

A SYSTEM AND METHOD FOR ESTIMATING ENERGY CONSUMPTION AND MANAGING LOAD SCHEDULE IN A BUILDING

FIELD OF INVENTION:

The present invention generally relates to energy management techniques. More particularly, the present invention relates to systems and methods for estimating energy consumption and managing load schedule in a building

BACKGROUND OF THE INVENTION:

This section is intended only to provide background information pertaining to the similar field of the present invention, and may be used only to enhance the understanding of the present invention and not as admissions of prior art.

Modern infrastructures are facilitated with bulk appliances and equipment to best serve the way of living and enhance the comfort of humans. Multi-storey buildings are provided with the advanced appliances to fulfil the day to day requirements such as air conditioning systems, lighting assemblies, and so forth.

In recent years, interest in building automation has been increasing in the central system to control facilities installed in buildings in order to save energy. That is, there is an increased interest in more efficiently and systematically managing facilities installed in buildings.

Particularly, a building energy management system is being developed that controls facilities that can appropriately adjust energy consumption for facilities installed in a building and

provide a pleasant environment to a user. Such a building energy management system is a standard protocol for implementing an integrated network, for example, using a back-net.

However, in the conventional building energy management system, for example, when a multi-type air conditioner is used as a facility, the facility has been mainly controlled considering only the factors influencing the temperature change. As a result, the optimal control of the plant, which takes into account various environmental factors such as factors affecting energy consumption, user's personal taste, and operation pattern, has not been achieved. Also, the conventional building energy management are unicode and can only be altered when replaced or reprogrammed, and has no management on real time basis.

Accordingly, in light of foregoing discussion there is a need to overcome the above-mentioned limitations of the conventional building energy management.

SUMMARY OF INVENTION:

In light of the limitations of the existing conventional systems as discussed above, it is evident that there arises a need of a smart and automated energy management system.

In one aspect, embodiments of the present disclosure provide a system for estimating energy consumption and managing load schedule in a building, the system includes:

a central server configured to monitor energy consumption in the building, the central server is communicably coupled to:

a plurality of sensors coupled each electrical equipment of the building, the plurality of sensors collect energy consumption from each of the electrical equipment, on real time basis;

a graphical user interface configured with virtual/augmented visualisation modules to generate a real time virtual scenario of the building depicting the energy consumption of the building.

In an embodiment, the plurality of sensors includes power sensors, temperature sensors, and/or pressure sensors. The system further comprises a control unit to regulate the energy consumption and managing load schedule.

In a second aspect, embodiments of the present disclosure provide a method for estimating energy consumption and managing load schedule in a building, the system includes:

collecting an energy consumption data from the plurality of sensors coupled each electrical equipment of the building;

analysing requirement of each of electrical equipment, on real time basis;

correlating the requirement of each of the electrical equipment with an optimum energy consumption data;

regulating the load schedule of each of the electrical equipment based on the optimum energy consumption data; and

evaluating the regulated load schedule and balanced energy consumption scenario.

In an embodiment, the method further comprises assigning the plurality of sensors to each of the electrical equipment of the building. Furthermore, collecting the energy consumption data include identifying the nature of equipment and a highest load consumption scenario thereof.

In an embodiment, method further comprises determining temperature and pressure of one or more sections of the building.

BREIF DESCRIPTION OF DRAWINGS:

The drawing/s mentioned herein disclose exemplary embodiments of the claimed invention. Detailed description and preparation of well-known compounds/substances/elements are omitted to not unnecessarily obscure the embodiments herein. Other objects, features, and advantages of the present invention will be apparent from the following description when read with reference to the accompanying drawing.

FIG. 1 illustrates a system (100) for estimating energy consumption and managing load schedule in a building, in accordance with an embodiment of the present disclosure;

FIG. 2 illustrates a method (200) for estimating energy consumption and managing load schedule in a building, in accordance with an embodiment of the present disclosure; and

FIG. 3 A-E illustrates various templates of an energy saving model (300) for managing load schedule in a building, in accordance with various embodiments of the present disclosure.

DETAILED DESCRIPTION:

This section is intended to provide explanation and description of various possible embodiments of the present invention. The embodiments used herein, and the various features and advantageous details thereof are explained more fully with reference to non-limiting embodiments illustrated in the accompanying drawing/s and detailed in the following description. The examples used herein are intended only to facilitate understanding of ways in which the embodiments may be practiced and to enable the person skilled in the art to practice the embodiments used herein. Also, the examples/embodiments described herein should not be construed as limiting the scope of the embodiments herein.

