A SURVEY ON EFFICIENT POWER MANAGEMENT USING SMART SOCKET AND IOT

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ABSTRACT

Energy Saving is visualized to be one of the key components driving vitality uses in electronic gadgets. In spite of the fact that there are various methods and standards used to moderate vitality, there is no prescribed answer for any of the issues overseeing wastage of electrical vitality. These wastages might be because of obliviousness, indiscretion and a few different variables. Instead of utilizing a sensor organizes, keen attachment is utilized as a part of the request to decrease the vitality devoured while watching those associated gadgets. These attachments are equipped for estimating the present going through them and transmit with each other by means of the Zigbee organize inside the home portal and exchange the information bundles in like manner. These vitality utilization subtle elements are the associated with the server through a web association. Here, the attachments are arranged such that it covers the whole ecological space and are assigned with urgencies in light of client's way of life, time of the task, day of activity and the aggregate vitality that is accessible. Consequently, there is better checking of energy devoured without squandering critical vitality in observing.

Contribution/Originality: This study contributes in the existing literature on efficient power management using smart socket and IoT. It refers to the use of intelligently connected device and systems to gather large amount of data. It is envisioned as an era in which objects can automatically and intelligently serve people in a collaborative manner.

1. INTRODUCTION

With the quick advancement of science and innovation, the world is getting to be smart Living in such a shrewd world individuals will be naturally and cooperatively served by the savvy gadgets (e.g., watches, cell phones, PCs), keen transportation (e.g., autos, transports, trains), brilliant situations (e.g., homes, workplaces, industrial facilities), and so on. For instance, utilizing a worldwide situating framework (GPS), a man's area can be ceaselessly transferred to a server that right away returns the best course to the individual's movement goal, shielding the individual from stalling out in traffic. What's more, the sound sensor inside a man's cell phone can consequently recognize and send any variation from the norm in a man's voice to a server that contrasts the variation from the norm and a progression of voiceprints to decide if the individual has some disease. In the end, all viewpoints with respect to individuals' digital, physical, social and mental world will be interconnected and canny in the shrewd world. As the following vital stage in mankind's history, the shrewd world is accepting various considerations from the scholarly community, industry, government, and so forth.

The IoT refers to the use of intelligently connected device and systems to gather large amount of data. It is envisioned as an era in which objects (e.g., watches, mobile phones, computers, cars, buses, and trains) can automatically and intelligently serve people in a collaborative manner. The IoT has the potential to deliver solution that dramatically improve energy efficiency, security, health, education, and many other aspects of our daily life clearly the internet of things is one of the most important and powerful development. Already IoT projects are underway that promise to close the gap between poor and rich improve distribution of the world resource for those who need them most. IoT has key attributes that distinguish it from regular internet as captured by sense framework.

A. Features of IoT

- Machine to machine communication.
- Machine to infrastructure communication.
- Tele health
- Continuous monitoring of and firmware upgrades for vehicles.
- Asset tracking of goods on the move.
- Automatic traffic management
- Remote security and control.
- Environmental monitoring and control
- Home and industrial building automation.

B. Green IoT

Empowering the practical keen world, the IoT ought to be described by vitality productivity. Especially, since all gadgets in the keen world should be outfitted with extra tactile and correspondence additional items so they can detect the world and speak with each other, they will require more vitality. Moreover, determined by the developing interest and selection from different associations, the vitality request will advance significantly increment.

All these make green IoT which centers on diminishing the vitality utilization of IoT a need, regarding satisfying the keen world with supportability. Considering the vitality productivity as the key amid the outline and advancement of IoT, Green IoT can be defined as takes after. ``The vitality productive strategies (equipment or programming) received by IoT either to encourage diminishing the greenhouse impact of existing applications and benefits or to decrease the effect of the greenhouse impact of IoT itself. In the prior case, the utilization of IoT will help diminish the greenhouse impact, though in the last case facilitate streamlining of IoT greenhouse impression will be taken care. The whole life cycle of green IoT should center around green outline, green creation, green use lastly green transfer/reusing to have no or little effect on nature.'' Green IoT deals with all the energy efficient ways in IoT in order to reduce or efface the energy consumption in existing and upcoming IoT based devices. Green IoT may be implemented using Green RFID (Radio Frequency Identification), Green Data Centers, Green Sensor Networks, Green Cloud Computing.

