INTERNATIONAL JOURNAL OF ADVANCE RESEARCH, IDEAS AND INNOVATIONS IN TECHNOLOGY

ISSN: 2454-132X
Impact factor: 4.295
(Volume2, Issue6)
Available online at: www.ijariit.com

SOA and Neural Network Based Building Management System

Sandhiya.B
ME (CSE)
Kathir College of Engineering
Sandhiya4993@gmail.com

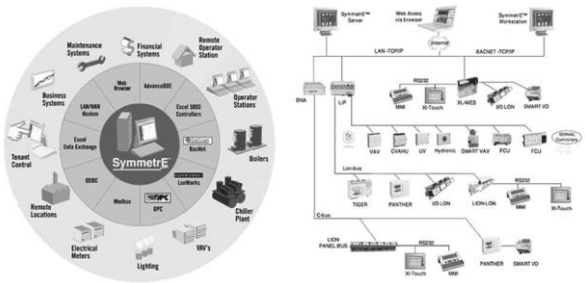
Mr. T. K. P. Rajagopal
Asst.Professor Dept. of CSE
Kathir College of Engineering
tkprgrg@gmail.com[1]

Abstract: In pursuance of attaining energy saving with productivity and provide good quality of service for users, the design of a logical energy examining and management system using the Microsoft neural network and computationally non tolling formula is projected in this paper. By examining the potential data consumption, nearby data and users' scenario data, the system assist the design and it will measure the percentage of dissipated energy consumption assisted the energy data consumption point, give bearable services based on the person-device interaction, and forecast the energy consumption supported the user energy consumption behaviors. The system is combined with cloud computing for data storage and processing. This document illustrates the propose and execution of the system structural design.

Keywords: Energy Saving, Power Consumption.

I. INTRODUCTION

The basic controls of a building can be realized in the form of manual switching, time clocks or even temperature switches that give the on and off signals for facultative pumps, fans or valves etc. In [10] is given a correct illustration for the intelligent building pyramid, that categorical very well the evolution of intelligent building systems (Fig. 2)



.

Figure 1 Intelligent building pyramid

With the rapid evolution of technology, smart building organization system are becoming further highly developed, and the level of integration is being developed progressively from the up system level to total building integration and convergence of information systems [10]. At the beginning the mechanization of building systems were achieved at the stage of being equipment, but after 1980 these equipment began to be incorporated. So, at the stage of building level integrated systems, the automations parts and also the communication systems were integrated at developing level as building automation system (BAS) and integrated communication system (ICS). The system might be access remotely by means of cellular phoneset of connections using a modem, while the cellular phone for voice and data communication was introduced to the market [10].At and once the stage of computer integrated building, as a result of the intensive use of web Protocol and to the rise of communications capacities,

convergence networks became offered and were utilized in apply increasingly. The integration was at the building level, with remote observation and management achieved via the net. At the last stage the smart building management systems is integrated and managed at enterprise level or maybe city level [10].

SBMS of 1 building are merged with SBMS of other buildings yet as other information systems via the worldwide Internet infrastructure (these systems aren't enclosed within buildings); Integration and management at this level become possible owing to the applications of advanced IT technologies like Web Services, XML, remote management and helpdesk. It's vital to imply that a good impact altogether our lives have the high development of communications, that permissible the image communication via mobile phone to be brought into sensible use.

II. LITERATURE SURVEY

In [13], Ariel Schwartz says that "the prototypical smart building development comes from IBM, which is revolving its 280,000 square foot headquarters in Armonk, New York into a pilot for the company's Smart Building initiative. Features of the system embody a building management system that keeps track of 7,600 points of knowledge concerning system performance (i.e. hot water, HVAC, security), automatically generated power and equipped alerts, and security badge scan that remain track of what percentage individuals are in a building at any given time (to optimize lighting and heating). Corporations like IBM and Johnson Controls that target good building comes will expect a windfall within the returning years as building managers notice that these sophisticated, ultra-complex systems really pay off". The flexibility to gather, analyze and kind building information quickly is vital to the period energy and performance optimisation of a better building. IBM, was one in every of the first very important firms interested in developing solutions permanently cities and put together for SBMS. So, IBM enforced the IBM TRIRIGA Energy optimisation resolution. IBM TRIRIGA Energy optimisation provides [12].

