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Energy Conservation in Automation Networks with Cluster Nodes Linked To Mobile Sink

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Abstract: Home automation networks have become very popular due to improvement in wireless sensor networks. This provide an efficient smart home for consumers. But this sometimes leads to more power consumption as the appliances are not monitored by consumer all the time. This results in wastage of energy or sometimes results in failure of appliances due to power shortage. The goal of this work is to make a complete energy conservation system using home automation by continuous monitoring of appliances with the help of smart meter. Each smart meter is connected to a cluster of appliances to monitor the clusters and to provide continuous report to consumer using GSM. When there is a power shortage the information is passed to the consumer and the required action prioritized by the consumer is applied to the appliances.

Keywords: PIC micro controller; GSM (Global System for mobile communication); sensors; mobility node; Home utility centre

I. INTRODUCTION

With the rapid growth in technology consumer has moved on to automation networks for the usage of user friendly appliances. It requires a smart home device such as home energy system to monitor and to control the electrical appliances. But this needs to control the energy requirement in a consistent and also in an efficient way as all the appliances are operated automatically. Energy optimization grips valuable and resourceful usage of electricity especially for residential consumers which results in reduction of energy bills and stability between production and usage.

Typically, the home consumer products are used to create home automation networks which are usually distributed in the environment to collect and send the sensed data to base station via wireless communication. These are mostly tiny sensors which collect and transmit data to a base station in a distributed environment. But these types of sensors are powered with the help of irreplaceable batteries which usually cannot be recharged. These issues are now overcomed with the help of clustering technique which reduce the energy utilized while collecting and transferring data to base station by sensors. The data's are collected with the help of sink node and transmitted.

The introduction of sink mobility into WSNs has been shown to be a very efficient way balance energy consumption [1]-[5]. To achieve sink mobility, sink nodes physically move throughout the network. The mobility may be achieved when the sink is attached to vehicles, animals or even people so that they can roam around the sensing field to collect data from sensors using very short range communications. Significant energy savings have been achieved offering long network lifetime [6]-[7].

II. EXISTING WORK

Huge amount of systems to develop home automation systems are proposed in past few years. A ZigBee based self-adjusting sensor (ZiSAS) for home energy management service was proposed. It divides whole appliance into self adjusting sensor and a sensor management system. The sensor act as a mobile node and collects data from other points to transmit the data to the management system where datas are analysed. The major drawback of this system is the recognition of every event in a system and the repeated

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pattern in that system is more difficult to analyse. These sensors are not applicable for the open system.

Data Mule for Sparse Sensor Networks [1] is used to collect data in three tier architecture. The main purpose of this system is to use data MULEs to collect data and to provide enough information to the utility centre the primary advantage is the potential of large power savings that can occur at the sensors during communications. The primary disadvantage of this approach is increased latency because sensors have to wait for a MULE to approach before the transfer can occur. It uses radio signals which only broad cast the message as it does not contain any line of sight. A Novel Scheme for WSAN Sink Mobility Based on Clustering method was proposed to collect data in home automation networks. It uses sink mobility approach which contains a fixed sink and mobility sink. The mobile sink gathers data from all the fixed nodes, process it and sends to utility centre. The major disadvantage of using mobility schemes is that they do not guarantee data gathering from all of the sensor nodes deployed in the target topology.

Some other systems used efficient energy management methods [8] in order to overcome the demand side management in consumer products. With the development of wireless sensor networks it is easy to track a appliance automatically without any manual intervention. But this lead to work appliances on their on which made more power consuming. hus to provide a energy efficient sensors they divide whole appliance into real time and schedulable appliance. When there is a power demand in a real time appliance, schedulable device is turned off with the help of home energy system and the power is measured by smart meter. But these consume more time and it takes only four seasonal models.

Clustering algorithm is another way to provide a smart home in a low power consumption method. It forms clusters within the environment and a cluster head is selected with the help of Hybrid Energy Efficient Distributed (HEED) [9] technique.

A data-mule (mobile sink node) is used to move around the cluster head to collect data and to send them to Home utility centre. The cluster head is selected with the help of parameters such as residual energy and intra cluster communication. But this method is difficult to implement as cluster head changes for each round.

