



GPS and IoT Based E-Pump with Advanced Data Mining and Visualization

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ABSTRACT

GPS and IOT based E-Pump with advanced data mining and visualization is the new technology that has various advantages and it is an adoptable technology in this present scenario. Data Mining is the hot topic of the day. All organizations are moving towards implementation of IOT devices into their business for effective development. In this paper, we discuss about automating a Petrol pump by providing support to the customer outside the organization. A sensor based system detects the status of crowd in the pump. We believe GPS based E-Pump will surely improve the current system of petrol pump and improve quality at an affordable cost.

Keywords— Internet of Things (IOT), Data Mining, Cost effective, Global Positioning System (GPS)

I. INTRODUCTION

The 21st century is aptly known as the internet age because of the increasing use of internet in the day to day activities. Examples of these applications include online banking and brokerage, cash management, tax filling, computerized petrol pump, medical field. As far as GPS and IOT based E-Pump is concerned is to manage the booking and delivery of petrol and diesel to the customer in a particular location. [2][4].

The main advantage of the GPS and IOT based System is that it. manage the booking and delivery of petrol and diesel to the customer in a particular location. It mainly focuses on helping people who get stuck in a place when no petrol pumps are nearby. And also IOT sensors are implemented in the Pump for customer data acquisition and

analysis. The same data will be stored in MYSQL cloud server for future processing. The project is developed using php as front end and MySQL Server as backend. Here used data mining algorithm is Time series Analysis.

II. BACKGROUND

A.PHP

PHP (Hypertext Pre-processor) is a server-side scripting language designed for web development but also used as a general-purpose programming language.PHP is a widely used open source general purpose scripting language that is especially suited for web development and can be embedded into HTML.

Instead of lots of commands to output HTML, PHP pages contain HTML with embedded code that



does something.

The PHP code is enclosed in special start and end processing instructions `<? php and ?>` that allow you to jump into and out of PHP mode. What distinguishes PHP from something like client-side java script is that the code is executed on the server, generating HTML which is then sent to the client.[2][3].

There are three main areas where PHP scripts are used.

- Server-side scripting

This is the most traditional and main target field for PHP

- Command Line Scripting

PHP script to run it without any server or browser

- Writing Desktop Applications

PHP is probably not the very best language to create a desktop application with a graphical user interface.

B.MYSQL

MySQL is an open source, SQL Relational Database Management System (RDBMS) that is free for many uses (more detail on that later). Early in its history, MySQL occasionally faced opposition due to its lack of support for some core SQL constructs such as sub selects and foreign keys. Ultimately, however, MySQL found a broad, enthusiastic user base for its liberal licensing terms, perky performance, and ease of use. Its acceptance was aided in part by the wide variety of other technologies such as PHP, Java, Perl, Python, and the like that have encouraged its use through stable, well-documented modules and extensions[5].

- Speed
- Reliability
- Security
- Scalability and portability

C.HTML

Hypertext Markup Language (HTML), the languages of the World Wide Web (WWW), allows users to produces Web pages that include text, graphics and pointer to other Web pages (Hyperlinks).

HTML is not a programming language but it is an application of ISO Standard 8879, SGML (Standard Generalized Markup Language), but specialized to hypertext and adapted to the Web. The idea behind Hypertext is that instead of reading text in rigid linear structure, we can easily jump from one point to another point. We can navigate through the information based on our interest and preference. A markup language is simply a series of elements, each delimited with special characters that define how text or other items enclosed within the elements should be displayed[5].

D. Apache Tomcat

Apache Tomcat is a web container which allows running servlet and Java Server Pages (JSP) based web applications. Most of the modern Java web frameworks are based on servlets, e.g. Java Server Faces, Struts, Spring.

Apache Tomcat also provides by default a HTTP connector on port 8080, i.e., Tomcat can also be used as HTTP server. But the performance of Tomcat is not as good as the performance of a designated web server, like the Apache HTTP server.

III. PROPOSED METHOD

In this scenario GPS and IOT based E-Pump used IOT sensors. Here used data mining algorithm is Time series Analysis.

A. Internet of Things (IoT)

Internet of Things (IoT) is an integrated part of Future Internet including existing and evolving Internet and network developments and could be conceptually defined as a dynamic global network infrastructure with self configuring capabilities based on standard and interoperable communication protocols where physical and virtual “things” have identities, physical attributes, and virtual personalities, use intelligent interfaces, and are seamlessly integrated into the information network[4].

Benefits of IoT

The internet of things offers a number of benefits to organizations, enabling them to:

- monitor their overall business processes;
- improve the customer experience;
- save time and money;
- enhance employee productivity;
- integrate and adapt business models;
- make better business decisions; and
- Generate more revenue



Figure A.1 IoT

B. Arduino Mega Board

Arduino is an open-source electronics platform

based on easy-to-use hardware and software. Arduino boards are able to read inputs - light on a sensor, a finger on a button, or a Twitter message - and turn it into an output - activating a motor, turning on an LED, publishing something online. You can tell your board what to do by sending a set of instructions to the microcontroller on the board. To do so you use the Arduino programming language (based on Wiring), and the Arduino Software (IDE), based on Processing.

