. LCD display**

**Table 1:**

| Pin no. | Function | Name |
|---|---|---|
| 1 | Ground (0V) | Ground |
| 2 | Supply voltage; 5V(4.7V – 5.3V) | $V_{CC}$ |
| 3 | Contrast adjustment; through a variable resistor | $V_{EE}$ |
| 4 | Selects command register when low; and data register when high | Register select |
| 5 | Low to write to the register; high to read from the register | Read/write |
| 6 | Sends data to data pins when high to low pulse is given | Enable |
| 7 | 8-bit data pins | DB0 |
| 8 | | DB1 |
| 9 | | DB2 |
| 10 | | DB3 |
| 11 | | DB4 |
| 12 | | DB5 |
| 13 | | DB6 |
| 14 | | DB7 |
| 15 | Backlight $V_{CC}$ (5V) | Led+ |
| 16 | Backlight ground (0) | Led- |

**Variable resistor:**

The 10 K variable resistor is used in this project is shown in the figure 5.The purpose of the variable resistor is for the adjustment of the LCD brightness. Based on the environment and day light, the brightness of the display can be adjust manually. The resistor is having three terminals. One terminal is grounded (Gnd). The second terminal is connected with the supply voltage (5V) in the 2nd pin of the LCD. The third terminal is connected with the 3rd pin of the LCD display.


**Figure 5Variable resister**

**WORKING MODEL:**

The float sensor (Variable Resistor) is attached to the sensor interface. The float get vary when the container or fuel tank is filled with the fuel or fluid. That variation will results in varying the resistance inside the sensor from +100Ω to 100Ω. The calibration taken between these variations. At initial level the value is said to be zero. The capacity of the container or tank used in this project is 5 litre. The first 1.5 litre fuel is considered as reserve. Untill 1 litre the LCD display only as reserve and the remaining fuel will be indicate by "#" symbol. The sensor is connected with the sensor interface board. It will act as an analog to digital converter. The variation from the sensor to the Arduino is through this sensor interface. The input signal from the sensor interface is given to the Arduino board by the pin A0. The pin A0 receives the signals. To make this A0 pin as an input signal it is necessary to mention this pin and its function in the program. The program for the Arduino should write in the Arduino software. This software helps to identify the error before execution of the program. After error has been checked the program will uploaded to the Arduino through Arduino cable. During testing the supply voltage of 5V is also given through the cable. Initially a calibration should be done by taking maximum and minimum value that has been taken for each and every 500ml of the fuel or fluid through the Arduino software. These values are coded in the program for the output. The Arduino itself consider if the resistance value of the float is between these two values (i.e. Maximum and

minimum values) the output will be calibrated value. In this project the calibration is the main part and it plays a vital role for displaying the output. The Arduino is connected to the 16X2 (column & row) LCD display. The change in sensor float will results in the LCD as an output. The LCD is programmed in order to display E (empty) in first column and first row and F (full) in last column and first row. The remaining segments is to display the fuel quantity in analog. In second row it will display as FUEL=xxxxml and whether the fuel tank is empty or reserve or full.

## RESULTS

In this generation a technology has been improved in all the fields. Since we are using an analog digital display for fuel indications. Even a modern vehicles also using the analog gauge. To know the exact quantity of fuel present in the fuel tank an experiment has been made and the output has been successfully taken. In this a display displays the quantity of fuel accurately. This is happens because with the help of Arduino UNO board and float sensor.

Initially one litre of water is poured in a container, the sensor senses and the LCD displays "FUEL= 1 LITRE RESERVE" is shown in the figure 6.

Then again one litre of water is poured. Now the total quantity of water in a container is two litre. The sensor senses and the LCD displays "FUEL= 2 LITRE" is shown in the figure 7.

The above said procedure is repeated upto five litre of water. The LCD displays the quantity of water like "FUEL= 3 LITRE/4 LITRE" is shown in the figure 8 & 9. For five litre of water the LCD display as "FUEL= 5 LITRE FULL" is shown in figure 10.

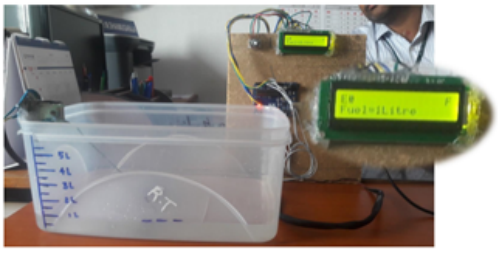

**Figure 6. Display at 1 litre**

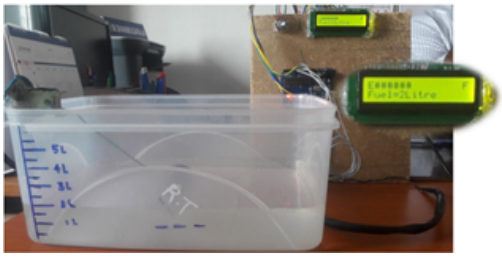

**Figure 7. Display at 2 litre**

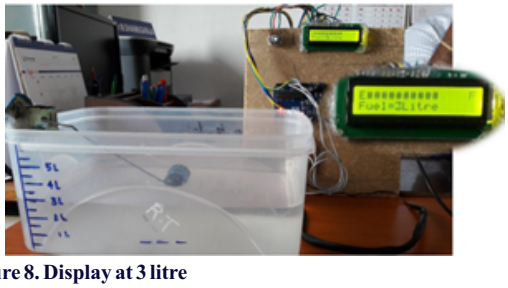

**Figure 8. Display at 3 litre**

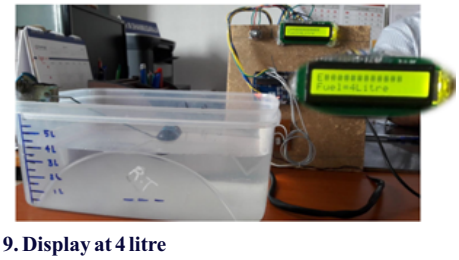

**Figure 9. Display at 4 litre**

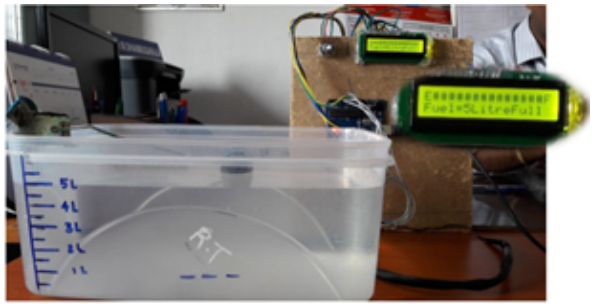

**Figure 10. Display at 5 litre**

## CONCLUSION

This project focus on digital display for fuel level indication. The sensor gives the input signal for Arduino and display displays the fuel quantity in numerical value. In future a vehicle manufacturer has been decided to implement this type of digital fuel gauge in a vehicle. It is safety for vehicle owner and they will be aware of fuel quantity present in the fuel tank.

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