III. Overview Of The System

The home automation System has the following important module section. Cluster formation, Device identification, ensuring budget price linked to Global system for mobile communication.

3.1 Cluster Formation

In a home automation system collecting data from each node is difficult as there may be huge number of nodes. Hence cluster formation will help to collect data efficiently and in a faster way.

Group of nodes which have same priority will form a single cluster. In a home environment each clusters will be linked to a smart meter to measure the amount of power consumed in each cluster. These clusters are formed based on the priority of consumer like devices that are mostly used, less mostly used and least used.

3.2 Working of the system

This system consist of a group of clusters linked to smart meter in a home environment. Clusters consist of group of electrical appliances which are used commonly by customers. When there is a demand in the environment cluster will indicate the utility centre. Then a mobile sink such as animal, people or any other movable device will move around the environment to identify the cluster and measure the amount of voltage from the cluster using smart meter. Thus device with same probability of power consumption will be turned off or same appliance which cause the demand will be turned off. The overall mechanism is shown in Fig 1.

The main component (BRAIN) of system is PIC (Peripheral Interface Controller) microcontroller. It is responsible for all monitoring and generation of inputs and outputs respectively. The output of the system will be displayed on LCD i.e., SMS arrival status and configuration etc. Proper LCD display is obtained through programming and LCD interface design. On receiving the SMS from owner using GSM technology, the device will be turned off.

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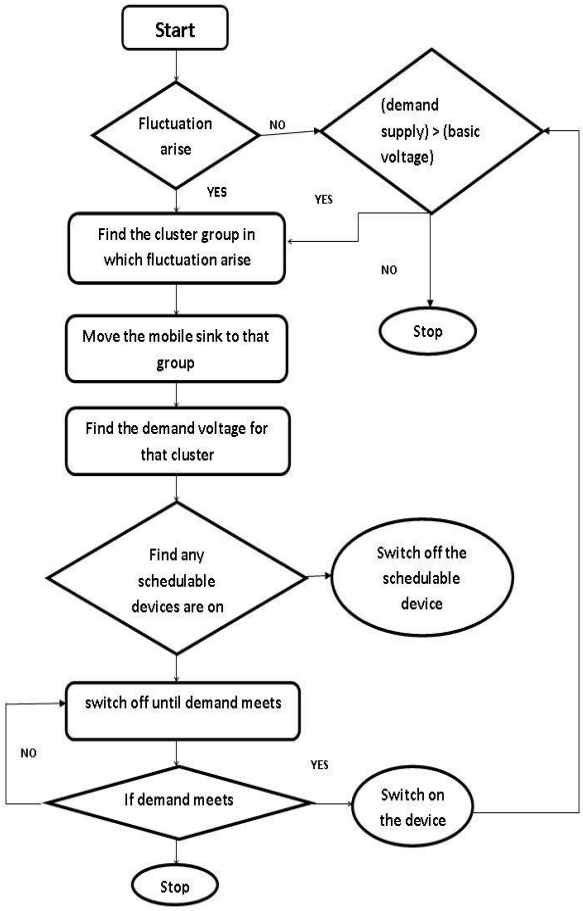

Figure 1 Flowchart representation of automation system

Human machine communication represents the Global System for Mobile (GSM) that acts as an intermediate between owner and system. GSM is the worldwide accepted standard for digital cellular communication. GSM modems are most frequently used to provide mobile internet connectivity and many are used for sending and receiving Short Message Service (SMS). A wireless link is provided between the owner's cell phone and MCU (Microcontroller Unit) by GSM (Global System for mobile) module.

The major advantage of this system is

1. Every power consumption in cluster is calculated and analyzed periodically.
2. Based on the customer priority devices are on and off automatically when a demand or load is raised
3. Customer budget price is always ensures using the help of real time price model
4. The clusters are grouped inside a particular area and no head selection is needed because they are connected to a smart meter.

IV. IMPLEMENTATION

An attempt to design anti-theft vehicular system has the following components. The hardware and software design is explained in this session:

4.1 Hardware Design

Detailed hardware composition is shown in Figure 2.

