Smart Home With Multiple Technology Home Automation: A Review

Ms. Siddhata Powar[1], Mr. Niyaj S. Nadaf[2]

[1] *Dept of E & TC, Zeal College of Engg.Pune.*
[2] *Project Engineer & coordinator, Shree Electrotech Shirol, Jaysinghpur.*

Abstract- *Now a day the Home automation becoming need as it was luxury before because of busy lifestyle. Time, Money & Security are the key factors which decide the future of any technology. In today's world variety of solutions available for home automation using different technologies but these solutions are not compatible to each other & also a single solution do not cover all popular communication & access technology options altogether. The main objective of this work is to facilitate the user to control & monitor home appliances & Sensors remotely using their any Android Smartphone or Tab with either by Bluetooth to access from Home itself or by GSM/GPRS to access from anywhere in this world. Two popular technologies used here for cost effective access solution. Apart from the access technology, Selection of Sensor network technology is an important aspect of the solution. Varity of wired/wireless technologies being offered by variety of solutions offered so far for Sensor networking. In this work, considering Key deciding factors & Comparative study & analysis of different available technologies we conclude to implement ZigBee wireless technology for our Smart home WSN (Wireless Sensor Network).*

Keywords: Bluetooth, End Device, GSM/GPRS, HUB, Smart Home, WSN, ZigBee.

I.   INTRODUCTION

The idea of the "Smart and Secured Home" is to provide a user friendly & cost effective home automation system with ease of installation, no wiring and minimum modifications in existing interiors of the home [6]. Home automation system will not only enable the residents to integrate or distribute controlled-homely interior equipments on finger tip, but also realize remote monitoring of home security systems, including anti-theft, anti-gas leak, heaters, fire and other functions, which is the future direction of Smart-n-secured home. The Smart-n-secured home implies multiple modern wireless technologies for effective optimization for distance flexibility with uninterrupted communication link & ease of finger tip accessibility.

System will be consisting of a centralized SSH HUB & multiple End devices to fit into multiple switch boards of interior home equipments, appliances & sensors. All end devices will be connected to SSH HUB by wireless ZigBee Network technology [1]. Along with ZigBee modem, the SSH HUB will also equipped with a GSM-GPRS modem to access & control the Smart Home from anywhere in this world [5] & a Bluetooth modem to make a smart phone as a remote control of each & every equipment in the interior of smart home [11].

II.   HISTORY

Home automation has been a feature of science fiction writing for many years, but has only become practical since the early 20th Century following the widespread introduction of electricity into the home, and the rapid advancement of information technology. Early remote control devices began to emerge in the late 1800s. For example, Nikola Tesla patented an idea for the remote control of vessels and vehicles in 1898.

The emergence of electrical home appliances began between 1915 and 1920; the decline in domestic servants meant that households needed cheap, mechanical replacements. Domestic electricity supply, however, was still in its infancy — meaning this luxury was afforded only the more affluent households. Ideas similar to modern home automation systems originated during the World's Fairs of the 1930s. Fairs in Chicago (1934) and New York (1939 and 1964–65) depicted electrified and automated homes. In 1966 Jim Sutherland, an engineer working for Westinghouse Electric, developed a home automation system called "ECHO IV"; this was a private project and never commercialized.

The first "wired homes" were built by American hobbyists during the 1960s, but were limited by the technology of the times. The term "smart house" was first coined by the American Association of House builders in 1984. With the invention of the microcontroller, the cost of electronic control fell rapidly. Remote and intelligent control technologies

were adopted by the building services industry and appliance manufacturers. Despite interest in home automation, by the end of the 1990s there was not a widespread uptake, with such systems still considered the domain of hobbyists or the rich. The lack of a single, simplified, protocol and high cost of entry has put off consumers.

III.   HOME AUTOMATION TECHNOLOGIES

Any automation system is composed of 2 high-level components, the controller, and the modules. The modules include light dimmers, relay switches, thermostats, motorized curtain control systems, distributed speakers, etc. which are to be controlled by the home owner. The controller is the heart of the system from which signals are sent to "Dim the lights" or "turn on the air conditioning". The method of communication between the controller and the modules are the Automation Communication Technology which we wish to address in this article. The method of communication can either be through wires or wireless and are usually in line with certain protocols or standards of communication. Some protocols or standards of communication

KNX, X10, ZigBee, En-Ocean, and Z-wave.

The criteria for the standard

1. Reliability of Communication
2. Security of Communication
3. Price
4. Features and Capabilities
5. Investment Protection
6. Interoperability

IV.   MOTIVATIONS

In this age of Computer & Smartphone almost all activities of our day to day life like Shopping, News update, learning, Navigation, Travel booking, Banking, Rent, purchase or sale of property Cars etc. and many more are available to be done online by using just a Smartphone and we are quite habitant about it now. Our busy lifestyle created this need as due to lack of time & considerable distances between our residences & work places it is become practically impossible to carry out these activities offline means by physically being there.

It's surprising that we could finish almost all of our day to day activities & we are connected to the world via internet using just a single device a Smartphone but we are not connected with our Home with the same Smartphone! The Home which is our most precious place, we work to enrich it, we equip it with various appliances, we invests to decorate it then why don't we are not connected it when we are away from home? Most of the times we forget at least one of the thing like to lock the door properly, to switch of the lights, fans or Air conditioners, Water heaters etc while leaving the Home for work in hurry. Though we remember it later at work place, we are not able to do anything about it until we get back to home at evening. And what we are losing by this is Safety & Security of Our Home, Economy & most important peace of mind!

The consequence leads to think & make our home a "Smart and secured Home".

