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POWER SAVING MANAGEMENT USING GSM

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Abstract

Nowadays, power consumed by the household electrical appliances play a vital role in our economic life. In this paper, the design and development of controlling system for household appliances using GSM has been reported. Measuring of power and monitoring the individual home appliance can be achieved using the mobile.Thus we can save the high electricity expense of the consumers with the low cost system. This design is also used to control multifarious home appliances ranging from the security lamps, the television and even the entire house lighting system. Comparing with manual control of appliances, this is very time consuming and thus the experimental results are very encouraged in real time situations.

Keywords: Global system for mobile (GSM), Peripheral interface controller (PIC), Subscriber identity module (SIM), Universal asynchronous receiver/transmitter (UART), Integrated development environment (IDE), Software development kit (SDK),Java development tools (JDT) and Virtual System Modeling (VSM).

1.Introduction

The increasing availability and affordability of wireless building and home automation networks has increased interest in residential and commercial building energy management. This interest has been coupled with an increased awareness of the environmental impact of energy generation and usage. Residential appliances and equipment account for 30% of all energy consumption in European countries indirectly contribute to 12% of energy generation related carbon dioxide emissions. The International Energy Association also predicts that electricity usage for residential appliances would grow by 12% between 2000 and 2010, eventually reaching 25% by 2020. These figures highlight the importance of managing energy use in order to improve stewardship of the environment. They also hint at the potential gains that are available through smart consumption strategies targeted at residential and commercial buildings. The challenge is how to achieve this objective without negatively impacting people'sstandard of living or their productivity.

Dynamic power management method [1] is proposed for sustaining perpetual operation and satisfying requirements for today's energy harvesting wireless sensor node. It monitors the environmental state and adjusts their operational duty cycle under criteria of energy neutrality to meet the demanded throughput. Outcomes of these observation-adjustment interactions are then evaluated by feedback/reward that represents how well its requests are met; subsequently, the observation-adjustment-evaluation process, so-called reinforcement learning, continues. After the learning process, then it is able to autonomously adjust the duty cycle for satisfying their requirement.But it is used to harvest very less power and not suitable for the industrial and domestic purpose.

GSM Based Automated Embedded System for Monitoring and Controlling of Smart Grid [2] is used to acquire the remote electricalparameters like Voltage, Current, and Frequency from Smart grid andsend these real time values over GSM network using GSM Modem/phone along with temperature at power station. This project is also designed to protect the electrical circuitry by operating an Electromagnetic Relay.The Relay can be used to operate a Circuit Breaker to switch off the main electrical supply. User can send commands in the form of SMS messages to read the remote electrical parameters. This system also can automatically send the real time electrical parameters periodically in the form of SMS. It can also send SMS alerts whenever the Circuit

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Breaker trips or whenever the Voltage or Current exceeds the predefined limits.But the circuit design is very complex and it is need to monitor the electricalparameters using high end PC. There is also the need of mobile phone at the circuit.

WSN-Based for Power Management in Intelligent Buildings**[3]**design and development of a smart monitoring and controlling system for household electrical appliances in real time has been reported in this paper.The system principally monitors electrical parameters of household appliances such as voltage and current and subsequently calculates the power consumed.The novelty of this system is the implementation of the controlling mechanism of appliances in different ways.The developed system is a low-cost andflexible in operation and thus can save electricity expense of the consumers.But there may accidents occur due to short circuiting. No energy saving system. Power is not efficiently utilized. Automatic ON/OFF of the appliance cannot be processed.

Power management in home area network [4] system helps to use the available energy efficiently. A Controller system has been designed that manages efficient utilization of power over an electrical network and helps conserve energy by making authorities keep a check on energy usage. To demonstrate this wireless sensor network is going to be developed which consists of number of nodes. ZigBee protocol will be used for the wireless communications. The main advantage of using ZigBee protocol is low power requirement which result in longer battery life. As a proof of concept PIC based prototype of proposed system is designed and going to be developed for small application.In this method zigbee standard was used. The zigbee communication range is very short. This system computer is used to monitor the power consumption.

In this paper, power saving management using GSM are proposed. Low-cost locally available components and can be used to control home appliances.The designed home automation system was tested a number of times and certified to control different homeappliances used in the lighting system, air conditioning system, heating system andhome entertainment system. This home automation system can be also implemented over Bluetooth, Infrared and WAP connectivity without much change to the design and yet still be able to control a variety of home appliances Thus the system is scalable and flexible.

