IoT based Smart Petrol Pump

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ABSTRACT

This paper presents the design and implementation of Smart Petrol Pump in which we are going to measure the level of fuel in the gas station and show it to the central server. If the fuel level is low then the central will provide fuel supply to that station. Our motive is to create a website which takes the fuel level as input from the fuel station where our hardware is installed and then return it to the site which is accessible by admin and users. Admin can change the data and update it. Users cannot change the data but they will only see it. We use ultrasonic sensor which measures the level of fuel.

Smart petrol pump is an IOT based petrol pump. In today's world, everything is getting automated. The design focuses on the depth measurement of the tanks in the petrol depots. Its secondary aim is to control the fluctuations in the prices of the fuel by the central authority.

Keywords :-*Internet of thing (IoT), Power consumption, Smart devices, Automation.*

1. INTRODUCTION

The future of Internet of Things increases the horizons of our vision and also enabling public to access and contribute rich resources about probably everything ever existed in the world. The success of the convergence of the internet of things and the world giving the capability to share experience and personalized insights with the humans also shows great potential for integration with place which need manual labour which can be at some points time taking and inaccurate. Information distribution may be rewarded through inducements, thus transforming the Internet of Things from mere manufacturing commercial applications to an intelligent infrastructure that would reduce human labour and could accomplish task in comparably less time and most accurately also allowing us the trading of enriched information and accelerate business innovation. Being open source and end-user programming will enable people to share to the Internet of Things with data, valued resources and functionalities.

Internet of Things gains its full potential by utilizing the key role playing objects i.e. "Smart" objects which use various sensors and actuators that are able to perceive their context, and via built in networking capabilities they could communicate to each other, access the open source Internet services and interact with the human world. This not only makes the world connected but also robust and comfortable.

Smart petrol pump is an IOT based petrol pump. In today's world, everything is getting automated. IoT had it's ascent from the convolution of wireless technologies, micro electromechanical systems and the Internet. The alignment has helped tear down the boundary walls between the operating technology and information technology, allowing unorganized machine-generated data to be analyzed for perception that will drive improvements.

Smart industries include global intelligent networks made of Cyber-Physical Systems (CPS), which combine physical systems and information communication technology. These systems can control each other autonomously to predict failures, trigger maintenance processes autonomously, provide advanced analytics or trigger self-organized logistics to respond to changes in the production.

The integration and interoperability directly at the site can be enhanced and extended by real-time analytics

possible with the use of sensors and various modules, intelligent web-based autonomous services which would updated in real-time and assist the user. The function of the hardware and software that base the Arduino platform is to minimize complexity when working on an electronic project. Galileo is an electronic circuit board that helps you create interactive objects by analyzing information from the human world, processing it, and then accordingly taking action in the world. If it has a network connection, it is also capable of communicate to other devices like web servers. It lets you experiment and invent technology. By offering compatibility with Arduino hardware and software, Intel Galileo delivers more power and features than typical Arduino boards.

The paper focuses on the depth measurement of the tanks in the from the transceiver to back to receiver is used to calculate the depth of the tank. The depth of the tank is updated on a remote server. The depth is sent to a JSP page via an auto submit form every 5 sec. The JSP page saves the data to a database. The project provides two interfaces for accessing the data which includes one for the central authority and the other for the users.

2. RELATEDWORK

A lot of research and development is going in the field of Internet of Things which includes from connecting to devices, collecting data from them, analyzing those large bytes of data and performing the required operation on the data and generates the desired output. Many IOT devices in all the fields including medical and healthcare, Home automation, Agriculture etc. have being developed and the same goes for our Smart Petrol Pump solution system. Some of the related IOT devices are discussedbelow.

CooeySmart Health

Cooey[1]Smart health lets you automatically log your medical data through Bluetooth entitled devices. It takes note of your health by storing, analyzing and sharing your medical records. It also advices you on the smart tips and services based upon your health analysis. It also give you alerts and messages about your health risks. It enables you to remotely monitor the health reports as well as also has the option of connecting yourself to various health service providers like pharma, labs, homecare and teleconsulting. It consists of three different health monitoring systems: Smart Blood Pressure Monitor, Smart Body Analyzer, Smart Glucometer. Cooey is lengthwise health monitoring IOT platforms which help the providers in collecting, storing and analyzing of raw medical data so as to provide provide alerts of vital signs for patients beforehand. It lets you choose and customize your personalized services based upon your health condition. For customers, it is a health management application with personalized services. It is personalized solution for chronic health management. No other product and app is able to provide a last mile connection of a patient with his health experts. But, through the help of #rd platform services, Cooey is able to interconnect and provide focused services to itscustomers.
Some of the 3rd Platform services that Cooey provides:

