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FUEL LEVEL CALIBRATION USING WIRELESS SENSOR NETWORK

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Abstract: **Due to increasing number of fuel thefts and fuel machines having chips installed in them so wrong reading of petrol filled can be displayed, the customer always gets cheated in this process. Whenever a customer fills fuel he takes help of the machine showing the reading and has to rely on it. We are making a project in which a sensor will show the exact count of the petrol that will be filled in the petrol tank and also the readings will be shown on the spot in a tabular format for the ease of the customer. The data will be stored on a cloud based database storage area. Two sensors and one Arduino circuit is being used in the proposed system**

Keywords: Petrol Level, IoT, Ultrasonic, flow level, GUI, LED display, fuel tank

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I INTRODUCTION

Due to the fast growth of automobile industry and the fuel level estimation and its indication is very much required to make known the vehicle owner about the total distance it can cover. Thus the requirement of fuel level management becomes more important. The system has to be robust, effective and durable. The proposed system will show the exact calibrated value which will prevent the customer from fraud. Algorithms and embedded system along with some coding and testing along with hardware helps in achieving this. Involvement of (Machine to machine) communication helps in providing the information to the user within his/her reach (i.e. data can be transported to user smart phone). This paper aims at the system which can highlight the issues like showing the exact fuel level information on the spot which can also be transferred to the user's phone. To achieve the set goal a system is developed using a system comprising microcontroller, sensor and display unit.

II LITERATURE SURVEY

Working of the existing system.
As used in vehicles, the gauge consists of two parts:

- The sensing unit which is present in the tank
- The indicator which is located on the dashboard

    A potentio meter is usually used by the sensing unit which uses typically printed ink design in a modern automobile. As the tank gets empty, the float drops and also slides a moving contact along the resistor, thus the resistance in total is increased. In addition, when the resistance is at a certain point a light indicating 'low fuel' is turned on which in turn tells that the fuel level is lower than what it was earlier The fuel sensors used were called magneto resistance, now becoming common in small aircraft applications, offer a potential alternative for automotive use. These fuel level sensors work similar to the potentiometer example, although a sealed detector at the float pivot helps in determining the angular position of a magnet pair at the pivot end of the float arm.

Figure 1: Existing Fuel Gauge Mechanism

These are highly exact and accurate, and the electronics used are completely outside of the fuel. The nature of these sensors which is non contact nature address the fire and explosion hazard, and also the issues related to any fuel combinations or additives to petrol or to any alcohol

fuel mixtures. The sensors with type magneto resistance are suitable to all kinds of fuels including LPG and CNG. The fuel level output for these senders can be of type ratio metric voltage or preferable can be digital. The sensors also are fool proof in the way that they either provide a level output or nothing.

III PROPOSED SYSTEM

A. Sensor Mechanism and Formula

The level of the fuel can be exactly sensed using a fuel level sensor, which should be robust and strong enough to work during mechanical shocks. The conventional step for fuel level estimation is to mount a float-arm assembly to either a resistive, capacitive or inductive sensor which is finally digitized using an analogue to digital converter. But the calibration done using float-arm based assembly is not absolute. Thus, to avoid the errors and to capture the data from the fuel tank two sensor mechanism logic can be followed

*Flow Rate (Litres/hour) = (Pulse frequency x 60 min) / 7.5Q

* Pulse frequency (Hz) = 7.5Q, Q is flow rate in Litres/minute

In other words:

*Sensor Frequency (Hz) = 7.5 * Q (Litres/min) litres = Q * time elapsed (seconds) / 60(seconds/minute)

*litres = (Frequency (Pulses/second) / 7.5) * time elapsed(seconds)/60*litres = Pulses / (7.5 * 60) Once the flow started, application will start. [2]

B. Hardware and Software Details

Hardware:

- Arduino Microcontroller
- RAM: 4GB or more
- Ultrasonic sensor
- HCSRO4 Sensor.

Software:

- WAMP Server version 2.2
- Windows Operating System.

C. Scope of the project

The scope of the project is that in the future fuel thefts can be prevented also the customer filling the fuel will come to know the exact amount of petrol filled also in the future the project can so be used modified so that it can tell us the exact mileage a car can run . [4]

IV COMPARISON BETWEEN EXISTING AND PROPOSED SYSTEM

A. Existing System

In the current existing system the customer does not get the total exact amount of fuel. We don't get fuel count that is the flow rate. Petrol theft is a very high possibility. The existing system is being used since past so many years and no innovation has been made. In the existing system, the customer has to rely on petrol filling system (machine)and the fuel indicator and hence does not get the exact amount of petrol that has been filled

B. Proposed System

In the proposed system we get the exact amount of petrol that has been filled in the petrol tank. We also use the flow rate sensor which helps to measure the flow rate at which petrol is being filled. There is no chance of fuel theft. Two sensors used are flow rate sensor and float rate sensor which give output on a led device which has a user-friendly interface for the better understanding of the customer.

Table 1: Existing System v/s Proposed System

Existing System	Proposed System
The customer does not get the exact count of fuel.	We get the exact count of petrol that has been filled in the petrol tank.
We don't get fuel flow rate	flow rate sensor is also used by us which helps to measure the flow rate at which petrol is being filled.
Petrol theft is very high possibility.	Petrol theft is not a possibility
The existing system is being used since many years and no innovation has been made.	The proposed system is fairly new and innovative which helps you give the exact measurement

The main purpose of IoT based fuel level detection sensor is to provide exact amount of fuel which is currently present in the container.

