Power Customer Interaction

Nikita Parab[1], Shweta Ghadage[2], Shubhangi Jadhav[3], Vaidehi Baviskar[4], Prof. Jayashree Kulkarni[5]
[1, 2, 3, 4] Dept of Information Technology
[5] Professor, Dept of Information Technology
[1, 2] MIT Academy of Engineering (Alandi) Pune(M.H)

Abstract- *Everyone rely on electricity to power lights, appliances and electronic devices. As people consume more and more power, electricity bills rise. As everyone knows MSEB employees come to the house to click the picture of meter readings and then they add it to the database to generate final bill. This is too lengthy and manpower consuming process. Hence a system is required which analyze the consumption of electricity time to time, to avoid human intervention. Using the IOT based model we are going to analyze the power consumption of devices. Where the sensors are used to get the power utilization. So, that user will get to know real time reading directly through application. To avoid excessive power consumption, the facility is provided to the consumer to set a benchmark in the application for his electricity usage and if the usage goes beyond the benchmark then the application will send notification to consumer. We are going to implement a software which generate customer usage pattern based on electricity used, so that customer will be able to control and monitor usage and can take necessary action to limit theusage.*

Keywords- Electricity, IOT, Power Consumption, Bill, etc.

I. INTRODUCTION

Electricity is the basic need in today's modern world. Energy consumption is increasing day by day, since prevention is better than cure awareness of energy consumption should be brought into every place before resources get vanished. Today, we are entering the wireless world revolution, known as Internet of things (IOT).The dream is to automatically monitor, stylize and respond to control power consumption in the country wide utility equipment, Trac, hospital equipment etc and many more over wider areas with billions of sensors. In this technological world the electric power is the main source for the development and advancement and we need to analyze and to take control over it.

We are going to implement one model and analyze the outcome's, where we use real-time electricity as data taking through the sensors and stored into the database through the Arduino Uno. This reading is then fetched using android application and used to display usage pattern to the customer.

II. LITERATUREREVIEW

[1] Fazil Kaytez, M. Cengiz Taplamacioglu, Ertuğrul Çam, Firat Hardalac ―presented the "Forecasting electricity consumption: In this the comparison of neural networks,LS– SVM and regression analysis" is done to forecast the electricity consumption. In these models, as independent variables total electricity power generation, installed capacity, total subscriptions and population using power are used from the historical data of the year 1970 to 2009. In this study, the results which are forecasted are then compared with each other using the diverse performance criteria. For determining the sensitivity of these practical results, the receiver operating characteristic (ROC) analysis is realized. From above practical it was concluded that the model which is an accurate and used as a quick prediction method is LS-SVM model.

[2] Cheng Fan, Fu Xiao, Shengwei Wang ―introduced the "Development of prediction models for next-day building energy consumption and peak power demand using data mining techniques". In this study, data mining (DM) techniques are used for predicting energy consumption and peak power demand for next day by developing ensemble models using these algorithms, with the focus on improving the accuracy of prediction. This approach is with the three steps in which the first step is, outlier detection, clustering analysis and the GESD. The outlier detection merges the feature extraction and clustering analysis performs the clustering of data, and the Generalized Extreme Standardized Deviate (GESD) is applied to eliminate the inconsistent day-to-day electricity consumption situations or profiles. The second step is, the recursive elimination method, which is an embedded inconsistent selection method made distinctively using eight commonly used predictive algorithms, pertained to choose the appropriate inputs to the base prediction models. Then through leave- group-out cross validation, the parameters of each of these models are acquired. The last step is to develop the ensemble model and also using generic algorithm the weight of these selected eight predictive models are reduced. This approach is used in Hong Kong in the tallest building, to examine large

amount of electricity consumption data. The prediction accuracy of the gathered models are measured by the mean absolute percentage error, which was 2.32 percent for the next-day of consumption of electricity and 2.85 percent for the peak powerdemand.

