Real Time Fuel monitoring and Theft Detection System using IoT

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Abstract –*The primary design goal is to design a system capable of monitoring the fuel information in real time whenever we visit petrol bunks to fill our vehicles. Whenever we visit bunks to fill tanks of our vehicles, they do fiddle while filling it from dispensers since they coded it internally with some digital error coding technique, which dispenses less amount of petrol and show correct amount on the display of the dispenser. These frauds are being taking place now-a-days in many bunks across the big cities and even small towns. Another problem is fuel thefts when we park our vehicles at some place. Some people remove petrol pipe of vehicle and do some other techniques to steal petrol from vehicles. Today's world needs digital techniques for measurement of any quantity conventional like real time fuel monitoring and theft detection system using IoT. Our proposed work we show the amount of fuel Present in fuel tank digitally with flow sensor. The fuel while its getting dispensed from dispenser in fuel stations and monitor lively to caught them if they try to make fraud. Also fuel theft is major problem in society. In our project we implemented if fuel gets theft then alert will be send to owner of vehicles also buzzer makes noise so that owner of vehicles, someone like watchmen or incharge of parking area get aware and take action. In traditional vehicle system such kind of system is not implemented like display fuel availability digitally, fuel dispensed from dispenser in bunks cannot be measured & fuel Theft from vehicles cannot be avoided. The proposed system integrated software Arduino IDE and firebase for Database purposes and an android application to see all the details. This system offers an theft detection System in addition to manual monitoring of fuel. This system measures fuel volume and sends measured volume to the owner's mobile as well as cloud through network. It also provides a technique for detecting theft or fraud incidents in case of fuel theft or fuel leakage are practically verified. This system allows for an automated analysis and monitoring of fuel level, having a reduced cost due to affordable and easy-to-acquire electronic components.*

Keywords: Internet of Things, Cloud Database, Node MCU ESP 8266.

1. INTRODUCTION

The proposed method given in this paper is designing a system to monitor fuel dispensing from the fuel dispenser in filling stations and it detects gambling by measuring the amount of fuel flown through the flow sensor. If the amount of fuel dispensed from dispenser doesn't match with the amount shown to us in the android application or cloud account, then the fraud can be detected. Another thing about this system is, fuel thefts can be caught by using ultrasonic sensor which is fixed at the fuel pipe which is basically present at the left side of bikes. This system offers an theft detection System in addition to manual monitoring of fuel. This system measures fuel volume and sends measured volume to the owner's mobile as well as cloud through network. It also provides a technique for detecting theft or fraud incidents in case of fuel theft or fuel leakage are practically verified. This system allows for an automated analysis and monitoring of fuel level, having a reduced cost due to affordable and easy-to-acquire electronic components.

1.1 Internet of Things

Fig. Internet of Things.

A network of Internet connected objects able to collect and exchange data." It is commonly abbreviated as IoT. In a simple way to put it, You have "things", called devices, that sense and collect data and send it to the internet. This data can be accessible by other "things" too. An IoT system consists of sensors, devices which "talk" to the cloud through some kind of connectivity. Once the data gets to the cloud, software processes it and then might decide to perform an action, such as sending an alert or automatically adjusting the sensors, devices without the need for the user.

Secure IoT connectivity without the Internet being involved at all with USSD. No Internet connection is available, so it's not an option. An array of sensors has characteristics unsuitable for direct connection to an IP-type Internet connection. Security concerns related to hacking of **I**nternet devices. IoT is about transferring data without or with human intervention. It is nothing about human-to-human or computer interaction as it has UIDs (Unique Identifiers). Artificial Intelligence is all about making your system behave smartly according to human behavior, whereas IoT is all about the sensors of devices.**IoT** allows us to use affordable wireless technology and transmit the data into the cloud at a component level. It also provides a place to save data as well as management and security. ... Whatever the future holds for **IoT**, Smart devices will become convoluted into our lives.

1.2 Arduino IDE

Arduino Integrated Development Environment (**IDE**) is a cross-platform application (for Windows, macOS, Linux) that is written in functions from C and C++. It is used to write and upload programs to Arduino compatible boards, but also, with the help of 3rd party cores, other vendor development boards.

