Fuel Theft Detection Location Tracing using Internet of Things

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Abstract - In today's world, the actual record of fuel filled and remaining fuel in vehicles tank is not maintained. It results in a financial loss. To quantify the actual amount of fuel into the tank we implement the system using the Internet of things. The system uses the flow sensor which calculates the amount of fuel runtime while filling the tank. The ultrasonic sensor continuously monitors the level of fuel in the tank. If suddenly the level fuel goes low then the system rings the beep and notifies the owner of car or bike. The system also provides the reporting function in which the fraud is directly reported to the higher authority or government officials. The system also stores the historical data for future use.

***Index Terms*— IOT, KNN, Flow Sensor, Ultrasonic Sensor, nodeMCU.**

I. INTRODUCTION

1.1. What is IOT?

The internet of things, or IoT, is a system of interrelated computing devices, mechanical and digital machines, objects, animals or people that are provided with unique identifiers (UIDs) and the ability to transfer data over a network without requiring human-to-human or human-to-computer interaction. A thing in the internet of things can be a person with a heart monitor implant, a farm animal with a biochip transponder, an automobile that has built-in sensors to alert the driver when tire pressure is low or any other natural or man-made object that can be assigned an IP address and is able to transfer data over a network. Increasingly, organizations in a variety of industries are using IoT to operate more efficiently, better understand customers to deliver enhanced customer service, improve decision-making and increase the value of the business. IoT has evolved from the convergence of wireless technologies, microelectromechanical systems (MEMS), microservices and the internet.

The convergence has helped tear down the silos between operational technology (OT) and information technology (IT), enabling unstructured machine-generated data to be analyzed for insights to drive improvements.

1.2 Why we use IoT?

Much research in recent years has focused on Internet of Things (IoT) which connects physical objects to network and manages information of the objects. Especially, home domain is the most important field of IoT. Because the research survey [1] reported that the number of connected device will grow to nearly 8 billion devices for the year 2020 excepting mobile phone, and home devices has the biggest portion of them about 3.7 billion. It means they will generate big data such as sensory data, usage information and so on. Home service providers want to develop various and advanced service using the data, but there remains a need for an efficient method that can analyze the data. Previous works have mainly focused communication way, or the specific service of analysis. E.S.Lee, et al. [2] developed an auto-configuration system structure and protocol for Internet-capable home appliances, which supports the initial configuration and remote maintenance service of the device with only little user effort. HJ.Lee, et al. [3] proposed a three stage conversion process for interoperability among different middleware of home network that supports not only the conversion of the message format and schema, but also semantic conversion. Shih-Yeh Chen, et al. [4] developed electronic appliance recognition system by building a database mechanism, electronic appliance recognition classification, and waveform recognition. It have been carried out smart meter data analysis but they are accepted only meter data. However, IoT platform needs to accept various kinds of data and manage the data uniformed system. Furthermore, many researches have studied IoT platform in another area. iHome Health-IoT [5] proposed platform seamlessly fuses IoT devices (e.g., wearable sensors and intelligent medicine packages) with in-home healthcare services (e.g., telemedicine) for improved user experience and service efficiency. It mainly concerned a variety of health IoT device from body to cloud, and their hardware architecture. Andrea Zanella, et al. [6] provided a comprehensive survey of the enabling technologies, protocols, and architecture for an urban IoT, and presented the technical solutions and bestpractice guidelines adopted in the Padova Smart City project. They collected the temperature, humidity, light, and benzene readings, and just shown the plots. They didnot have analysis part for urban IoT yet. Hongming Cai, et al [7] proposed a platform which based on an abstract information model, information encapsulating, composing, discomposing, transferring, tracing, and interacting in Product Lifecycle Management could be carried out.