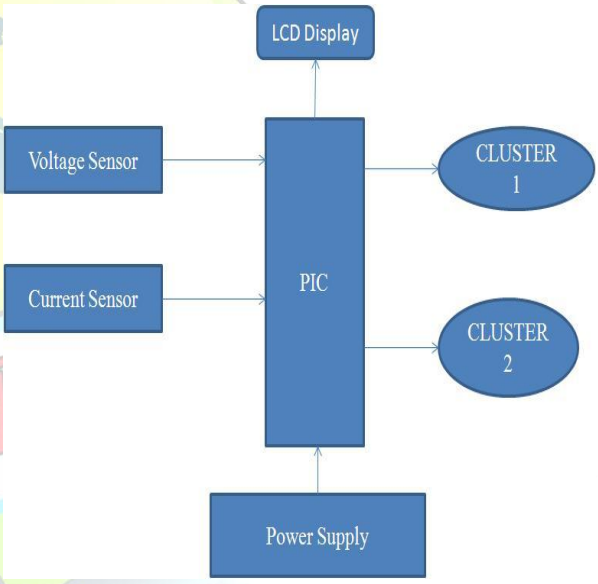

Figure 2 Block diagram for automation system

Microcontroller

Microcontroller is the BRAIN of the security system. The microcontroller is fed with the program containing the logic required to control motor of the vehicle. The microcontroller implied is PIC 16F877A (Peripheral Interface Controller).

PIC microcontroller is selected because it has the following advantages:

Microcomputer with minimum power utilization

a. Extremely flexible and
b. Cost-effective solution for many embedded control applications.

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Configurations of PIC

a. 32KB in-system reprogrammable flash memory, 512 bytes of internal RAM,
b. 32 programmable I/O lines,
c. 32 bit timers/counters

GSM Modem

GSM provides a wireless bond between the authorized person mobile and MCU (Microcontroller Unit). The mobile controlled vehicle security offers many features of an effective two-way communication between the alarm system and the owner. This system is able to notify the owner immediately when intrusion is detected.GSM modems are controlled using AT (Attention) commands [12].

GSM modem consists of set of standard AT commands which is used for communication whose functions are listed below:

- Reading, writing and deleting SMS messages.
- Sending SMS messages.
- Monitoring the signal strength.
- Monitoring the charging status and charge level of the battery.
- Reading, writing and searching phone book entries.

Liquid Crystal Display (LCD)

A liquid crystal display is low-priced, low power device used for displaying text as well as images. LCD contains 3 control lines and 8 I/O lines for the data bus. LCD has two registers.

a. Command register – Stores the set of LCD Command instruction.
b. Data register – Stores data to be displayed on LCD.

Current Sensor

A current sensor is a device that detects electric current (AC or DC) in a wire, and generates a signal proportional to it. The generated signal could be analog voltage or current or even digital output.

Transformer

A transformer is an electrical device that transfers electrical energy between two or more circuits through electromagnetic induction.Transformers are used to increase or decrease the alternating voltages in electric power applications

Resistor

It is a component used to reduce current flow, adjust signal levels and to divide voltage. It is mainly used to reduce heat emitted during power supply.

Capacitor

It is used in charge pump circuits as the energy storage element in the generation of higher voltages. Capacitors are connected in parallel with the DC power circuits in most electronic devices to smooth current fluctuations for signal or control circuits

4.2 Software Design

The different softwares used to design vehicle security system is given below:

Embedded C

Embedded C is the extension set of C language for the embedded system design. It is used for microcontroller based applications. Embedded C uses the resources (RAM, ROM, I/Os) of the embedded processor. The code for the home automation system is done using Embedded C.

The consists of various components like transistor, capacitor, current sensor, LCD, GSM Modem, etc. The power supply is provided to all the units. The circuit diagram for the entire system is given in figure 3.

V. RESULTS

The results of the implementation is listed below.

5.1 Hardware Assembly

The automation system consist of a transistor, current sensor connected to a electrical appliance. PIC microcontroller is connected to the entire system and a LCD display is connected to display the amount of power in the electrical appliance (Fig 3).