"Arduino language" is simply **C++** (and therefore also **C**). All the standard system librarys are written in **C/C++** and the IDE uses the gcc g++ compiler. Arduino is a great tool for developing interactive objects, taking inputs from a variety of switches or sensors and controlling a variety of lights, motors and other outputs. Arduino projects can be stand-alone or they can be connected to a computer using USB. [6]

Fig. Arduino IDE

1.3 Ultrasonic Sensor – HC-SR04

It is used in estimating the distance between source and target. Working frequency is 40KHz. A short 10uS pulse is applied to the trigger input to initiate ranging. Then the module will send 8 cycle burst of ultrasonic sound at 40KHz. When an object is encountered in the ranging, echo will be received. This will help to estimate the range through the time interval between trigger and echo signals. Thus, distance is calculated by formula, *Distance*

= *(Velocity of Sound * Time) / 2*Consider the Velocity of sound 343 ms-1.[5]

Fig. Ultrasonic sensor HC-SR04

1.4. Flow Sensor

Flow sensors are devices used for measuring the *flow* rate or quantity of a moving liquid or gas .

Fig. Flow Sensor

Liquid that passes through the sensor will move the rotor causing rotation. This sensor, every liter of liquid that is flowed per minute emits approximately 4.5 pulses, that number will be calibrated. The flow (Q) is equal to the cross-sectional area of the pipe (A) in a volumetric flow meter, and the velocity of the flowing fluid (v): $Q = A * v$ [4]

1.5. Buzzer

A **buzzer** or beeper is an audio signalling device, which may be mechanical, electromechanical, or piezoelectric (piezo for short). Typical uses of **buzzers** and beepers include alarm devices, timers, and confirmation of user input such as a mouse click or keystroke.

The **buzzer** consists of an outside case with two pins to attach it to power and ground. ... When current is applied to the **buzzer** it causes the ceramic disk to contract or expand. Changing the This then causes the surrounding disc to vibrate. That's the sound that you hear.

Fig. BUZZER

Sensor-Buzzer is a passive **buzzer**. Like a magnetic speaker, it needs voltage with different frequency so that it can make sound accordingly. The pitch becomes louder when the frequency gets higher.[3]

1.6 Google Firebase

Firebase is a mobile and web application development platform developed by Firebase, Inc. in 2011, then acquired by Google in 2014. As of October 2018, the Firebase platform has 18 products.

Formerly known as Google Cloud

Messaging (GCM), Firebase Cloud Messaging (FCM) is a cross-platform solution for messages and notifications for Android, iOS , and web applications, which as of 2016 can be used at no cost .

Firebase Storage provides secure file uploads and downloads for Firebase apps, regardless of network quality, to be used for storing images, audio, video, or other user-generated content. It is backed by Google Cloud.[2]

1.7. ESP 8266 NODE MCU

The **ESP8266** is a low-cost Wi-Fi microchip, with a full TCP/IP stack and microcontroller capability, produced by Espressif Systems in Shanghai, China. ESP8266 is capable of functioning consistently in industrial environments, due to its wide operating temperature range. With highly-integrated on-chip features and minimal external discrete component count, the chip offers reliability, compactness and robustness
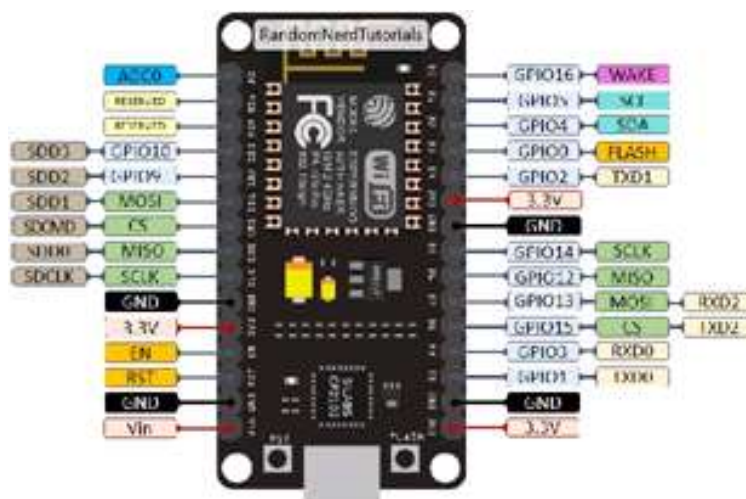
Engineered for mobile devices, wearable electronics and IoT applications, ESP8266 achieves low power consumption with a combination of several proprietary technologies. The power-saving architecture features three modes of operation: active mode, sleep mode and deep sleep mode. This allows battery-powered designs to run longer.[1]