1.3 Sensors used in IoT

Ultrasonic Sensor

An ultrasonic sensor is an instrument that measures the distance to an object using ultrasonic sound waves. An ultrasonic sensor uses a transducer to send and receive ultrasonic pulses that relay back information about an objects proximity. High-frequency sound waves reect from boundaries to produce distinct echo patterns. Ultrasound is reliable in any lighting environment and can be used inside or outside. Ultrasonic sensors can handle collision avoidance for a robot, and being moved often, as long as it isnt too fast. Ultrasonics are so widely used, they can be reliably implemented in grain bin sensing applications, water level sensing, drone applications and sensing cars at your local drive-thru restaurant or bank. Ultrasonic rangefinders are commonly used as devices to detect a collision. Ultrasonic sensors are superior to infrared sensors because they aren't affected by smoke or black materials, however, soft materials which dont reect the sonar (ultrasonic) waves very well may cause issues. Its not a perfect system, but its good and reliable.

Flow Sensors

Water flow sensor consists of a plastic valve body, a water rotor, and a hall-effect sensor. When water flows through the rotor, rotor rolls. Its speed changes with different rate of flow. The hall-effect sensor outputs the corresponding pulse signal. This one is suitable to detect flow in water dispenser or coffee machine. We have a comprehensive line of water flow sensors in different diameters. Effective water management involves supplying water according to the real requirement, and thus measuring water is very essential step in water management systems. There are many water flow measurement techniques as well as different types of water flow meters used to measure the volume of water flow in pipelines but these all are too costly. This article describes ideas for design and development of low cost automatic water flow meters, with the help of readily-available and low-cost water flow sensors. YF-S201 Hall-Effect Water Flow Sensor ccurate flow measurement is an essential step both in the terms of ualitative and economic points of view. Flow meters have proven excellent devices for measuring water flow, and now it is very easy to build a water management system using the renowned water flow sensor YF-S201. This sensor sits in line with the water line and contains a pinwheel sensor to measure how much water has moved through it. There is an integrated magnetic Hall-Effect sensor that outputs an electrical pulse with every revolution. The YFS201 Hall Effect Water Flow Sensor comes with three wires: Red/VCC (5-24V DC Input), Black/GND (0V) and Yellow/OUT (Pulse Output). By counting the pulses from the output of the sensor, we can easily calculate the water flow rate (in litre/hour L/hr) using a suitable conversion formula.

1.4 Problem Definition

In the current framework it was impractical to recognize the fuel robbery from fuel tank and additionally the accuracy of the existing framework was low. So we have designed the fuel theft Monitoring system to detect the theft of fuel and locate the vehicle using Internet of Things.

