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Fuel Level Indication and Mileage Calculation using IoT

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Abstract - *Digital technologies shape our everyday lives for calculating everything. In this project we proposed to implement a digital way to view fuel target in a vehicle using IOT. The simple aspect of this work is to check whether the fuel filled in the vehicle is appropriate to the given price or not, as for the first two pumps the tank is filled with fuel with air and then for the rest of the pumps, tank is filled with fuel. The level of the fuel is calculated with the help of float sensor. When people are moving in the highways or in the hills, they don't know how long will that vehicle will travel. So, we are embedding the mileage calculation with the level detection. With the help of the distance which is displayed in the LCD, the person can aware about how far that vehicle will move further.*

Key Words: **IOT (Internet of Things), LCD (Liquid Crystal Display), Tank, Fuel, Float Sensor, etc**

1. INTRODUCTION

Nowadays all world become digital so that we can easily deals with real time system. At same time digital fuel meter also implemented in recent vehicle system but actual fuel present in fuel tank of bike not shown in term of digits that show in terms of bar or deflecting needle so that we did not get idea about actual fuel present in fuel tank of bike it only show level of fuel present in fuel tank. To solved this problem we developed system digital fuel meter that indicate value of fuel in digits and fuel theft value of fuel shown in digits such as 1lits, 1.5lits, 2lits etc. The digital fuel meter is applicable for only for two-wheelers bikes. In our project we can add features of such as distance travelled by bike within certain amount of fuel so that we can calculate performance of bike in terms of millage. Sometimes customer fill fuel in terms of petrol from petrol filling pump they filled the petrol in digitally but in our bike there is no digital system there is bar or deflection needle system so that it not give the accurate fuel filled by customer so the petrol filling pump owner is cheated on customer but customer do not know about cheating due to traditional system because sometime fuel may minimum or maximum than filled value. All benefit goes to the petrol filling pump owner so that they many times cheated with customer. All vehicle has bar or deflecting pointer measurement system so that they don't know the exact amount of bunk into bike so that owner of petrol bunk station easily cheated on customer. Thus idea of Digital Fuel Meter is applicable for fuel indication and fuel theft also helpful to avoid cheating of customer from petrol filling station owner

In existing world, the population of the people increases day by day, so the need of the vehicle also increased. While filling the fuel in petrol bunks, people may not know whether the fuel is filled to the correct level for the amount given by them and gets cheated by the staffs who are in the bunk at sometime. During the travel, maximum people are not aware of the distance covered for the rest of fuel present in a vehicle. To overcome this drawback we have proposed this work. The sensor used in this project is float sensor to indicate the level, this sensor does not emit any type of rays and will not damage the vehicle. When the fuel is poured inside the tank, the level is analyzed and indicated at the moment itself in the digital form, with this data the distance covered by the vehicle is also shown.

2. LITRATURE SURVEY

The level of fuel is calculated with the help of the flow sensor and the ultrasonic sensor. Due to the presence of the ultrasonic sensor there may be a emission of ray from it. If there is any emission of rays it may lead the explosion of the vehicle. The Ultrasonic sensor is used for calculating the amount of fuel in the vehicle and also detects whether the vehicle may lead to any accident during the travel time. fuel float sensor which is a Indicator unit measuring and displaying the amount of electric current flowing through the sending unit. When the tank level is high and maximum current is flowing, the needle points to "F" indicating a full tank. When the tank is empty and the least current is flowing, the needle points to "E" indicting an empty tank.

3. EXISTING SYSTEM

In the current world, the fuel level indication will be in the analog meter or in the digital barcode. It is very difficult for the person to analyze the level of fuel in the vehicle. At some times, while travelling in the highways we don't know what's the amount of fuel in the vehicle and the distance travelled by the vehicle also, because of that there may be a chance of vehicle to stop while we are travelling. It gives the physical problem for the people to fill the fuel back by pushing it and moving to the petrol bunk. This will lead to the waste of time during the travel.