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Figure 3 Output for hardware module

5.2 Software Module

The power unit is connected to the entire automation system. Current from the power unit is supplied to the appliance, then amount of current is measured with the help of current and voltage sensor. A embedded C program is programmed to PIC micro unit. With the help of the program the current value is checked with a inbuilt value (eg 220V) and if the value measured exceeds it the value is displayed in the LCD display.

VI. Conclusion & Enhancement

Using automated systems in home is a fast developing sector now a days. This paper involves in producing a home conservation system with a least amount of power consumption. This system is easy to implement as it provides only electrical appliances, a sensor and a GSM. When there is a demand in power the system will be turned off and it will be indicated to the consumer with the help of GSM. This is the initial phase of the project as it intimates only the amount of power consumed in appliance when it exceeds the default value with the help of PIC micro unit.

This system must be enhanced by connecting GSM with a group of clusters and making a mobile sink node to move to the cluster. It can also e enhanced by providing automatic off when the power demand increases. Also the consumer must be updated periodically about the budget price level so that consumer could be aware of the price of power consumed.

References

[1]. R. C. Shah, S. Roy, S. Jain, and W. Brunette, "Data MULEs: modeling a three-tier architecture for sparse sensor networks", *in Proc. 1st IEEE Int Workshop Sensor Network Protocols and Applications*, Alaska, pp. 30-41, May. 2003.

[2]. M. Ma, Y. Y. Yang, and M. Zhao, "Tour Planning for Mobile Data-Gathering Mechanisms in Wireless Sensor Networks", *IEEE Trans. Veh. Technol.*, vol. 62, no. 4, pp. 1472-1483, Nov. 2013.

[3]. H. Nakayama and Z. M. Fadlullah, and N. Ansari, "A Novel Scheme for WSAN Sink Mobility Based on Clustering and Set Packing Techniques", *IEEE Trans. Autom. Control*, vol. 56, no. 10, pp. 2381-2389, Aug. 2011.

[4]. C. Konstantopoulos, G. Pantziou, and D. Gavalas, "A Rendezvous-Based Approach Enabling Energy-Efficient Sensory Data Collection with Mobile Sinks", *IEEE Trans. Parallel Distrib. Syst.*, vol. 23, no. 5, pp. 809-817, Sept. 2012.

[5]. Y.Gu, Y. S. Ji, and J. Li, "ESWC: Efficient Scheduling for the Mobile Sink in Wireless Sensor Networks with Delay Constraint", *IEEE Trans. Parallel Distrib. Syst.*, vol. 24, no. 7, pp. 1310-1320, Jul. 2013.

[6]. J. Wang, Y. Yin, J. Zhang, S. Lee, and R. S. Sherratt, "Mobility based energy efficient and multi-sink algorithm for consumer home networks", *IEEE Trans. Consum. Electron.*, vol. 59, no. 1, pp.77-84, Feb. 2013.

[7]. P. Chanak, I. Banerjee, J. Wang, and R. S. Sherratt, "Obstacle Avoidance Routing Scheme Through Optimal Sink Movement for Home Monitoring and Mobile Robotic Consumer Devices", *IEEE Trans. Consum. Electron.* vol. 60, no. 4, pp. 596 – 604, Nov. 2014.

[8]. J. Byun, B. Jeon, and J. Noh, "An intelligent self-adjusting sensor for smart home services based on ZigBee communications", *IEEE Trans. Consum. Electron.*, vol. 58, no. 3, Aug. 2012.

[9]. Z. Zhao, W. C. Lee, Y. Shin, and K.-B. Song, "An optimal power scheduling method for demand response in home energy management system," *IEEE Trans. Smart Grid*, vol. 4, no. 3, pp. 1391–1400, Sep.2013.

[10]. S.Tiptipakorn and W.-J. Lee, "A residential consumer-centered load control strategy in real-time electricity pricing environment," in *Proc. IEEE 39th North Amer. Power Symp.*, Las Cruces, NM, USA, 2007, pp. 505–510.

[11]. Heemin. Park, Jeff. Burke,Mani B. Srivastava, " Intelligent Lighting Control using Wireless Sensor Networks for Media Production," *KSII Transactions on Internet and Information Systems*.vol.3, no.5,Oct. 2009.

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