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A Survey on Smart Building Automation in WSN Technology

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ABSTRACT: The WSNs are increasingly being used in thehome for energy controlling services. Regular household appliances are monitored and controlled by WSNs installed in the home. New technologies include cutting-edge advancements in information technology, sensors, metering, transmission, distribution, and electricity storage technology, as well as providing new information and flexibility to both consumers and providers of electricity. The developed system is a low-cost and flexible in operation and thus can save electricity expense of the consumers.The prototype has been extensively tested in real-life situations and experimental results are very encouraging.

KEYWORDS: Energy management, home automation,intelligent control system, wireless sensor network, ZigBee.

I. INTRODUCTION

The design and development of a smart monitoring and controlling system for household electrical appliances in real time has been reported in this project. It is foreseen that service and private care wireless mechatronic systems can become a lot of and a lot of omnipresent reception within the close to future and can be terribly helpful in helpful attention notably for the aged and disabled folks.

Wireless sensor networks (WSNs) have become progressively vital due to their ability to observe and manage situational info for varied intelligent services. Due to those advantages, WSNs has been applied in many fields, such as the military, industry, environmental monitoring, and healthcare.The WSNs are progressively being used within the home for energy dominant services. Regular householdappliances square measure monitored and controlled by WSNs put in in the home.

The ZigBee Alliance, wireless communication platform is presently examining Japan's new smart home wireless system implication by having a new initiative with Japan's Government which will appraise use of the forthcoming ZigBee, Internet Proto-col (IP) specification, and the IEEE 802.15.4g standard to facilitate Japan to make good homes that improve energy management and potency.

There has been design and developments of good meters predicting the usage of power consumption. However, a low-cost, flexible, and robust system to endlessly monitor and management primarily based on shopper needs is at the first stages of development. because it has low-power and affordable characteristics, which change it to be wide used in home and building environments.

II. RELATED WORK

The suggested system consists of mains power supply,home electrical devices, ZigBeeCoordinator, associate automatic standby power cutoff outlet, and a server. The power outlet with a ZigBee module cuts off the ac power when the energy consumption of the device connected to the facility outlet is below a set price. The central hub collects information from the power channels and controls these power channels through the ZigBee module. The central hub sends state information to a server then a user will monitor or management the present energy usage victimisation the HEMS computerprogramme.

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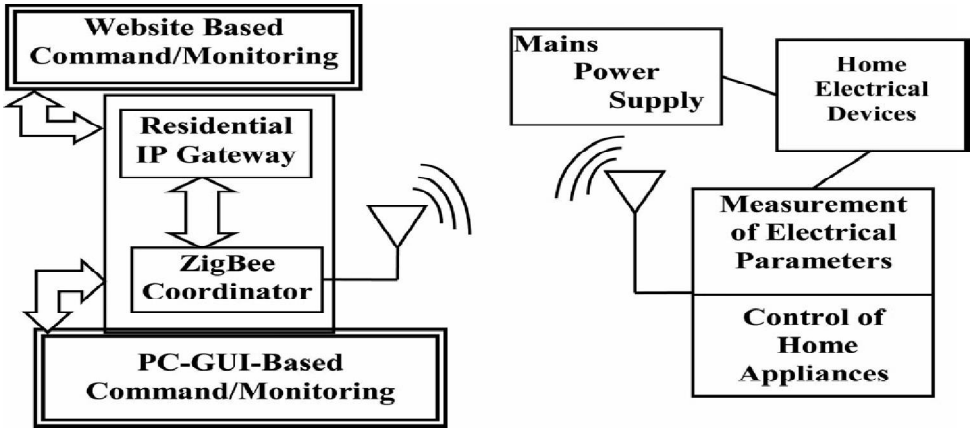

Fig. 1.Functional block diagram of the system.

This system consists of a home network unit and a gateway. The core part of the event is that the ability of various networks within the home surroundings. Less importance is given to the home automation.

Wireless sensors square measure accountable for measure current illuminations and also the lights are controlled by applying the model of user's actions and profiles.

The above mentioned home observance and dominant systems have limitations with respect to true home automation such as:

- energy consumption control mechanism is restricted to solely bound devices like light-weight illuminations, whereas several menage appliances will be controlled;

- energy control is primarily based on fastened threshold power consumption, which could not be applicable to totally different consumers;

- controlling the home appliances through network management functions, in practice indweller needs could vary according to their behavior however not with network characteristics.

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III. SYSTEM DESCRIPTION

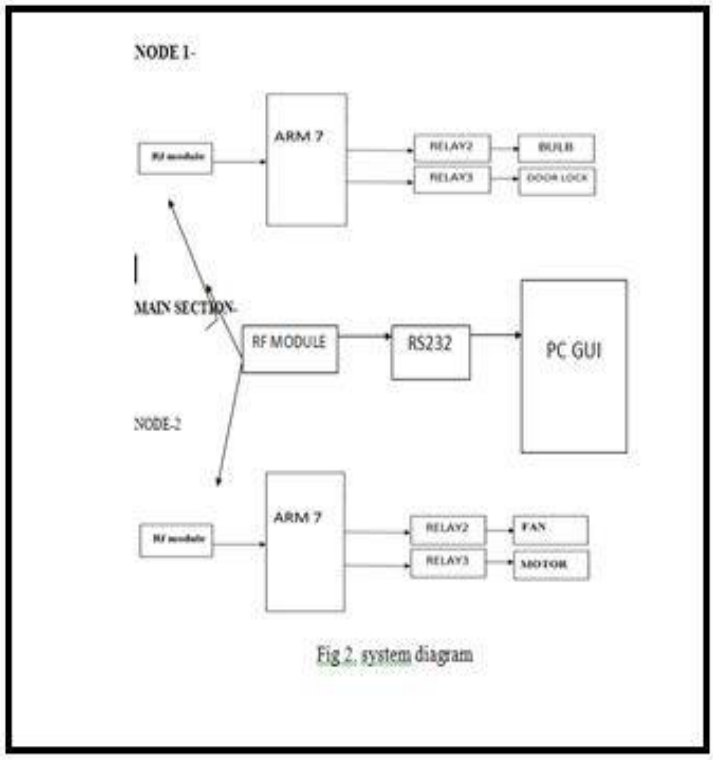

Fig 2. system diagram

Fig. 2 shows the practical description of the developed system to monitor electrical parameters and management appliances supported the buyer necessities.

