iJRASET
International Journal For Research in Applied Science and Engineering Technology

INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

Volume: 6 **Issue:** III **Month of publication:** March 2018

DOI: http://doi.org/10.22214/ijraset.2018.3521

www.ijraset.com

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International Journal for Research in Applied Science & Engineering Technology (IJRASET)
ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 6.887
Volume 6 Issue III, March 2018- Available at www.ijraset.com

A Survey on IOT Based Smart Building System

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***Abstract:** This document gives formatting instructions for authors preparing papers for publication in the Proceedings of an IEEE A smart building system is implemented to automate and remotely control the home appliances in cost effective manner by connecting various sensor nodes to the home appliances and sending the data to the Raspberry pi a pocket size computer and the cloud by forming wireless sensor network. Various techniques are available to establish the wireless sensor network. In this paper, we survey various WSN techniques in brief which are used to provide smart solution of the data. The collected data is used for analysis and calculate energy consumption of the smart system.*
***Keywords:** Automation, Internet of Things (IoT), Smart Building, Smart Home, Wireless sensor network (WSN).*

I. INTRODUCTION

Now a days power crises is the major problem in the world. Technologies have been developed to ensure efficient power management by remotely controlling the home appliances and by means buildings. Traditionally users have to manually switch on or off the appliances, sometimes it may lead to west of energy in case of user left the appliances on. A researchers shows that an appliances consuming energy in standby mode. A house is one the place where appliances left on in standby mode [1]. Advancement has made our life simpler. By using android app and websites user can control home appliances anytime, anywhere.
The purpose of this research is to control building electrical appliances while also monitor the electricity consumption using web based application.

II. LITERATURE REVIEW

Smart building using wireless Techniques. Due to advancement in wireless techniques building management become smart. In the literature lot of work has been found as below for various wireless protocols used.

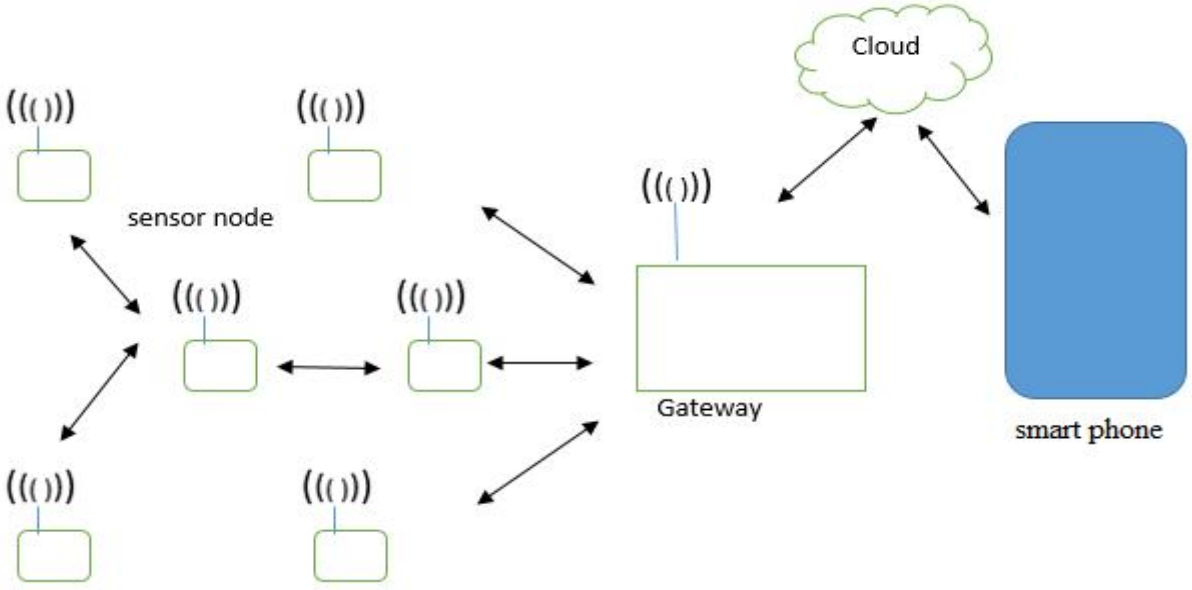

Fig1: Generalized Wireless Technique for Smart Building System [16]

A. ZigBee based wireless technique.

ZigBee is wireless mesh networking standard intended for wireless automation with low-cost and low-power, which has encourage the development of devices with longer battery life. Zigbee chips have microcontrollers and radios integrated within it with very low amount of flash memory [2].

In [2] various sensors nodes were deployed in home like LM35 temperature sensor, PIR motion sensor, Piezoresistive A301sensor, etc. this sensed data is transmitted to RF module XBee series-2 end-device or router to xBee coordinator connected to home gateway. Which stores data in MYSQL server through Visual Studio C# graphical user interface. From this local server data will be analysed and uploaded to website.

