Home Automation Using XBEE

Abstract – Various progressive wireless communication standards were developed and implemented Global system for mobile and Bluetooth are known by most people in the modern society. These standards are penetrated into their daily routine with outstanding popularity in mainstream In our project there are two sections one is transmitter section and other is receiver section. The transmitter section consist of one 4*4 keypad, Micro controller 89c51, level converter Max 232 and one X BEE transmitter module. And the receiver section consist of X BEE receiver module, one micro controller 89c51, one output relay driver and relays.

These technologies make peoples life so easier, especially for old persons and disable persons. These systems are existing. There are many non-interoperable, expensive, and often wired systems. Wiring complicates implementation of the HA in buildings which are already built, especially in historical ones. Therefore an invention of an open and standardized wireless network of battery powered cheap sensors, control devices and actuators could effectively communicate with each other for some years in new wireless standard.

I. INTRODUCTION

In our project basic concept is to control devices from remote location. To perform such operations few techniques are available such as IR, RF, BLUETOOTH, XBEE, XBEE PRO, GSM etc. Out of this techniques GSM is advance technique which having unlimited range and the IR technology covers limited distance and the position of transmitter and receiver should in front of each other so its performance is poor . The RF technology covers only 30m within range so it also having such limitation. After the RF next technology is The Bluetooth which haves range of 50m. To cover more area we can use XBEE it covers 100m. Now if we need to cover more area the next option is XBEE pro it having ability to cover 1.5km. But its cost is much more than others technology so it is not used widely. So using XBEE is much better than using other technology for home automation, that's why we have choose XBEE technology for our project "home automation system using XBEE"

When remote key is pressed, each key having its own unique code. Micro controller gives code to x bee. It transmits through the air. At receiver side x bee receives that code and gives to micro controller. It have a look up table it contains different code for each device as per look up table micro controller gives command to relay driver. The relay driver circuit drives relay to perform particular action like on\off and control as per command Home Automation (HA). The HA systems provide mutual interactive interface for people to control that operation. These features are most helpful to optimize and to economize energy consumption whereby saved energy during some few years could make more money than HA systems implementation cost.

[1234]Department of Electronics & Telecommunication,
   Dr.Daulatrao Aher College Of Engineering, Karad, Dist: Satara,
Maharashtra, India
   [1]**Mr. Suraj A. Shewale**
   [2]**Miss. Minal M. Nijsure**
   [3]**Miss. Sheetal B. Jakknawar**
   [4]**Prof. A. S. Tamboli.**

II. BLOCK DIAGRAM

2.1) Transmitter

In the transmitter there is 4*4 matrix keypad which is act as input. There is a micro controller which read the code. Apparent to code it gives signal to level converter and it gives signal to x bee. X bee operates on serial communication, which operates on 9600 bits per sec. which is set by micro controller. The transmitter consists of power supply and reset circuit and using all these transmission circuitry we can transmits the data 100 meters anywhere. Transmitter sets ASCII code '1', '2', '3', '4', '5', '6', '7', '8', '9', '0'.
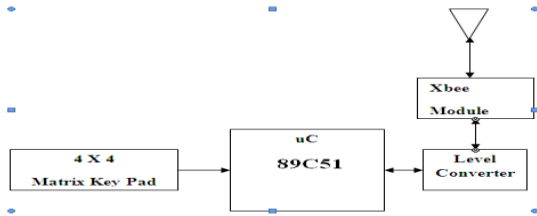
2.2) Receiver
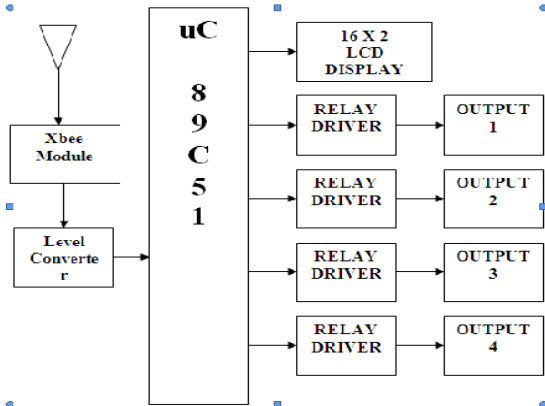
In receiver, all these wireless data received by the receiver. This is given to the microcontroller through the level converter IC max 232. Xbee operates on 232 and microcontroller operates on TTL. They are not compatible so we used level converter. This signal is goes to microcontroller.

Microcontroller check the code where it is '1', '2', '3', '4', '5', '6', '7', '8', '9', '0'. .Microcontroller board accepts ASCII code so we use pc directly here where xbee connected as 232 wire. This is become wired on or off control. If we removed transmitter then we can connect pc to RF transmitter from pc it will become wireless automation, we can control the various devices.

