

International Journal of Advance Research in Computer Science and Management Studies

Research Article / Survey Paper / Case Study

Available online at: www.ijarcsms.com

Survey on IoT Based Home Automation System

Aditi Agrawal¹

Dept.of CSE
BMSCE
Bengaluru – India

Kaushik Kiran Karalgikar²

Dept.of CSE
BMSCE
Bengaluru – India

Suman Saurav Vidyarthi³

Dept.of CSE
BMSCE
Bengaluru – India

Mohammad Azharuddin⁴

Dept.of CSE
BMSCE
Bengaluru – India

Madhavi R P⁵

Associate Professor, Dept. of CSE
BMSCE
Bengaluru – India

Abstract: Automation means a device or an appliance works on its own using the data provided to it . Home automation is exciting field when it is integrated with new technologies like Internet of Things (IoT). It is automation of the home and household activity. Proposed implementation of home automation include centralized control of lighting, heating, ventilation and it gives the user full control by using any smart phone through the particular android application. The main advantage of this is small device can be part of internet so it is easy to communicate, manage and control without human interferences. It also provides a sense of security, safety, comfort and energy saving. Automating home appliances has become easier with the arrival of Raspberry Pi which is small, inexpensive, portable credit-size single board computer and supports many peripherals and network communication like Ethernet port, USB port, HDMI port, SD card slot. Raspberry pi set of technologies that combines the power of PC, communication and multimedia technologies of web and portability of mobile device. In this project we are going to monitor the temperature and Humidity of room through webpage and controlling the 230V home appliances. Here we add one more feature, when the room temperature exceeds more than 40 degree Celsius your AC (Motor) will automatically turn on.

Keywords: IoT, Raspberry Pi, Internet.

I. INTRODUCTION

Internet of Things (IoT) is a concept that believes that all objects around us as part of internet. IoT coverage is very wide and includes variety of objects like smart phones, tablets, digital cameras and sensors. With advancement of internet technology lifestyle of every person is changing constantly .Internet of Things is a concept which is used to make life more flexible and efficient by connecting distinct physical objects and control their operations through internet.

Home automation is a new application of Internet of Things. IoT can be used in a home to make it a smart home where everything is connected by the Internet. We can control appliances using Internet from anywhere and at any time.

Usually, when we go out of the house we turn off the light or the electrical equipments to avoid certain accidents such as short circuit, firing etc. but sometimes we forget to switch them off and then we have to come back home to do so. This wastes a lot of our precious time and creates a lots of chaos and tension. So to avoid such kind of situation the latest technology coming up is the smart home technology. Smart home is one in which all electrical equipment around the home are technologically

smart or we can call them intelligent with highly advanced automatic system. Smart home is consisting of three parts- network, controlling device and home automation.

Network can be wireless or wired. It is used for connecting the automation to controlling devices, for instance Bluetooth or Internet. Controlling devices can be used for managing the system. Home automation is the combination of appliances which are the part of physical environment. It can be used in kitchen, home or offices etc.

II. LITERATURE SURVEY

AZ. Alkar and U. Buhur have developed an internet based wireless home automation system for multifunctional devices. A flexible, low cost, wireless solution to the home automation is introduced. The paper discussed the transformation of the control mechanism of devices which had simple functionality in the beginning to more complex devices. All the home appliances are connected through a server to a central node. The system is secured by using SSL algorithm. During tests, the wireless communication was found to be limited to <100 meters in a concrete building.[1]

Muhammad Izhar Ramli, Mohd Helmy Abd Wahab, Nabihah had developed a prototype electrical device control system using Web. They have developed a web based controller in place of using a technology like Bluetooth, for controlling electrical devices. Whenever the condition of server is down they also set their server with auto restart. The system doesn't use mobile technology. This application proved less effective since the use of headphones and Smart phones is increasing rapidly as it used a web based system.[2]

N. Sriskanthan and Tan Karand in their paper used Bluetooth Technology for Home Automation which emerged in late 1990's. Various appliances such as air conditioners, home theatres, cellular phones, heater, fans etc., are interconnected, thereby creating a Personal Area Network in Home Environment. The communication between the various client modules and the host server is done by the Bluetooth module. A Home Automation Protocol has been developed to make the communication between the host server and the client modules better. We can also integrate or remove a device to the network which renders the system scalable. The wireless system aims at cost reduction of Home Automation. But the system does not use the trending mobile technology.[3] Fig.1 shows the implementation by N.Sriskanthan and Tan Karand where they have used a 8051 microcontroller.

