

A REVIEW ON ENERGY SAVING USING SMART ENVIRONMENT

A1: SANJEEV KUMAR

M.C.A Student, Dayananda Sagar College of Engineering

CO-AUTHOR: Dr. Suma S

Associate Professor, Department of MCA, Dayananda Sagar College of Engineering

-----***-----

Abstract –In this paper, we are going to present deeply discussion about the smart environment that helps in energy saving .The smart environment that comes with different embedded sensors which are connected to the system that helps system to interact with the environment and control the system. The smart environment systems can save energy by switching them off or putting them on low power whenever required automatically, this idea can save lot of energy. In this paper we are going to present the advantages and disadvantages and discuss approach used in the project in this paper we have also mentioned the real life projects and their implementation.

Key Words: Smart Environment, Energy saving, Sensors, System.

1. INTRODUCTION

The smart environment in another word the ambient Intelligence has recently been gaining lot of user interests. The smart devices that consists of hidden sensors and actuators, automatically interacts with user and the environment. The sensors are so tiny and hidden that it becomes the part of the environment and due to this the user does not required to explicitly or manually interact with the system or the device. There are many examples of the sensors such as camera, motion sensor, thermometer and microphones that could be installed on the devices to work smartly. These sensors provide information to the devices or the control systems regarding the state of the environment.

The actuators in the smart devices at very useful to alter the condition of the environment these actuators could be anything such as the lights or curtains within a room to control lighting or things which can be altered. The ability to give these kinds of changes to the environment by using smart devices is sort of known as ambient intelligence. According to natural resources Canada's recent surveys that were carried out by the Canadian government from that Canadians households uses most of the energy for their water heating space cooling and lightings out of those space heating consumes most of the energy in the residential sector according to the natural resources Canada the residential of Canada uses about 17% of the national energy for the Restoration purpose. In the recent studies they have found that 20% of the energy is being used for space heating where as a 14% is used for lightening and approximately 10%, 8.6% are being used for space cooling and water heating respectively. These four factors making up to 52.6% add the numbers which are being consumed by the households of Canada. Seeing this huge amount of uses of energy make think that this is the good time to focus energy saving. In the same

study they have also predicted that there will be more than 33% increase in the electricity usage between 2006 and 2030.

2. Body of Paper

The paper is structured as follows: Section 1 talks about the coaches for energy saving in smart environments followed by an overview of the papers in section 2 which present the several projects and their implementations and their advantages and the disadvantages in the section 3 we have also presented the Different techniques for performance improvement or the effectiveness by using different approaches with a brief review in section 4.

1. Different approaches for Energy Savings.

There are many approaches where we can use smart environmental saver energy. The first basic control is to use rule based upon that should be programmed by the programmers/Users. For an example motion detector sensors can only switch on the lights when they detect humans presence.

This is the first and basic step towards energy saving, however devices such as motion sensor and thermometer sense Only One dimension and are not perfect enough to give correct output every time. These motion detectors and the small computers do not make their own decisions they are programmed react with environment and give the output based on some rules. To have a system that truly makes their decision by its own, it needs artificial intelligence which is capable of adapting the behavior based on the previous outputs. According to our studies we have found that the best approach used in smart environment that could be fuzzy logic, neural networks difference of agents.

Fuzzy logic is basically a logic based on approximate values ranging between 0 to 1, rather than having the traditional Boolean logic, which only uses two values that are 0 and 1 input/output. Fuzzy logic provides approximate values and yet it is best suited for the situations where input values are approximate. This logics can be perfectly used in a system where approximate values are required such as the temperature, for example we can use the thermometer the to measure the temperature of the rule which is not required to be precise, engine the smart environment can make their decision based on the current temperature. If the temperature is hot then it can automatically turn on the air conditioner and if the temperature is just worm then do nothing, this idea can save decent amount of energy.

Artificial neural networks (ANN) are the components of artificial intelligence where it simulates the functionality of human brains. These artificial neural networks are salt of "black box" where the inner working is unknown not defined. The ANN will initially be in learning phase, it keeps on learning from the previous output.

The software agents could be any software components that work on behalf of someone or something. These software agents have the capability to perceive the environment. The software agents could be used in different rooms to maximize or minimize their uses.

2. The art of artificial intelligence in energy Management System

In this section we are going to present vs projects and system of the smart environment that actually saves lot of energy in the environment.

2.1 Fuzzy logic

2.1.1 iDorm

The iDorm of University of Essex is kind of research project did that is totally based on fuzzy logic controllers that helps in controlling the systems of a Dorm room. Their research focuses being able to quickly learn the user's priorities and differences and then generating the rules on how to reach those settings this includes the lighting levels are the temperature that could be comfortable for the users in the room, etc. The system is also program to save energy when the room is an occupied. In this case, table of lightings and the temperatures are set to a level death requires very low power of energy. This system can also quickly e waste use these levels to required level when the users is back to the room. The iDorm the system can also be controlled by a wireless device that is Compac iPAQ, where the user can manually change /alter the levels of settings. To test the system, they had test object live in the room for five games to measure how well the system can learn from the subject's preferences. Their result shows that the system was able to generate the rules of the subject's preferences only within 3 days.

This project is one of the best examples of smart environment. However they did not mention or present any search data which shows how much energy was saved.



2.2 Neural networks

2.2.1 Neural network house

The University of Colorado's Students made up project on neural network house that uses neural network to control the energy consumption of house to reduce it. They named their project as adaptive control of home environment

(ACHE) it mainly had two objectives: To predict the human needs and energy conservation.