Arduino was born at the Ivrea Interaction Design Institute as an easy tool for fast prototyping, aimed at students without a background in electronics and programming. As soon as it reached a wider community, the Arduino board started changing to adapt to new needs and challenges, differentiating its offer from simple 8-bit boards to products for IoT applications, wearable, 3D printing, and embedded environments[7].

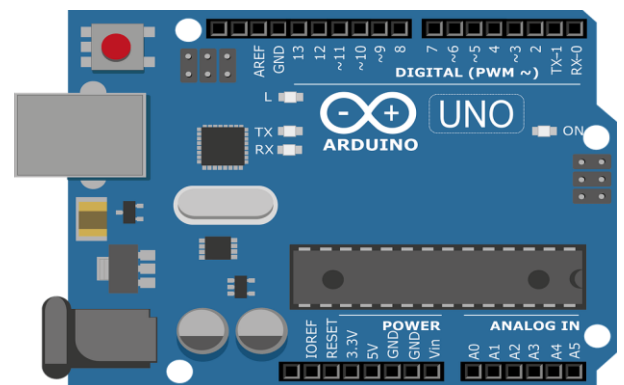


Figure B.1 Arduino Mega

Features of the Arduino UNO

- Microcontroller: ATmega328.
- Operating Voltage: 5V.
- Input Voltage (recommended): 7-12V.
- Input Voltage (limits): 6-20V.
- Digital I/O Pins: 14 (of which 6 provide PWM output)

- Analog Input Pins: 6.
- DC Current per I/O Pin: 40 mA.
- DC Current for 3.3V Pin: 50 mA.



Figure B.2 running the first arduino program

C. Time Series Analysis

A time series is a series of data points indexed (or listed or graphed) in time order. Most commonly, a time series is a sequence taken at successive equally spaced points in time. Thus it is a sequence of discrete-time data. Examples of time series are heights of ocean tides, counts of sunspots, and the daily closing value of the Dow Jones Industrial Average.

Time series are very frequently plotted via line charts.

Time series are used in statistics, signal processing, pattern recognition, econometrics, mathematical finance, weather forecasting, earthquake prediction, electroencephalography, control engineering, astronomy, communications engineering, and largely in any domain of applied science and engineering which involves temporal measurements.

Time series analysis comprises methods for analyzing time series data in order to extract meaningful statistics and other characteristics of the data. Time series forecasting is the use of a model to predict future values based on

previously observed values. While regression analysis is often employed in such a way as to test theories that the current values of one or more independent time series affect the current value of another time series, this type of analysis of time series is not called "time series analysis", which focuses on comparing values of a single time series or multiple dependent time series at different points in time [6].

Time series data have a natural temporal ordering. This makes time series analysis distinct from cross-sectional studies, in which there is no natural ordering of the observations (e.g. explaining people's wages by reference to their respective education levels, where the individuals' data could be entered in any order). Time series analysis is also distinct from spatial data analysis where the observations typically relate to geographical locations (e.g. accounting for house prices by the location as well as the intrinsic characteristics of the houses). A stochastic model for a time series will generally reflect the fact that observations close together in time will be more closely related than observations further apart.

Methods for time series analysis may be divided into two classes: frequency-domain methods and time-domain methods. The former include spectral analysis and wavelet analysis; the latter include auto-correlation and cross-correlation analysis. In the time domain, correlation and analysis can be made in a filter-like manner using scaled correlation, thereby mitigating the need to operate in the frequency domain.

Additionally, time series analysis techniques may be divided into parametric and non-

parametric methods. The parametric approaches assume that the underlying stationary stochastic process has a certain structure which can be described using a small number of parameters (for example, using an autoregressive or moving average model). In these approaches, the task is to estimate the parameters of the model that describes the stochastic process. By contrast, non-parametric approaches explicitly estimate the covariance or the spectrum of the process without assuming that the process has any particular structure.