2. Proposed system

2.1 Methodology

In designing a power saving management system, one or more suitable platforms are used in order to build a reliable and flexible system that can be easily operated and adapted for a new household appliance. Therefore, for the purpose of this project some specific deliberate choices were made on the type of platforms, hardware components and mode of operation of the automation system**.**

2.2. Preliminary considerations

Before the actual design of the project work, specific deliberate choices in selection of appropriate implementation platforms and hardware components were made. Priority was given to low cost availability, reliability, flexibility and simplicity in all these selections.

2.3. Selection of implementation platform

As already explained in the previous chapter, there are many platforms over which an automation system can be implemented. Of the currently available platforms – Power line, RS232, Ethernet, Bluetooth, Infrared, GSM and Microcontroller, GSM and Microcontroller were found most appropriate due to their low cost availability, reliability and simplicity when used for an individual control home automation system which my project work is on. Power line and Ethernet is too expensive and complex for this kind of home automation system, while Bluetooth and Infrared are unreliable.

2.4. Proposed block diagram

Design and implementation of monitor's electrical parameters of household appliances such as voltage and current and subsequently calculates the power consumed. The novelty of this system is the implementation of the controlling mechanism of appliances in different ways.

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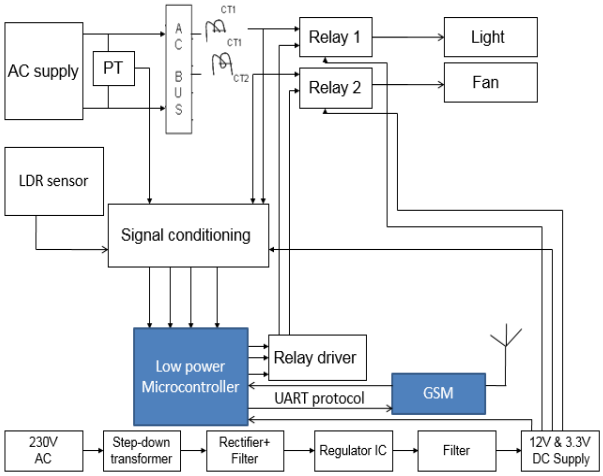

Fig 2.1. Block diagram of power management system

The developedsystem is a low-cost and flexible in operation and thus can save electricity expense of the consumers. Monitors each and every home appliance individually for knowing their power consumption using the mobiles.Through GSM, the message is sent to the user mobile for informing that there is any short circuit and even how much load is consumed by the appliance such as light, fan. So the user can control the appliance through the mobile.

The designed power management system uses PIC18F4520 microcontroller, Smart phone with android platform, SIM-900 standard GSM module for communication between the microcontroller and mobile phone, UART protocol for interfacing the microcontroller, a relay and a driver for interfacing the relay. As illustrated in the block diagram shown in Fig 2.1, when the GSM module receives the required signal, it communicates via the UART protocol to the PIC18F4520, the PIC18F4520 controls the relay state via a driver and this in turn determines the state of the connected appliance, whether switched on or off.

2.4. Smart phone application

The smart phone android based application is built by using the eclipse software. In computer programming, Eclipse is an integrated development environment (IDE). It contains a base workspace and an extensible plug-in system for customizing the environment. Eclipse is written mostly in Java and its primary use is for developing Java applications, but it may also be used to develop applications in other programming languages through the use of plugins. It can also be used to develop packages for the software Mathematical. Development environments include the Eclipse Java development tools (JDT) for Java. The initial codebase originated from IBM Visual Age. The Eclipse software development kit (SDK), which includes the Java development tools, is meant for Java developers. Users can extend its abilities by installing plug-ins written for the Eclipse Platform, such as development toolkits for other programming languages, and can write and contribute their own plug-in modules.

Released under the terms of the Eclipse Public License, Eclipse SDK is free and open-source software (although it is incompatible with the GNU General Public License). It was one of the first IDEs to run under GNU Class path and it runs without problems under Iced Tea.

The application consists of the message sending feature to control the power consumed by the home appliances. It consists of following selections.

Number configuration: The user configures the GSM SIM numberusing this option.

Mode selection: In this option user can select automatic control andmanual mode control.

Watt setting: In this option user can set the watt that the specificelectrical appliance such as motor.

Load: In this user can switch the load OFF/ON operations manually

Status: This option will send the request to controller to send the statussuch the voltage, current, power and cost of the individual electrical appliances.