• Period knowledge gathering and analysis of energy and operational metrics of all infrastructure assets. Some recent studies focused on the energy consumption statistic of both devices of the low voltage and the high voltage. [2] Anticipated a hi-fi energy monitor and response architecture for decreasing electrical utilization. It projected the load tree for power statistics study and visualization. Based on the feedback and visual image of the energy consumption to users within the application interface, user's amendment their energy consumption behavior so as to avoid wasting energy in buildings. And the energy manager in the building is able to know the energy consumption by re aggregating the load tree by different functions.

Other studies focused on situation-awareness in order to effectively provide the building control and energy saving services. [3][4] Projected an intellectual system with few sensors in every field to conscious the user and environment in sequence for construction of energy reduction and context-aware elegant services. This system uses the context-aware technology to manage electrical devices supported the data of user's state of affairs, atmosphere, and device management for building energy saving. As a result of the system used sensors to observe the user's movement, the impact of energy saving depends on the quantity of sensors. Apart from for these systems, [6] anticipated an innovative infrastructure called Sensor-Cloud infrastructure which manages substantial sensors on IT infrastructure. The infrastructure virtualizes physical sensors as a virtual sensor on the cloud computing for managing and provisioning sensing elements effectively. [7] proposed a technique of statement future voltage demand. [8] Proposed a new fuzzy logic method for midterm energy forecasting. Compared to these presented works, we suggest the architecture of a smart energy monitoring and management system for energy saves and context-aware services in buildings combining cloud computing. The system is enforced to live and analyze energy consumption, come through person-device interaction supported context-aware technology, and forecast energy consumption based on the user energy consumption behavior.

III. BUILDING MANAGEMENT SYSTEM

In our proposed Building Management system the various parameters such as User information, Building details and electrical equipment are discussed.

a. User Information

The user information consists of the particular person or individual company account by providing username, password, full name, Email id, Mobile no. To sign in to the account the above details should be registered and verified.

b. Building Details

The building details consist of data regarding Building name, address, floor number, number of rooms. The building details should be provided during the first time registration. Once the building data is provided from the time of registration it starts monitoring and management of energy for each building registered.

C. Electrical Equipment's

The electrical equipment consists of the equipment count, power supply (between two values), and Output values. The output value consists of total power supply, power of each equipment like light, fan, computer, etc and Maximum amount of power consumed building.

The equipment power can be calculated by the following equation 1,

Equipment power =Math. Random ().Next (minimum value, maximum value); (1)

The total power supply can be calculated by the following equation 2,

Total power supply= (Each equipment power * equipment count)*Total no. of rooms; (2)

ALGORITHMOF BMS

The BMS focuses on Microsoft Neural network rule and computationally non tolling rule.

a) Microsoft Neural Network rule

The Microsoft Neural Network uses a Multilayer Perceptron network, additionally referred to as a Back-Propagated Delta Rule network, composed of up to 3 layers of neurons, or perceptrons. These layers are associate input layer, associate non mandatory hidden layer, associated an output layer.

In a Multilayer Perceptron neural network, every somatic cell receives one or a lot of inputs and produces one or a lot of identical outputs. Every output could be a easy non-linear operate of the add of the inputs to the somatic cell. Inputs pass forward from nodes within the input layer to nodes within the hidden layer, so pass from the hidden layer to the output layer; there aren't any connections between neurons inside a layer. If no hidden layer is enclosed, as in an exceedingly provision regression model, inputs pass forward directly from nodes within the input layer to nodes within the output layer.

