International Research Journal of Engineering and Technology (IRJET) e-ISSN: 2395 -0056
Volume: 03 Issue: 06 | June-2016 www.irjet.net p-ISSN: 2395-0072

Energy Management System for Smart Home

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Abstract— *As home energy use is increasing and renewable energy systems are implemented, home energy management system (HEMS) needs to consider both energy consumption and generation simultaneously in order to minimize the energy cost. This paper proposes a smart HEMS architecture that considers both of these things. ZigBee based energy measurement modules are used to monitor the energy consumption of home appliances and lights. Sensors are used to control the energy consumption. Solar energy is used as an alternate source of energy to main source so that according to weather change we can switch between our resources. The PC server aggregates the energy data from numerous home servers, compares them, and creates useful statistical analysis information. By considering both energy consumption and generation, the proposed architecture is expected.*

Key Words: Home energy management system, ZigBee, Renewable Energy.

INTRODUCTION

Overuse of energy has caused many environmental and economic crises around the world. Home appliances as well as industrial applications consume high energy. Energy consumption by home appliances is considered as one of the most critical areas for the attention to the researchers. Energy saving is a big challenge in front of us. Energy can be saved effectively by proper management of electricity distribution for home appliances based on the activities of the users and prioritizing our tasks. Recognizing human activities and providing energy supply for those appliances that are related to that activity can provide effective power utilization and conservation. The existing system uses sensors and servers which monitors the human activities. Thus a simple technique, based on LDR and PIR sensors is suggested which might help users to control their overall energy consumption by almost 15%.

The purpose of using this project based on HEMS technology is which is used to reduce and manage home energy use. A typical HEMS just shows the energy consumption of the whole home and home appliances. Users cannot figure out how efficient a home appliance is, compared to the others. So it is necessary to compare the energy usage of home appliances to that of the same kinds of home appliances

LITERATURE SURVEY

In [2] Young-Sung Son proposed home energy management system based on power line communication. It combines both home network and internet. It makes use of smart meter technology and PLC to provide customers detailed information of their energy consumption patterns and smart controlling of their home appliances.
It mainly consists of 3 things:
1. Advanced power control engine
2. Device control module
3. Power resource management server
The smart meter measures the power consumption in every 15-20 minutes and uploads this information to web interface via internet so that users can access. It relies on power consumption history to control appliances. The device controlled module is responsible to handle networked appliances. Also renewable energy is used as an alternate source.

B. In [3], Jinsoo Han, Chang-Sic Choi, Wan-Ki Park, Ilwoo Lee Green Computing Research Department ETRI,
Daejeon, Korea proposed green home energy management system through comparison of energy usage between the same kinds of home appliances. This HEMS tends to reduce and manage home energy usage. It monitors, compares and controls the home appliance through home server. It changes the behavior of user by comparing energy usage between similar kinds of home appliances. Thus it is useful to detect if the appliance is energy efficient or not. Here, the feedback system is used to report the customers on their energy consumption. Electrical outlets are used to measure energy consumption of appliances which is further sent to home server via Zigbee.

User has to register a new appliance on server using electrical outlet number. HEMS gathers consumption information and displays hourly, monthly and yearly usage. Disadvantage of this system is that it does not make use of renewable energy sources.

In [4] Jinsoo Han, Chang-Sic Choi, Wan-Ki Park, Ilwoo Lee, and Sang- Ha Kim proposed PLC-based Photovoltaic System Management for Smart Home Energy Management System. It describes a photovoltaic management system. It constitutes of PLC modem, REG and smart device application. The PLC modems are connected to measure the status of PV modules. The REG aggregates the measured status values from the PLC modems. The smart device application displays the status of the PV system. A user can easily identify failures in the PV system for better performance and also maintenance. The proposed system enhances a PV system management and can create synergy with smart home energy management system.

In [5] Alphy John, I.Bildass Santhosam proposed Home Energy Management System Based on Zigbee. It is the the Home Energy Management System (HEMS) based on ZigBee communication using remote controller and sensor. This technique gives the more efficient home energy management system to reduce power consumption in home area. The room is considered easily controllable with an IR remote control of a home appliance. The room consists of power outlets, a light, sensor and a ZigBee hub. The ZigBee hub has an IR code learning function and gives the IR remote control signal of a home appliance connected to the power outlet. Then it can control the power outlets and the light in the room. A LCD is used for the user interface. The LCD displays the power consumed and the value of PIR sensor. The ZigBee hubs in each room communicate with the home server and report the power consumption information to the home server.

