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Review on Robust Approach for Power Monitoring and Device Management

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Abstract— **Wireless sensor networks (WSNs) have become increasingly important because of their ability to monitor and manage situational information for various intelligent services. Due to these advantages, WSNs has been applied in many fields, such as the military, industry, environmental monitoring, and healthcare. As the power consumption varies as per the uses it is necessary to reduce the power usage and manage the total power consumption. To do so we propose a design for wireless sensor based embedded system for monitoring and controlling of remotely electrical appliances. Smart monitoring and controlling system will calculate the total power consumption of electrical appliances. Thus the GUI is developed to show the status and consumption of electrical appliances which in turn help the user to manage the appliances wirelessly.**

***Index Terms*— WSN, intelligent services, power consumption, smart monitoring, control system, GUI, wireless sensor, embedded system..**

I. INTRODUCTION

Wireless Sensor Networks (WSNs) have become an attractive technology for the research community, particularly with the rapid increase in Micro-Electro-Mechanical Systems technology which has facilitated the development of smart sensors [3]. Typically, a WSN is a distributed system that is composed of autonomous units with sensing capabilities (sensor nodes), interconnected by wireless communication system. This network offers a optimized and potentially low-cost solution to several problems [4-8] including military target tracking, health care services monitoring, environment control systems, animal monitoring, and smart Homes. In recent years, the introduction of network enabled devices into the home environment has proceeded at a remarkable rate. Moreover, with the rapid growth of the Internet, there is the requirement for the control and monitoring of such network enabled devices remotely. However, the new and exciting opportunities to increase the connectivity of devices within the home for the purpose of home automation remain largely undeveloped.

Nowadays home and building automation systems are used on large scale. They also provide increased comfort and convenience especially when employed in a private home. On the other hand, automation systems installed in commercial buildings not only increase comfort, but also allow centralized control of heating, ventilation, air condition and lighting. Hence, they contribute to an overall cost reduction.

An intelligent environment is a physically networked world that is interconnected through a continuous network abundantly and invisibly with sensors, actuators and computational units, embedded seamlessly in the everyday objects of our lives [1]. A smart home is the one in which computing and information technology concept apply to the occupiers' needs and can be used to enhance the everyday life at home. Probable applications used for smart homes can be found in the categories such as welfare, entertainment, environment, safety, communication, and appliances [2].

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II. REVIEW WORK

A brief review of all the following papers has been done and the work of the authors is as written below. These papers describe about wireless sensor networks based on different technologies.

1. Nagender Kumar Suryadevara [1] presents the paper on the design and development of a smart monitoring and controlling system for household electrical appliances in real time. The system principally monitors electrical parameters of household appliances such as voltage and current and subsequently calculates the power consumed. The uniqueness of this system is the controlling mechanism of appliances in different ways. The developed system is a low-cost and flexible in operation and thus can save electricity expense of the consumers.

   The measurement of electrical parameters of home appliances is carried out by interfacing with fabricated sensing modules. The output signals from the sensors are integrated and connected to ZigBee module for transmitting electrical parameters data wirelessly. The ZigBee modules are interfaced with various sensing elements and interconnected using mesh topology to have reliable data reception at a centralized ZigBee coordinator. The maximum distance between the adjacent ZigBee nodes is less than 10 m, and through hopping technique of the mesh topology, reliable sensor fusion data has been performed. The ZigBee coordinator has been connected through the USB cable of the host computer, which stores the data into a database of computer system. The collected sensor

fusion data have been sent to an internet residential gateway for remote monitoring and controlling the home environment.

2. Ahmed ElShafee, Karim Alaa Hamed [2] in this paper presents a design and prototype implementation of new home automation system that uses Wi-Fi technology as a network infrastructure connecting its parts. The proposed system consists of two main components; the first module is the server (web server), which presents system core that manages, controls, and monitors users' home. Consumers and system administrators can locally (LAN) or remotely (internet) manage and control system code. Second part is hardware interface module, which provides appropriate interface to sensors and actuator of home automation system. Unlike most of available home automation system in the market the proposed system is scalable that one server can manage many hardware interface modules as long as it exists on Wi-Fi network coverage. System supports a wide range of home automation devices like power management components, and security components. The proposed system is on the higher end if compared on the scalability and flexibility point of view than the commercially available home automation systems.

3. Debraj Basu, Giovanni Moretti, Gourab Sen Gupta [3] in this paper details the installation and configuration of unobtrusive sensors in an elderly person's house - a smart home in the making - in a small city in New Zealand. The overall system is conceptualized to use machine learning for analyzing the data generated by the sensor nodes. The novelty of this project is that instead of setting up an artificial test bed of sensors within the University premises, the sensors have been installed in a subject's home so that data can be collected in a real, not artificial, environment.

