

Sensors Based Automotive vehicle for the detection of fuel level



Puneet Kalsi, Harpreet Singh

Abstract: Structure and usage of computerized fuel check which estimates the precise dimension of fuel including while fuel filling process. Presently a-days all fuel bunks having sorts of advanced presentations unit so as to show the estimation of fuel adding to the vehicle. In this paper we have proposed a method to quantify the measure of fuel accessible in tank. This framework carefully shows the dimension of fuel inside the tank by utilizing ultrasonic sensor and fuel flow sensor and these sensors are interfaced with an advancement board-Arduino. In this manner, it is an effective framework to distinguish the fuel volume in the fuel tank, to get quick perusing of fuel volume and to stay away from oil burglaries at the different oil siphons at the time of filling of tanks. In addition, if the vehicle is given to colleague to fill the fuel and to use that for some distance, this paper identifies that whether the vehicle is used for particular distance or the fuel that is already in tank is used by the colleague.

Index Terms: Arduino, Fuel Flow Sensor, Liquid Crystal Display Screen, Ultrasonic sensor

I. INTRODUCTION

Automobile vehicles use fuel as a fundamental wellspring of vitality. Numerous advances, over some stretch of time have been developed for legitimate effective utilization just as for anticipating and precisely closing the fuel outfit at each phase of its utilization in any framework. Flowmeters are utilized in liquid frameworks to show the rate of stream of the liquid. They can likewise control the rate of flow if they are outfitted with a flow control valve. There is a great deal of news in regards to the oil siphon fakes which prompts defilement. There is distinction between the measure of fuel showed on the meter and the fuel filled in the tank. A large portion of the occasions the fuel filled is not exactly the shown value. This is a direct result of the game plans made in the filling machine which prompts the advantage to the proprietor. In the event of simple showcase client can't discover the exact estimation of the rest of the fuel. By thinking about this reality, we have planned a computerized fuel level pointer which will be of extraordinary significance to maintain a strategic distance from fuel robberies on the oil siphons. Although contactless techniques are more muddled than contact techniques, there are various types of sensors accessible for the fuel estimation. We have utilized an Ultrasonic sensor for the count of the remaining fuel.

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II. LITERATURE SURVEY

Author [1] has explained that amount of fuel present in tank is made digital which display the value on the screen. The sensor that is used to detect the amount of fuel in tank is ultrasonic sensor.

Author [2] proposed the work that are various measurement techniques to know the amount of fuel. The method that is used by this author is with the help of ultrasonic sensor to know amount of fuel present in tank. There are different impacts that influence the return signal. Things like powders, overwhelming vapors, surface disturbance, froth and even surrounding clamor can influence the returning sign.

Author [3] showed the microcontroller based system is progressively precise contrasted with the customary strategy yet at the same time needs exactness because of fuel sloshing in the tank except if drift sensor is aligned as for the size and bends of the tank.

This paper centers around making a computerized showcase of the careful measure of fuel contained in the vehicles tank and further more helps in cross check the amount of fuel filled at the fuel bunk with the goal that the clients can't be conned as they cross check the amount of the fuel. Also, consequent extra highlights are added to the framework to help the drivers which upgrade the similarity of the framework. A fuel amount estimating unit is planned with the goal that precise measure of fuel is known to the driver.

This paper also show that if we give vehicle to our colleague, then it fills the fuel at petrol pump and used the petrol that is already in tank by travelling more distance, the digital screen display the reading in negative which shows that how much petrol is used by that person which is already in petrol tank.

III. METHODOLOGY

In this project, fuel measurement system is designed that detect the level of fuel in vehicle tank. The fuel that is entered to the tank flows through by using the flow meter. The flow meter sensor measures the exact value of fuel that is flows through that sensor when the fuel is filled in petrol pump. The level of the fuel in the tank is measured with the help of ultrasonic sensor. The ultrasonic sensor transmits the sound waves, these waves strikes the fuel and reflect back the echo. The duration of the sound waves is converted into distance as the speed of sound waves is 343m/s. The formula that is used to calculate the total distance is given as:

Total distance = (343 x Time of echo pulse)/2.

