

# Different Technology Comparison for Home Automation System

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*Abstract -- Home Automation is becoming popular day by day due to numerous advantage. Home automation means the monitoring and control of household object intelligently for effective usage. "Smart Home" is the term commonly used to define a residence that has appliance, lighting, heating, Air conditioning, TVs, Computers, Entertainment audio and Video System, Security and Camera system that are capable of communicating with one and another. And can be controlled remotely and any location in the world by phone or internet. In this paper describe different type of technology use for home automation system like Bluetooth, ZigBee, Voice recognition, and IOT (Internet of Thing). Comparison of this technology to graphical view and which technology is best for home automation system.*

*Key Words— Home Automation, Bluetooth, Voice Recognition, ZigBee, IOT (Internet of Thing)*

## I. INTRODUCTION

Home Automation is growing rapidly day by day. Automation is a technique or system of operating or controlling a process by electronic devices with reducing human involvement to a minimum. Automation makes not only on efficient but also an economical use of the electricity and water reduces much of the wastage. This system to various method to use for a home automation and control to temperature, door lock, CCTV camera, security, and lighting etc. This technology to reduce of human work and controlling by remotely or smart phone.

The home automation system helps you control the devices at your home automatically in order to change the settings of it you simple need to have a computer, android devices with internet or remote control. In this way everything will work according to you wish. We have heard about smart phones and smart devices by installing a home automation system you can easily make your ordinary home a smart home. Home

automation is becoming popular all over the world with each passing day. These systems are very convenient for people who have hectic schedules and do not get much time to carry the house hold activities.

One of the greatest advantage of home automation system is that it can be controlled and managed easily from an array of devices such as smart phone, tablet, desktop and laptop [1]. Recent time of home automation system is growing rapidly and the various type of the electronics equipment is used to controlling of home and become a smart home system.

IOT (Internet of Thing) based technique is use that time to the any location to control for home with the help of the smart phone and the seen to the live status of a home. An automated devices has ability to work with versatility, diligence and with lowest error rate. Automation system not only helps to reduce the human labor but it also saves time and energy [2].

The aim of the home automation system is the best technology to used and which technology to reduces cost, higher efficiency, longer life, Save time, easily maintain etc. In this paper we have discussed various type of technology used for home automation and comparison of those technology which is best use of home automation system with reduce cost and best use of home automation and various type of factor is satisfy.

## II. METHODOLOGIES

### A. Voice Recognition System

Voice recognition is a computer software program or hardware device with the ability to decode the human voice. Voice recognition system is use to home automation to light turn ON or OFF with the help of human voice. Voice recognition system is a work to

voice command to smart phone and this smart phone is the receive signal to Bluetooth module. Bluetooth module is to signal transfer to the Arduino UNO and Arduino UNO is a programming with the help of computer and the voice signal to check this device and the any light equipment is to turn ON or OFF to work according to human.

The system captures human voice using a sampling rate (fs) of 8 KHz. It is known that the highest frequency component of the human voice is 20 KHz, however the most significant parts of the information is encoded in frequencies between 6 Hz and 3.5 KHz [3]. When you speak you create a vibration in the air the ADC (analog to digital converter) digitizes the sound by taking precise measurement of the wave at frequent intervals, then filtering the sound remove unwanted noise.

The tests involved 35 subjects the trails were conducted with people with different English accents. The test subject were a mix of male and female and 35 different voice commands were sent by each person. Thus the test involves sending a total of 1225 commands. 79.8% of this commands were recognized correctly. Many advantage of voice recognition like eliminate handwriting spelling problem, allow user to operate computer by speaking to it. Many disadvantage of this system like requires large amount of files memory to store voice files, due to noise interference, Limited range of Bluetooth.

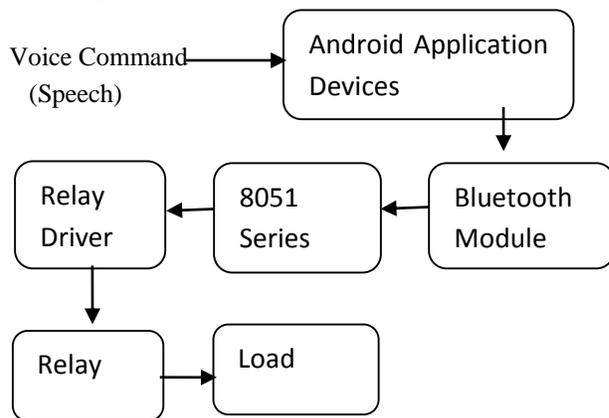


Fig. 1 Block Diagram of Voice Recognition

*B. Bluetooth Based System*

Home Automation system is use of the information technologies and control to reduce the human labor. A Bluetooth [7] based home automation system proposed by R. Piyare and M. Tazil [1]. This technology to used various home equipment control like Light, Temperature, Security devices, Air Conditions and many more home appliance equipment. In this system has ability to work with versatility and lowest error rate. Symbian OS cell phone can only support the python language and this system failed to support Java based application [2].