III. WORKING

These technologies make peoples' life also easier, especially for elderly persons and persons with disabilities. These systems exist of course, but there are many non-interoperable, expensive, and often wired systems. Wiring complicates implementation of the HA in buildings which are already built, especially in historical ones. Therefore, an invention of an open and standardized wireless network of battery powered cheap sensors, actuators, and control devices which are effectively communicate with each other for some years,

eventuate in new wireless standard. To operate Home automation we will needs two X Bee, two micro controllers, 4*4 key pad, 16*2 LCD display, level converter MAX 232, relay driver, Number of relays. One X BEE will act as a transmitter and the other will act as a receiver. If we want to send something from one side to another, we connect one X BEE at the transmitter side and the other at the receiver side. microcontrollers attached with both the XBEEs. A step down transformer which converts 230v ac supply into 12v unregulated dc supply. For pure dc supply we use filter circuit. We get pure 12v dc voltage. It is used to drive x bee module , to drive micro controller we need only 5v so by using regulated IC 7805 we can obtain 5v dc supply. In our project home automation using X BEE in which we are using a remote to switch on light or fan etc. So in that case there must be one X BEE in our remote and the second one in our board where the light circuit is placed. So when we press the button of remote, the X BEE in remote will send an instruction to the X BEE in the board. As soon as the X BEE in the board receive the instruction from X BEE in the remote it will on the light.

IV. CIRCUIT DIAGRAM
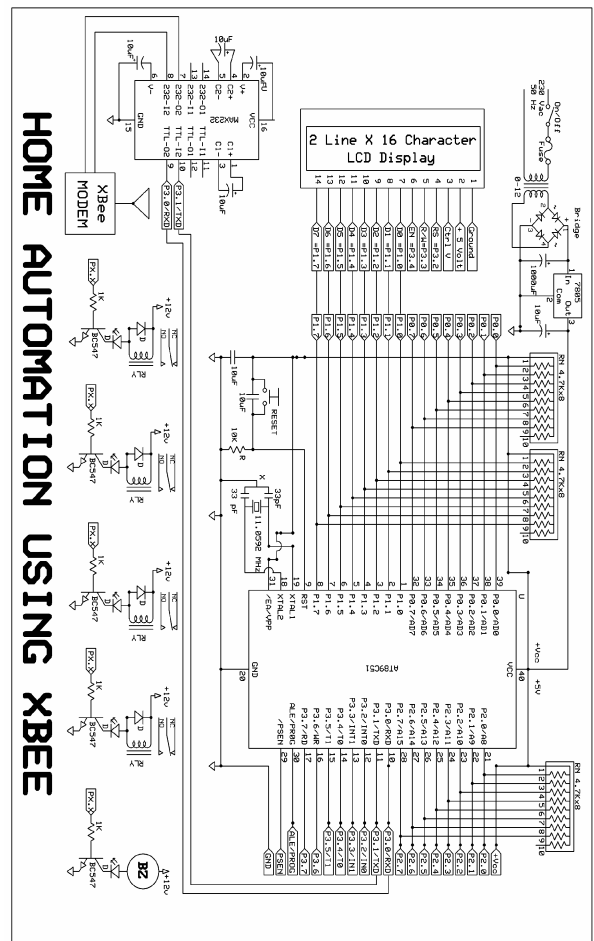
In our project there are two sections one is transmitter section and other is receiver section. The transmitter section consist one 4*4 keypad, Micro controller 89c51, level converter MAX 232 and one X BEE transmitter module. And the receiver section consists of X BEE receiver module, one micro controller 89c51, one output relay driver, and relays. When remote key is pressed, each key having its own unique code. Micro controller gives that code to x bee. It transmits through air. At receiver side x bee receives that code and gives to micro controller. It have a look up table it contains different code for each device as per look up table micro controller gives command to relay driver. The relay driver circuit drives the relay to perform particular action.

In the transmitter there is 4*4 matrix keypad which is act as input. There is a micro controller which read the code. Apparent the code it gives signal to level converter it gives signal to X bee. X bee operates on serial communication, which operates on 9600 bits per sec.Which is set by micro controller. The transmitter consists of power supply and reset circuit. And using all these transmission circuitry we can transmits the data 100 meters anywhere. All these wireless data received by the receiver. This is given to the micro controller through the level converter IC max 232. X bee operates on 232 and micro controller operates on TTL. They are not compatible, so we used level converter. This signal goes to micro controller. Micro controller check the code where it is '0', '1', '2', '3', '4', '5', '6', '7', '8', '9'. Micro controller board accepts ASCII code so we use PC directly here where x bee connected as 232 wires. This is become wired on? Off control If we removed transmitter then we can connect PC to RF transmitter from PC it will become wireless automation we can control the various devices.