C. Components for Green IoT

- For Green RFID's, biodegradable RFID tags, printable RFID tags, Paper based RFID tags are preferred. Also efficient algorithmic optimizations are considered to make the tags more reliable.
- Radio-frequency identification (RFID) is a technology that uses radio waves to transfer data from an electronic tag, called RFID tag or label, attached to an object, through a reader for the purpose of identifying and tracking the object Some RFID tags can be read from several meters object. Some RFID tags can be read from several meters away and beyond the line of sight of the reader.

- Green DC techniques such as usage of renewable sources of energy, dynamic power management technologies, energy efficient hardware, power conserving architectures, energy efficient routing algorithms are considered.
- Usually Green WSN embraces the concept of sleep mode to save energy consumption, radio optimization techniques, data reduction mechanisms and energy efficient routing techniques such as multi path routing, node mobility.

D. Smart Home

IoT plays a major role in home automation concept. There is a main hub or a controller to provide the access control of the devices to the user. The devices are things which are present in the home like lights, fan, air conditioner, security systems. They are environment friendly as they will conserve the power by turning off the lights and AC automatically when not needed. Smart home is now installed in most of the cities and it is very helpful for the people.

E. Energy Management

Energy management is a main term that is to be considered while using home automation. Energy management is done by connecting sensing and actuation system to the internet. This system will considerably save the energy by sensing and actuating. The energy management will system will communicate with the devices for supplying the effective power to balance the power generation.

F. Importance of home energy Conservation

The role of smart home technologies to increase energy efficiencies in households and conserving it intelligently for appliances is very much important. Research also been carried out in developing smart home monitor and control system using Zigbee, Bluetooth etc. Also research been done on Smart Home monitoring using Android and wireless sensor where usage characteristics of electrical power from each socket outlet is monitored in real time towards minimizing the hazards by electrical faults. By using a control system using Zigbee the energy can be conserved a lot more than ordinary way. The way the M2M communicates in the process will be carried out in a low energy process. By conserving the energy, the cost of electricity bills can also be reduced.

2. LITERATURE REVIEW

A. Technology Overview

In general, IoT has three layers, i.e., sensor layer, network layer, and application layer. From the IoT viewpoint, the sensor layer is the smart sockets, and the network layer is Zigbee, 3G, 4G, etc., whereas the application layer is the smart grid and energy management mechanism.

The main idea here is to monitor and control the consumption of energy in the electrical home appliances for a better conservation.

B. Existing Method

The usage of manually operating and self-automated energy conservation modes have been well discussed in Sourabh [1] which indeed gives us an idea about the different energy needs of home appliances and their wastages happening due to negligence and unawareness .There are also some important tips given to save energy as well. The concept of conservation voltage reduction has well explained with the usage of opt coupler, PIR sensors, Ethernet, INSTEON alongside with Raspberry pi and Adriano modules.

The scenario of taking into consideration of habitant's age and social status incorporated into the energy management arena has been well explained in Eng [2] with respect to the case study prescribed. It has indeed

proven that there has been better conservation of energy with the usage of co-relational statistical model based on the assumptions made under different circumstances. Here the factors considered apply only for lightening, air conditioning and home appliances and are not applied for any other environments.

HEMS described in Kim [3] makes use of several environmental sensors such as temperature sensor, smoke sensor, current measurement sensor, flame sensor, the image sensor, infrared and ultrasonic sensors to completely control the overall usage of energy. The technology emphasized here is the use of ICT technology to handle the building of efficient energy management systems. It makes use of a well-developed interface to gain access to individual appliances and control them smartly. But there is an issue with the energy used by the sensor for monitoring and the energy consumption rate difference is not well known to the user.

The importance of combining a energy regulation system coupled with a security control system in Singh, et al. [4] has proven to give more control to the user in understanding the various situations where energy control, parental control, security control play a crucial role in decision making processes where significant energy demands are to be met. Here the importance of parental role has made it a unique feature since not many IoT systems encompass a holistic approach to smart home management.

In Pan, et al. [5] there are several designs, prototypes to implement an IoT based device is clearly explained. Energy monitoring and Energy modeling, evaluation of IoT devices along with data analysis methodologies such a finding the short term and long term correlation analysis proves to be indispensable tools to be considered when developing an IoT device for energy management. Regression control analysis and occupancy control analysis provide a framework for easy statistical analysis of the IoT devices. The significance of using location-based controls, energy- saving policy hierarchies and Cloud computing storage structures have in turn lead to better designing of IoT devices.