4. METHODOLOGY

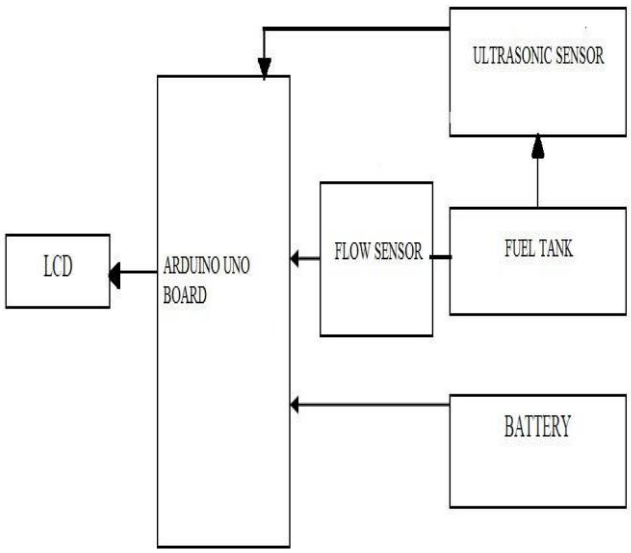


Fig-1: Block diagram of proposed system

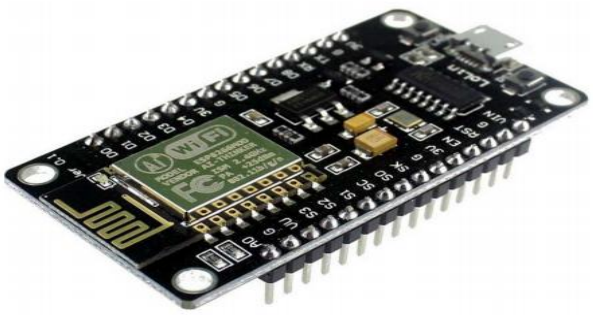
In the proposed block diagram, We Connect the fuel tank with the float sensor to calculating the fuel level. The output of the float sensor will be in the fluctuating mode. So it is controlled with the help of the controller. The analog output of the sensor is given to the nodeMCU microcontroller board. The analog input is converted into digital with the Arduino programming language and display in the LCD Board. In our work, we are converting that analog fuel detection meter into the digital display where the level of the fuel will be detected and shown for the people who are travelling in that vehicle. With the help of fuel level which has been sensed by the sensor the mileage of the vehicle will be calculated and displayed in the LCD. This helps the person to know the distance which will be covered by the vehicle.

For the indication of fuel level, two major sensors are used. One is an ultrasonic sensor used to find the duration of ultrasonic waves transmitted and received between the sensor and the surface of fuel. The results are received by arduino board. And the arduino programming converts the duration into distance. The distance converted is again converted into litres. Other is a flow sensor used to calculate the discharge of the fuel from the fuel tank. There are two outputs from the flow sensor. The first output is discharge in terms of lit/min and the second output is the total litres of fuel discharged through the sensor. Only the second output from the flow sensor (i.e the total litres of fuel discharged) is required for final fuel level indication. The modified result of ultrasonic sensor and the second output from flow sensor are taken and the difference between these two readings gives the final accurate fuel level in litres.

5. COMPONENTS USED

5.1 Node MCU

ESP8266 NodeMCU WiFi Devkit



The ESP8266 is the name of a micro controller designed by Espressif Systems. The ESP8266 itself is a self-contained WiFi networking solution offering as a bridge from existing micro controller to WiFi and is also capable of running self-contained applications. This module comes with a built in USB connector and a rich assortment of pin-outs. With a micro USB cable, you can connect NodeMCU devkit to your laptop and flash it without any trouble, just like Arduino. It is also immediately breadboard friendly.