In one aspect, embodiments of the present disclosure provide a system for estimating energy consumption and managing load schedule in a building, the system includes:

a central server configured to monitor energy consumption in the building, the central server is communicably coupled to:

a plurality of sensors coupled each electrical equipment of the building, the plurality of sensors collect energy consumption from each of the electrical equipment, on real time basis;

a graphical user interface configured with virtual/augmented visualisation modules to generate a real time virtual scenario of the building depicting the energy consumption of the building.

In an embodiment, the plurality of sensors includes power sensors, temperature sensors, and/or pressure sensors. The system further comprises a control unit to regulate the energy consumption and managing load schedule.

In a second aspect, embodiments of the present disclosure provide a method for estimating energy consumption and managing load schedule in a building, the system includes:

collecting an energy consumption data from the plurality of sensors coupled each electrical equipment of the building;

analysing requirement of each of electrical equipment, on real time basis;

correlating the requirement of each of the electrical equipment with an optimum energy consumption data;

regulating the load schedule of each of the electrical equipment based on the optimum energy consumption data; and

evaluating the regulated load schedule and balanced energy consumption scenario.

In an embodiment, the method further comprises assigning the plurality of sensors to each of the electrical equipment of the building. Furthermore, collecting the energy consumption data include identifying the nature of equipment and a highest load consumption scenario thereof.

In an embodiment, method further comprises determining temperature and pressure of one or more sections of the building.

Throughout the present disclosure, the term “estimating energy consumption and managing load schedule” refers to electricity management system to reduce consumption of energy and thereby reduction in cost. Conventionally, the present invention can be applied to various types of buildings, such as a commercial building, an industrial building, an educational institution building, a government office building and so on, And a control method of the building energy management system for controlling the facility so that the reduction of the power consumption and the efficient driving increase can be optimized at the same time. In addition, embodiments of the present invention can be implemented by setting a minimum saving criterion for energy consumption or an element that emphasizes more in facility control for user-customized control, There is another purpose in providing a building energy management system and its control method.

Furthermore, an embodiment of the present invention is an external device or device for collecting and real-time device data and operation data, environmental data of the environment, and user data of the facility in the central control and / or individual control of the facility to reflect in the facility control. Another object of the present invention is to provide a building energy management system and a control method thereof, which can provide an optimal environment according to a change of situation by interlocking the installed system.

A building energy management system according to an embodiment of the present invention includes at least one facility installed in a building; At least one central controller in communication with the facility and for centrally controlling the operation of the facility, wherein the central controller collectively considers device data, travel data, ambient environmental data, and user data of the facility. Furthermore, the present invention discloses determining an optimum point for optimizing a reduction rate of energy consumption and an increase rate of efficient driving of the facility, and automatically controlling the facility to meet the optimum point.

In an embodiment, the central controller comprises: a saving mode setting module for setting a minimum saving criterion of energy consumption for the facility according to a user input or preset criteria; And an optimum point calculating module for calculating an expected point of the energy consumption and an estimated increase rate of efficient driving based on the data and calculating an optimum point thereof.

In an embodiment, the building energy management system comprises: an individual controller for individually controlling the facility; And a web service module communicating with the central controller and facility and providing the facility data, the operational data, the environmental condition data, and the user data of the facility to the individual controller via the Internet, And the control data is separately provided to the central controller.

In the embodiment, the optimum point may be changed within a predetermined range according to whether or not it is interlocked with an external device, a characteristic of a building, or a user's preference.

In an embodiment, the building energy management system includes a central server that is interlocked with the central controller and stores device data of the facility, operation data, environmental condition data, and user data, and logic for controlling the control pattern for the facility And further comprising:

In an embodiment, the environmental condition data includes at least one of weather data, user reacquisition, spatial characteristics, user's connection position, current time, and external device interlocking, and the sensor unit includes an infrared sensor, a sensor, a body reaction sensor, a temperature sensor, a humidity sensor, a moisture sensor, a wind direction sensor, an illuminance sensor, and a timer sensor.

In an embodiment, the building energy management system includes an input unit for receiving the user data and a control command for the facility; and an output unit for displaying a current state and an operation result of the central controller.

Referring to FIG. 1 illustrates a system (100) for estimating energy consumption and managing load schedule in a building, in accordance with an embodiment of the present disclosure. The system (100) includes a central server (102), a plurality of sensors (104), and a graphical user interface (106).