V.   PROPOSED RESEARCH WORK

Proposed scope of work is to design a versatile Home automation system with Embedded Hardware & Software using advanced generation of AVR micro-controllers ATXMEGA series. System will be consisting of a centralized SSH HUB & multiple End devices to fit into multiple switch boards of interior home equipments, appliances & sensors. All end devices will be connected to SSH HUB by wireless ZigBee Network technology. Along with ZigBee modem, the SSH HUB will also equip with a GSM-GPRS modem to access & control the Smart Home from anywhere to make a smart phone as a remote control of each & every equipment in the interior of smart home. To make the Smartphone a remote of our smart home we need to develop an android application.
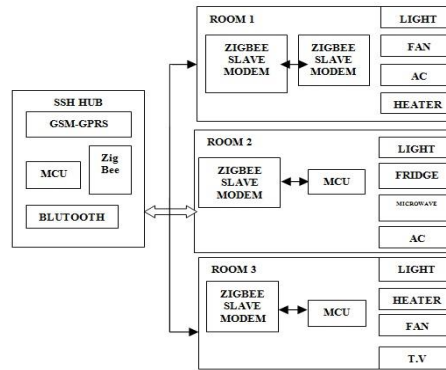
Figure 1. Proposed System Block diagram

WhyZigBee?

ZigBee technology is a very reliable wireless data transmission network, from the standard communication distance of 75 meters to the infinite expansion. ZigBee technology used Netcom letter in self-organizing way, every data transmit between ZigBee network can be communicated by each other, so people in any room can control the other room's device and display it.

As ZigBee & Bluetooth being the local wireless network, we need either Wi-Fi or GSM-GPRS connectivity to this Smart home network. If we integrate a GSM-GPRS module into our SSH HUB we can access & control our each & every device of our home network from anywhere by SMS.

5.1 SHUB

As per the functionality we discussed so far & as indicated in functional block diagram the SSH HUB should have a ZigBee master, a Bluetooth interface & GSM-GPRS module built-in and a Microcontroller to handle the interconnecting & communication intelligence. HUB can be located preferably at central location & will be mains powered with suitable power adapter as it will required more power than end device.

5.2 End Device

END device will be part of a switch board & can be battery powered or mains powered with suitable power adaptor. It has got a ZigBee slave, a Relay board, Sensor interface & a microcontroller to communicate with network & operate the devices or send Sensor data as requested by SSH HUB. Each switch board will have a Voltage sensing transformer to provide Voltage information & four switches to operate the devices. Each Switch will have a switch status contact output & a CT (Current transformer) sense the current flowing through connected Device. Other sensors like Temperature, Water level, Motion, Gas leak etc can be connected to end device microcontroller as it has got total 12 ADC channels.

5.3 Devices

Devices will be Refrigerator, water heater, Fan, Lighting, Gas Valve, water pump, TV, washing machine etc to control and Sensor will be Voltage, Current, temperature, gas detector, security, motion, water level etc...

VI.   Conclusion

The main objective of this work is to facilitate the user to control & monitor home appliances & Sensors remotely using their any Android Smartphone or Tab with either by Bluetooth to access from Home itself or by GSM/GPRS to access from anywhere in this world.

References

[1] Manish kumar, Ramadeep Singh, "Home appliances controlling using ZigBee on Atmega128 hardware platform", International Journal of Engineering Research & Technology (IJERT) Volume: 03 Issue: 7 July 2014.

[2] S.D.T. Kelly, N. K. Suryadevara and S. C. Mukhopadhyay, FIEEE, "Towards the implementation of environmental condition monitoring in home", IEEE Transaction 2013.

[3] Abhishek N. Tripathi, Utkarsh Sharma, Deepak Simaiya, Hardware implementation of GPRS enabled Embedded server for remote access terminal ", IEEE Transaction 2013.

[4] Suraj Bhatia et al, Int.J.Computer Technology & Applications, International Journal of Engineering & Computer Science Vol 5 (5)1690-1695.

[5] Rozita Teymourzadeh, CEng, Member IEEE/IET, Salah Addin Ahmed, Kok Wai Chan, and Mok Vee Hoong, "Smart GSM Based Home Automation System" IEEE Conference on Systems, Process & Control (ICSPC2013), 13 - 15 December 2013, Kuala Lumpur, Malaysia.

[6] Moor Insights & Strategy, "Wireless Technologies for Home Automation" Confusion Reigns for Mainstream and DIY Consumers June 2014.

[7] Guangming Song, Member, IEEE, Yaoxin Zhou, Weijuan Zhang and Aiguo Song, Member, IEEE, "A Multi-interface Gateway Architecture for Home Automation Networks" IEEE Transactions on Consumer Electronics, Vol. 54, No. 3, AUGUST 2008.

[8] Khusvinder Gill, Shuang-Hua Yang, Fang Yao, and Xin Lu, "A ZigBee-Based Home Automation System" IEEE Transactions on Consumer Electronics, Vol. 55, No. 2, MAY 2009.

[9] Intark Han, Hong-Shik Park, Youn-Kwae Jeong, and Kwang-Roh Park, "An Integrated Home Server for Communication, Broadcast Reception, and Home Automation" IEEE Transactions on Consumer Electronics, Vol. 52, No. 1, FEBRUARY 2006.

[10] Taewan Kim, Hakjoon Lee, and Yunmo Chung, "Advanced Universal Remote Controller for Home Automation and Security" IEEE Transaction 2010.

[11] Moor Insights & Strategy," Wireless Technologies for Home Automation: Confusion Reigns for Mainstream and DIY Consumers" June 2014 Copyright ©2014.