[3] Hideitsu Hino, Haoyang Shen ―presented "A Versatile Clustering Method for Electricity Consumption Pattern Analysis of usage of electricity in Households". This paper represents the employing statistical techniques whichareused in this survey.Firstly the method which is used to model daily consumption patterns of the power usage in households and secondly the method used to extract a little number of the generated typical patterns. By using the mixture of Gaussian distributions, the used electricity consumption patterns in the household are modelled.After that, the typical consumption patterns are extracted by using the hierarchical clustering, by using the symmetrized generalized Kullback-Leibler divergence of the distributions as a distance measure. To capture the important similarities of the consumption patterns is allowed by the statistical modelling of daily consumption patterns. Through the experiments it is proved that the proposed methodology is able to extract only the typical electricity consumption patterns by using the wide-range of big dataset which includes about 500 houses datasets which is the electricity consumption records in a suburban area in Japan.

[4] PedramSamadi, Amir-Hamed Mohsenian-Rad, Robert Schober, Vincent W.S. Wong, and JuriJatskevich―presented the "Optimal Real-Time Pricing Algorithm based on Utility Maximization for Smart Grid". For this examination they think about a savvy control foundation, in which numerous clients share a typical power source. As per this task or study each client is having a vitality utilization controller unit as a feature of its keen meter where each brilliant meter is associated with the power lattice just as to the correspondence foundation utilizing a neighborhood. This advantages in the both-path correspondence between the shrewd meters. For the future Smart Grid, they proposed a novel constant valuing calculation by considering the significance of vitality evaluating as a key apparatus for creating productive interest side administration techniques, through the trading of control messages with the emphasis on the communications between the savvy meters and the vitality supplier. These control messages contain the client's vitality utilization information and the constant value data. be dependent on the demand of the energy, and on the anotherside, the growth of an economy hinges on the availability of environmentally mild and cost effective energy resources. For showing that, how the energy is efficiently used in the developing economy, the energy intensity is used an indicator. The OECD (Organization of Economic Co-task and Development) part nations spoke to that, when contrasted with develop economies the vitality force of India is over twice, which is additionally a lot higher than the risingeconomies.

[5] Santosh Sahu ―presented the "Trends and Patterns of Energy Consumption in India". This paper defines, the energy as globally identified key factor and it is also the very essential input to the economic growth to reduce the expenditure and also in the human development.

[6] Vera Silva, Fátima Rodrigues, Zita Vale, Joaquim Borges Gouveia ―developed "An Electric Energy Consumer Characterization Framework based on DataMining Techniques". Based on a knowledge discovery in databases (KDD) procedure,this paper represent an electricity consumer characterization framework which is supported by the data mining (DM) techniques, which is applied at the different levels of the KDD process. The key factor of this framework is the data mining model which is based on the mixture of unsupervised and supervised learning techniques. The two main modules such as, the load profiling module and the classification module, construct this framework. The main module - stack profiling module,using a bunching activity, makes a lot of buyer classes and for each class it speaks to the heap profiles. The second module - classification module uses this information of load profile module for building the classification model which should be able to assign different consumer's account to the already presented classes. The nature of this structure is actualized from the Portuguese conveyance organization with a contextual analysis which includes the genuine database of LVclients.

III. PROBLEMSTATEMENT

The realization of power consumed dawns up on the customer only when they see the bill for the month. Through IOT Technology the electricityusage pattern is to be sent to the customer so that he is aware of his consumption pattern and would take appropriate measures to reduce unwanted electricity consumption.

IV. SYSTEM ARCHITECTUREOVERVIEW

We are developing an android application, which can be installed in Android mobile phone.To calculate the electricity consumption, the amount of electricity used is captured with the help of voltage sensor and current sensor, then with the help of node MCU this data is sent to the server where database is created. It is a Firebase database. User can access the usage information through application using his credentials like email ID and password. He can add the

number of meters he has. Using this android application consumer can set a benchmark for his electricity usage. On crossing the benchmark, the consumer gets notification through this application. So that he can beaware of his excess usage and can take appropriate measures to reduce unwanted energy usage. This setup can also display the real time reading to the customer through application.

To calculate the power consumption it uses the formulae,

$$P = V * I$$

Where, P is power consumed, I is electric current usage, and V is voltage or electric potential difference.

From the server information is exchanged between the mobile
devices. After processing, the result is shown in the form of usage pattern to the consumer.

Every day the client can access the everyday information required about the electricity utilized. So, from this the user can get a tentative idea of the power consumed and can try to reduce the usage of power and hence can save money andelectricity.

