Computer Based Device Controlling Using Zigbee

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Abstract – We are in the age where the need for wireless communication in home is increasing day by day and technologies are being discovered by the minute. The paper demonstrates a way for wireless controlling of home appliances using a Computer. The Computer will communicate with the help of a zigbee module which consists of both transmitter and receiver. This project will be able to control electrical appliances such as fan, bulbs, doors etc by sending commands through the computer using software called hyperlink. Communication is done through XBEE wireless communication. Commands will be inputted on the computer and accordingly anyone of the appliances connected to the relays will be switched ON/OFF. Sensors have been attached to the rooms which will sense any movement and switch off lights if there are none thus saving electricity. An alternative method for controlling the appliances has also been made in this project. The appliances can be switched on and off using a remote which has a total of 8 buttons, each for switching on and off the appliances.

Index Terms – Zigbee, Wireless, XBEE.

1. INTRODUCTION

Home automation may be defined as a way of controlling home appliances with the help of a computer or a smart device. It is a combination of one or more computers and microcontrollers to control electric devices.

We are in an age where everything around us has gone digital and technologies are being discovered by the minute. These technologies are being discovered to make our lives easy and make things available at a much faster process, for example: Earlier people had to stand and watch when they were washing clothes in the washing machine but now automatic washing machines are there and there is no need to stand around to see if the clothes are getting washed or not. Similarly home automation will also help and provide a breakthrough to an easier lifestyle. In this project we are using a computer to control electronic devices with the help of zigbee as a communication medium. There are a number of devices that are used for wireless communication such as zigbee, Bluetooth, RF, GPRS etc.Zigbee is used for short distance communication. In this project the commands will be written on a software called hyperlink terminal and then sent over throughzigbee to the Arduino board which will then decode the command and switch any one of the relays accordingly. Zigbee is one of the wireless medium which has been developed as a global standard for low power, low cost, M2M wireless network and belongs to IEEE 802.15.4 standard and operates in the unlicensed band: 868 MHZ, 915MHZ and 2.4 GHZ. The maximum speed at which the zigbee device can communicate is 250kbps at 2.4GHZ frequency and has a data rate of 20 kbps at 868 MHZ and 40 kbps at 915 MHZ.Zigbee can communicate upto 50 meters in a typical environment. The distance is maximum in ideal conditions. When the duty cycle is low zigbee has a high data rate. Considering all these features it can be said that zigbee is ideal for home automation, industrial automation and all places where sensors and control devices are used.

2. MODES OF OPERATION OF ZIGBEE

Idle mode: This is usually the mode in which the zigbee is switched on and the commands are going to be inputted shortly.

Transmit mode: This is the mode in which the zigbee is transmitting the commands received from the computer to receiver.

Command mode: This the mode in which the commands are being inputted on to computer to the zigbee. A ping is sent to the zigbee before commands are sent

Receiving mode: This is the mode in which the zigbee receiver receives the commands that have been transmitted from the zigbee transmitter.

Sleep mode: When no commands are being sent and it remains idle for more than 4 mins then the zigbee module goes in to sleep mode. It switches on as soon as commands need to be inputted.

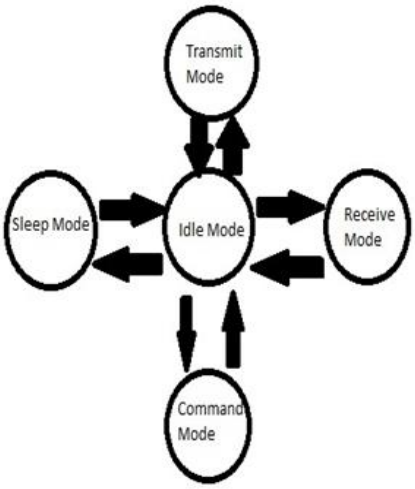
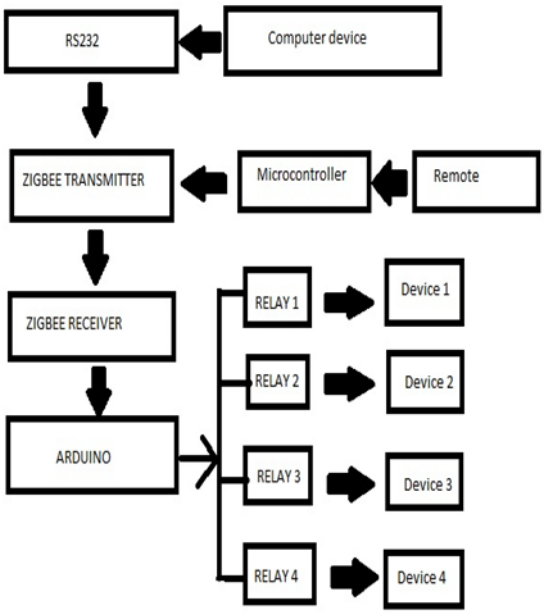