The distance is divided by 2 as the signal first transmit and then reflects back to the sensor module. Then the distance is converted into liters with the help of calibration method.



The LCD screen shows the reading of the total petrol in tank and the reading of fuel that is consumed by the vehicle more than that which is filled at petrol pump. The fuel that is consumed which is already in tank is indicated by negative value. As the more fuel is consumed that is already in tank, the negative value rises accordingly.

IV. EXPERIMENTAL PROCEDURE

For this experimental setup, the basic components that is used are described below:

A. Arduino Uno (ATmega328): Arduino Uno is a microcontroller board dependent on 8-bit ATmega328P microcontroller [4]. Alongside ATmega328P, it comprises different segments, for example crystal oscillator, serial communication, voltage regulator and so on to help the microcontroller.

B. Ultrasonic Sensor: HC-SR-04 has an ultrasonic transmitter, collector and control circuit [5]. In ultrasonic module HCSR04, we need to give trigger heartbeat, with the goal that it will produce ultrasound of recurrence 40 kHz. In the wake of creating ultrasound for example 8 beats of 40 kHz, it makes reverberation stick high. Reverberation stick stays high until it doesn't recover the reverberation sound. So, the width of reverberation stick will be the ideal opportunity for sound to make a trip to the article and return back. We can compute separate, as we probably aware the speed of sound. HCSR04 can make the grade regarding range from 2 cm - 400 cm.

C. Fuel Flow Sensor: This sensor sits in line with water line and contains a pinwheel sensor to measure how much liquid has moved through it. There's an integrated magnetic hall effect sensor [6] that outputs an electrical pulse with every revolution. The hall effect sensor is sealed from the water pipe and allows the sensor to stay safe and dry. The sensor comes with three wires: red (5-24VDC power), black (ground) and yellow (Hall effect pulse output). By counting the pulses from the output of the sensor, we can easily calculate water flow.

D. LCD Display: LCD (Liquid Crystal Display) screen is an electronic module and locate a wide scope of uses. A 16x2 LCD screen [7] is extremely essential module and is ordinarily utilized in different devices and circuits. A 16x2 LCD implies it can show 16 characters for every line and there are 2 such lines. In this LCD each character is shown in 5x7 pixel matrix.

V. BLOCK DIAGRAM

The block diagram of the project shows that two sensors ultrasonic and fuel flow sensor placed in fuel tank. The output of the sensors is given to the Arduino Uno microcontroller which evaluates the data and the output of it is shown on the LCD display. LCD screen display the total fuel in tank and relative balance of fuel which is used by the colleague. The block diagram is shown in fig. 1.

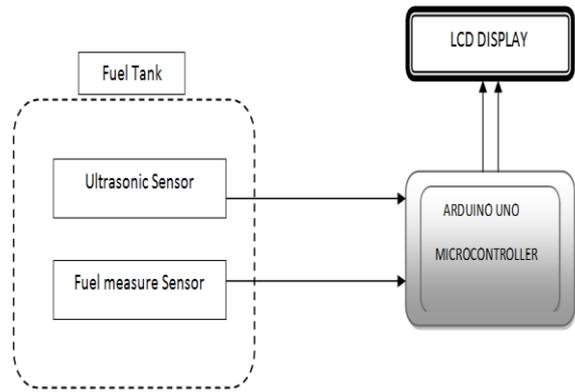


Fig. 1: Block Diagram of fuel level detection

VI. FLOW CHART

The below flow chart shows the actual process of the system how the values are calculated.