There area unit 3 varieties of neurons in an exceedingly neural network that's created with the Microsoft Neural Network algorithm:

- Input neurons

Input neurons give input attribute values for the info mining model. For separate input attributes, associate input somatic cell generally represents one state from the input attribute. This includes missing values, if the coaching knowledge contains nulls for that attribute. A separate input attribute that has over 2 states generates one input neuron for every state, and one input neuron for a missing state, if there area unit any nulls within the training knowledge. Endless input attribute generates 2 input neurons: one neuron for a missing state, and one neuron for the worth of the continual attribute itself. Input neurons give inputs to 1 or a lot of hidden neurons.

- Hidden neurons

Hidden neurons receive inputs from input neurons and supply outputs to output neurons.

- Output neurons

Output neurons represent inevitable attribute values for the info mining model. For separate input attributes, associate output neuron generally represents one expected state for a inevitable attribute, as well as missing values. as an example, a binary inevitable attribute produces one output node that describes a missing or existing state, to point whether or not a worth exists for that attribute. A mathematician column that's used as a inevitable attribute generates 3 output neurons: one neuron for a real worth, one neuron for a false worth, and one neuron for a missing or existing state. A separate inevitable attribute that has over 2 states generates one output neuron for every state, and one output neuron for a missing or existing state. Continuous inevitable columns generate 2 output neurons: one neuron for a missing or existing state, and one neuron for the worth of the continual column itself. If over five hundred output neurons area unit generated by reviewing the set of inevitable columns, Analysis Services generates a replacement network within the mining model to represent the extra output neurons.

A neuron receives input from alternative neurons, or from alternative knowledge, reckoning on that layer of the network its in. associate input neuron receives inputs from the first knowledge. Hidden neurons and output neurons receive inputs from the output of alternative neurons within the neural network. Inputs establish relationships between neurons, and also the relationships function a path of study for a particular set of cases.

Each input incorporates a worth appointed thereto, referred to as the burden, that describes the connection or importance of that exact input to the hidden somatic cell or the output neuron. The larger the burden that's appointed to associate input, the lot of relevant or necessary the worth of that input. Weights may be negative, which suggests that the input will inhibit, instead of activate, a particular neuron. The worth of every input is increased by the burden to emphasise the importance of associate input for a particular neuron. For negative weights, the impact of multiplying the worth by the burden is to deemphasize the importance.

Each neuron incorporates a easy non-linear operate appointed thereto, referred to as the activation operate, that describes the connection or importance of a selected neuron thereto layer of a neural network. Hidden neurons use a hyperbolic tangent operates (tanh) for his or her activation operate, whereas output neurons use a sigmoid operates for activation. Each functions area unit nonlinear, continuous functions that enable the neural network to model nonlinear relationships between input and output neurons.

Training Neural Networks

Several steps area unit concerned in training an information mining model that uses the Microsoft Neural Network rule. These steps area unit heavily influenced by the values that you simply specify for the rule parameters.

The rule initial evaluates and extracts training knowledge from the info supply. A share of the training information, referred to as the holdout information, is reserved to be used in assessing the accuracy of the network. Throughout the training method, the network is evaluated instantly when every iteration through the training information. once the accuracy now not will increase, the training method is stopped.

The values of the SAMPLE_SIZE and HOLDOUT_PERCENTAGE parameters area unit accustomed confirm range the amount the quantity} of cases to sample from the training information and also the number of cases to be over passed for the holdout information. The worth of the HOLDOUT_SEED parameter is employed to arbitrarily confirm the individual cases to be over passed for the holdout information.

The rule next determines the amount and quality of the networks that the mining model supports. If the mining model contains one or a lot of attributes that area unit used just for prediction, the rule creates one network that represents all such attributes. If the mining model contains one or a lot of attributes that area unit used for each input and prediction, the rule supplier constructs a network for every attribute.