- Measure and Monitor: Smart devices like Bluetooth entitled BP monitor and Weighing Scale lets you automatically record the medical data and lets your medical health experts to remotely access this data.
- Engage: Different data including the profile of patient, his health vitals, his medication and medication history are collected and on that basis health tips are provided in order to improve healthmanagement
- Fulfilment: The data collected so is also used to create dynamic profile of the patient according to his current health condition so that on further analysis this profile can be used by other medicalexperts

Synco Living

Synco Living [2] Home automation and control system provide comfort and superior energy efficiency through intelligent home automation. This system provides convenient control and switching of HVAC systems, lights, blinds andmore.

This system boasts of providing a comfortable home where you save energy costs every month, a pleasant oasis with a perfectly coordinated room climate, and the security of knowing that your home is always monitored even when you are notthere.

One system for the entire home

Synco™ living, the intelligent home automation system turns your four walls into a secure and energy-efficient home. It is a reliable system that thinks along with you and controls many things in the background, including the room temperature and ventilation. Synco living controls your blinds, provides scene control functions, simulates your presence by turning lamps on and off, reports water damage and monitors doors and windows. In addition, a smart phone allows you to access the system at any time – fromeverywhere.

Smart e-health gateway

There have been many efforts in designing gateways for one or several specific applications and architectural layers. There is a gateway SwissGate which handles and optimizes the operation of sensor networks. They transparently employ their proposed gateway on home automation applications.

There is proposed prototype of a smart 6LoWPAN (IPv6 over Low power Wireless Personal Area Networks) border router that makes local decisions of users' health states based on a Hidden Markov Model. Finally, Smart e-health gateway called UT-GATE in order to bring intelligence into IoT-based ubiquitous healthcare systems. These gateways are intelligent in the sense that they have been empowered to autonomously perform local data storage and processing, to learn, and to make decisions at the edge of the network (i.e., in a distributed fashion), thanks to the provided embedded processing power and storage capabilities of the gateways. A smart gateway can rapidly provide preliminary results and reduce the redundant remote communication to cloud servers by using data aggregation, embedded machine learning, and inferences, thus offering the basic services at the edge of the network. In this way, remote cloud computers will just provide premium services which are often computationally intensive and require access to the central database

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3.PROPOSEDMODEL

Nowadays fuel has become primary importance for any country. To go anywhere we need fuel for our automobile. A problem that still persists nowadays with petrol pumps is that the depth of fuel in the fuel tanks still has to check manually. Also, the fuel prices can be regulated by the depot owner to whatever they wish to, which causes high fluctuation in prices to the customer from different stations. Say a person is travelling from a place to another place X to place Y. At halfway he decides to refill fuel. Wouldn't it be nice if the fuel station could just tell whether they have fuel available or not? This paper addresses the same problem. The objectives kept into consideration while implementing such a system was to develop such an intelligent fuel station where manual measuring of tank is not required, just to improve on efficiency. To develop a system, this would restrict the price to a fixed value avoiding fluctuations at depot for the customer. To develop a system that acts as a network between the depot owner and the central authority opening routes for better communication and quick responses. To develop a system that can assist the user about the fuel details and can sort the situation making travelling easier.

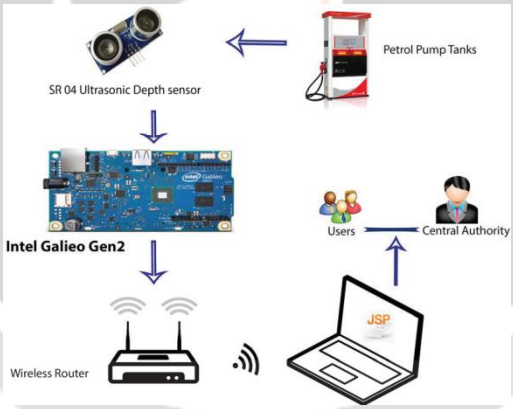

Fig. 1 System Architecture

In this project 'Smart Petrol Pump' we measured the level of fuel in the gas station and updated it to the central server. Sensors used measures the level of fuel. If at any time the fuel level is below a critical level, then the central will provide fuel to that station. Another motive is to create a website which takes the fuel level as input from the fuel station; the hardware installed there processes it and then returns it to the site which is accessible by admin and users. Admin alone has the right to change the data and update it. Users are not allowed to change any data but can only viewit.