In this system to use microcontroller to control whole system with the help of user command Micro controller AT89c52 is low power high performance 8 bit controller used of this system. Second is main part of this system is Bluetooth module HC-05. This module communicate between mobile phone and microcontroller system. It is a lowest power is used 1.8v and other component is used to relay, relay is basically device to turn on and off by applying the voltage across is contact. Advantage of this system it is a robust and easy to control of system, no need to extra training of that person who is using it, by using this system the users can check the status of the appliance at whatever time of the day. The main drawback of this system limited range 10 to 20 meters so the control cannot be achieved from the outside the range. When the new user want to connect the first download application software then the code and configuration must be done.

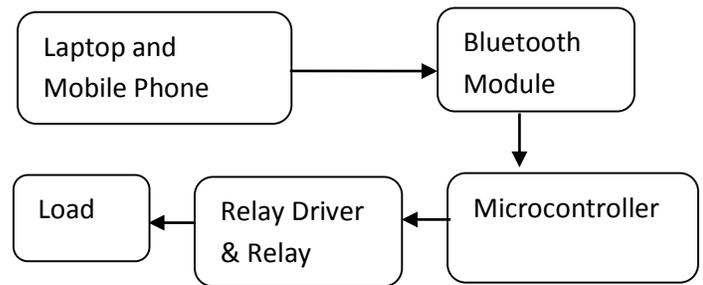


Fig. 2 Block Diagram of Bluetooth System

*C. ZigBee Based System*

ZigBee is a wireless technology developed as an open global standard to address the unique needs of low cost, low power wireless M2M network. The ZigBee

standard unlicensed bands including 2.4 GHz, 900 MHz and 868 MHz [4]. ZigBee is low cost and low powered mesh network widely deployed for controlling and monitoring application where it covers 10 to 100 meters within the range.

This communication system is less expensive and simple than the other proprietary short-range wireless sensor network as Bluetooth and Wi-Fi.

ZigBee supports different configuration for master to master or master to slave communication. ZigBee support several network topologies however the most commonly used configuration are star, mesh and cluster tree topologies. The ZigBee communication protocols offers maximum baud rate of 250 kbps, but 115.2kbps was used for microcontroller for sending and receiving data [1]. This technology is various application used industrial automation, Home automation, smart metering, and smart Grid monitoring. Industrial automation in manufacturing and production industries a communication link continually monitors various parameters and critical equipment. Home automation ZigBee is perfectly suited for controlling home appliance remotely as a lighting system control, appliance control, heating and cooling system control, safety equipment operations and control, surveillance, and so on. It is a good human living environment of safety, time saving, convenience and energy saving. Network communication technique can be combined data collection and centralized management equipment to achieve the goal of smart home [4].

Various advantage of ZigBee technology is a comfortable and vary safe. It is a range of approximate 100 to 300 feet. In very rare cases the reliability of home automated devices is decrease. ZigBee are classified into three type such as ZC (ZigBee Coordinator), ZR (ZigBee Router), and ZED (ZigBee End Devices). ZC is the root of network tree and bridge to the other network in each network there is one ZigBee coordinator. ZR work as a middle router it takes the data from one router and passes it to another router. ZED has less functionality as compare to ZR and ZC.

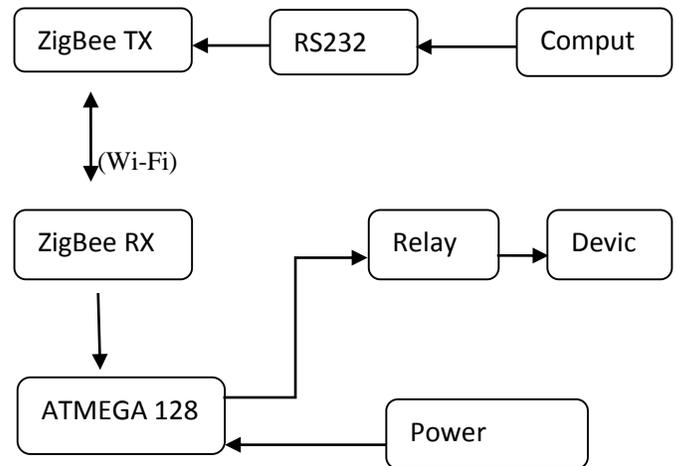


Fig. 3 Block Diagram of ZigBee System

*D. IOT (Internet of Thing)*

The concept of Internet of things (IOT) was introduced by the growth of the widely used global network known as the internet along with the deployment of ubiquitous computing and mobiles in smart objects which brings new opportunities for the creation of innovative solution to various aspects of life.