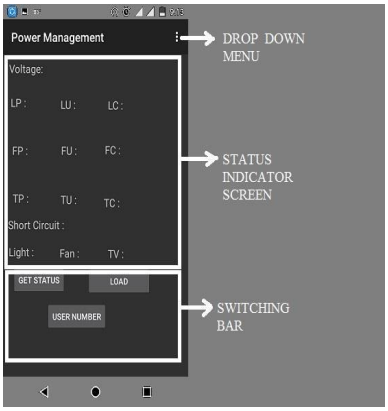

Fig 2.2 Android application

User number: This option will send the user number to

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controller. Thecontroller will configure user number.

2.5 PROTEUS 7.0 SIMULATION TOOL

Proteus 7.0 is a Virtual System Modeling (VSM) that combines circuit simulation, animated components and microprocessor models to co-simulate the complete microcontroller based designs. This is the perfect tool for engineers to test their microcontroller designs before constructing a physical prototype in real time.

This program allows users to interact with the design using on-screen indicators and/or LED and LCD displays and, if attached to the PC, switches and buttons. One of the main components of Proteus 7.0 is the Circuit Simulation -- a product that uses a SPICE3f5 analogue simulator kernel combined with an event-driven digital simulator that allow users to utilize any SPICE model by any manufacturer.

Proteus VSM comes with extensive debugging features, including breakpoints, single stepping and variable display for a neat design prior to hardware prototyping. In summary, Proteus 7.0 is the program to use when we want to simulate the interaction betweensoftware running on a microcontroller and any analog or digital electronic device connected to it.

2.6Testing and complete design

After the completion of the hardware coupling, several tests were done on the design. Some observations and corrections were made as follows:

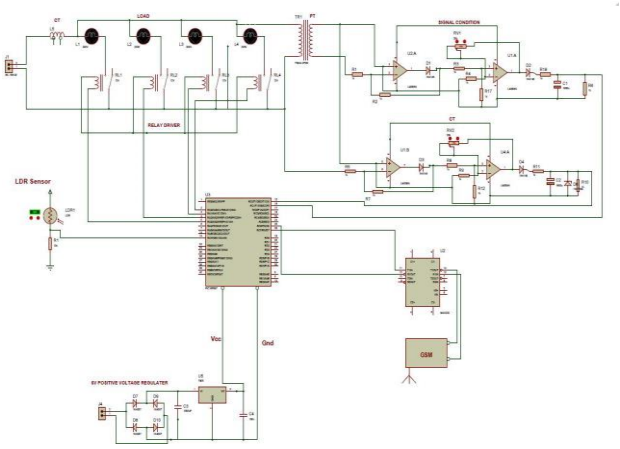

Fig 2.3 Circuit diagram

The system would not work when the phone is connected after powering it, even after a reset. This was due to the fact that the signals sent at first by the system to the GSM do not die of the line immediately and affects subsequent signals sent even after connecting and resetting the system.

This can be prevented by connecting the phone first before powering the system. Much concern was not given to this shortcoming because the system was designed to have a permanently connected GSM, making it impossible for this shortcoming to arise.

It was also observed that the system would not respond after about four loop cycles (this corresponds to four concurrent switch toggle). This was due to buffer overflow on the microcontroller which makes it not process new data sent it by the GSM after those cycles.

The attempted solution was to find a way of flushing the buffer after each cycle, but due to little help found from books, internet and fellow PIC programmers, it's solution could not be implemented. Other than in the above stated situations, the system worked very well and reliably. In designing the case for the system, utmost concern was given to guarding the system from physical strain and stress during carriage and project presentation. A transparent plastic material was used for the casing as against glass material which may easily break, a paper material which may give in to strain and stress, or even a metallic material which will make the project work quite uneconomical, clumsy and heavy.

The casing was made in a manner that permits the whole circuit board to be detached from the system. The complete power saving management system circuit controlling a lighting fixture, and the designed system are shown in Fig 2.3 and 2.4.

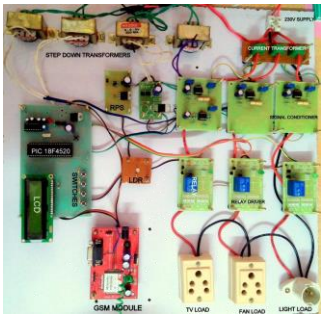

Fig 2.4 The complete power management system.