The Intel Galileo Gen 2 development board is a 32 bit microcontroller board based on the Intel Quark SoC X1000 application processor. The ultrasonic depth sensor used in the project is HCSR04 which senses the depth of the fuel in the tank. The microcontroller is connected to this ultrasonic sensor; Ultrasonic module HCSR04 has a 2cm 400cm noncontact measurement function, the ranging accuracy maybe up to 3mm. This modules includes ultrasonic transmitters, receiver and control circuit. The sensor uses IO trigger for at least 10us high level signal, to detect the depth the ultrasonic sensor automatically sends eight 40 kHz frequency pluses and then checks for

whether there is a pulse signal received back. If the signal received back, through high level, time of high output IO duration is the time from sending ultrasonic to returning. Helps in determining the distance, the Test distance is calculated as Test distance = (high level time × velocity of sound (340M/S) /
2.Thedistancecalculatedbytheultrasonicsensorisprovided
as input to the Galileo board.

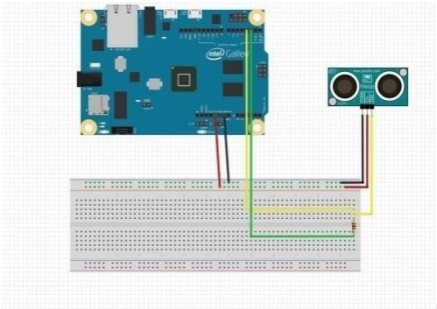

Fig. 2 Hardware Implementation

For, the part where a network has to be established, a very generic web server is setup up consisting of a single web page, the Galileo handles the web server. To create a web server, an arduino sketch is written, which then uploaded to the Galileo enables it to establish and serve up a single web page that user can view in any web browser. Any user can access the Galileo just by typing the IP address. The user can anytime surfs to the IP address of the Galileo server as long as the server is on, a request is send from the client to the server, the sketch uploaded for establishing the server on the Galileo tells it to reads every character from the browser request. The microcontroller takes every character as input and to know of the end of the request it looks for the blank line. After receiving and processing the request for a web page from the browser which is a client, the Galileo server at the beginning sends a standard HTTP response, after the server has sent the HTTP response; it sends the actual web page which is then displayed in the browser. The web page is kept stock and interactive, made of text with HTML tags easy for the user to understand.

To complete the model all parts of the project needs to be connected together. The Galileo as told earlier already has the depth of the fuel tank which was detected by the ultrasonic sensor. The calculated distance is accepted by the sketch uploaded on the board and then is sent to a web page. To make it more user friendly and interactive Google's maps API is used for Google maps which will make the task easy for the user by telling and directing them to the nearest depot along with the details of estimated time and distance of the source and the destination.

4 Architecture & Diagrams

The proposed intelligent Smart Petrol Pump is being deployed for three different user ids and the database is tested continuously for the changes. Also, the Map view results are also being recorded for a single search from Delhi to Chandigarh and the screenshots are taken. The IOT device used here is Intel Galileo board and the sensor used for sensing ultrasonic sensor. The system architecture of the proposed model is explained by the given below figures which includes a server connected Intel Galileoboard.

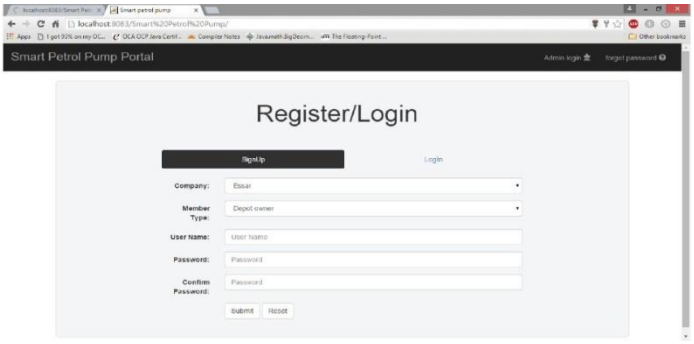

Fig. 3 Sytem web portal design

A Register page is made on the sever that has various options of signing up as a new user to register for smart petrol pump membership by selecting valid username and password along with selecting amongst the various membership types.

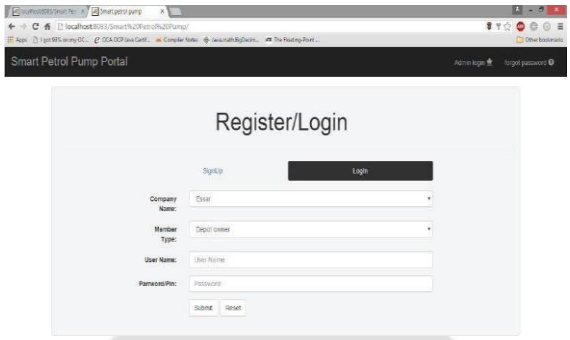

Fig. 4 System Register/Login Page

A Login page is made on the sever which lets the previously registered users to login with their credentials and acces their dashboard.

