HOME AUTOMATION: PAST, PRESENT AND FUTURE

Sharda R. Katre[1], Dinesh V. Rojatkar[2]

[1]UG student, Department of electronics and telecommunication engineering, Government College of Engineering, Chandrapur, Maharashtra.
[2]Assistant Professor, Department of electronics and telecommunication engineering, Government College of Engineering, Chandrapur, Maharashtra.

---***---

Abstract - *Home Automation is an approach to have things around your home happen consequently. Home automation is getting to be plainly prominent because of its various benefits. Home automation refers to the control of home appliances by remote control. Heterogeneous home automation frameworks and advances considered in survey with central controller based (Arduino or Raspberry pi), web based, email based, Bluetooth-based, versatile based, SMS based, ZigBee based, Dual Tone Multi Frequency-based, Cloud-based and the Internet with execution. This paper introduces a review of past smart home research and the related innovation and also the current technologies of smart home research. This paper also talks about future home automation.*

Key Words: Automation, Technology, Smart Home, Healthcare, IoT.

1. INTRODUCTION

Home automation is building mechanization for a home, called a smart home. It includes the control and computerization of lighting, warming, (for example, brilliant indoor regulators), ventilation, aerating and cooling (HVAC), and security, and also home machines, for example, washer/dryers, stoves or fridges/coolers. Wi-Fi is regularly utilized for remote checking and control. Home devices, when remotely observed and controlled through the Internet, are an essential constituent of the Internet of Things.

Smart homes constitute a branch of ubiquitous computing that involves incorporating smartness into dwellings for comfort, healthcare, safety, security, and energy conservation. Early home automation began with labour-saving machines. Self-contained electric or gas-powered home appliances became viable in the 1900s with the introduction of electric power distribution [1] and led to the introduction of washing machines (1904), water heaters (1889), refrigerators, sewing machines, dishwashers, and clothes dryers.

In 1975, the main broadly useful home computerization arrange innovation, X10, was created. X10 is a communication protocol for electronic devices. It basically utilizes electric power transmission wiring for flagging and control, where the signs include brief radio recurrence blasts of advanced information, and remains the most broadly available. [2] By 1978, X10 items incorporated a 16channel charge support, a light module, and an apparatus module. Not long after came the divider switch module and the primary X10 clock. By 2012, in the United States, as indicated by ABI Research, 1.5 million home mechanization frameworks were installed. [3] As per Li et al. (2016) there are three generations of home automation: [4]

First generation: remote innovation with intermediary server, e.g. ZigBee robotization.
Second generation: artificial brainpower controls electrical devices, e.g. Amazon Echo;
Third generation: robot buddy who associates with human, e.g. Robot Rovio, Roomba.

Smart homes enhance traditional security and safety mechanisms by using intelligent monitoring and access control. According to the World Health Organization (WHO), 650 million people live with disabilities around the world [5]. It is not possible or logical to support all of these patients in medical centre or nursing homes for an uncertain period of time. The solution is to accommodate healthcare services and assistive technologies in patients' home environment.

This paper is a survey on smart home projects, which are arranged according to their intended services. It also discusses the significance and limitations of smart home components and the various technologies used in home automation. It explains the current trends of smart home research and future challenges that must be overcome to design a feasible smart home.

2. HOME AUTOMATION

A smart home is an application of ubiquitous or pervasive computing or environment. Several synonyms are used for smart home, e.g., smart house, home automation, domestique, intelligent home, adaptive home, and aware house. An early definition of smart homes was provided by Rudolf [5]. According to Rudolf, "the smart home concept is the integration of different services within a home by using a common communication system. It assures an economic,

secure and comfortable operation of the home and includes a high degree of intelligent functionality and flexibility."
Sampath provides a more appropriate concept of smart homes. According to Sampath, "A home which is smart enough to assist the inhabitants to live independently and comfortably with the help of technology is termed as smart home. In a smart home, all the mechanical and digital devices are interconnected to form a network, which can communicate with each other and with the user to create an interactive space" [6]. Considering the current trends in smart home research, we can define the smart home as an application of ubiquitous computing that is able to provide user context-aware automated or assistive services in the form of ambient intelligence, remote home control or home automation.