In [3]the smart energy efficient and interface free environment is built to control home appliances. This system is developed in main three different parts 1) Smart Interface control system 2) smart energy control system and 3) smart management control system. In smart interface control system, it is unconcealed that the being of multiple wireless technologies on same ISM band effect the performance of each other, CoZNET coordinators are placed in each room to overcome the problem of packet loss due to distance between sensor node and management system.2) in smart energy control system the energy consumption is calculated by functioning time. Here home appliances are connected to the ZigBee sensor.3) the smart management control system analysed the gathered data and also perform some events based on predefined threshold value.

In [4], smart demand and responsive home energy management system based on ZigBee based wireless sensor network has been developed. WSN comprises of PAN(personal area network) and data collection node which are further connected to home appliance to perform action like controlling ON/OFF switch, sending timestamp, signal quantizing. Base station will sends collected data to MCU (Microcontroller unit) for further processing. An advance energy management algorithm define the status for demand responsive action for each home appliance and inform to take necessary decision for efficient energy management.

B. Wifi based Techniques for Smart Building

Now days Wifi is A widely used technology for mobile communication with faster transmission speed up to 600Mbps.it provides long transmission rang, the 802.11n standard provides the range up to 1000m [5]

In [6], smart home automation system has been developed that uses devices like ESP8266 wifi module, raspberry pi, DS18B20 temperature sensor, Lm1117 voltage regulator. This system works in two mode switch mode and video mode. In switch mode home appliances are controlled based on status of radio button. Raspberry pi connect to network through wifi module. Pi collects and analyses the data.

In [7], low cost home automation system was developed based on ESP8266 wifi module. Various sensors, Atmel microcontrollers, nrf24101 RF module, SPDT relay and solid state relays are used for voltage regulation. To communicate microcontrollers each other RF module are connected to microcontroller. Microcontroller are programmed to perform specific task, like reading sensor value, activating alarm etc. where one microcontroller act as a gateway. Sensed data are sent to the gateway. The collected data from gateway are sent to server via ESP8266 wifi module. User can use data through Android app.

C. Bluetooth Based Techniques For Smart Building

Bluetooth works under IEEE 802.15.1 standard. It is applicable for PAN with short range up to 100M. It's just for indoor use only and find interference from sunrays [3].

In [8] BLE based complete system is implemented for data gathering and control system for home. System supports maximum 64 sensors and 8 different devices, also can measure signal with sample rate up to 8000S/s with less than 0.7% error and transfer up to 9000bits/s with less than 5% error. So it can measure current, voltage and other environmental parameters like temperature, luminosity etc. Whole system can connect to mobile devices through server.

D. 6LowPAN wireless technique for smart building

6LowPAN is wireless techniques comprises of IPV6 and Low power wireless personal area network which allow provisioning of IP to devices with low power and capabilities [9].

In [10] automation of devices on 6LoWPAN are presented. The use of 6LoWPAN reduces the complexity of the architecture and the low tax burden. It can also control the transparent Internet device at home to be implemented. In our system, we proposed the use of IT CC2530, energy efficient SoC solution for 802.15.4 combined application with Contiki, an open source operating system for embedded memory systems that has connections with digital sensors for ambient light ISL 29023. The use of 6LoWPAN Home Gateway Provides Intelligent Platform During Interconnection the home automation network, based on IEEE 802.15.4e 6LoWPAN, with an existing IPv6 network, based on Ethernet total energy independence using Solar cell in small polycrystalline silicon collects energy at 3V, 70mA.

E. GSM based smart building

In [11]a smart home industrial system was build using IR Sensor, PIR sensor, ldr sensor and temperature sensor , ARM 7 TDMI core processor , Zigbee Module, GSM module, 16x2 LCD. Sensors are connected to ARM processor which stored the sensed data in flash memory, result shown on LCD and sends to monitoring station through GSM. System continuously monitor and control home appliances through webpage and also monitor the value of sensors. If the value of temperature, smoke and light intensity are excessed above predefined threshold value then users are notified by automatic email alert. PIR sensor checking for availability of person in home based on that ON/OFF appliances.

This paper [12]present GSM based smart home system. It consist of PIC microcontroller and GSM module. User can interact with system by sending text message to GSM module via cellular network further GSM send it to PIC microcontroller through RS232 interface. Microcontroller provides status of any device weather it is ON or OFF. Oscilloscope monitor received and transmitted wave form of message.

F. IoT based smart building

In [13] service Robot and WSN based home automation system has been implemented. Sensor nodes are embedded with smart devices which provides sensing and processing capabilities. Sensor nodes collect the information like temperature, fire, gas leakage, water leakage. Network has master- slave relationship. ZigBee is used to send the collected data from slave node to master node connected to personal computer. In case of failure of any node in home service robot reached to the location and carry out rescue task. User can control whole system and service robot through smart phone or PC.

Table i. Comparison of wireless techniques

In below table shows the comparison of various parameters of wireless techniques like frequency, data rate, range, power consumption etc. [14][15].