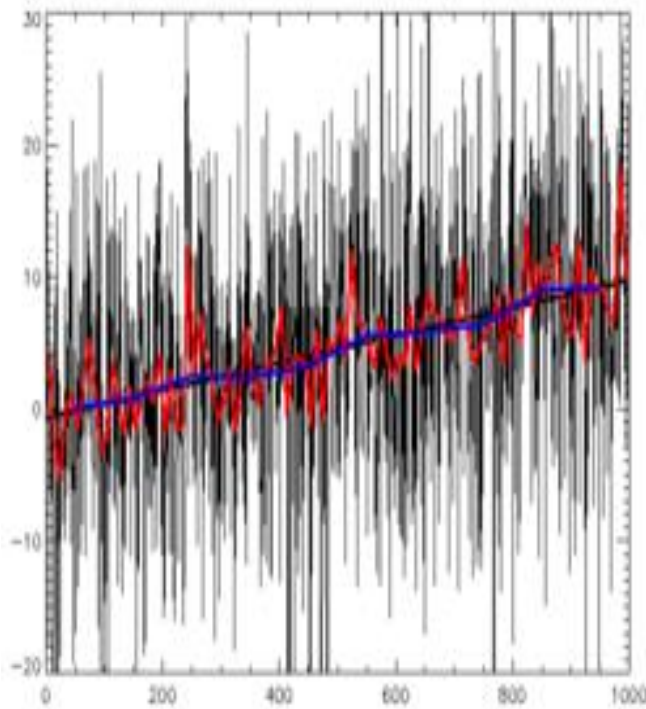
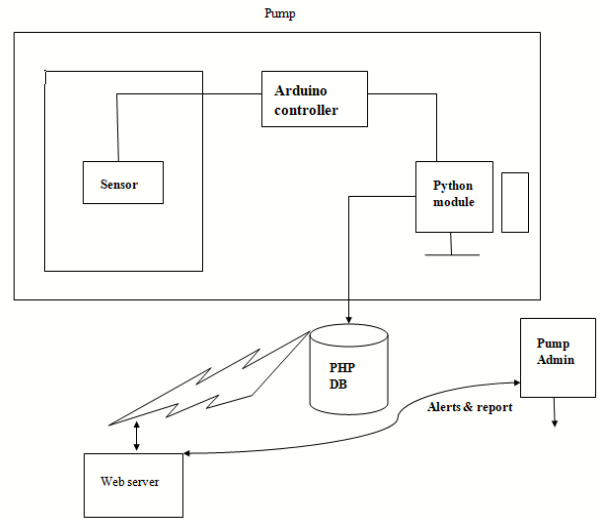


Fig C.1: Time series: random data plus trend, with best-fit line and, different, applied, filters

D. Architecture



E. Level of Users

➤ Operator

This module deals with the services that are offered to operator. In this module, duty of the admin to approving the petrol pump request and processing according to the user requirements, tracking the location of the user etc.

➤ Petrol Pump

The petrol pump handles the activities in a pump, Register the Owners of the petrol pumps,

Upload the details of the pumps, branches and facilities, Adding staffs and providing their services, Updates pump details, Add new stock details, View applications, View order details, Update status, IOT sensors are connected in the pump. And also get alerts to the admin.

➤ Customer

The user logs in to the site via email id and phone number, Upload the details, View order details, View pump details

Set location for delivery, they can give the feedback about the petrol pump

➤ **GPS based E-pump module**

GPS tracking, Calculate the shortest distance between two points

➤ **IOT based sensor data acquisition**

Sensors are connected in the petrol pump. And the are stored in local pc, PIR sensor is used, Python module, Application server, Data Analysis module.

➤ **Data mining functions**

Time series analysis is used

➤ **Visualization**

Alerts and Graphical visualization

IV. RESULT

A. SCREEN SHOTS

The figure 1 shows the alert message by using Time series Analysis in data mining. This effectively reports the crowd status to the operator.

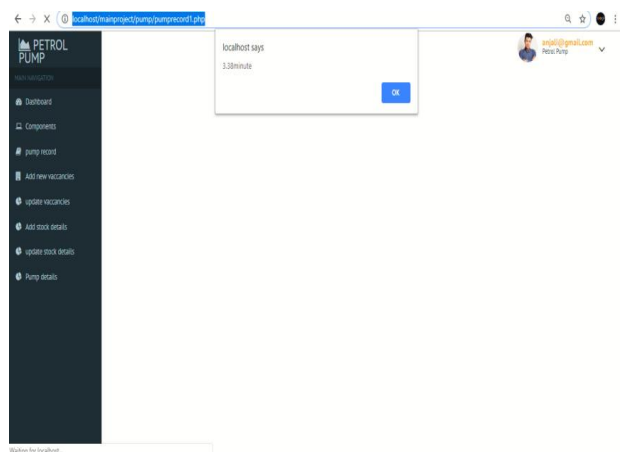


Fig 1: Time series analysis

V. CONCLUSION

The research work titled as “GPS and IOT based E-Pump ” is a web based work. This software is to manage the booking and delivery of petrol and diesel to the customer in a particular location. It mainly focuses on helping people who get stuck in a place when no petrol pumps are nearby. You can soon have the comfort of buying them on one click, without going to the fuel pump. And also IOT sensors are connected in the petrol pump for detecting the crowd and getting alerts to the operator. . Our system can provide solution for the existing system which is completely controlled and maintained by the pump operator.

VI. REFERENCES

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