5.2 ARDUINO IDE

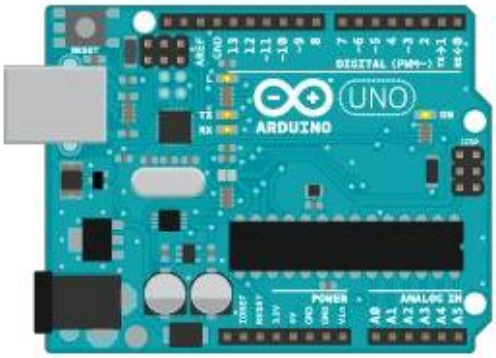


Fig 2-Arduino Uno dev. board (Fritzing part graphic)

Arduino first and foremost is an open-source computer hardware and software company. The Arduino Community refers to the project and user community that designs and utilizes microcontroller-based development boards. These development boards are known as Arduino Modules, which are open-source prototyping platforms. The simplified microcontroller board comes in a variety of development board packages.

The most common programming approach is to use the Arduino IDE, which utilizes the C programming language.

This gives you access to an enormous Arduino Library that is constantly growing thanks to open-source community.

Arduino IDE is not: AVR Studio (Yes, we know you loved EE 346, but unfortunately you won't be utilizing Assembly Language)

5.3 ULTRASONIC SENSOR

Fig- 3 Ultrasonic sensor

Active ultrasonic sensors generate high-frequency sound waves and evaluate the echo which is received back by the sensor, measuring the time interval between sending the signal and receiving the echo to determine the distance to an object.

5.4 WATER FLOW SENSOR

Fig- 4 Water flow sensor

Liquidflow sensor consists of a plastic valve body, a liquid rotor, and a hall-effect sensor. When liquid flows through the rotor, rotor rolls. Its speed changes with different rate of flow. The halleffect sensor outputs the corresponding pulse signal.

5.5 LIQUID CRYSTAL DISPLAY

LCD (Liquid Crystal Display) screen is an electronic display module and finds a wide range of applications. A16x2 LCD display is very basic module and is very commonly used in various devices and circuits. These modules are preferred over seven segments.

6. EXPERIMENTAL METHOD

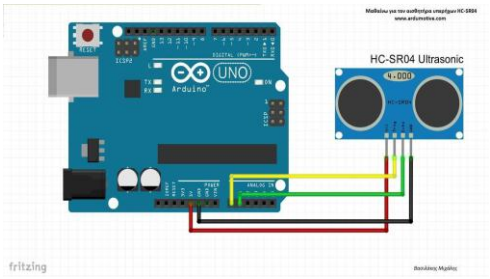


Fig 5: Circuit connection of aurdino with ultrasonic sensor

When vehicle's ignition is turned ON, the battery will power the arduino board and the sensors. At first, the ultrasonic sensor will measure the duration of the ultrasonic waves transmitted and received between the sensor and the surface of the fuel.

Now the program uploaded in the arduino board will convert the duration into distance using the formula (**distance=duration*0.034/2**) and again the distance is converted into litres by trial and error method.Note that the reading now calculated from ultrasonic sensor will not be changed until the reset button is pressed. The reset button should be pressed only when filling up additional fuel into the fuel tank.

Now the second output (total fuel passed through the flow sensor) from the flow sensor will be in terms of litres. The modified output from the ultrasonic sensor and the second output from the flow sensor is taken and the difference between these two values gives the final fuel level indication in litres which will be displayed in Liquid Crystal Display fixed near the instrument cluster. The ultrasonic sensor will be positioned inside the fuel tank where the depth is maximum. The position should be identified such that the maximum duration of ultrasonic waves is possible between the sensor and the surface of the fuel. The flow sensor will be attached to the outlet tube of fuel tank to measure the discharge and the total fuel passing through the sensor.

7. IOT TESTING PROCESS

7.1 BLYNK

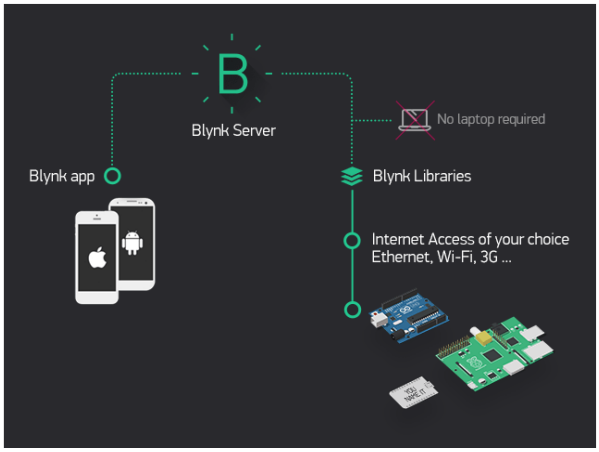
Blynk was designed for the Internet of Things. It can control hardware remotely, it can display sensor data, it can store data, visualize it and do many other cool things.