3. Results and analysis

3.1. Results and discussion

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This chapter highlights the results of the project & the snapshots for each of the activities are shown along with the discussion of each activity describing it's working. Each snapshot describes every single step of the controlling mechanism done by the android application. The main activities as well as the options provided to the users in each activity such as menu options and the activities which are created on the click of these options are also shown and described in brief.

3.2. Snapshot of results

Fig 3.1 is shows that the android application layout representation. It consists of upper right side drop down menu, switching bars, status indicator screen.Initially we need to configure the GSM SIM number on the Android application to send messages. Select the Drop down menu in the android application at top right and configurethe GSM number. Fig 3.2 shows that GSM number configuration in smart phone.

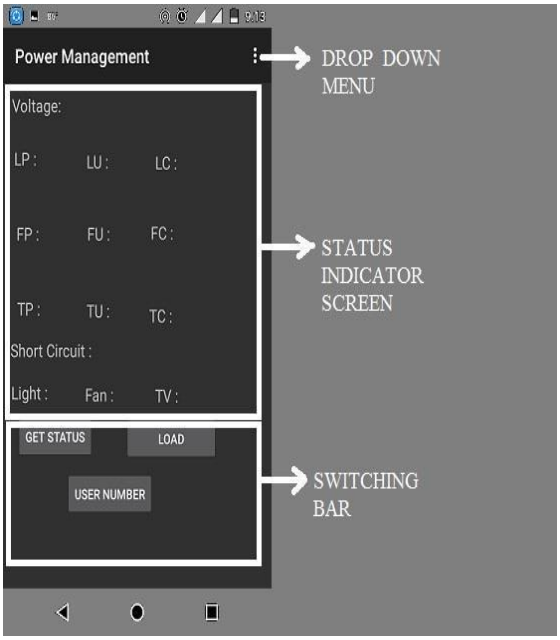

Fig 3.1. Android application layout

Now the microcontroller need now the user number. Click the USER NUMBER bar. SMS will send to the GSM number. On LCD of microcontroller system displays the text as "SMS Reading". Then the microcontroller stores the user number. Fig 3.3 shows that the user number configuring operation.

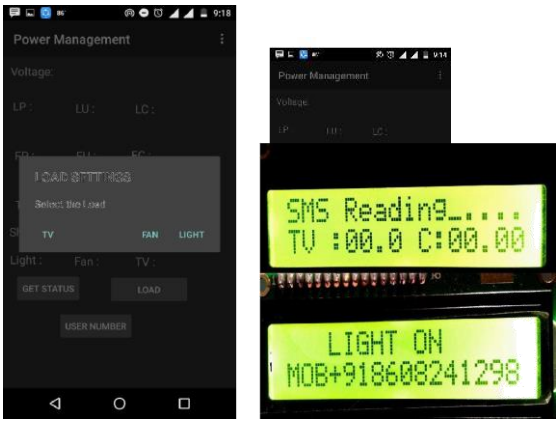

Fig 3.2 GSM Number configuration

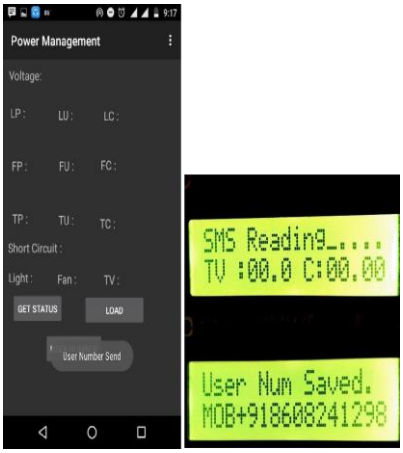

Fig 3.3 User NumberConfiguration

Then by clicking the LOAD bar on the screen then the pop up window open it consist of 3 loads Fan, Light, and TV. Now select any one of the load we can able to do the ON/OFF operations. Fig 3.4 shows ON/OFF operations. When select the light load initially it is in OFF condition the message will send through the smart phone, the GSM will receive the message. The received information is processed by the pic microcontroller. The microcontroller will send the bit information to relay

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driver. If the bit information is '0' then it will turn off the device through the relay switch else, if the information is '1' relay switch on the devices. Fig 3.5 shows that the load ON status.

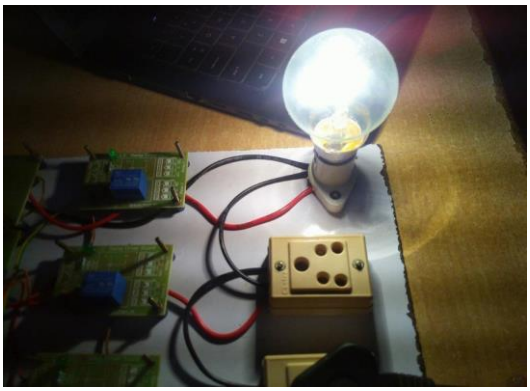

Fig 3.4Load ON/OFF operation.