II. LITERATURE SURVEY

Embedded Optimal Energy and Catalyst Temperature Management of Plugin Hybrid Electric Vehicles for Minimum Fuel Consumption and TailPipe Emissions. In this paper, they develop a method to synthesize a supervisory power-train controller (SPC) that achieves near optimal fuel economy and tail pipe emissions under known travel distances. We first find the globally optimal solution using the dynamic programming (DP) technique, which provides an optimal control policy and state trajectories. Based on the analysis of the optimal state trajectories, a new variable energy-to-distance ratio (EDR), is introduced to quantify the level of battery, state-of charge (SOC) relative to the remaining distance. This variable plays an important role in adjusting both energy and catalyst thermal management strategies for PHEVs. A novel extraction method is developed to extract adjustable engine on/off ,gear-shift, and power-split strategies from the DP control policy over the entire state space. Based on the extracted results, an adaptive SPC that optimally adjusts the engine on/off. gear-shift, and power-split strategies under various EDR and catalyst temperature conditions was developed to achieve near-optimal fuel economy and emission performance[2]. Wireless sensor network based smart home: Sensor selection, deployment and monitoring. This paper details the installation and configuration of sensors in an elderly persons house a smart home in the making in a small city in New Zealand. The overall system is envisaged to use machine learning to analyze the data generated by the sensor nodes. The novelty of this system is that instead of setting up an artificial test bed of sensors within the University premises, the sensors have been installed in a subjects home so that data can be collected in a real not artificial environment.[3] The liquid level detector and optimizer play an important role in tanks to indicate the level of liquid of a particular density. In this paper we have proposed a technique to measure the amount of liquid available in tank also give the knowledge about their chemical composition as well as purity level of fuel it is the first device which can give the accurate knowledge about of how much the vehicle can run. This device digitally displays the level of liquid inside the tank, fuel composition running capability of vehicle by using load sensors. The measurements are taken so the accuracy level is of 95% - 98%.[8] The conversion involves quantization of the input, so it necessarily introduces a small amount of error. Furthermore, instead of continuously performing the conversion, an ADC does the conversion periodically, sampling the input. The result is a sequence of digital values that have been converted from a continuous-time and continuous-amplitude analog signal to a discrete-time and discreteamplitude digital signal. An ADC is defined by its bandwidth and its signal-to-noise ratio. The bandwidth of an ADC is characterized primarily by its sampling rate. The dynamic range of an ADC is inuenced by many factors, including the resolution, linearity and accuracy (how well the quantization levels match the true analog signal), aliasing and jitter. The dynamic range of an ADC is often summarized in terms of its effective number of bits (ENOB), the number of bits of each measure it returns that are on average not noise.[9] The reed switch which works according to the principle of Hall Effect for sensing the amount of fuel filled in the vehicle. So as soon as agent starts filling petrol in your bike/car, the flow sensor is activated. This flow sensor will be active till flow ends. Once flow ends it will calculate the amount of fuel filled and directly notify on your mobile phone. If the phone is not available then it will store this data on cloud.[10] A method to synthesize a supervisory power train controller (SPC) that achieves near-optimal fuel economy and tailpipe emissions under known travel distances. We first find the globally optimal solution using the dynamic programming (DP) technique, which provides an optimal control policy and state trajectories. Based on the analysis of the optimal state trajectories, a new variable energy-to-distance ratio (EDR), , is introduced to quantify the level of battery state-of charge (SOC) relative to the remaining distance. This variable plays an important role in adjusting both energy and catalyst thermal management strategies for PHEVs.[12]

SYSTEM DESIGN

A. System Architecture

This system is based on the Internet of Things for the implementation of the fuel theft detection and location tracing in the vehicles. The system uses the different types of sensors like Ultrasonic Sensor and flow sensor. The ultrasonic sensor is used to detect the flow of fuel and flow sensor will detect how much fuel is filled in the fuel tank at petrol pumps. If the level of fuel is low then the system will notify to the owner of vehicle with proper locations of the manhole. This same type of alert notifications will be send while filling the petrol at petrol stations. We also design the website to monitor the readings of these sensors from the remote place. So the working of the system can be monitored by the owner of the vehicle.