The a central server (102) configured to monitor energy consumption in the building, wherein the central server is communicably coupled to the plurality of sensors (104) coupled each electrical equipment of the building, wherein the plurality of sensors collect energy consumption from each of the electrical equipment, on real time basis; and the graphical user interface (106) configured with virtual/augmented visualisation modules to generate a real time virtual scenario of the building depicting the energy consumption of the building.

In an embodiment, the plurality of sensors (104) includes power sensors. In another embodiment, the plurality of sensors (104) includes temperature sensors. In yet another embodiment, the plurality of sensors (104) includes pressure sensors. In yet another embodiment, the plurality of sensors (104) includes humidity sensors. In yet another embodiment, the plurality of sensors (104) includes moisture sensors.

In an optional embodiment, the system further comprises a control unit to regulate the energy consumption and managing load schedule.

Referring to FIG. 2 illustrates a method (200) for estimating energy consumption and managing load schedule in a building, in accordance with an embodiment of the present disclosure.

At a step (202), an energy consumption data is collected from the plurality of sensors coupled to each of the electrical equipment of the building.

At a step (204), requirement of each of electrical equipment is analysed, on real time basis.

At a step (206), the requirement of each of the electrical equipment is correlated with an optimum energy consumption data.

At a step (208), the load schedule of each of the electrical equipment is regulated based on the optimum energy consumption data.

At a step (210), the regulated load schedule and balanced energy consumption scenario is evaluated.

In an embodiment, the method (200) further comprises assigning the plurality of sensors to each of the electrical equipment of the building.

In another embodiment, collecting the energy consumption data includes identifying the nature of equipment and a highest load consumption scenario thereof.

In yet another embodiment, the method (200) further comprises determining temperature of one or more sections of the building.

In yet another embodiment, the method (200) further comprises determining pressure of one or more sections of the building.

Referring to FIG. 3 A-E illustrates various templates of an energy saving model (300) for managing load schedule in a building, in accordance with various embodiments of the present disclosure. The representation model (302) shows a report of a building. The representation model (304) shows a 3D visualisation of building having plurality of sensors at various sections. The graphical representation (306) shows load schedule of various equipment such as

pump, chiller, cooling tower, and conveyor. The graphical representation (308) shows load schedule with reference to the energy consumption in a building, before load schedule optimization. The graphical representation (310) shows load schedule with reference to the energy consumption in a building, after load schedule optimization with predicted solar generation.

As will be readily apparent to a person skilled in the art, the present invention may easily be produced in other specific forms without departing from its essential composition and properties. The present embodiments should be construed as merely illustrative and non-restrictive and the scope of the present invention being indicated by the claims rather than the foregoing description, and all changes which come within therefore intended to be embraced therein.

We Claim:

1. A system (100) for estimating energy consumption and managing load schedule in a building, the system comprising:

a central server (102) configured to monitor energy consumption in the building, wherein the central server is communicably coupled to:

a plurality of sensors (104) coupled each electrical equipment of the building, wherein the plurality of sensors collect energy consumption from each of the electrical equipment, on real time basis; and

a graphical user interface (106) configured with virtual/augmented visualisation modules to generate a real time virtual scenario of the building depicting the energy consumption of the building.

2. The system (100) as claimed in claim 1, wherein the plurality of sensors (104) includes power sensors.

3. The system (100) as claimed in claim 1, wherein the plurality of sensors (104) includes temperature sensors.

4. The system (100) as claimed in claim 1, wherein the plurality of sensors (104) includes pressure sensors.

4. The system (100) as claimed in claim 1, wherein the plurality of sensors (104) includes humidity sensors.

5. The system (100) as claimed in claim 1, wherein the plurality of sensors (104) includes moisture sensors.

6. The system (100) as claimed in claim 1, further comprising a control unit to regulate the energy consumption and managing load schedule.

7. A method (200) for estimating energy consumption and managing load schedule in a building, the system comprising:

collecting an energy consumption data from the plurality of sensors coupled each electrical equipment of the building;

analysing requirement of each of electrical equipment, on real time basis;

correlating the requirement of each of the electrical equipment with an optimum energy consumption data;

regulating the load schedule of each of the electrical equipment based on the optimum energy consumption data; and

evaluating the regulated load schedule and balanced energy consumption scenario.

8. The method (200) as claimed in claim 4, further comprising assigning the plurality of sensors to each of the electrical equipment of the building.

9. The method (200) as claimed in claim 4, wherein collecting the energy consumption data includes identifying the nature of equipment and a highest load consumption scenario thereof.

10. The method (200) as claimed in claim 4, further comprising determining temperature of one or more sections of the building.

11. The method (200) as claimed in claim 4, further comprising determining pressure of one or more sections of the building.