2. REAL TIME FUEL MONITORING AND THEFT DETECTION SYSTEM

Design and implementation of real time monitoring and theft detection system is monitor fuel dispensing from the fuel dispenser in filling stations and it detects fiddle by measuring the amount of fuel flown through the flow sensor. If the amount of fuel dispensed from dispenser doesn't match with the amount shown to us in the android application or cloud account, then the fraud can be detected. Another thing about this system is, fuel thefts can be caught by using ultrasonic sensor which is fixed at the fuel pipe which is basically present at the vehicles.
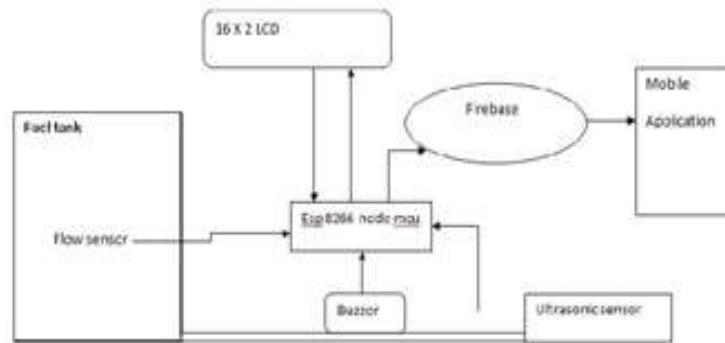
Figure: Real Time Fuel Monitoring and Theft Detection System

2.1 Android application

This application will be installed by the every user, so that he can know the fuel dispensed into the tank and also to see the amount of fuel present in the tank. It also gives notification when stealing of fuel takes place.

2.2 Data base and Cloud server

Data base the place where we store the data collected from micro controller. It, can be accessed when it is required using mobile application.

2.3 Fuel measurement system

It consists of a flow sensor to measure the fuel getting dispensed from the Fuel dispenser of petrol bunks so that measurement mismatch can be caught there itself and shows the value both on lcd and also in firebase, application.

2.4 Theft detection system

In this, ultrasonic sensor present at the fuel pipe will detect thefts and makes buzzer to alarm when theft takes place.
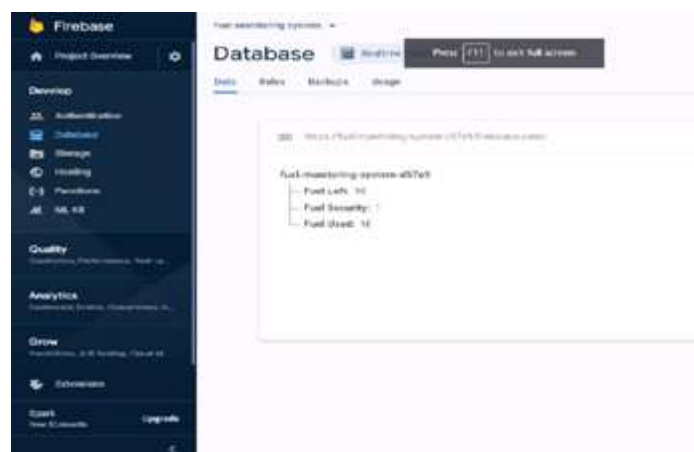
3. Results