The implementation of Current sensor and voltage sensor at the electrical loading in Pallavi [6] through the Zigbee network alongside the Ethernet shield has enabled the user to have flexible control mechanism remotely through a secured internet connection to control the electric appliances automatically, manually and remotely expense of the consumers. The availability of automatic control, remote control and manual control gives us an idea about the easy switching between the devices with the help of AT mega 328.

Barbato, et al. [7] the WSN network using MobiWSN provides with all necessary measurements such as user profiling based temperature and light sensor parameters using Information Exchange Protocol (IEP) for better energy management system. The MobiWSN Gateways using a mesh network are resilient to failure due to the usage of protocol called infrared-based Presence Detection System (i-PeDS), based on Passive InfraRed (PIR) sensors.

3. PROPOSED METHOD

There are four important components namely

A. Smart Socket

Smart socket is a wireless socket that is used to connect any electrical device from a remote distance. This socket is capable of identifying the amount of energy consumed by individual sockets using a current sensor and a voltage sensor. It supports 90-250 V AC input. It is built in with a TCP/IP protocol stack. The Standby power consumption is less than 1.0mW.Here the sockets are identified by unique addresses so that they can be identified easily whenever there is an issue relating to higher energy consumption.

B. Zigbee

Zigbee is an 802.15.4 standard WPAN protocol. It is capable of transmitting data within a 100m radius of nodal sensor networking. It consumes less power and it can be operated at three different band of frequencies

(2.4GHz, 915MHz, 868MHz).A Zigbee network constitutes the coordinator and end devices. It can support a maximum 65,000 devices within the Zigbee network. Its data rate is 256 kbps. Generally it is used for sensing and controlling applications. In the Zigbee network, end devices are the sensor nodes which communicate wirelessly with the coordinator in the form of mesh topological configuration. Direct Sequence Spread Spectrum (DSSS) is the modulation technique that is used here. The data packets have a maximum size of 128 bytes, allowing a maximum payload of 104 bytes.

C. Home Gateway

This important component (coordinator) communicates with the smart sockets with the help of Zigbee network. This is the primary display arena within the home circuit which presents the amount of energy consumed by the individual sockets. These details are then sent to the cloud server through a 3G/4G internet connection for a continual monitoring of energy for every 30 minutes. This home gateway also makes use of a memory to store energy details and is erased once sent to the energy controller.

D. Energy Controller (Cloud Server)

This is the main server that serves the purpose of storing all the history details of energy consumed by various households along with their energy consumed by individual sockets .These details could indeed lead to the detection in the misuse of energy, issue of warning to the user about them in order to take appropriate measures. The user can set the priority and the energy-limit of the sockets based on the user's habitat (young or old), day (weekday or weekend), and time (before noon or after noon).

E. Working of the System

While designing the energy management system there are several factors that are to be considered. The major priority factors that are considered are

- User's lifestyle
- Day
- Time
- Precedence of priority sockets
- Energy-limits defined for each sockets

F. Modules

The two important modules are

Automatic control mode:

In general, all the sockets here are provided with an inbuilt setting. Initially, all the sockets are provided with equal priority. But as the time passes, this inbuilt setting is based on the past history of energy consumed by the household. Generally all the sockets stay in automatic control mode until the mode has been changed by the user.

G. User Control Mode:

In this module, the user can define the total energy that is to be consumed for a period of one month. Based on this, the energy-limits for individual sockets, their priorities (that depend on the time, day) are defined. In case, if the defined energy limit exceeds for a particular socket, warning is issued to the user to take necessary action either by increasing the energy limit or switching off that particular socket through the cloud server.

H. Advantages

- It allows one to keep a track of all the activities taking place at his/her place even in their absence.

- Energy consumption can be reduced to a considerable level.
- Any kind of illegal malicious activity relating to energy consumption can be identified easily
- Parents can have a hold on the energy consumed by children.
- There is better management of energy consumption when in crisis

4. CONCLUSION

This system thus helps in better energy conservation and management thereby leading to better usage of resources in an amicable manner. There is also better monitoring of energy because of the identification in wastage scenarios. It is significant that this system can be worked alongside with smart metering in the future for better conservation of energy by identifying critical energy loss arenas.

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