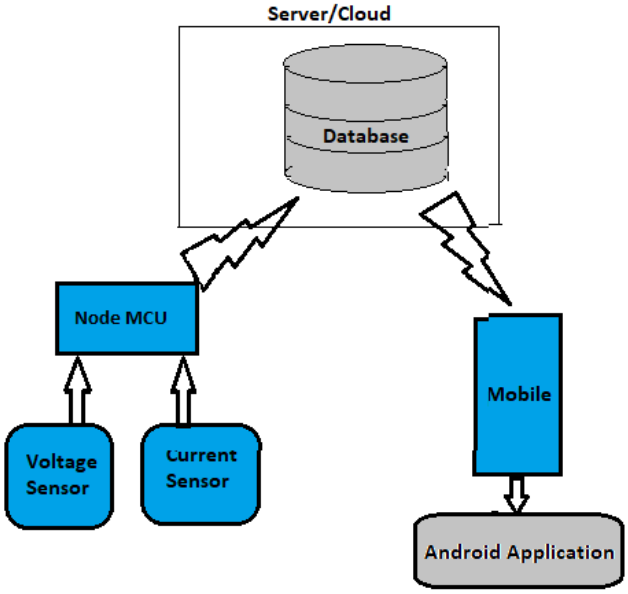

Fig.1 (System Architecture)

I. USERS

Clients are a definitive human client of a product item. The term is utilized to digest and separate the individuals who just utilize the product from the engineers of the framework, who improve the product for end clients. In client plan, it additionally recognizes the product administrator from the customer who pays for its improvement and different partners who may not straightforwardly utilize the product, but rather help set up itsnecessities.

2. NODEMCU

NodeMCU is an open-source firmware and development kit that helps you to prototype or build IoT product. It includes firmware which runs on the ESP8266 Wi-Fi SoC from Espressif Systems, and hardware which is based on the ESP- 12 module. The firmware uses the Lua scripting language. It is based on the eLua project, and built on the Espressif Non- OS SDK for ESP8266. It includes firmware which runs on the ESP8266 Wi-Fi SoC from Espressif Systems and hardware which is based on the ESP-12 module. NodeMCU provides access to the GPIO (General Purpose Input/Output).

A. SENSORS

We are using two sensors to input the amount of current and voltage across the system –

3. Current Sensors

A current sensor is a device that detects electric current in a wire, and generates a signal proportional to that current. The generated signal could be analog voltage or current or even a digital output. The generated signal can be then used to display the measured current in an ammeter, or can be stored for further analysis in a data acquisition system, or can be used for the purpose of control. The sensed current can be alternating or direct. For an Alternative input current, you canget analog, bipolar and unipolar outputs. Whereas for direct current input you can get unipolar or digital output.

4. Voltage Sensors

A voltage sensor is going to be able to determine and even monitor and measure the voltage supply. It is then able to take those measurements and turn them into a signal that one will then be able to read. The signal will often go into a specialized electronic device for recording, but sometimes, an observer will be present to manually read the sensoroutput.

V. SYSTEMANALYSIS

To keep the continuous balancing of energy demand and supply is a fundamental prerequisite for the stability of energy grids. Photovoltaic power generation (PV) is one of the key components. Therefore, it is important to know in what way and how much electricity can be generated by PV at real-time, and how households' behavior can be changed by displaying their power generation and consumption with a

web browser for future demand forecast. For this purpose, we monitored and created electricity generation and consumption data in households.

VI. CONCLUSION

Hence, we are going to make a model which supports remote metering. As this model generate customer usage pattern based on electricity used, it is very easy to check real time usage and control it accordingly for user. The complete working model of a smart energy meter was built which uses existing internet/wi-fi module system. The model satisfactorily worked with all home appliances. Automatic meter reading can be explained well using this system. In future, we can modify the system so that the financial losses of electricity board can be minimized. Labour charges and effort can be reduced. The error, time delay that occurs due to manual metering can be avoided to a great extent. In future, one can make this project for larger geographical area by considering above features. So that, it will be useful for utility companies or power generating plant to balance consumption and generation of powerIn future, one can make this project for larger geographical area by considering above features. So that it will be useful for utility companies or power generating plant to balance consumption and generation of power.

VII. ACKNOWLEDGEMENT

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