4. Xiangyang Li ,Weiqiang Zhang ,Hujing [4] introduces the intelligent home appliance control system, the system is developed through ARM microprocessor, embedded Linux operating system, ZigBee (CC2430) wireless communication technology and network technology. It gives the overall framework of hardware and software design, and describes ways to implement the system. User can control appliances through hand-held mobile terminal. ZigBee coordinator establishes and maintains the home network, it receives control commands from ARM controller and forwards to other ZigBee devices. The system uses the network topology; the set-up of network includes system initialization, network topology update and node Communication. Basic module named as 'Home gateway' is the system master, it leads the whole process of network' set-up. It communicates with many nodes and controls and configures them when system is running. In addition, the home gateway must be able to discover the change of network topology and achieve network self-organizing feature.

5. Manivannam M, Kumaresan N [9] in this paper approaches the design and development of online Interactive Data Acquisition and control System (IDACS) using ARM based embedded web server. This can be a network, intelligent and digital distributed control system. The suggested Single chip method improves the processing capability of a system and overcomes the problem of poor real time and reliability. This system uses ARM9 Processor portability with Real Time Linux operating system (RTLinux RTOS) which makes the system more real time and handling various processes based on multi tasking and reliable scheduling mechanisms. Web server application is ported into an ARM processor using embedded 'C' language. Web pages are written by Hyper Text mark-up language (HTML); it is beneficial for real time IDACS, Mission critical applications, ATM networks and more.

III. PROBLEMS ASSOCIATED

There are many definitions of home automation available in the literatures available in present situation. Some describes home automation as the introduction of technology within the home to enhance the quality of life of its occupants, through the provision of different services such as telecom, health, multimedia entertainment and energy conservation. There has been important research into the field of home and building automation. Recently, research into the field of home automation has continued to receive much attention in academia.

Home automation systems face four major challenges [4], these are high cost of ownership, inflexibility, poor manageability, and difficulty achieving security. The main objectives of that research is to design and to implement a cheap and open source home automation system that is capable of controlling and automating most of the house appliance through an easy manageable interface to run and maintain the home automation system.

As the demand for smart electronic appliances has increased in the present world due to insufficient and unmanageable time, the control and monitoring of such appliances has becomes important. Also, these appliances consume power as per their utilization and the efficiency. So, the calculation of per day power consumption of electrical appliances is necessary which makes easy to monitor the total number of unit. The proposed system has the similar idea by using RF module technology to interconnect its distributed modules to home automation server. The system will

decrease deployment cost with increased ability of upgrading and system reconfiguration. System will make use of module for the monitoring of appliances connected to it. It will also be able to calculate the power that is units of power consumed by the appliances. If all such major appliances are monitored, the approximate number of units consumed can be calculated which will help users to get the idea of expected electric bill amount based on the units.

IV. PROPOSED WORK

The proposed system focuses on human-friendly technical solutions for monitoring and easy control of electronic devices. The inhabitant's comfort will be increased and better assistance can be provided. The system consists of two nodes such as monitoring node and sensor node. The GUI is built on MATLAB. This GUI will display the current status of appliances whether the appliance is ON /OFF. Also the graphical representation of the monitored parameters can be shown using this GUI.

The Monitoring Node (M.N) will be able to calculate the per day power consumption of appliances connected to the sensor node. Fig.6(a) shows the Monitoring Node.

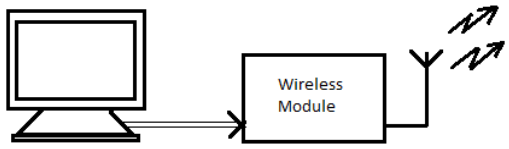

Fig. 6(a) Monitoring Node

This node consists of PC where GUI is implemented in MATLAB and Wireless module is attached which sends a wireless data to Sensor Node. The wireless module will be used for communication with the electronic devices connected at the sensor node. The parameters that are being monitored at the sensor side will be transmitted to the monitoring node wirelessly using this module.

At the other end, a sensor node is present. This node consists of another part Wireless module, a microcontroller and Relay driver circuit. Wireless module is interfaced to a microcontroller. The microcontroller is used for managing the devices connected to the node.

The controller will receive data through sensor node and this data will be communicated with the monitoring nod using wireless module.

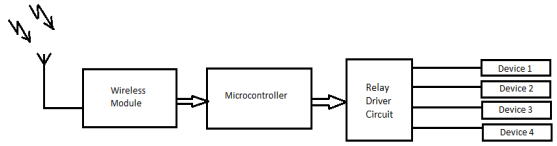

Fig. 6(b) Sensor Node

Then according to the signal received at the sensor node, it can operate or control the status of appliances using the wireless communication. Fig 6(b) shows the sensor unit.

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