ACHE uses neural network to work out on the usage pattern of humans/inhabitants. It basically launch from the users by observing their comfort setting which user manually adjust. For the energy conservation, when the user is not present at the room at house the lights and the other devices are maintained at the minimum level so they use less powers.

This project was built in 1905, installed with many different sensors however they did not show any data related to energy consumption.

2.2.2 Ministry of Education, Nequen Argentina

Ministry of Education, Argentina is another project that is based on neural networks this project is from the Buenos Aires institute of Technology and University in Argentina. Their goal is also to study the user's comfort setting and use it laterIn this project they have built the system in the building of ministry of education in the Nequen city located in Argentina. They have also conducted a survey of satisfaction of the system where the 75% of a user world very satisfied. 20% were just satisfied and 5% but not satisfied at all. The system uses a central computer as a common computing system so all the values and comfort settings were common to everyone. There was no individual database for different users, and even this system does not mention how much energy was saved.

2.3 Software Agents

2.3.1 MASBO pause

In the University of reading in the UK they developed a software agent system and named it as MASBO (multi-agent system building control) in this system the system agents were used to control the heating ventilation and air conditioners of the house. It was built on ISES system architectures, which stands for (information /society/ energy/ system).The ISES project was earlier built by the University of KARLSKRONA/RONNEBY in Sweden.

In the system local agents were responsible the room. Intermediate between the computing system and user preferences and provides information about the room to the user.

- The personal agents (PA) were responsible for learning the use of preferences by continuously monitoring the user preferences and the interaction between them.
- The monitoring and control agents were responsible for providing settings product provided by the local agent.
- And finally the central agent had two major functions to perform; first one is providing variety of the

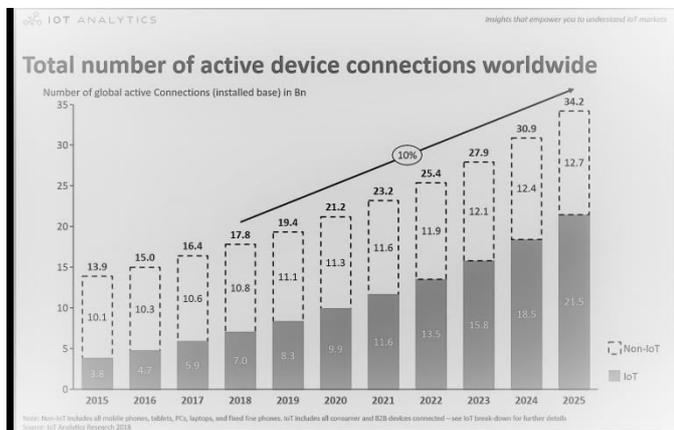
Seasons and interacts with the external and internal services.

Here are some lists of projects based on software agents.

- Multi-agent system design for room energy saving-(proposed by ShenBin, Zhan Guiquin).
- XEROX PARC: Multi-agent system for controlling building environments (Xerox Palo Alto Research Center).
- iHome: University of Massachusetts

Charts

Graph that shows total number of active IOT devices that are active or will be active and keep on helping in saving environment worldwide (2015-2025)



3. CONCLUSIONS

In this paper, we have deeply discussed and reviewed on the smart environment projects and their approaches also the disadvantage and advantages of the system, we have also is your deeply reviewed how the smart environment devices helps environment to conserve less amount of energy. This project was developed by well-known universities and also teste thoroughly by them. By reviewing and studying deeply these projects, I hereby conclude that the smart devices are really helpful for the environment energy saving so smart enough to perform variety of tasks.

ACKNOWLEDGEMENT

This research was carried out based on reviewing and studying deeply the different smart devices projects that were earlier developed by well-known universities.

REFERENCES

1. M. Chan, D. Estève, C. Escriba, and E. Campo, "A review of smart homes- present state and future challenges.," Computer methods and programs in biomedicine, vol. 91, no. 1, pp. 55-81, Jul. 2008.

2. D. J. Cook and S. K. Das, "How Smart are our Environments? An Updated Look at the State of the Art The Role of Physical Components in Smart Environ- ments," pp. 1-22.
3. "2007 Survey of Household Energy Use." [Online]. Available:<http://oee.nrcanrncan.gc.ca/publications/statistics/sheusummary07/sheu.cfm?attr=0>.
4. U. S. D. of Energy, Buildings Energy Data Book. 2009. H. Hagras, V. Callaghan, M. Colley, G. Clarke, A. Pounds-Cornish, and H. Duman, "Creating an ambient-intelligence environment using embedded agents," IEEE Intelligent Systems, vol. 19, no. 06, pp. 12-20, 2004.
5. F. Doctor, H. Hagras, and V. Callaghan, "A Fuzzy Embedded Agent-Based Approach for Realizing Ambient Intelligence in Intelligent Inhabited Environments," IEEE Transactions on Systems, Man, and Cybernetics - Part A: Systems and Humans, vol. 35, no. 1, pp. 55-65, Jan. 2005.
6. M. C. Mozer, "The Neural Network House : An Environment that Adapts to its Inhabitants," Artificial Intelligence, pp. 110-114, 1998.
7. M. C. Mozer, "Lessons from an Adaptive Home," Smart Environments, pp. 271-294, 2005
8. <https://www.statista.com/statistics/471264/iot-number-of-connected-devices-worldwide/>