For input and inevitable attributes that have separate values, every input or output somatic cell severally represents one state. For input and inevitable attributes that have continuous values, every input or output somatic cell severally represents the vary and distribution of values for the attribute. The utmost range of states that's supported in either case depends on the worth of the MAXIMUM_STATES rule parameter. If the amount of states for a particular attribute exceeds the worth of the MAXIMUM_STATES rule parameter, the foremost common or relevant states for that attribute area unit chosen, up to the utmost range of states allowed, and also the remaining states area unit sorted as missing values for the needs of study.

The rule then uses the worth of the HIDDEN_NODE_RATIO parameter once determinative the initial range of neurons to make for the hidden layer. You'll be able to set HIDDEN_NODE_RATIO to zero to forestall the creation of a hidden layer within the networks that the rule generates for the mining model, to treat the neural network as a provision regression.

The rule supplier iteratively evaluates the burden for all inputs across the network at identical time, by taking the set of training information that was reserved earlier and comparison the particular well-known worth for every case within the holdout information with the network's prediction, in an exceedingly method referred to as batch learning. when the rule has evaluated the complete set of training information, the rule reviews the anticipated and actual worth for every neuron. The rule calculates the degree of error, if any, and adjusts the weights that area unit related to the inputs for that somatic cell, operating backward from output neurons to input neurons in an exceedingly method referred to as back propagation. The rule then repeats the method over the complete set of training information. as a result of the rule will support several weights and output neurons, the conjugate gradient rule is employed to guide the training process for assignment and evaluating weights for inputs. A discussion of the conjugate gradient rule is outside the scope of this documentation.

b) Computationally non tolling rule

A rolling hash (also referred to as a rolling checksum) could be a hash operate wherever the input is hashed in an exceedingly window that moves through the input.

A few hash functions enable a rolling hash to be computed terribly quickly—the new hash worth is quickly calculated given solely the recent hash worth, the recent worth off from the window, and also the new worth supplementary to the window—similar to the approach a moving average operate may be computed rather more quickly than alternative low-pass filters.

All rolling hash functions area unit linear within the range of characters, however their quality with reference to the length of the window ( ) varies. Rabin-Karp rolling hash needs the multiplications of 2 -bit numbers, number multiplication is in . Hashing ngrams by cyclic polynomials may be drained linear time.

IV. RESULTS

The BMS user login and homepage is shown in figure 2.

Figure 2 Homepage and User Login.

The BMS when user is logged the industry based registration for building is provided as shown in figure 3.

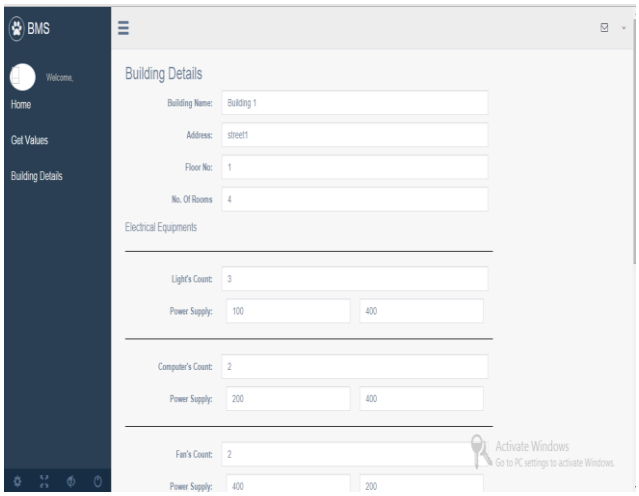


Figure 3 BMS user registration of buildings.

The registered building details are monitored to measure the total power watts consumed as shown in figure 4.

Figure 4 Total power consumed for the day.

The total number of buildings and no of rooms registered are shown in the figure 5 as shown below.

