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FUEL MONITORING SYSTEM FOR VEHICLES USING IOT TECHNOLOGY

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Abstract—In this rapid changing world, it is difficult to monitor and collect the data of fuel flowing inside the fuel tank and maintain all the records. It can be overcome with the help of this fuel monitoring system we can monitor and keep records of the fuel filled in the fuel tank. This is done through remote monitoring. This type of system is used to measure the quantity of petrol, diesel and any kind of liquids. The purpose of this device is to prevent the scam in the petrol stations where in some cases the amount of fuel displayed in the machine is not the actual amount of fuel flowed inside the fuel tank. This happens in very few petrol stations as the machine is diluted by the owner or the operator of the petrol stations. Hence, when this fuel monitoring system is installed it prevents the customer from getting cheated.

Keywords—Flow Sensor, IOT, Flow Rate, Think Speak.

I. INTRODUCTION

In the world right now, keeping an eye on the changes in the environment to understand the current scenarios is difficult therefore the same applies in vehicle to monitor the fuel level in the tank. By maintaining a rigid track of fuel filled and fuel usage in the vehicle can lead to fuel saving and cost–efficient. We can achieve this by monitoring it remotely and gathering information with ease. In every vehicle the level of fuel displays in analog meter with lack accuracy. The companies provide the specification E, H and F bars that shows the fuel level in the tank. In day-to-day life we might face the problem of inaccurate measurements of the fuel level in the current system. Today in this computerized world the analogy fuel indicators won't help us to know the exact amount of fuel present in the tank so replacing them with the digital system will more useful. Therefore, to overcome this issue we are developing the digital fuel monitoring system for the vehicle that displays the correct quantity of fuel. It can be used for any vehicle and the fuel filled in the tank is calculated with the help of aflow sensor and ultrasonic range finder (URF) and this sensor is connected with an ATMEGA328 microcontroller. The URF is used to sense any type of liquid. The URF used in this project can measured distance 2cm to 400m with an accuracy of 3mm. Hence,it shows an accurate quantity of fuel. A 20*4 LCD display is used with ATMEGA328 microcontrollers. Therefore, it shows the amount of fuel filled, present in the tank and the fuel consumption digitally. Here we use simple steps in fuel monitoring system:

- Initialize the system.
- Read inflow fuel.
- Total fuel in the tank = fuel inflow – fuel outflow.
- Read the GPS data to get the location of the vehicle.
- Update all the collected data to the cloud.
- If the outflow is more than the threshold value than send the instant notification to the vehicle owner.

II. LITRETURESURVEY

Low cost mileage measurement [1] and fuel forecasting system: In this paper the author designed alow-cost setup to indicate mileage along with the fuel monitoring. This device was installed on the real time vehicle called "Honda twister" and without any disturbing the other function or components of that vehicle. This setup can be implementing on any other type of vehicle. The vehicle was tested with the different amount of weight on it and different places and condition because it should not differ in the value from one another and this device gave the satisfaction results on every test. In this paper the author added one more component called buzzer system. This buzzer system it is used for the alarm purpose, if the vehicle is consuming fuel excusably then it will alter to the owner of the vehicle that there is some issue with vehicle and it should be serviced
IOT based smart fuel monitoring system. This paper [2] presents the implementation of such a monitoring system based on internet of things (IOT) technology to protect the fuel customers from theft at the gas station. These systems measure the level of the fuel in

the tank and relay the information to the user's thorough web page and mobile app. The system also tracks the fuel consumption patterns using edge analytics technology to help the consumersfigure out better ways of fuel conservation and cost efficiency. This is done by using flow and load sensors in the fuel tank to tack the intake and consumption of fuel. This acquired information is then analyzed on site to determine consumption patterns. The fuel intake data and the analyzed data are then sent to the user's mobile phone app incorporating the edge analytics and Internet of Things (IOT) technology.

Implementation of digital fuel gauge [3] which measures the accurate level of fuel adding, by fixing the pressure sensor below the Fuel tank, at any point of time it will continuously measures the amount of fuel with the help of processor and displays the calculated value in the digital numeric form in theLCD 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.

Design and production [4] of a fuel tank measuring system using computer interface: In this paper, the author is designing a fuel tank measuring system using computer node. Here he used the digital indicators to display the process values of the sensor with the help of 12 volts battery. This fuel tank is efficient for the use underground storage. This fuel tank is made up of metallic. A computer node is a system, which monitors the activities through the use of the programming language which is encoded in the computer. This project aimed to provides the users to identify the exact quantity of the fuel inside the underground storage and to detect the underground storage tank using some standard technology protocols and to keep eye on the stock's levels. Here the author used the ultra-sonic sensor to measure the liquid level. At last this underground storage tank is suited for the pump stations and any other fuel company.[4]

III. METHODOLOGY

1. Firstly, power gets on and flow sensor gets activated.
2. Flow sensor will wait till the flow of fuel gets over.
3. Once, the flow ends.
4. Flow sensor will measure how much amount of fuel is filled in the tank.
5. Then this measured data of fuel is sent to the cloud through the Wi-Fi.
6. At the same time location of the vehicle is fetch by the owner's mobile.