Fig : Different modes of Zigbee

3. BLOCK DIAGRAM

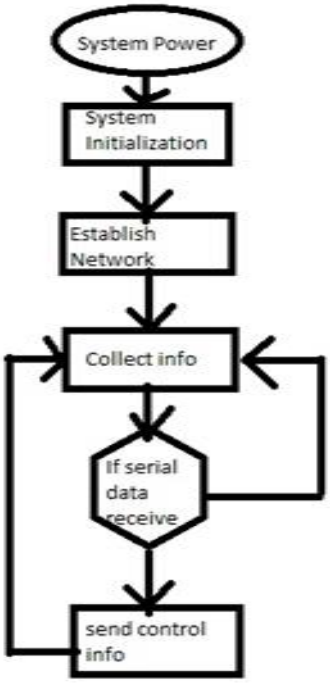


The given block diagram shows a circuit that is used to control electrical appliances with a computer device. All the appliances are connected to the relays. The commands are given on the computer using software called hyper terminal. The circuit is divided into 3 parts: the zigbee transmitter connected to the computer, the zigbee transmitter connected to the microcontroller and remote and finally the zigbee receiver connected to Arduino module which acts as the motherboard of the circuit. The relays are connected to the Arduino through a relay master which amplifies the signal and sends the inputs from the Arduino to the relays which then switches ON/OFF any one of the electrical appliances. For eg : Suppose command 1 is given at the computer then the Arduino module switches ON relay 1 and if command Q is given it switches OFF relay 1. A remote has also been introduced to the circuit. This remote consists of 8 switches, pair of which is used to switch ON and OFF the relays. The remote is connected to a microcontroller which is connected to the zigbee transmitter and vice versa

The hardware consideration for this embedded system is the use of computer to give commands. Sensors have also been used in this project. The sensors have been placed in room's so that it can sense any movement and accordingly switch OFF the appliance if not in use. When the relays switch ONN, the sensors sense if any movement is there and accordingly after a short duration switch OFF the appliance. Thus saving electricity in the process.

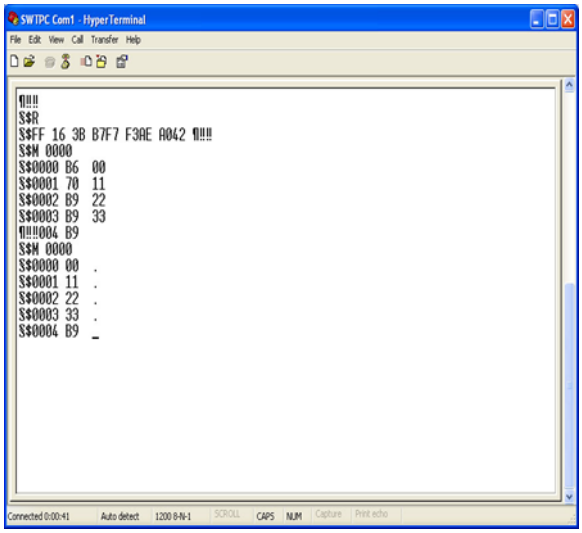
4. FLOW CHART

When the system is switched on it initializes to set up a network between the Zigbee transmitter and receiver.Zigbee takes few seconds to initialize. After proper connection is set up between the transmitter and receiver commands can be sent. If serial data is received then the command is sent to the Arduino module, if not then it waits for serial data to be inputted.



5. HYPER TERMINAL

This software is used to write commands on the computer. Hyper terminal offers a way for controlling devices by sending text based commands. Serial local interfacing is possible because of it. In this project when we write a command 1 on the hyper terminal then relay 1 switches ON and when we write 'Q' then relay 1 switches OFF.



6. COMMANDS AND PACKET FORMAT GENERATED

Command	Connected on PIN	Serial Communication data command for ON/OFF
FAN	Relay 1	1 : On Q:Off
BULB 1	Relay 2	2:On W:Off
BULB 2	Relay 3	3:On E:Off
Motor	Relay 4	4:On R:Off

7. APPLICATIONS

VITAL MONITORING: There are lots of applications such as

1. Heart Rate Monitoring
2. Body Rate Monitoring
3. Personal Equipment Control

CONSUMER ELECTRONICS: They are as follows

1. Remote Control
2. PC peripheral
3. Control of window roll/shades

ALARM AND SECURITY:

1. Smoke Detector
2. Water Leakage Alarm.

8. ADVANTAGE AND LIMITATION

The advantage of Zigbee home automation is,

- Low power consumption device.
- Home automation takes less time to finish a task thus making the work simpler.
- . The range of Zigbee is 100 to 300 feet approx. The overall system cost is very low as compared to other systems.
- The cost is dependent on advancement of system.

The limitation of the Zigbee home automation is

- If there is any damage due to rupturing of cable the entire system gets crashed.
- . In very rare case, the reliability of home automated device is decreases.
- More number of zigbee devices have to be placed if house is very big.

9. RESULT

The project is able to switch on/off the devices as per the commands given by the user successfully. The project gives us an understanding of wireless communication and also a deep knowledge of the working of microcontrollers.

10. CONCLUSION AND FUTURE SCOPE

This paper presents a wireless home automation which is controlled by PC. In proposed architecture XBEE module is used for wireless transmission and command is sent from hyper terminal of PC.

In future, the transmitter Zigbee can be replaced by a wifizigbee module which has large range compared to the zigbee currently being used in the project.

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