Cascaded communication of Zigbee for monitoring & controlling.

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Abstract

This paper proposes to connect more than one room which can be monitored appliances and to make the room easily remote controllable with a zigbee. This paper introduces the conceptual understanding and strategy of zigbee IEEE 802.15.4 standard to be deployed in smart home environment. Zigbee technology offers a multi-hop communication capability for data transfer.Multi-hop communications will provide unlimited range of communications for the system as long as there are intermediate nodes that will pass the data from one nodes to another until it reaches the designation .Remote controlling Home Using Zigbee embedded[2] system is used in various home applications, such as home appliance controlling, security systems and automation etc are not very easy to do it manually with human interaction. It is main feature its use of the zigbee protocol as the communication medium between the transmitter and receiver modules.

**Keywords**: Zigbee, wireless sensor, zigbee cascading communication.

1. Introduction

Now day's smart home using wireless communication is replacing the wired system which was very messy and difficult to set up. However[1] the existing wireless smart home system only can cover up to a certain range of area that is limited by the range of wireless module being used. We proposed to describe more efficient home energy management system to reduce power consumption in home area. We consider the room easily controllable with an IR remote control of a home appliance.[1]Home power consumption tends to grow in proportion to the increase of the number of large-sized home electric appliances. To implement home energy management,networked appliancewith control /monitor capabilities and homenetworkwithout new wiring are indispensable. Zigbee wireless system can control the home electric appliances wirelessly at home without new wiring.Wireless [6,7]sensor networks are often found in the fields of home security, industrial control and maintenance, medical assistance and traffic monitoring and the appearance of Zigbee indicates a network system which is highly reliable, developed as an open global standard to address the unique needs of cost-effective, low power consumption, programmable and fast establishing. Currently, many of the wireless sensor network systems are now using Zigbee to implement the designs.

In this paper we want to connect more than one room which can be remote-controllable and energy-saving room architecture to reduce standby power consumption and to make the room easily controllable

with a zigbee. We want to monitor all connected power outlet at remote palce.To efficiently manage the all power devices, to realize the proposed room architecture, we proposed and designed the Zigbee controller with IR code learning functionality.

2.Proposed Home architecture based on ZigBee communication
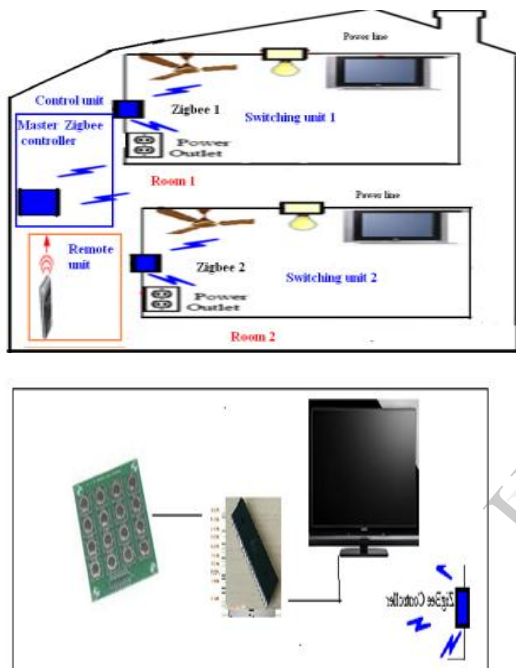
Fig 1. Proposed Home architecture based on Zigbee communication.

Fig shows the home architecture based on the zigbee cascaded communication the home has two rooms each room equipped with home appliances, zigbee hub. in this three zigbee are used two zigbee used as slave zigbee and one used as a master zigbee. Master Zigbee controls the communication of other two zigbee and displays the all details in LCD. Zigbee can be control by using remote also. It consists of two switching unit, control unit and remote unit. A user can figure out which home appliances are on or off. A user can access server from remote place as well as from outside of the room. Here range of zigbee used is 30 m if required it may be extend up to 1 km.

3. About zigbee:

Zigbee is a wireless technology [9] developed as an open global standard to address the unique needs of low-cost, low-power, wireless sensor networks. The standard takes full advantage of the IEEE 802.15.4 physical radio specification and **operates in unlicensed bands worldwide at the following frequencies**: 2.400–2.484 GHz, 902-928 MHz and 868.0–868.6 MHz The ZigBee protocol was designed to carry data through the hostile RF environments that routinely exist in commercial and industrial applications. [10]A key component of the Zigbee protocol is the ability to support wireless **mesh networks** form to transmit data over longer distances, passing data through intermediate devices to reach more distant ones.