Figure: General Home Automation System
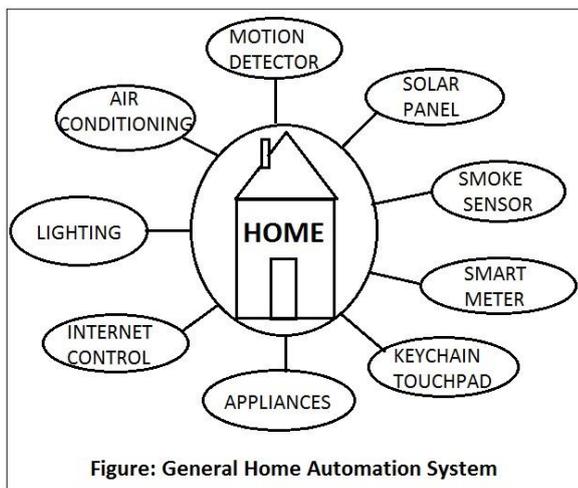
2.1 HOME AUTOMATION IN PAST

Home automation really started in a physical sense with the formation of mechanization items, starting with home apparatuses. The centralization and automation of private exercises has its underlying foundations in the principal electrically-wired private structures toward the finish of the nineteenth century. The capacity to enlighten the room from a solitary switch radically changed the way we lived by making it simple and moderately safe to light vast regions for broadened periods around evening time.

The following awesome progress accompanied the presentation of the home TV in the 1950s and the later presentation of the infrared remote control. The two innovations were helpful for point-to-control correspondence between gadgets however did not have a two-route trade of data. X10 was discharged in the 1970's as a standard convention for wiring houses for home automation.

1901-1920: The invention of home appliances- like refrigerators, washing machine, dishwashers, irons, toaster and garments dryers.

1966-1967: The invention of ECHO IV and Kitchen Computer- the ECHO IV was the first brilliant device. In spite of the fact that it was not industrially sold, the device could register shopping records, control the home's temperature, and turn apparatuses on and off. the "Kitchen Computer" was made for the current year. The apparatus was equipped for putting away formulas, yet didn't offer many models because of poor advertising. The cutting edge came as the Internet, which made an overall system of PCs in the 1990s. Before long, remote Internet as Wi-Fi turned into a typical apparatus in American homes.

2000's: The early 2,000's saw a further ascent in brilliant home innovation, including local tech, home systems administration, and different devices showing up available. A combination of short-range technologies created by Zen-Sys in 2005, this wireless technology creates a mesh network at the user's home and sends signals at the 900 MHz spectrum. The Z-Wave technology is capable of connecting a variety of devices to control appliances, door locks and even flood monitors.

2.2 HOME AUTOMATION IN PRESENT

In recent years the Internet of Things (IOT) have enabled shrewd innovation to end up plainly a vital piece of our day by day lives. Everything from refrigerators, to apparatuses, to home security can be controlled with smart home innovation. Home devices, when remotely observed and controlled through the Internet, are an essential constituent of the Internet of Things.

The present smart homes are more about security and living greener. Current patterns in home mechanization incorporate remote versatile control, computerized lights, robotized indoor regulator modification, booking machines, portable/email/content warnings, and remote video observation Sensors are the eyes and ears of the home system. There are sensors for an extensive variety of uses, for example, measuring temperature, dampness, light, fluid, and gas and recognizing development or commotion.
The various technologies used in home automation- [7]

1.Bluetooth:

Bluetooth is a remote standard that has a place with the PAN convention family. It works in the 2.4 GHz band partitioned into 79 sub channels with 1MHz separating, utilizing FHSS. GFSK and additionally PSK regulations are utilized, contingent upon the Bluetooth variant utilized. Full duplex exchanges are acknowledged by means of TDD.

2. Wi-Fi:

Wi-Fi is probably the most exploited wireless technology nowadays. It belongs to the family of (W) LAN networks, but with latest amendments it could also be belonging to the (W)

MAN family) . In distinction to Bluetooth, the Wi-Fi range is partitioned into just 13 halfway overlaying sub channels (fourteenth accessible in Japan just), each involving the band of 22MHz.

3. ZigBee:

ZigBee is a radio recurrence (RF) correspondences standard. The ZigBee organizer is in charge of making and keeping up the system. Each electronic gadget (i.e. Clothes washer, Television, Lamp and so on) in the framework is a ZigBee gadget oversaw by the facilitator. All correspondence between gadgets proliferates through the facilitator to the goal gadget. The remote idea of ZigBee defeats the meddling establishment issue with the current home mechanization frameworks recognized before. ZigBee networks can be established by a coordinator only. Upon correct PAN parameters settings, other devices may join the network, forming one of the following topologies.

4. X10:

X10 has for some time been the standard by which other home computerization innovations are measured. X10 works by means of home's electrical cable wiring and may encounter issues identified with wiring separations, stage contrasts, and line commotion. Numerous lovers trust X10 innovation has turned out to be old, supplanted by the more up to date and more adaptable remote advancements. In case you're new to home computerization it's most likely a smart thought to begin with some other innovation, on the grounds that X10 gadgets can be more hard to design and execution is here and there whimsical.