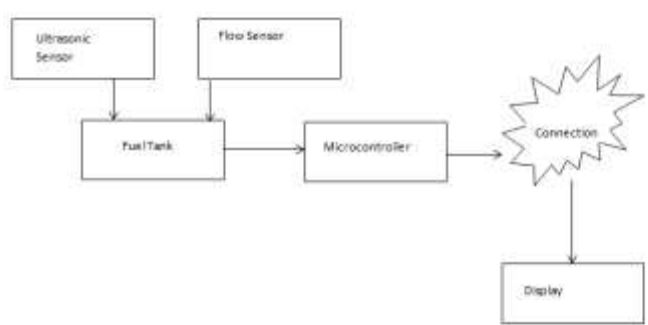


Figure: System Architecture

III. RESULT

Figure : Website Home Page

Figure : Website Login Page

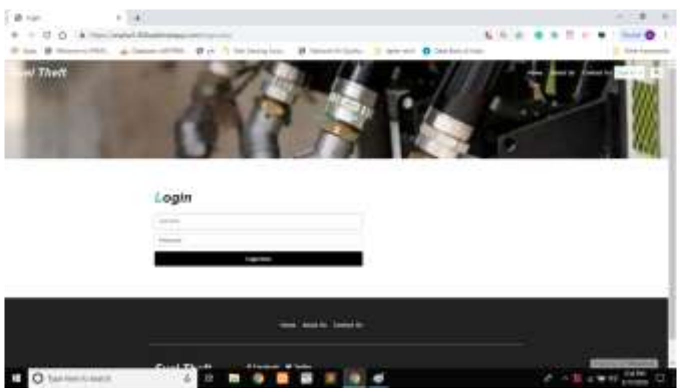


Figure : Report Page

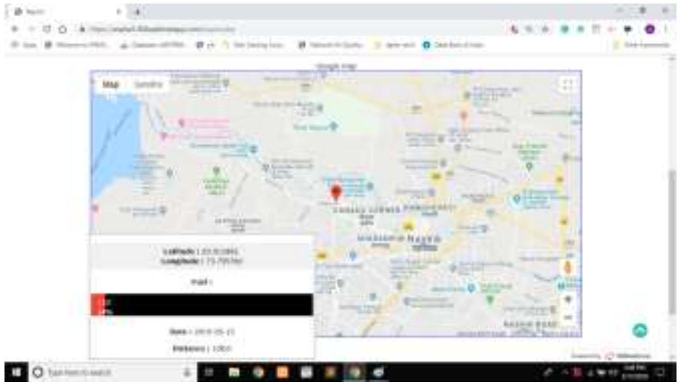
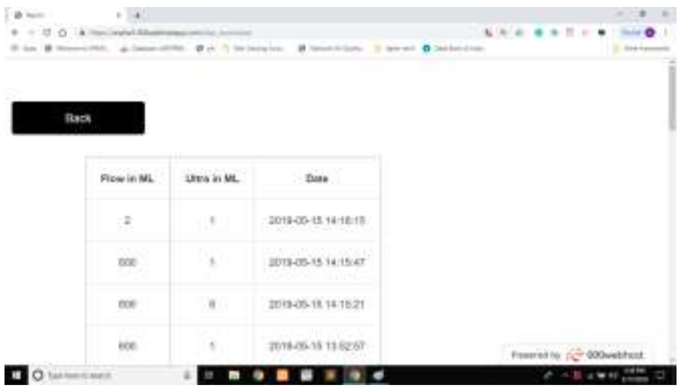


Figure Report Page



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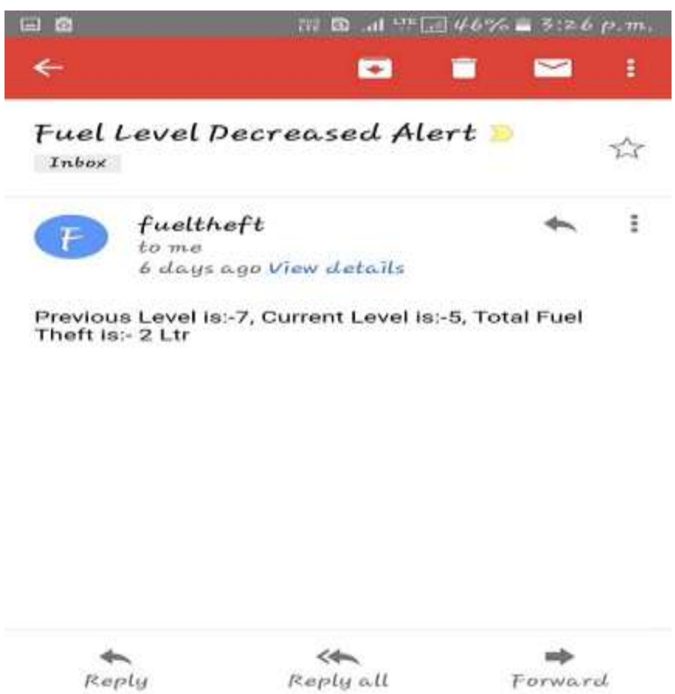
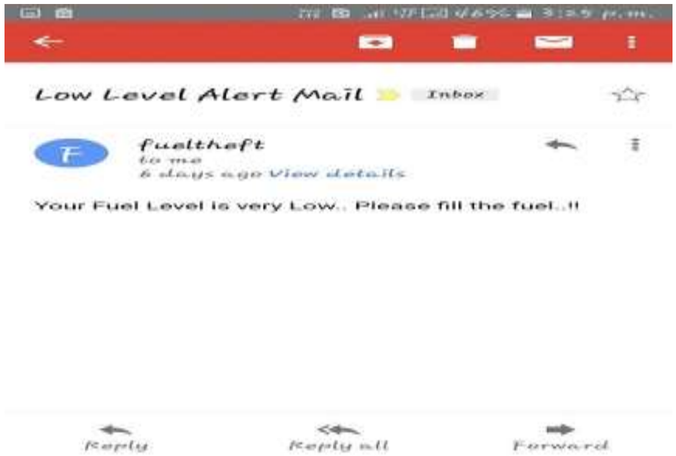