Technology	Standard	Frequency	Power Consumption	Data Rate	Cost	Range
ZigBee	802.15.4	2.4GHz, 868Mhz, 915MHz, 784 MHz	Low	250kbps	Low	~10-100 meters
WiFi	802.11	2.4GHz, 5GHz	High	54Mbps	High	~50-100 meters
Bluetooth	802.15.1	2.4 GHz	Medium	~3Mbps	Low	~10
6LoWPAN	802.15.4	2.4GHz, 868Mhz, 915MHz	Very Low	250kbps	Low	~20

In [15], this paper techniques for controlling and monitoring power consumption of the Home appliances are presented. Arduiono uno and current sensor are used to obtain the power and data. Arduiono will convert the ac signal to dc and provide this digital data to raspberry pi. Raspberry pi does the diagnosing part and system will continuously monitor the power consumption and if certain power conditions are met system will warn the user. For controlling the appliances four-channel relay is used which is connected to the raspberry pi GPIO pin. A local dedicated server is used to store the data.

III.CONCLUSION

To summarize the review, automation in home environment leads to the efficient use of home appliances. Use of smart building system facilitates the user to remotely monitor and control the home appliances. System also reduces the energy consumption and provides security alerts. There are various techniques ~~are~~ available for remote monitoring using wireless sensor network. All are differ from each other by parameters like power consumption and transmission rang etc.

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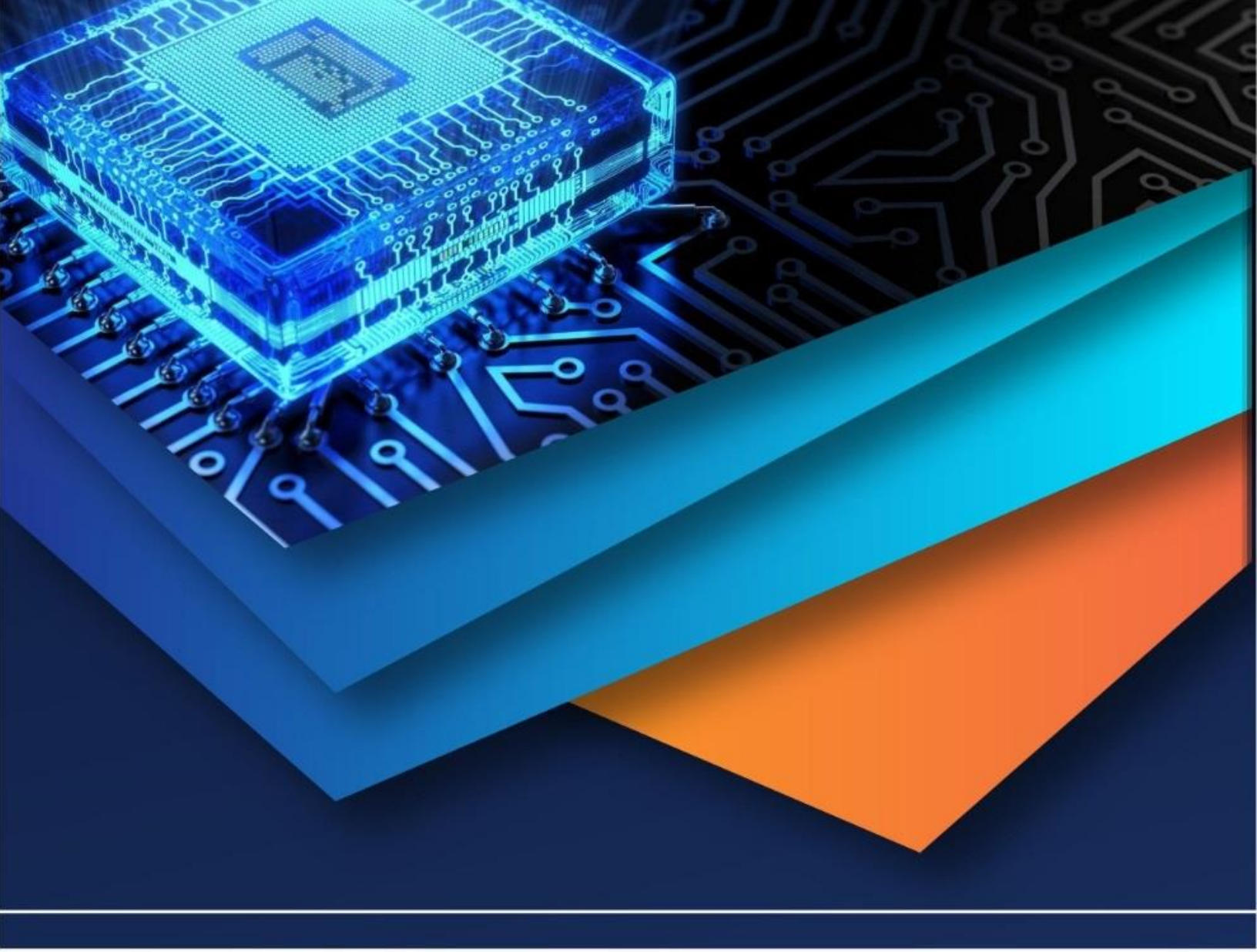

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