A Novel IoT Based Power Monitoring System

S.Suriya*, Agusthiyar R 2,N.Vijayalakshmi1, J. Shyamala Devi1
1Assistant Professor
2HoD, Department of Computer Applications, SRM IST Ramapuram Campus

*Email Id: sssuriya54@gmail.com

Abstract

The use of IoT is increasing day by day; the significance and utilization is on the increase with more sophistication. In real world situation the electricity board calculates the bill amount and passed to the user mail or EB card. Now an efficient power monitoring system is proposed which uses a sensor at the heap to ascertain current, a circuit is utilized to figure voltage and with these two, power can be computed. Control qualities are put away in cloud database. Noninvasive current transformer sensor which receives the input from the live power supply and transfer the value to Voltage sensor, Nodemcu gets the value from voltage sensor and stores it in cloud database. With the help of cloud database user can monitor the power consumption value. Home automation can be achieved with the help of Relay Module and separate Nodemcu. Devices can be controlled from cloud dashboard. EB bill is a big challenging expenditure on day to day life. To overcome this situation Power Monitoring System will be very useful for the Average Salary people and also it overcomes the Electricity theft, unwanted Power wastage, avoidance of high power consumption devices.

I. Introduction

Power Monitoring System based on IoT system provides an easy way to automatically retrieve and analyze power quality events. We are often left wondering how much power is consumed by the devices that we use in our day-to-day lives. To get a satisfying answer to this question, it is recommended to install Power monitoring system that integrates all devices operating on power.

Real time energy monitoring is made possible by this smart system that operates on the concept of the internet of things (IoT). Such tracking of power consumption gives you a fair idea of how much
energy is eaten up by each device. Such insights help in making strategies to optimize overall power consumption. Power Monitoring System accompanied with Home Automation is possible in this Research. Keep a check on number of units used by each device and plots an optimization strategy to minimize the daily usage. Enables user in real time tracking of watts to calculate approximate electricity bill for a month based on current usage. Gives details of daily, weekly and monthly power consumption to compare time period of maximum usage. Highlights insights of increase or decrease in overall power consumption to let user know how good is the formulated strategy of power consumption in terms of energy saving.

Graphical representation of Watts consumed by devices presents a clear picture to an individual on power consumption. Identifying abnormal pattern in energy consumption makes it easier for user to find out malfunctioning in appliance.

II. Existing System

In an Existing only data is being recorded and retrieved. Only certain IoT enabled devices have been programmed to control the flow of electricity and power consumption. Tracking of power consumption gives you a fair idea of how much energy is eaten up by each device. The users will be able to monitor their current power consumptions (bill) anytime, anywhere by using their mobile phone via Short Message Services (SMS) The present system of energy metering as well as billing in India uses electromechanical and somewhere digital energy meter.

In the paper titled Design of Intelligent Power Load Automatic Monitoring system by Taoyunzhang et.al. [1]. Overcome the traditional monitoring system with small monitoring range and low accuracy by using an intelligent power load automatic detection system designed with data collector and data detector along with the power load characteristic database which helps to monitor electric loads simultaneously.

The paper titled A Low cost monitoring system for maximum power point of a photovoltaic system using IoT technique by N. Rouibah et.al. [2]. has introduced the low cost monitoring system for maximum power point tracking (MPPT) in Photovoltaic system. AT mega 2560 embedded board with voltage sensors, and Wi-Fi module ESP8266 to transmit the real time data is used. The output power is compared with the expected result using the above model. Thus the existing system has an individual task with monitoring devices achieved possibly

III. Proposed System

In Proposed system the Power Monitoring System has been accompanied with Home Automation system. All Electronic devices can able to monitor current consumption, voltage details using voltage sensor also possible. Tracking of power consumption gives you a fair idea of how much energy is eaten up by each devices and Future bill prediction amount and current consumption achieved by Genetic algorithm. The Proposed System at low cost with highly secured data storage at cloud by trigger for particular timestamp interval also achieved by the proposed research.
IV. Architecture diagram

Current transformer sensor senses the current flow from the live wire and sends to the current sensor as an analogue input. The Current sensor which is used whole building power monitoring system. In prior to this it is used to fetch the primary current all over through the entrance gateway, secondary power flow can also been calculated using some ratios i.e., number of turns of coil in the transformers as follows

Secondary current = total turns *Primary current

Current turn ratio=primary turns/secondary turns

Current sensor process the analogue data to digital form and sends to the node mcu. Node mcu is programmed to fetch the data from current sensor and send the data to our database. 4 channel relay board which controls the 4 device is connected. Node mcu is connected with relay module and to our cloud database. Our cloud database consists of dashboard which displays the power consumption reading and virtual switch to control the devices connected to the relay module.