5. Z-Wave:

The first remote home mechanization innovation, Z-Wave set models for remote home computerization. Z-Wave broadened the usable scope of home mechanization by influencing all gadgets to twofold as repeaters. Its expanded system unwavering quality additionally empowered business applications. Z-Wave gadgets are intended for simplicity of setup and utilize, and happen as near turnkey as the home mechanization industry permits, particularly accommodating for starting devotees.

3.FUTURE SCOPE

Future homes will be able to offer almost all required services, e.g., communication, medical, energy, utility, entertainment, and security. As we move into the next generation, more and more devices will begin to connect to one another. The dream is a future in which data is communicated between devices and humans without relying on manual input of individual bytes. Computers that can automatically mine data and then use that data to change

aspects of the home environment is the future. For example, a smart thermostat that is able to automatically gauge the temperature of a room and then adjust the central heating and cooling units as necessary or a washing machine that automatically detects its contents and programs itself to be finished washing at a specified time. These are all goals that engineers are working toward and depend not only on advances in data-mining technologies but also in big data computing. Pert is the next generation home automation innovation, that lets you control, monitor and secure your home with your smartphone. The future healthcare service provider will consider the smart home an effective way of providing remote healthcare services, especially to the elderly and disabled who do not require intensive healthcare support. As technologies continue to advance, you can expect the house of tomorrow to be even more automated than that of today.

4. CONCLUSION

This paper shows a general overview of smart home project that are masterminded by their expected services. It also covers the survey of various technologies which emphatically support the home automation systems in reliable way. This paper recognizes a few future bearings of smart home research. The future healthcare service provider will consider the smart home powerful method for giving remote social insurance administrations, particularly to the elderly and disabled people. In future home automation will smarter and it would be extended to the large-scale environment.

REFERENCES

[1] D. Pasha, K. Takeda, "A Product Based Security Model for Smart Home Appliances", Proctor 40th Annual IEEE Int. Carnahan Conf. Security Technology, 2006, pp. 234 – 242.

[2] Rye, Dave (October 1999). "My Life at X10". AV and Automation Industry magazine. AV and Automation Industry magazine. Retrieved October 8, 2014.

[3] "1.5 Million Home Automation Systems Installed in the US This Year". www.abiresearch.com. Retrieved 2016-11-22.

[4] Li, Rita Yi Man; Li, Hero Ching Yu; Make, Cho Kei; Tang, Tony Bei qi. "Sustainable Smart Home and Home Automation: Big Data Analytics Approach". International Journal of Smart Home. 10 (8): 177–198. doi:10.14257/ijsh.2016.10.8.18.

[5] R. Rudolf, "Smart Home concept and the integration of energy meters into a home-based system," in Proc. 7th Int. Conf. Metering Apparatus and Tariffs for Electricity Supply, 1992, pp.277-278.

[6] L. Sampath, Smart housing: Technology to aid aging in place. New opportunities and challenges, M.S. dissertation, Mississippi State University, 2006.

[7] "A Review of Smart Homes – Past, Present, and Future", IEEE transactions on Systems Man and Cybernetics, November 2012.

[8] Brush, A. J.; Lee, Longshan; Mahajan, Ratel; Agarwal, Sharad; Serious, Stefan; Dixon, Colin (2011-05-01). "Home Automation in the Wild: Challenges and Opportunities". Microsoft Research.

[9] "Google's parent company is deliberately disabling some of its customers' old smart-home devices". Business Insider. Retrieved 2016-11-22.

[10] M. Chan, D. Estevez, C. Escribe and E. Campo, "A review of smart homes-Present state and future challenges", Computer Methods and Programs in Biomedicine, vol. 91, pp.55-81, Jul. 2008.

[11] Sanuci, Gerald. "The Internet of Things: Between the Revolution of the Internet and the Metamorphosis of Objects". European Commission Community Research and Development Information Service. Retrieved 23 October 2016.

[12] Matter, Friedman; Floerke Meier, Christian. "From the Internet of Computers to the Internet of Things". ETH Zurich. Retrieved 23 October 2016.

[13] Chan, M. Campo, E. Estevez, D., Furaneols, J.Y., "Smart homes-current features and future perspectives," Maturitas, vol.64, issue 2, pp.90-97, 2009.

[14] Yamazaki, T, "Beyond the Smart Home." Hybrid Information Technology, 2006. ICHIT'06. Vol 2. International Conference on, Volume 2, Nov. 2006 Page(s):350 – 355.