Fig. Fire base

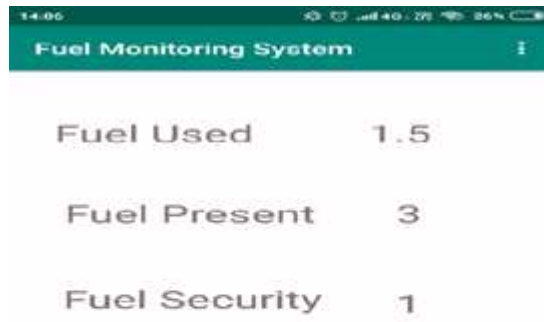Fig. Android app Logo android application.
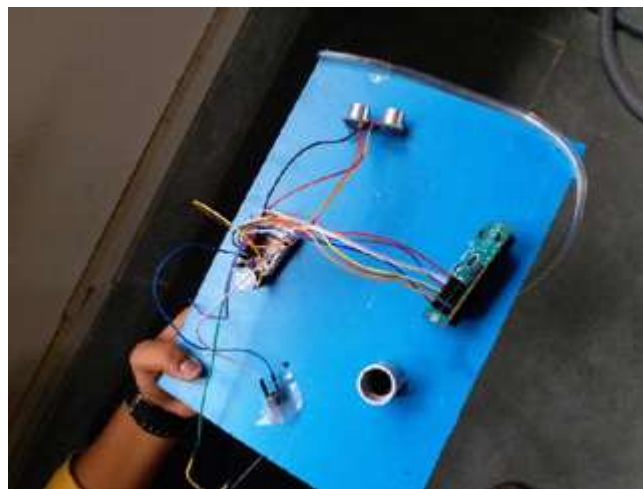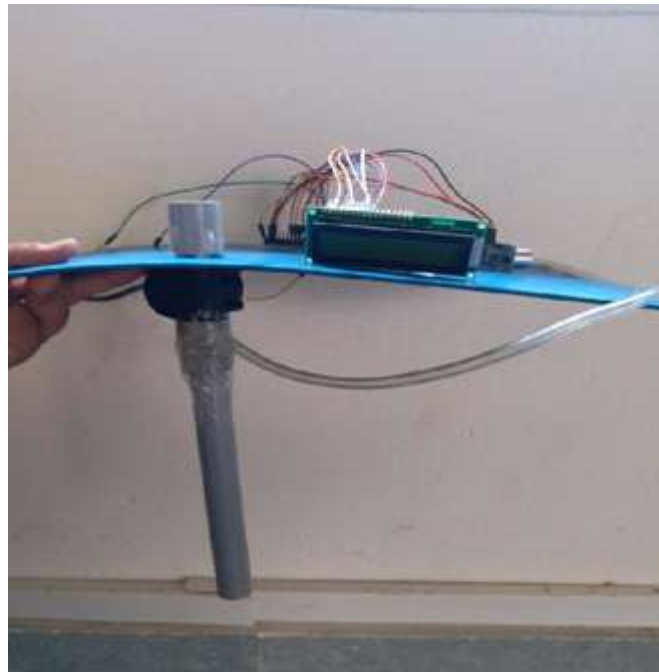

Fig. Android app

Fig. Project kit

4. CONCLUSION

The proposed method works efficiently in fuel monitoring in fuel stations and theft detections. This also provides real-time data with in time on web portal and android application. By this system the thefts can be detected at parking places and also the at bunks. This proposed system could help us solve these two problems.

5. REFERENCES

1)https://en.wikipedia.org/wiki/ESP8266

2)https://en.wikipedia.org/wiki/Firebase

3)https://en.wikipedia.org/wiki/Buzzer

4)https://files.amperka.ru/store-media/products/water-flow-sensor/media/YF-S201.pdf

5)https://www.arrow.com/en/research-and-events/articles/ultrasonic-sensors-how-they-work-and-how-to-use-them-with-arduino

6) https://en.wikipedia.org/wiki/Arduino_IDE

7)https://www.projectsof8051.com/iot-vehicle-fuel- theft-detection-system-using-arduino/

8)https://www.researchgate.net/publication/336728183_Vehicle_Fuel_Activities_Monitoring_System_Using_IoT