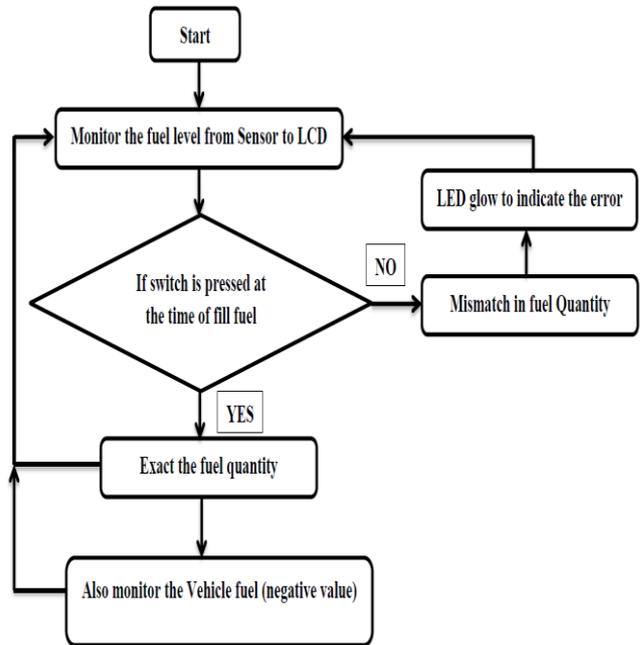


Fig. 2: Flow Chart of the system

VII. CIRCUIT DIAGRAM

Fuel flow sensor and ultrasonic sensor are interfaced with the Arduino to display on the screen the volume of fuel in tank.

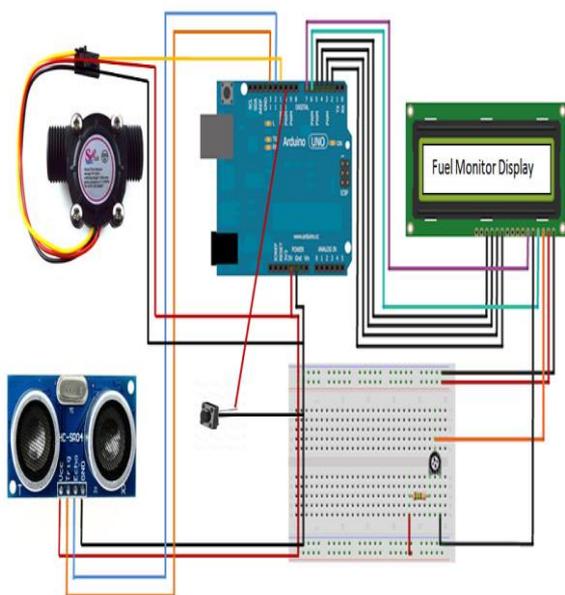


Fig. 3: Circuit Diagram of the project

VIII. IMPLEMENTATION SETUP

This system contains two sensor module that are fuel flow sensor and ultrasonic sensor. Fuel flow sensor is placed at the inlet of the fuel tank through which the fuel is entered when filled at the petrol pump. When any person takes the vehicle from you for its use, then this project is implemented.

Firstly, when the push button is pressed, the battery gives the supply to the Arduino board and sensors. Fuel fill at the petrol pump is entered through the fuel flow sensor which gives the reading of petrol actually filled in tank which will not give the chance of petrol bunks to cheat with the customers. The reading is shown to the customer at the front panel of the vehicle on the LCD screen. The fuel that is already in the tank is sensed by the ultrasonic sensor and show on the screen. If the fuel that is already in tank is consumed by the vehicle then the negative reading of fuel in liters is shown on the screen.