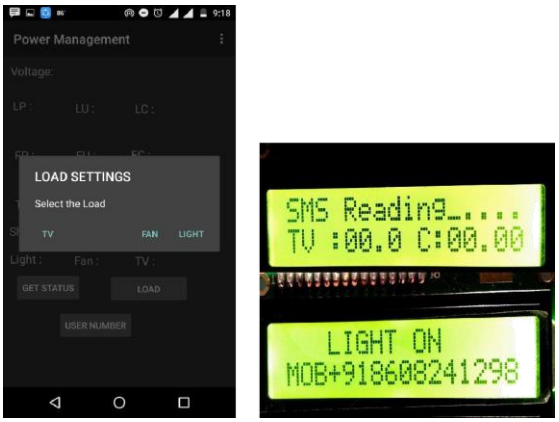

Fig 3.5. Light Load ON status

Mode setting

In this project power saving technique was done bythe automatic mode control operation. From the drop down menu we canselect the automatic mode and the microcontroller change the mode. Microcontroller analyze machine condition or sensor measurement and it will switch ON/OFF the devices automatically. Fig 3.6 shows that the automatic mode selection.

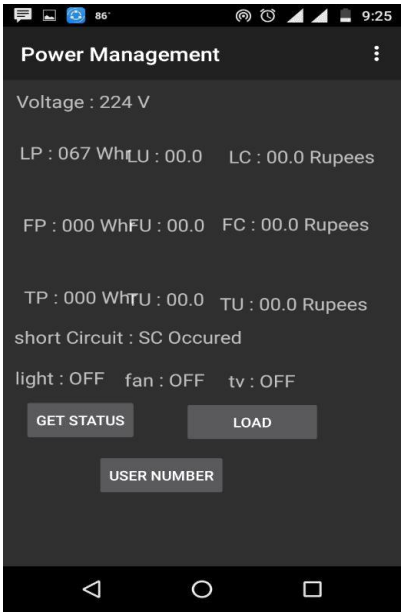

Fig 3.6 Mode selection

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Watt setting

We can set the power to the particular electric appliances then they are automatically turned off after the consumption of the power. It should be helpful for the life time of the appliance. E.g. we can fix the average power of the refrigerator and we can avoid excess of power consumption. Fig 3.7 shows that the power setup operation.

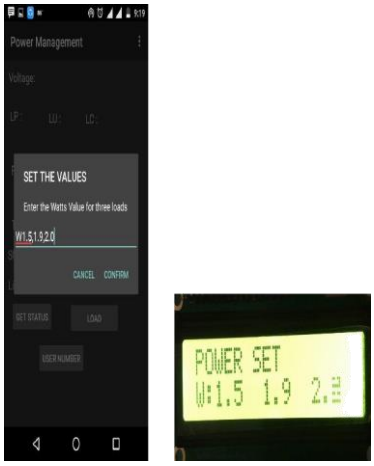

Fig 3.7 Power setup

Getting status

We can check the status of the loads and can view the voltage level, power consumed level, unit loading, cost of each appliance and short circuit notification. Fig 3.8 shows that the status receiving operation through the mobile.

Fig 3.8 Getting status

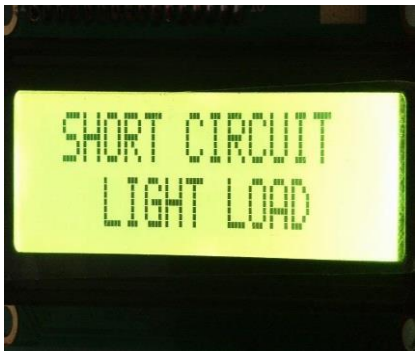

Fig 3.9 Status view

Fig 3.9 shows the voltage level of power consumption of load, Unit measurement, cost value and the short circuit notification.