- We can cross check how much fuel is deposited.
- We can also check total amount of fuel we have deposited.
- Instant Notification.
- The proposed system will make sure that how much amount of fuel is exactly deposited to avoid loss of amount of money.

V METHODOLOGY
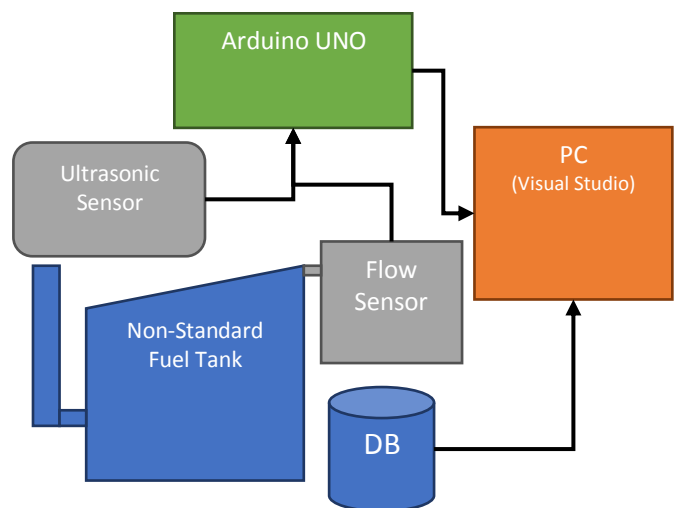
Figure 2: Block Diagram of Proposed System

Following is the working:

1. The Flow rate sensor and Ultrasonic level sensor together will measure the data and feed to Arduino Microcontroller
2. Arduino Uno will measure the analogue value and will convert it to digital value
3. The digital value will be transmitted to PC and will need authentication and displayed in real time in tabular format
4. The data will also be recorded in database
5. The database can be opened with the help of unique id and password to view the details of the recordings
6. The screen located at the dashboard can be used to view the real time data

VI DESIGN DETAILS
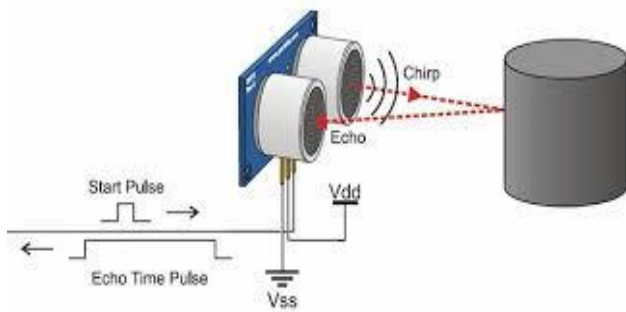
Figure 2: Working of Ultrasonic Sensor

In the design used to make the proposed system, the sensor which is ultrasonic in nature is placed at the top most level of the tank from which it can measure the level of the tank. The working of the sensor includes a transmitter which emits rays and it detects the level of the liquid present in the tank and the rays hit the liquid level and are thrown back. The rays are received by the receiver and the data is collected by the sensor. The technique used by the sensor in doing all this work is called pzeu electric technique. The data is collected by the arduino uno circuit board and stored in cloud based database and the data is displayed on the LED Display or any computer or any Smartphone having the link to the website. Every user gets his unique id and password which is used by him to access the data

VII RESULTS
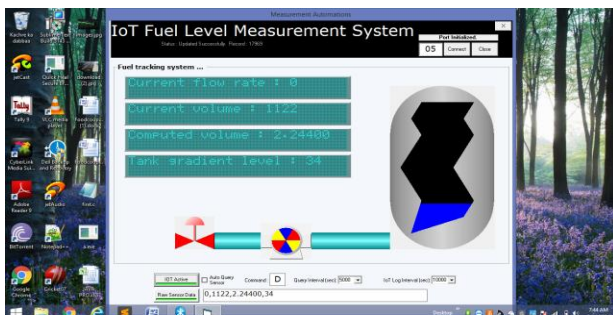
Figure 3: Screenshot of readings taken in demo

The proposed project work has aimed for developing a feasible cost automation technique to measure the fluid level and its quantity. We can achieve least possible error and maximum accuracy in the measurement. We are designing a system which digitally displays the level of liquid inside the tank. Thus, it is an efficient device made by keeping in mind the petroleum thefts at the various petrolpumps

.*Figure 4: Login Page for accessing the data*

Figure 5: The data is visible in tabular format

After successfully logging in the database. One can view the data of the petrol levels filled in a tabular format. One can also download the data in Excel format in one click of the button given o the homepage.

VIII CONCLUSION

Many applications look small, but have a huge application in real-time systems. One of this is the proposed system .Human race is developing new technologies day by day, for many purposes such as entertainment, health care, engineering and many more. But with advancements comes a demerit side of the technologies which are supposed to be put in use for good. Usually, vehicles show the level of fuel using a pointer against numbers. But there is no precise data available about the amount of fuel filled. The proposed system will make sure that how much amount of fuel is exactly deposited to avoid loss of amount of money. System implementation will be done by using flow sensor and mobile. You can see the level while filling the fuel, but one cannot blindly trust any gas station meter, since it can be altered as well. For this, the proposed system is the best solution. It not only shows the level of fuel in your vehicle in precise digits, but also is a very reliable system on which, the customer can trust.

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