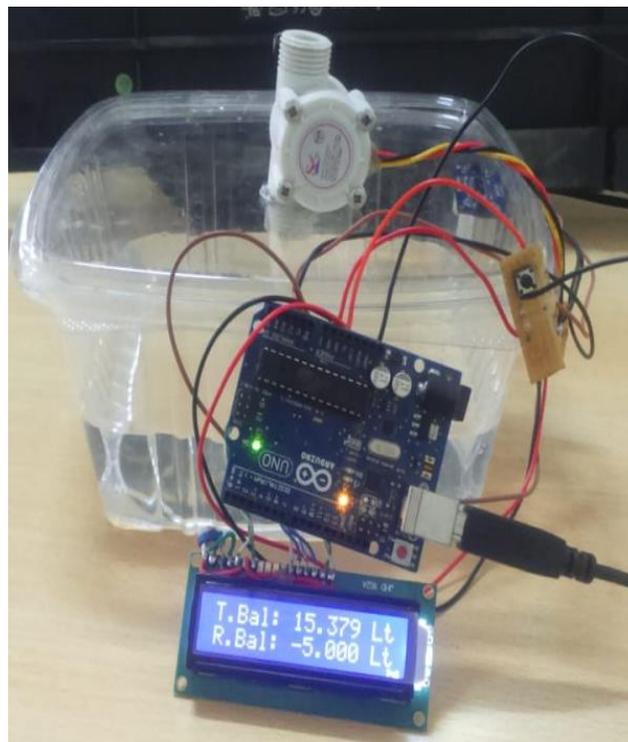


Fig. 4: Implementation of the fuel detection system

IX. CALCULATIONS

When handover the vehicle to colleague, the pushbutton is pressed, this shows the total fuel in tank of the vehicle and also calculate the volume of fuel consumed that is filled at the petrol pump.

Present fuel in vehicle = X
 Fuel filled by Colleague = Y
 Total Fuel in Vehicle = Z
 If (SW = 1); Pushbutton is pressed

```
{
    Constant C = X
}
```

Z = Y + C

C = Z - X

Calculations of fuel that is detected from the sensors is shown in Table I.

Table I: Readings of the sensors and calculations

S. No.	Total fuel level in tank(Lt)	Distance from Ultrasonic sensor(cm)	Previous fuel level	Fuel at petrol pump (when switch pressed) = Y(Lt)	Z=	Vehicle handover to another person
			#NAME? (Lt)		X+Y	Y = Z - X
1	0.5	9.5	12	0.5	12.5	Depend upon the fuel level may be positive /negative value
2	1	9	12	1	13	
3	1.5	8.5	12	1.5	13.5	
4	2	8	12	2	14	
5	2.5	7.5	12	2.5	14.5	
6	3	7	12	3	15	

7	3.5	6.5	12	3.5	15.5
8	4	6	12	4	16
9	4.5	5.5	12	4.5	16.5
10	5	5	12	5	17
11	5.5	4.5	12	5.5	17.5
12	6	4	12	6	18
13	6.5	3.5	12	6.5	18.5
14	7	3	12	7	19
15	7.5	2.5	12	7.5	19.5
16	8	2	12	8	20
17	8.5	1.5	12	8.5	20.5
18	9	1	12	9	21
19	9.5	0.5	12	9.5	21.5
20	10	0	12	10	22

X. RESULTS

The experimental setup of the system shows that the total fuel in the tank of the vehicle is given by the ultrasonic sensor. The total fuel is the sum of the previous fuel and the fuel that is filled at the petrol pump. The readings of the fuel in the tank goes negative when the fuel that is already in the tank is consumed by the colleague for travelling some more distance.

XI. CONCLUSION AND FUTURE SCOPE

With the use of fuel flow sensor and ultrasonic sensor beneficial results came over the regular fuel level measurement. All the reading regarding the total fuel in tank, fuel through the flow meter and the fuel that is consumed by the vehicle which is already in it is shown in front of dash board. This paper depicts that there is no chance of petrol pump thefts who fills the petrol less than that display on the meter. One additional advantage of this paper is to know about the fuel consumed that is already in the vehicle when the vehicle is given to the other person. The whole framework is progressively practical and solid. In the future scope there is possibility to send all the detail of the fuel to the owner and will also track the location.

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