There are three major components in the platform:

Blynk App - allows to you create amazing interfaces for your projects using various widgets we provide.

Blynk Server -responsible for all the communications between the Smartphone and hardware. You can use our Blynk Cloud or run your private Blynk server locally. It is open-source, could easily handle thousands of devices and can even be launched on a Raspberry Pi.

Blynk Libraries - for all the popular hardware platforms - enable communication with the server and process all the incoming and out coming commands. Now imagine: every time you press a Button in the Blynk app, the message travels to the Blynk Cloud, where it magically finds its way to your hardware. It works the same in the opposite direction and everything happens in a blynk of an eye.



To use Blynk app we need

7.1.1 Hardware

An Arduino, Raspberry Pi, or a similar development kit.

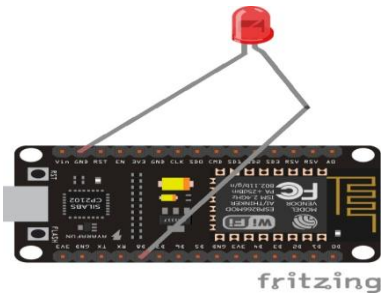
Blynk works over the Internet. This means that the hardware you choose should be able to connect to the internet. Some of the boards, like Arduino Uno will need an Ethernet or Wi-Fi Shield to communicate, others are already Internet-enabled: like the ESP8266, Raspberri Pi with WiFi dongle, Particle Photon or SparkFunBlynk Board. But even if you don't have a shield, you can connect it over USB to your laptop or desktop (it's a bit more complicated for newbies, but we got you covered). What's cool, is that the list of hardware that works with Blynk is huge and will keep on growing.

7.1.2 Smartphone

The Blynk App is a well-designed interface builder. It works on both iOS and Android.

Getting Started Let's get you started in 5 minutes (reading doesn't count!). We will switch on an LED connected to your nodeMCU using the Blynk App on your smartphone.

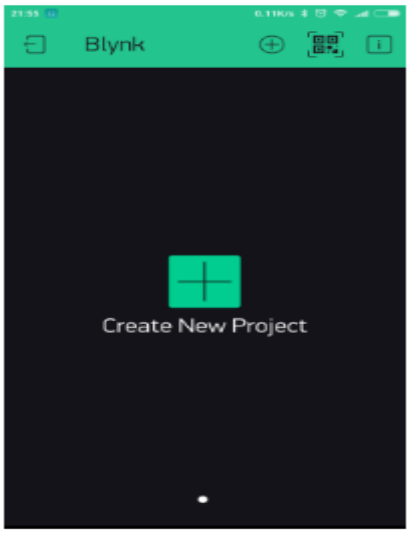
Connect an LED as shown here:



Getting Started with the Blynk App

1. Create a Blynk Account

After you download the Blynk App, you'll need to create a New Blynk account. This account is separate from the accounts used for the Blynk Forums, in case you already have one.We recommend using a **real** email address because it will simplify things later. After you've successfully logged into your account, start by creating a new project.



Choose Your Hardware Select the hardware model you will use that is Node MCU

Auth Token is a unique identifier which is needed to connect your hardware to your smartphone. Every new project you create will have its own Auth Token. You'll get Auth Token automatically on your email after project creation. You can also copy it manually. Click on devices section and selected required device. Auth token is sent to the registered email.