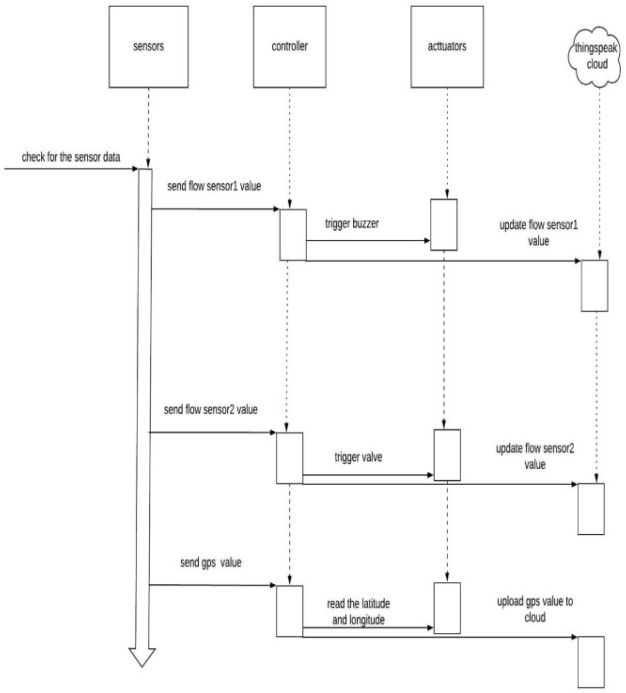

Figure 1: Sequence Diagram

IV. PROPOSED SYSTEM

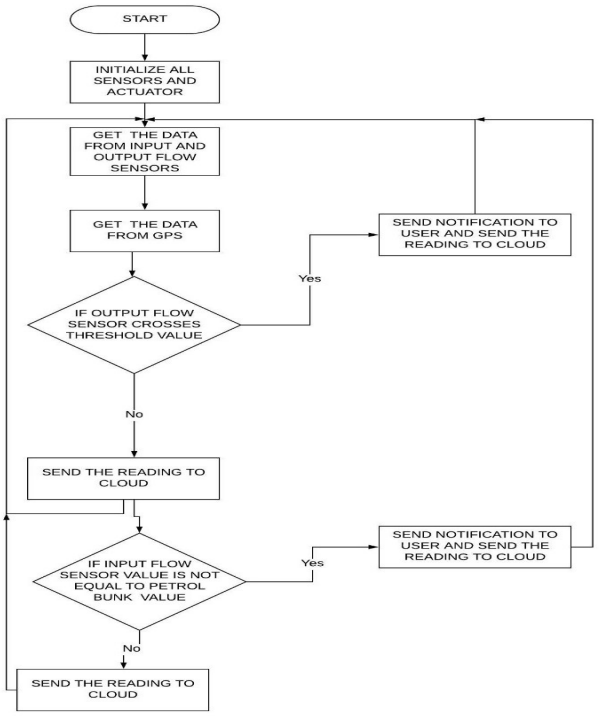

Figure 2: Flow Graph of Proposed Fuel Monitoring System

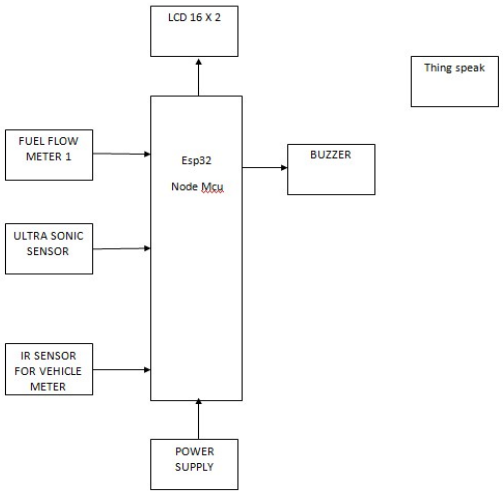

Figure 3:Block Diagram of Fuel Monitoring System

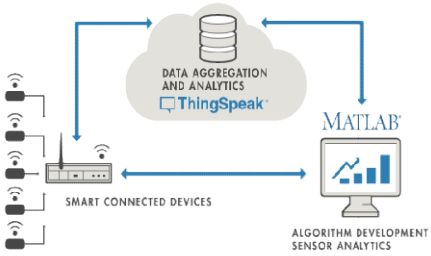

Figure 4: Cloud (Think Speak)

VI. SYSTEM DESCRIPTION

- With the location history of the vehicle a owner can plan for the future journey and dynamic travelling.
- To overcome from this, we are developing an IOT based fuel monitoring and GPS tracking system.
- When we enter in the petrol station the operator starts filling the petrol. The flow sensor will get activated.
- After the flow end it will calculate the fuel filled in the tank and notify on the vehicle's owner mobile phone in the form of graph and digital.
- It stores all the calculated data in the think speak cloud.