The data’s stored in cloud are then fetched and store as csv files on periodically. The CSV files has been stored in to the local database. Often the data programatically manipulated using Genetic algorithm for accurate future bill prediction. Genetic Algorithm is a heuristic search and natural selection process. The optimization quality of data will be good. The future bill prediction, calculation of power eaten by each devices, above 500 unit’s constraints, Home automation are possible over here in Power Monitoring system.

a. Components Used

Figure: 2 Current Transformer sensor 30A

Figure: 3 NODEMCUESP8266
b. Process Flow

**Login**

By login to the UI (User Interface) user can able to get into the home page. The home page consists of different categories, monitoring the whole flow, monitoring by device, home automation, and Future bill Predictions, Search By past month Usage.

**Monitoring**

Monitoring to keep on track for the devices entirely or particular by choosing the category accordingly.

- Monitoring the whole meter
- Monitoring the particular device

**Future bill prediction**

It is possible by fetching the details from Ubidots cloud and store it into the own database. Monthly bill amount will be stored into the database with double a month accordingly. That data is manipulated with the help of Genetic Algorithm and optimized result will be produced for users view will be possible over here.

**Home Automation**

The Home automation is embedded over here in the power monitoring system, by which we can able to switch on or off the devices connected to the relay module from remote location too.

V. Implementations

The Power from the meter is captured through current transformer sensor as analog input and sends to current sensor which is then converted into digital input and transported to the Nodemcu which in turn reaches the Ubidots cloud. The live current value is monitored using the User Interface designed. If the current exceeds threshold value an alert is sent to the user.
Fig 6: Current consumption from ubidots cloud

**Threshold value**

It is the value received from the user history for the past few years for comparison.

By implementing this features the user can beware of their daily current consumption and also electricity. Also if the user forgetter to switch off their electronic devices the sensor will capture the human movement if not present it will send some alert message, the user can access it from remotely is possible over here.

If (Reading > 350)  
{  
AV (approximate Val)  
AV=No of days left * average reading per day  
}  
Future bill prediction, Home automation, Average current usage crossover all of this futures implemented as features in Power Monitoring system with home automation.

**VI. Conclusion**

The IoT based Power Monitoring system predicts and suggest the future bill, which helps in identifying anomalies and reducing wastages. Also outlier identification helps in fraud detection. Genetic algorithm helps us to select the near accurate value.

**VII. Future enhancement**

The Power monitoring system with combination of any other new algorithm to produce the optimized result and enhancing the clarity of data for manipulation and controlling the voltage of device using sensor devices for high consumption devices.
REFERENCES

[1] Huang Shihui; Yang Zhongliang; Zhou Yu “An Intelligent Power Online Monitoring and Measurement System of FGC Wind Photovoltaic Storage Integrated Power Station” 2018 IEEE International Telecommunications Energy Conference (INTELEC)

[2] S.J. Balser; H.K. Clark “Long-term disturbance monitoring for improved system analysis [power systems]” IEEE Computer Applications in PowerYear: 1989 | Volume: 2, Issue: 2 | Magazine Article | Publisher: IEEE

[3] J. Dhillipan, N. Vijayalakshmi, S. Suriya, D B. Shanmugam, “A Secure wild animals alert system for preventing the farming land using IoT”, International Journal of Recent Technology and Engineering, Vol.8, No.2, pp 3232-3236.

[4] Ahmad B. A. Hassanat *, Esra’a Alkafaween “On Enhancing Genetic Algorithms Using New Crossovers” International Journal of Computer Applications in Technology 55, no. 3 (2017): 202-212

[5] J. Dhillipan, N. Vijayalakshmi, S. Sindhu, “IoT Based Human Temperature Monitoring system for intellectual virus spreading like Covid-19”, HIT Journal, Vol.23, No. 11, pp 121-133.

[6] Taoyun Zhang; Haonan Shi; Mingxia Chen; Ling Xue; Yanjun Hao; Junsuo Qu “Design of Intelligent Power Load Automatic Monitoring System” 2019 3rd International Conference on Electronic Information Technology and Computer Engineering (EITCE)IEEE 18-20 Oct. 2019.

[7] N. Rouibah; L. Barazane; A. Mellit; B. Hajji; A. Rabhi “A low-cost monitoring system for maximum power point of a photovoltaic system using IoT technique” 2019 International Conference on Wireless Technologies, Embedded and Intelligent (WITS).

[8] J. Dhillipan, N. Vijayalakshmi, S. Suriya, “Network Monitoring System using Ping Methodology and GUI”, Springer (Recent Trends and Advances in Artificial Intelligence and Internet of Things), Vol.172, PP. 13-22.