IOT aims in creating a network between objects embedded with sensors that can store, analyze, communicate and exchange data together over the internet. This leads to efficient industry, manufacturing, efficient energy management, resource management, accurate health care, smarter business decisions based on analyzed data, safer driving through smart cars that are able to communicate together, smart home automation and countless more application [5].

Internet of thing based home automation system is flexible and reliable, communication between home appliance and user is done through internet. Any smartphone that can support 3G, 4G or Wi-Fi can be used for transmitting commands from user to server which is further connected with home appliance [1].

A benefit of smart home automation is the possibility of saving electric power and energy. Apart from remote control users should be able to monitor how these devices are being used daily, what is their daily energy

consumption and own electricity bill will reduce [6]. In most of these system, it is shown how data can be sent from a microcontroller to a cloud server and from the cloud to a mobile application.

For example, a temperature sensor will keep sending data to the cloud about the current temperature in the room. The resident can then set a rule that if the temperature goes beyond a certain point, switch on the air conditioning. There can be many such rule based actions that will need to be triggered in real time when an event happens. We have found that the following components will fulfill all these requirement that need to be met in a home automation system.

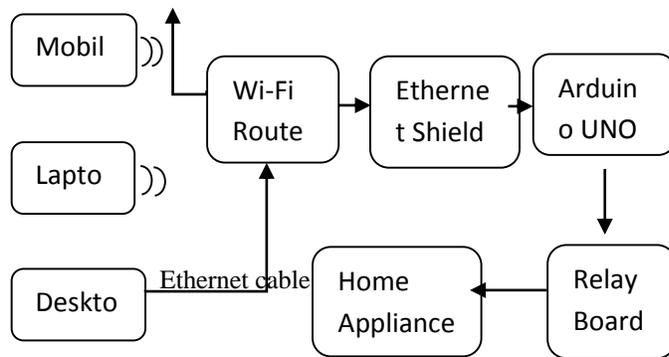


Fig. 4 Block diagram of IOT system

IOT is having tremendous attention recently and its various application are growing, changing the way we live and work. Future work focus would be working on actual AC devices to implement what was simulated in the model in a real house, developing a more advanced motion detection algorithm on surveillance cameras, and surveillance car moving autonomously avoiding obstacles. The advantage of our IOT framework is that it is not limited to just security. The user can set rules of various kinds and receive alerts if any of the rules get triggered in their home.

### III. COMPARISON OF DIFFERENT TECHNOLOGY

In this section different type of technology used in home automation system to comparison of different parameter. This section to compare which technology

is best used to home automation system and show to the graphically representation to the system.

Table 1. Bluetooth and ZigBee

Features	Bluetooth	ZigBee
Protocol Stack	250kb	<32kb(4kb)
Range	10-100 meter	30-100 meter
Link Rate	1mbps	250kbps
Devices	8	2^16
Air Interface	FHSS	DSSS
Usage	Frequently	Infrequently
N/W Join Time	Longer	Short
Power profile	Days	Years
Complexity	Complex	Simple
Nodes	7	64000
Stack Size	100+kbytes	8-60kbytes
Topology	Star	Star, Cluster, Mesh
Optimized for	Reliability, Low power, Low cost, Scalability	Long range, Low power, Low cost

Table 2. Comparison different technology

Features	Bluetooth	Voice Recognition	ZigBee	IOT
Cost	LOW	LOW	LOW	HIGH
Speed	HIGH	HIGH	HIGH	SLOW
Real Time	YES	YES	YES	YES

Table 3. Comparison of NFC, RFID and Wi-Fi

Feature	NFC(Near field communication)	RFID(Radio Frequency Identification)	Wi-Fi
Operating Range	10 cm	3m	100m
Operating frequency	13.56 MHz	Varies	2.4/5 GHz
Directional Communication	Two Way	One Way	Two Way

Bit rate	106/212/424 kbps	Varies	22 mbps
Potential Uses	E ticket, Credit Card Payment	Tracking Items	Com m.

#### IV. CONCLUSION AND FUTURE WORK

In this paper different type of home automation system technology discussed and different technology is various advantage and disadvantage are discussed so, In this paper four technology is describe like Bluetooth, ZigBee, Voice recognition and IoT based system. Firstly Bluetooth based system is better performance of home automation system and it is also beneficial to reduce human labor and save energy with the help of sensors. Second is voice recognition based this system is also help to elderly and handicapped people but one disadvantage of noise sensitive and their accuracy can be affected by signal to noise ratio. Third is IoT based system can only work to presence of internet. IoT based system is the main disadvantage is server can't work to the system is totally failed and devices is not work so this system is totally depend on internet.

Bluetooth based system is short range, for future research work it is recommended to increase the range and interface more sensor and it is low cost and user friendly system.

Future of home automation system requires to make smarter home and more convenient. And market different type of gestures to control home appliance with the help of different type of use technology. Future research of IoT based system to low cost and more efficient and reliable to use home automation system and reduce problem to connection of internet.

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