The reason to select Zigbee technology:

Wireless sensor networks are often found in the fields of home security, industrial control and maintenance, medical assistance and traffic monitoring. The appearance of Zigbee indicates a network system which is highly reliable, cost-effective with low power consumption. [11][8] Currently, many of thewireless sensor network systems are using Zigbee devices to implement the systems.A key component of the Zigbee protocol is the ability to support wireless **mesh networks** form to transmit data over longer distances, passing data through intermediate devices to reach more distant ones.
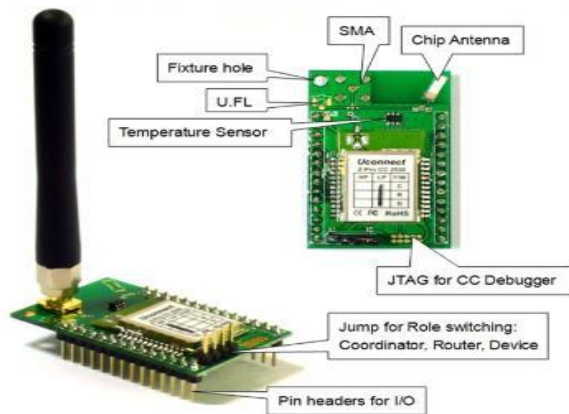
Fig 2. Zigbee module
This has inspired to select Zigbee technology for this project.

This project is based on wireless controlled switch board where the switch boards are being controlled through stationary switches or Remote control

We have three categories: 1. Switching unit 2. Control Unit 3. Remote control.

Switching Unit: This Unit is Switch board unit in which Zigbee is connected to receive command from Control unit for switch OFF or ON the relays as four relays are connected with the microcontroller and each relay is corresponds to one device or equipment etc. Four LDRs for four relays are placed with the relays to monitor whether relays are actually working or not, if then it sends status to control unit through zigbee.

Control Unit: In this Unit zigbee is connected with the microcontroller to send command to the switching unit to control the switches by pressing attached switches or by the remote control through the TSOP (IR signal receiver) and IR Decoder also connected with the microcontroller. And LCD is here to show the Switching Status.

Remote Control: Here IR encoder and Switches are connected with the microcontroller for pressing the switches and send IR encoded data (command) to Control Unit to control the Relays in.

The algorithm is to continuously reading IR status for any input from Remote Control or Local Keypad. After receiving any valid input, transmits it from CONTROL UNIT to SWITCHING UNIT through RF (Zigbee).At the same time SWITCHING UNIT is also continuously reading RF status for any input data from SWITCHING UNIT and after receiving valid input, it operates the relays and get the feedback from the relays as it is continuously on monitoring process. The Feedback is fetched into the microcontroller and sends the relay and feedback status to the CONTROL UNIT through RF and Display on the LCD. The REMOTE CONTROL is consists of keypad and IR transmitter (encoder). Through keypad by pressing keys data sends to CONTROL UNIT and again sends it to SWITCHING UNIT for controlling relays. Microcontroller gets input data from the keypad process it and output to IR ENCODER to send data wirelessly.IR based communication is between REMOTE CONTROL and CONTROL UNIT and data sends through 4 bit IR ENCODER with 38khz frequency in REMOTE UNIT to the CONTROLLING UNIT using TSOP which is 38khz IR receiver and send it to IR DECODER which decodes IR based data to 4 bit binary equivalent.IR based data is received by the CONTROL UNIT and processed by the microcontroller and send it to the SWITCHING UNIT through wireless ZIGBEE protocol. The switching unit receives data wirelessly from control unit and process in microcontroller. According to the input data and processed algorithm, controls the relays of switch board 1 or switch board 2 for operating FAN, LIGHT, and TV connected with the

switch board 1 and switch board 2. The microcontroller on SWITCH BOARD cannot drive Relays directly as it requires more current and voltage, so it is important to use driver in between to amplify current and voltage as our relay is of 12 volt, thus we are using ULN2803 to satisfy the requirement. The controlling relays which are operating Electrical Appliances are based on feedback mechanism where it monitors the relay switch status for ON OFF and damage. All relay switching status and feedback monitoring status will be shown on LCD in CONTROL UNIT for us to know the current relay status and feedback status. Our whole system operates on 3.3v except relays (12v) for the required operation

Conclusion: This paper has implemented zigbee communication for remote monitoring and control system that allows home owners to monitor and control various appliance of their home. A novel architecture for a home automation system based on the zigbee protocol that is cost effective and scales to large number of device. We implement the system wherein ZigBee controllers in each room are linked together to the home server via Zigbee communication. The complete system for the propose system can be managed from the remote area as well as from home. Zigbee controllers use IR code learning functionality and monitor the same outlet device. We accomplish the aim of power consumption in domestic environment. In future, we can also use these systems to manage multiple floors in a tower provided the range of Zigbee operation is increased this will definitely result in reduction of power consumption and cost than the presently used system. The feasibility and appropriateness of the proposed architecture and technologies in the creation of a low cost, flexible and secure system has been succefully evaluated by experimentation.

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