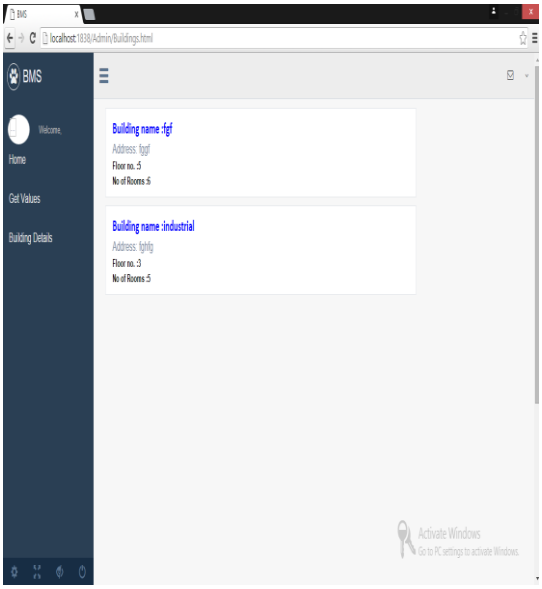


Figure 5 Building details.

To monitor and control the energy consumption by power control based on thresholding is shown in figure 6.

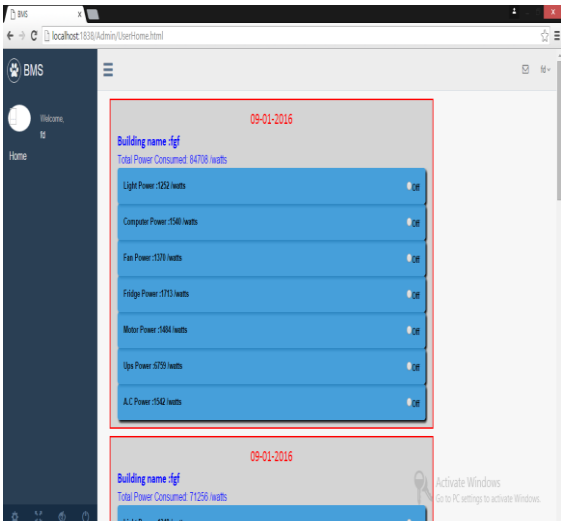


Figure 6 Total power consumed based on thresholding.

CONCLUSION

This paper proposes an architecture of a smart energy monitoring and management system with cloud computing for building energy saving and context-aware smart services. We consider integration of cloud computing for storing and analyzing data, energy consumption statistic for low voltage devices, person-device interaction based on context-aware technology, and energy consumption forecasting based on the user behavior in order to make the energy consumption more efficient and intelligent. We have implemented some parts of our system.

REFERENCE

[1]Wikipedia, Building management system, http://en.wikipedia.org/wiki/Building_management_system
[2] site-wikipewdia accessed on 20.12.2012http://en.wikipedia.org/wiki/Building_management_system,
[3] site official al firmei Technical FacilitiesSolutions: http://www.tfsmanagement.com,http://www.tfsmanagement.com/Building-Management-Systems.php, 2010, accessed on10.01.2012

[4] Peter HampelBCGmbH, Patrick KnobelElectronics, Building Management System,Feasibility Study on Intelligent Airconditioning, 2009

[5]http://open.eucalyptus.com/wiki/EucalyptusAdministratorGuide, 2012a.

[6] Shengwei Wang, Intelligent Buildings andBuilding Automation, Spon Press an imprint ofTaylor & Francis, London and New York,ISBN 0-203-89081-7 Master e-book ISBN, -2010

[7] Site oficial IBM, accessed on 1.11.2012,http://www.ibm.com/smarterplanet/us/en/green_buildings/overview/index.html?re=spf,

[8] Site oficial IBM, accessed on 1.11.2012,http://public.dhe.ibm.com/common/ssi/ecm/en/gvb03011usen/GVB03011USEN.PDF,

[9]M. Yuriyama and T. Kushida."Sensor-Cloud Infrastructure".The 13th International Conference on Network-Based Information Systems,2010.

[10] J. Byun, I. Hong, B. Kang, and Sehyun Park. "A Smart EnergyDistribution and Management System for Renewable EnergyDistribution and Context-aware Services based on User Patterns andLoad Forecasting" Consumer Electronics, IEEE Transactions on,Vol.57, pp.436-444, 2011.