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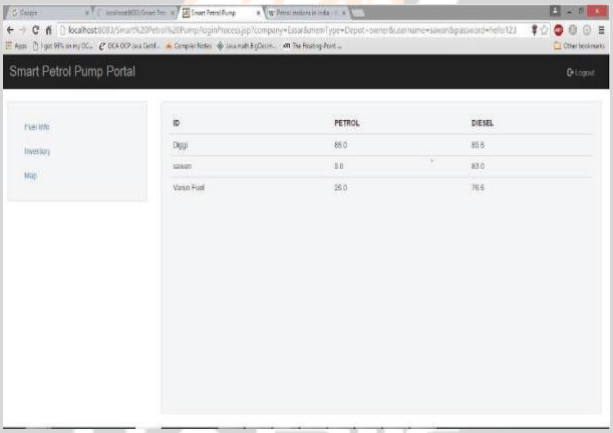

Fig. 5 System Dashboarddesign

Fig.6 System DashboardDesign

In the dashboard menu, the user can see the amount of petrol or diesel used by individual id owners. This dashboard helps to maintain the smart track of the fuel consumption by the user.

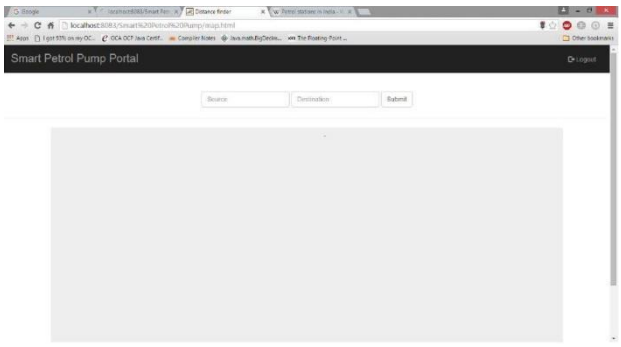

Fig.7 Sytem web portal Map View

In the Map view menu, the server provides an option to enter the source and the destination address of the required route and search for the exact routedetails.

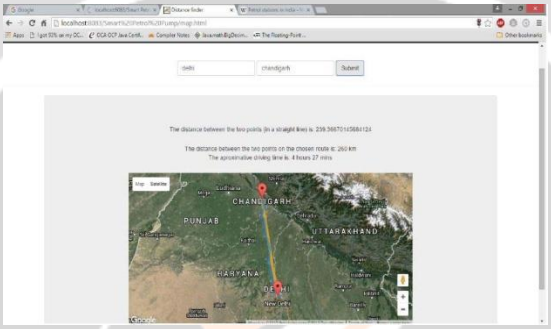

Fig.8 Sytem web portal Detailed Map View

In the Map menu tab, after the source and destination is provided, the server computes the straight line distance along with the route distance and accordingly calculates the driving time. This uses a Google Map API for plotting the location of the petrol pump and your current location along with approximate distance between them.

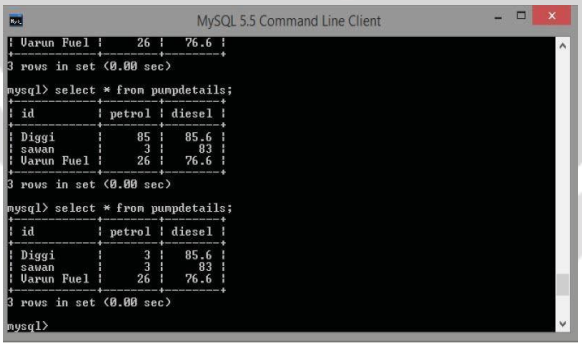

Fig.9 MySQL Database Screenshot

This figure shows the real time computation of the MySQl server on the run showing the updating of theconsumption rates of the each individualid's.

5 Conclusions

From the experimental results section it is clear that a smart and an intelligent petrol station design has been set up which not only makes it easy for the user to access and manage their fuel usage but also tries to make the user updated about the fluctuating fuel prices. An easy and reliable web interface is being provided to the user which also features the Map view that helps users to decide their preferred route by giving them distance and the travel timeneeded.

Thus in all, the system proves to be a an efficient and reliable system by automating the fuel stations and making the travelling for users moreeasy.

References

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