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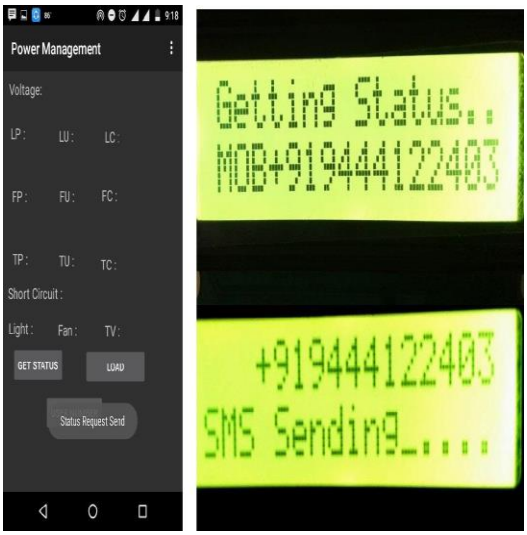

Fig 3.10. Short circuit detection

Fig 3.10 shows that the short circuit notification. If the power is very high and abnormal then the controller turnoff the particular load immediately. It is very useful for the appliance safety. If the short circuit occurred immediately the GSM system send the status to the user.

4.Conclusion

It is evident from this project work that an individual control home automation system can be cheaply made from low-cost locally available components and can be used to control multifarious home appliances ranging from the security lamps, the television to the air conditioning system and even the entire house lighting system. And better still, the components required are so small and few that they can be packaged into a small inconspicuous container.

The designed home automation system was tested a number of times and certified to control different home appliances used in the lighting system, air conditioning system, heating system, home entertainment system and many more (this is as long as the maximum power and current rating of the appliance does not exceed that of the used relay).

Finally, this home automation system can be also implemented over Bluetooth, Infrared and WAP connectivity without much change to the design and yet still be able to control a variety of home appliances. Hence, this system is scalable and flexible.

5. References

[1] Hsu, Roy Chaoming, Cheng-Ting Liu, and Hao-Li Wang. "A Reinforcement Learning-Based ToD Provisioning Dynamic Power Management for Sustainable Operation of Energy Harvesting Wireless Sensor Node." *Emerging Topics in Computing, IEEE Transactions on* 2.2 (2014): 181-191.

[2] achan, Amit. "GSM Based Automated Embedded System for Monitoring and Controlling of Smart Grid." *International Journal of Electrical,Electronic Science and Engineering Vol: 7 No* 12 (2013).

[3] Suryadevara, Nagender Kumar, Subhas Chandra Mukhopadhyay, Sean Dieter Tebje Kelly, and Satinder Pal Singh Gill. "WSN-based smart sensors and actuator for power management in intelligent buildings." *Mechatronics, IEEE/ASME Transactions on* 20, no. 2 (2015): 564-571.

[4] Ramalakshmi, R., and G. Balaji. "Power Management in Home Area Network Using Zigbee Protocol." *International Journal of Science andResearch (IJSR), ISSN (Online)*: 2319-7064.

[5] Han, Jinsoo, Chang-Sic Choi, and Ilwoo Lee. "More efficient home energy management system based on ZigBee communication and infrared remote controls." *Consumer Electronics, IEEE Transactions on* 57, no. 1 (2011): 85-89.

[6] Nguyen, Kim Doang, I. Chen, Zhiqiang Luo, Song Huat Yeo, and Henry Been-Lirn Duh. "A wearable sensing system for tracking and monitoring of functional arm movement." *Mechatronics, IEEE/ASME Transactionson* 16, no. 2 (2011): 213-220.

[7] Han, Dae-Man, and Jae-Hyun Lim. "Smart home energy management system using IEEE 802.15. 4 and zigbee." *Consumer Electronics, IEEETransactions on* 56, no. 3 (2010): 1403-1410.

[8] Cheong, Pedro, Ka-Fai Chang, Ying-Hoi Lai, Sut-Kam Ho, Iam-KeongSou, and Kam-Weng Tam. "A ZigBee-based wireless sensor network node for ultraviolet detection of flame." *Industrial Electronics, IEEETransactions on* 58, no. 11 (2011): 5271-5277.

[9] Erol-Kantarci, Melike, and Hussein T. Mouftah. "Wireless sensor networks for cost-efficient residential energy management in the smart grid." *Smart Grid, IEEE Transactions on* 2, no. 2 (2011): 314-325.

[10] Kunold, Ingo, Markus Kuller, Joerg Bauer, and NursiKaraoglan. "A system concept of an energy information system in flats using wireless technologies and smart metering devices." In

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Intelligent Data Acquisitionand Advanced Computing Systems (IDAACS), 2011 IEEE 6th International Conference on, vol. 2, pp. 812-816. IEEE, 2011.

BIOGRAPHY

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