Sethuraman M and S. Jayanthi [6] proposed a Low cost and high efficiency Smart HEMS by using Zigbee with MPPT techniques. This paper proposes a smart HEMS architecture which uses renewable energies. Home energy problems can be solved by using renewable energy sources and energy saving method. PIC microcontroller can be used to monitor and control the energy generation from renewable energy sources such as solar panel, wind turbine. Zigbee is used for the measurement of energy consumption from home appliances. The efficiency of power generation can be increased by using Maximum Power Point Tracking (MPPT). The energy consumption of home appliances and generation of renewable energies are collected from home server which is used for analyzing the total energy estimation and control the energy consumption in home to minimize the energy cost.

PROPOSED SYSTEM

Lighting systems, especially in the public sector, are still designed according to the old standards of reliability and they often do not take advantage of the latest technological developments. In many cases, this is related to the plant administrators who have not completed the return of the expenses derived from the construction of existing facilities yet. However, the recent increasing pressure related to the raw material costs and the greater social sensitivity to environmental issues are leading manufacturers to develop new techniques and technologies which allow significant cost savings and a greater respect for the environment.

Proposed here is an energy management system, which takes into consideration both energy generation and consumption. It also makes use of solar renewable energy source. The appliances are connected to either of the power supply according to availability of source and also are connected to EMCU (Electronic measurement and control unit: a device that measures amount to energy consumption) which sends this information to PC server via Zigbee in order to keep record. A microcontroller is used which is interfaced with presence sensor, LDR, emergency switch to reduce consumption when not necessary. Server manages energy consumption and generation in order to optimize the energy usage.

DISCUSSION AND CONCLUSION:

In order to support raw ongoing energy crisis residential homes can make use of installed renewable energy sources to save the energy cost, and it is important that both energy consumption and generation are simultaneously considered in HEMS

REFERENCES

[1] Jinsoo Han, Chang-Sic Choi, Wan-Ki Park, Ilwoo Lee, and Sang-Ha K, "Smart Home Energy Management System Including Renewable Energy Based on ZigBee and PLC", IEEE Transactions on Consumer Electronics, Vol. 60, No. 2, May 2014.

[2] Masahiro Inoue, Toshiyasu Higuma, oshiak Ito, Noriyuki Kushiro, and Hitoshi Kubota, "Network Architecture for Home Energy Management System," IEEE Trans on Consumer Electronics, Vol. 49, No. 3, pp. 606613, Aug. 2003.

[3] YoungSung Son and Kyeong Deok Moon, "Home Energy Management System Based on Power Line Communication," Proceedings of the 28thInternational Conference on Consumer Electronics (ICCE), 2010.

[4] KwangSoon Choi, Yang Keun Ahn, YoungChoong Park, WooChoolPark, Hae Moon Seo, and Kwang Mo Jung, "Architectural Design of Home Energy Saving System Based on Real time Energy Awareness". Proceedings of the 4th International Conference on Ubiquitous Information Technologies & Applications (ICUT), 2009.

[5] ChiaHung Len, YingWen Bai, Hsien Chung Chen, and ChiHuang Hung, "Home Appliance Energy Monitoring and Controlling Based on Power Line Communication," Proceedings of the 27th International Conference on Consumer Electronics (ICCE), 2009.

[6] Young-Sung Son and Kyeong-Deok Moon, "Home energy management system based on power line communication," in Proc. IEEE International Conference on Consumer Electronics, Las Vegas, USA, pp. 115-116, Jan. 2010.

[7] Young-Sung Son and Kyeong-Deok Moon, "Home energy management system based on power line communication," IEEE Trans. Consumer Electron., vol. 56, no. 3, pp. 1380-1386, Aug. 2010

[8] Jinsoo Han, Chang-Sic Choi, Wan-Ki Park, and Ilwoo Lee, "Green home energy management system through comparison of energy usage between the same kinds of home appliances," in Proc. IEEE International Symposium on Consumer Electronics, Singapore, pp. 1-4, Jun. 2011.

[9] Chia-Hung Lien, Hsien-Chung Chen, Ying-Wen Bai, and Ming-Bo Lin, "Power monitoring and control for electric home appliances based on power line communication," in Proc. IEEE International Instrumentation and Measurement Technology Conference, British Columbia, Canada, pp. 2179-2184, May 2008.

[10] J. Li, J. Y. Chung, J. Xiao, J.W. Hong, and R. Boutaba, "On the design and implementation of a home energy management system," in Proc. 6th Int. Symp.Wireless Pervasive Comput. (ISWPC), Feb. 23–25, 2011, pp. 1–6.