Figure : Alert Notification Messages



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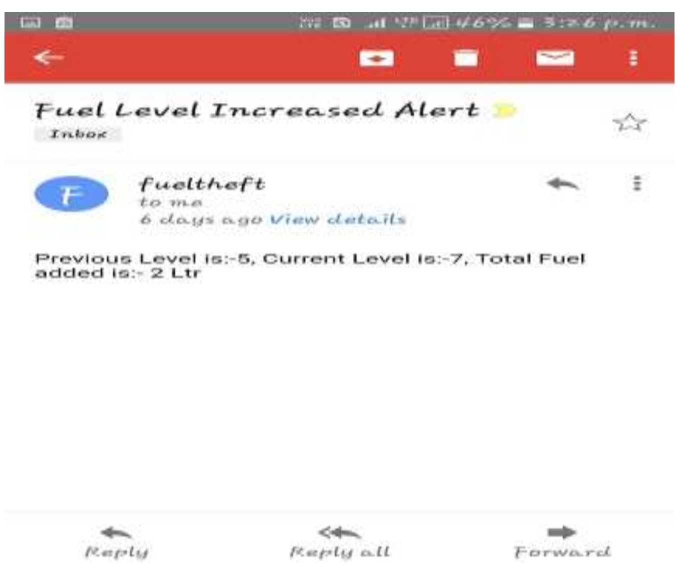

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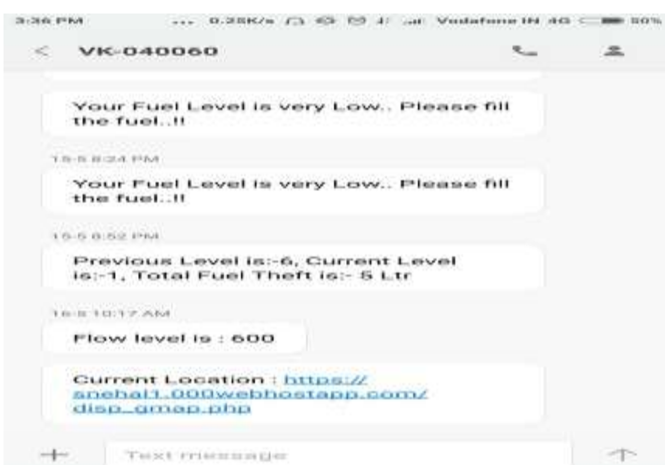

Figure : Alert Notification Messages

IV. CONCLUSION

We implemented system which quantifies the amount of fuel in the fuel tank in the form of numeric digits more accurately. Thus, to achieve this we developed the system. We also want to detect the fuel theft from the fuel tank by using various sensors. The system also able to judge that how long distance can be travelled by the remaining fuel in the tank. This will also give vivid information of fuel filled at the petrol pumps. We feel that our system serves something good to this world and like to present it before the prosperous world.

APPENDIX

Appendixes, if needed, appear before the acknowledgment.

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