The block diagram of fuel monitoring system uses ESP32 node MCU. The URF is placed on the surface of the fuel tank. The distance of fuel level from the URF is calculated by using the relation Distance = speed * time. The volume of fuel is measured from the distance of the fuel obtained from URF. The LCD display is interfaced with the microcontroller in such a way that when the microcontroller is switched on the current value of fuel is displayed. The microcontroller then checks for the quantity of fuel in the tank and accordingly asks the user to enter the quantity of fuel to be filled. The user can then enter the quantity of fuel to be filled through the keypad which is also interfaced to the microcontroller. After the user gives input time delay is given for the filling of fuel in the tank. After the tank is filled the microcontroller checks for the quantity of fuel and if the volume of fuel is not filled properly as specified then the microcontroller is programmed in such a way that the remaining amount of fuel to be filled is displayed in the LCD. The process gets when the volume of fuel filled is as per specifications of the user. When they filling fuel from the petrol pump the flow meter measure the fuel and display in the LCD display and also in cloud called (thing speak).

VII. HARDWARE SPECIFICATIONS

The hardware used in implementing this project is as follows:

1. ESP32 NODE MCU**:** It is an open-source firmware that helps to build an IOT projects. This uses LUA scripting language. It supports c, wifi and Bluetooth. The pin diagram of ESP 32 NODE MCU is as follows:

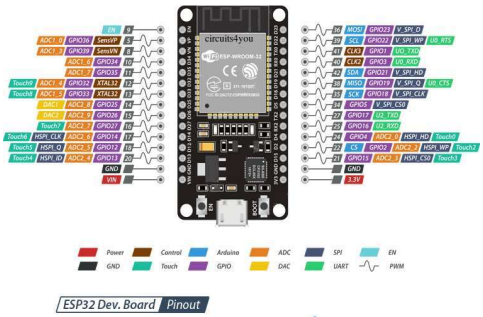

Figure 5: Eps332 Node MCU

2. FLOW METER: The fuel and oil flow meter of the FPD3000 Series are affordable and accurate positive displacement flow meters. One prime feature is the ability to maintain consistent accuracy despite changing viscosity circumstances. The flow meter's solid structure and dynamic feedback are appropriate to measure the fuels and other oils. Since there is no need for straight run piping upstream or downstream of the flow meter, this flow meters are easy to use and to install. The meter has good settlement and high accuracy at low flow standards.

Figure 6: Flow Meter

3. HC-SR04 Ultrasonic Range Finder [URF]: This produce 2cm - 400cm non contact measure task, the ranging accuracy can reach up to 3mm. This module consists ultrasonic transmitters, receiver and control circuit. Distance calculation:
   Distance D=1/2 * E * F
   Where D is the distance, E is the time and F is the speed (The value is multiplied
   by ½ because E is the time for return distance).

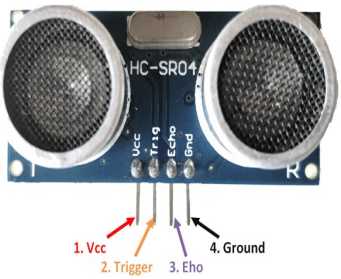

Figure 7: Ultrasonic Sensor

4. LCD (LIQUID CRYSTAL DISPLAY): We use this LCD display because its best fit for electronic projects. It is good for displaying the data like sensors data and it is very cheap. It is used in a wide range like computer desktop, watches, cameras and many applications. It is available in different size and shapes of screen.

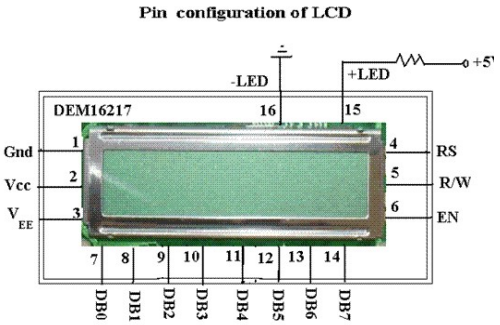

Figure 8: LCD

CONCLUSION

The measurements are taken accurately. We will be building an efficient and cost-effective model which will monitor the fuel consumption by the vehicle and will generate time series data which will be stored in the cloud and visualized in the thing speak cloud. The sensed data will also be used to calculate the amount of fuel inside the tank, where the vehicle has consumed more fuel and at what time and date it happened will be monitored.

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