Add a Widget

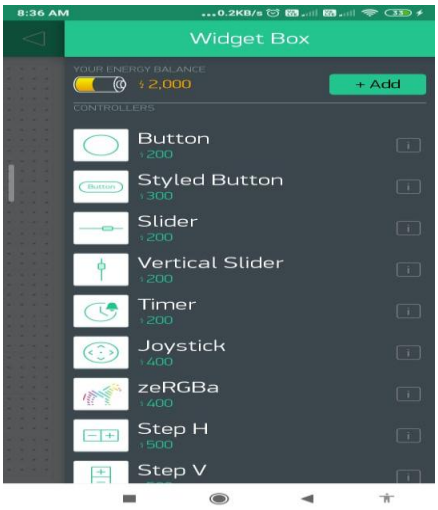
Your project canvas is empty, let's add a button to control our LED.

Tap anywhere on the canvas to open the widget box. All the available widgets are located here. Now pick a button.

Widget Box

Drag-n-Drop - Tap and hold the Widget to drag it to the new position.

Widget Settings - Each Widget has it's own settings. Tap on the widget to get to them.



Run the Project

When you are done with the Settings - press the **PLAY** button. This will switch you from EDIT mode to PLAY mode where you can interact with the hardware. While in PLAY mode, you won't be able to drag or set up new widgets, press **STOP** and get back to EDIT mode.

You will get a message saying "led is offline". We'll deal with that in the next section.

Getting Started With Hardware

How To Use an Example Sketch You should by now have the Blynk Library installed on your computer. After installing the blynklib ,GoTo file - > Examples - >Blynk - >Board_WiFi - >NodeMCU

Auth Token

In this example sketch, find this line:

char auth[] = "YourAuthToken";

This is the Auth Token that you emailed yourself. Please check your email and copy it, then paste it inside the quotation marks.

It should look similar to this:

char auth[] = "f45626c103a94983b469637978b0c78a";

Upload the sketch to the board and open Serial Terminal/Monitor. Wait until you see something like this:

Blynkv.X.X.X

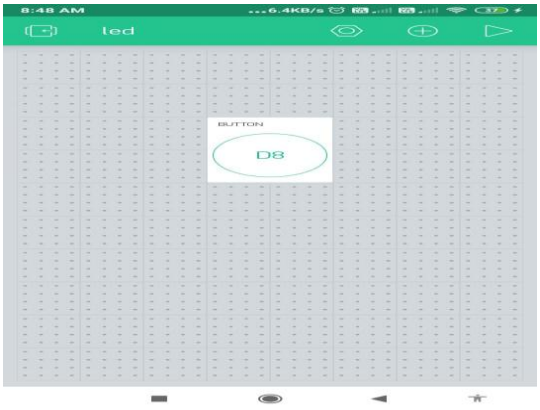
Your IP is 192.168.0.11

Connecting...

Blynk connected!

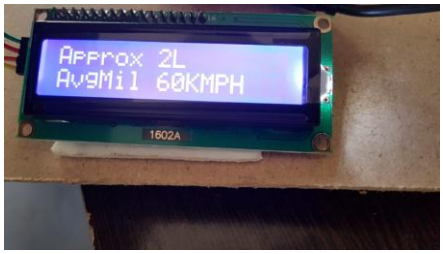
Congrats! You are all set! Now your hardware is connected to the Blynk Cloud!

Go back to the Blynk App, push the button and turn the LED on and off! It should be Blynking



8. RESULTS

The Proposed system is expected to calculate the exact quantity of the fuel level in the vehicle and the mileage of the vehicle will be calculated which is displayed in the digital meter. This helps the user to know the level of fuel in the vehicle.



9. CONCLUSIONS

The deployment of flow sensor and ultrasonic sensor in fuel level indication have yielded satisfactory results over the conventional fuel level indication. The accuracy has been increased to 94% with a tolerance of ±0.1litres. This method will yield accurate results while driving on plane surfaces or roads and the accuracy will reduce while driving on slopes or hills. The entire system is more economical and reliable. The system requires less maintenance. As years passes, technology gets updated and different solutions arises for the same problem. And the usage of ultrasonic sensor and flow sensor to digitalize and indicate the fuel level in two wheelers is one such up-gradation to this problem.

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