A) Microcontroller: - It is a low-power, high-performance C MOS 8-bit micro-computer with 4K bytes of flash Programmable and Erasable Read Only Memory PER OM. The device is manufactured using Atmel high-density nonvolatile memory technology and compatible with the MCS-51™ instruction set and pin out. The on chip flash allows the program memory to be reprogrammed in-system or by a conventional nonvolatile memory programmer. By combining versatile 8-bit CPU with flash on a monolithic chip.The Atmel micro-controller is a powerful microcomputer which provides a highly flexible and cost effective solution so many embedded control applications. Outputs from port pins of the micro controller are fed to relay driver to drive relays. The micro controller output is not sufficient to drive the relay, so current drivers are required for driving the relay.

B) Relay Driver: - In our project we have to turn ON or OFF the electric devices. The electric devices operating on higher voltages therefore we have to use relay. And for driving relay we have to use transistor as switch to energize or de energize the relay. A relay is an electro-magnetic switch which is useful if you want to use a low. Voltage circuit to switch on and off which connected to the 220v mains supply.The current needed to operate the relay coil is more than can be supplied by Most chips (op- amps etc.) so a transistor is usually needed. A resistor of 4k will probably be all right. The diode is needed to short circuit a high voltage "back emf" induced when current flowing through the coil is suddenly switched off.

C) SPDT relay: - SPDT means Single Pole Double Throw Relay an electromagnetic switch consist of a coil, one common, one normally closed terminal and one normally open terminal. When the coil of an SPDT relay is at reset, the common terminal and the normally closed terminal have continuity. The coil is energized the common terminal and the normally open terminal have continuity. An SPDT relay at reset with the coil not energized then relay with the coil energized. The electromagnetic coil causes the arm that is always connected to the common to pivot when energized whereby contact is broken from the normally closed terminal and made with the normally open terminal. When energizing the coil of a relay polarity of the coil does not matter unless there is a diode across the coil. If diode is not present then you may attach positive voltage to either terminal of the coil and negative voltage to the other.

D) 16X2 LCD:- LCD screen is an electronic display module and find a wide range of applications. Basic module is 16x2 LCD display and it is very commonly used in various devices and circuits. These modules preferred over seven segments and other multi segment LED s. The reasons being LCD are economical; easily programmable; have no limitation of displaying special & even custom characters and so on. A 16x2 LCD means it can display 16 characters per line and there are 2 such lines. In LCD each character is displayed in 5x7 pixel matrix. This LCD consist two registers that are Command and Data.

E) Level Converter:- MAX232 is a widely known IC used for establishing serial communication between Microcontrollers and Personal Computers (PC). This IC is used to convert TTL/CMOS logic levels to RS232 Logic levels during the process of serial communication. A Microcontroller operates at TTL (Transistor Transistor Logic) of about 0-5V whereas a PC works on RS232 standards that is (-25 to +25V). So it is not possible to interface a PC directly with a Microcontroller and this is exactly where a MAX232 IC comes into Play. MAX232 offers a intermediate link between the Microcontroller and our PC. The transmitter of that IC will convert the TTL/CMOS input level into RS232 voltage levels. The receiver pins having capacity of taking input around -30V to +30V. Meanwhile each receiver converts RS232 inputs to 5V TTL/CMOS logic level which was fed into the Rx pin of a Microcontroller. So summing up this IC acts as an intermediate by converting the voltage level of signals. This IC is capable of supplying RS232 standard voltage logic levels by means of a single 5V power supply. This was done by capacitive voltage generator used in that IC. So we need to connect three external capacitors whose value range from 1uF to 22uF. The capacitors are connected across the pins C1+ & C1-, C2+ & C2-, C3+ & C3-.

F) Xbee Module:- XBee 802.15.4 modules are the easy to use most reliable and cost effective RF devices. The 802.15.4 XBee modules provide two modes of communication – a simple serial method of transmit/receive or a framed mode providing advanced features. Xbee are ready to use package or they can be configured through the X-CTU utility or from your microcontroller. These modules are communicated point to point from one point to PC or in a mesh network. You only need to choose an antenna style (PCB or wire) and power level 1 mW up to 300 ft. The PCB antenna provides a lower profile footprint for applications with limited space while the wire antenna version allows for more flexibility in adjusting for optimal range at the same output power. Only series 1 module can work with series 1 type modules you cannot mix up series 1 and series 2 modules to setup communication.

V. RESULTS AND EXPERIMENTATION

When remote key is pressed each key having own unique code. Microcontroller gives code to x bee and it transmits through air. At receiver side xbee receives code and gives to microcontroller. It have a look up table. As per lookup table microcontroller gives command to relay then we can access devices.

VI. CONCLUSION

In the designing of IR and RF technologies we came across certain restrictions and limitations such as it covers Limited area. The position of transmitter and receiver also matter.But with help of XBEE technology we can overcome these limitations. With the help of XBEE we can control and access devices within range of 100 meters.

VII. ACKNOWLEDGMENT

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