The measurement of electrical parameters of home appliances is done by interfacing with fictional sensing modules. The output signals from the sensors are integrated and connected to XBee module for transmittal electrical parameters knowledge wirelessly. The XBee modules are interfaced with numerous sensing devices and interconnected in the type of network topology to own reliable knowledge

Above block diagram consits of following components:

- ARM 7 controller
- RF module
- relay bank

We have to create a GUI on pc using vb software to control the devices, there are transmitting and receiving zigbee modules for establishing the connection between pc and arm board. we are going to provide 4 options for switching on and off function of modules connected to the relay bank.

When any key is press on GUI the following connected device will turn on and off .reception at a centralized ZigBee coordinator. The maximum distance between the adjacent ZigBee nodes is a smaller amount than ten m, and through hopping technique of the network topology, reliable sensor fusion knowledge has been performed.TheZigBee coordinator has been connected through the USB cable of the host pc, which stores the knowledge into a info of ADP system. The collectedsensor fusion knowledge have been sent to a web residential entranceway for remote observance and dominant the house setting.

By analyzing the power from the system, energy consumption can be controlled. An electricity tariff set up has been set up to run numerous appliances at peak and off-season tariff rates. The appliances are controlled either mechanically or

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manually determining the supply or destination address of a packet that encapsulates a ZigBee packets' payload.

IV. WORKING METHODOLOGY

A. Measurement of Electrical Parameters

1]Voltage Measurement:The voltage transformerused in our paper step-down transformer. The step-down voltage transformer is used to convert input supply of 230–240 V to 10 VRMS ac signal. The secondary voltage is rectified and passed through the filter capacitor to get a dc voltage.

The actual voltage is thus obtained as follows:

$$Vact = m1 \times Vmeasuredvoltage \quad (1)$$

2] Current Measurement: For sensing current, we used current transformer. The main features of this sensor include fully encapsulated PCB mounting and compact.

$$Iact = m2 \times Vmeasuredvoltage \text{ for current} \quad (2)$$

3] Power Measurement: In order to calculate power of a single-phase ac circuit, the product of root mean square (RMS) voltage and RMS current must be multiplied by the power factor as given in (3). Power factor is the cosine of the phase angle of voltage and current waveforms as shown in the Fig. 3 for an ideal situation

$$Pact = Vrms \times Irms \times Pf \quad (3)$$

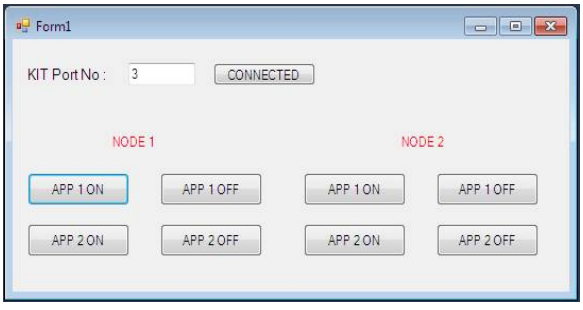
Where Pact is the actual power, Vrms and Irms are the RMS values of voltage and current, respectively, and Pf is the power factor.
The power consumed by the appliances is calculated in the computer system after receiving voltage outputs from corresponding current and voltage sensors by the following equation:

$$Pcal = Vact \times Iact \times Cf \quad (4)$$

Where Pcal is the calculated power.

V. EXPERIMENTAL RESULTS

The prototype is in operation in a trial home with various electrical appliances regularly used by an inhabitant. The following appliances were tested: room heaters, bulb, door, fan, motor ,microwave, oven, toasters, water kettle, fridge, television, audio device, battery chargers, and water pump.
To on Application 1 of the Node 1,Click on the button APP 1 ON of the NODE 1 on GUI.



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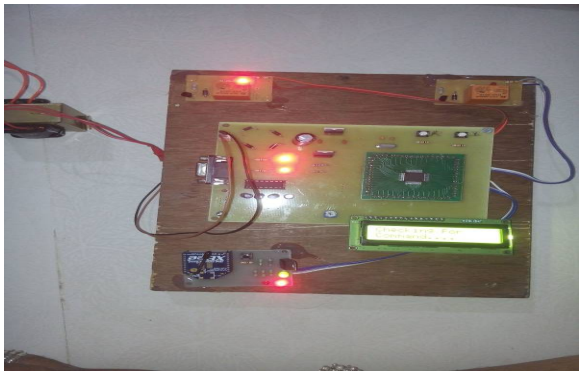

Fig 3.Experimental result

VI. CONCLUSION AND FUTURE WORK

A smart power watching associated system has been designed and developed toward the implementation of an intelligent building. The developed system effectively monitors and controls the electrical appliance usages at an old home.. Local and remote user interfaces are straightforward to handle by a novice shopper and are economical in handling the operations. In future, the system will be integrated with co-systems like good home somebody behavior recognitions systems to work out the eudaimonia of the somebody in terms of energy consumption.The system can be extended for monitoring the whole smart building. The sensor networks are programmed with various user interfaces suitable for users of varying ability and for expert users such that the system can be maintained easily and interacted with very simply.

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