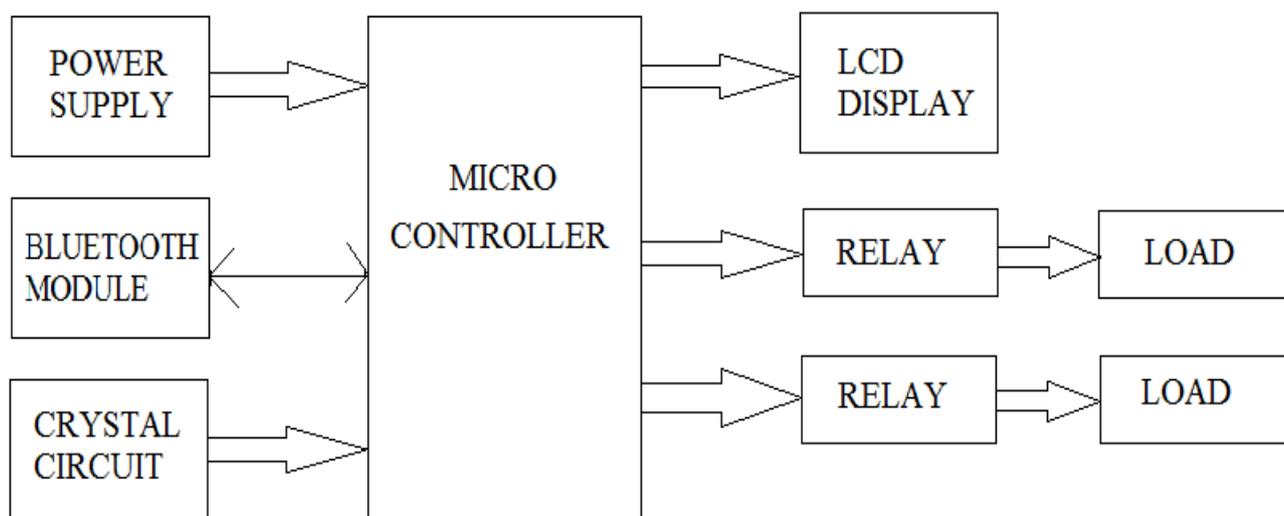


Fig: 1 .Home Automation System using Bluetooth Module using an 8051 Microcontroller.[3]

The Internet of Things (IoT) is a network of uniquely identifiable embedded computing devices inside the existing Internet framework. Generally, IoT is expected to offer advanced connectivity of devices and systems, and services that are far beyond M2M i.e. machine-to-machine communications and includes variety of domains, protocols, and applications. The interconnection of all these devices which also includes smart objects, is expected to lead in automation in almost all fields enabling advanced applications like a Smart Grid.[7][15] According to Gartner, by 2020, there will be near about 26 billion

devices on the Internet of Things. More than 30 billion devices will be wirelessly connected to the Internet of Things by 2020 according to the research conducted by ABI. According to the recent survey done by Pew Research Internet Project, a large majority of the technical experts and regular Internet users who responded 83 percent agreed that the Internet of Things, embedded, wearable computing will be widespread and effective by 2025. It is clear that the IoT will consist of a very large number of devices being connected to the Internet. [8][13][16]

The Internet of Things (IoT) means differently recognizable objects and their virtual representations in an Internet-like structure. Internet of Things refers to day-to-day objects, that are easy to understand, are discernible, locatable, can be addressed, and or controllable via the Internet using either RFID, wireless LAN, WAN, Bluetooth or other means.[15] These objects include not only the everyday usable electronic devices or the products of advanced technological development such as vehicles and equipment, but also include various things like food, clothing, shelter; materials, commodities and luxury items; boundaries, landmarks, and monuments; and all the collection of commerce and culture. Universal computing refers to a new genre of computing in which the computer completely permeates the life of the user. [9]. Internet of Things (IoT) is going to comprise of billions of devices that can sense, converse, gauge and potentially actuate. The traditional approaches will be challenged by the Data streams of these devices to data management and contribute to the emerging paradigm of Big Data. IoT has made a huge impact, interconnecting daily objects over the Internet, which acts as everlasting sources of information.[14][8]

Jitendra Rajendra Rana and Sunil N. Pawar used an entirely different technology, they have implemented a zigbee based home automation system. Zigbee is a high-level communication protocol used to create personal area network. It supports any kind of microcontroller. The system eliminates the complication of wiring in case of wired automation. Considerable amount of power saving is also possible. Bluetooth's operating range is less than zigbee's. The disadvantage of this is that the system does not allow remote monitoring and controlling of appliances.[4]

R. Piyare and M. Tazil have shown the design and implementation of a low cost, flexible and wireless solution to the home automation. Bluetooth technology is used by the system where the cell phone is used for communication between the host server and the client modules. The highlight of this system is that it doesn't need internet connectivity for appliances that require On-off switching. The downside of this system was that it had a limited range i.e less than 50m in a concreted building and maximum of 100m range in an open range. The system supports only the Symbian OS cell phones.[5]

S. V. A. Syed Anwaarullah also introduces the design and implementation of a less costly, compressed and secure Android smart phone based home automation system. A single chip microcontroller real time operating system is combined to the system, to increase the receptiveness of the system and make it more dynamic. Here also Bluetooth technology is used by the system. The Bluetooth module is based on the Bluetooth V2.0 protocol and has a range of 10m operating at frequency of 2.4GHz with a maximum data exchange rate of 2.1Mbps. The problem with this system is that it does not support remote monitoring and controlling of devices.[6]

Deepali Javale, Shreerang Nandanwar, Mohd. Mohsin and M. Shingate have used Android ADK to implement home automation and security system. It presents a system in which the devices are connected to a Bluetooth subcontroller physically. It does not require internet connectivity. The Smart phone is used to access and control the devices using built-in Bluetooth connectivity. Communication is recognized between the android mobile device and the ADK, by linking the appliances to the ADK. Mobility is restricted by the system and can only be controlled within the specified boundary because of limited range of operation (max up to 100 m). Hence the system does not support remote monitoring and controlling of appliances. [11]

Amul Jadhav, S. Anand, Nilesh Dhangare, K.S. Wagh established a system which uses one of the OS for implementation of the Home Automation System. Any mobile device without any platform issue can use the XML document which is fabricated and stored on the server.. The layout of the screen is controlled by a common XML format. Downloading of XML file from the server and its parsing needs to be coded on every platform. Design part is coded only once, which reduces a lot of coding effort.

The same file is used by every other platform. The main motive of the paper was to develop a system which could be used on any OS for Universal Mobile Applications.[12]

ACKNOWLEDGEMENT

The work reported in this paper is supported by the college through the Technical Education Quality Improvement Program [TEQIP-II] of the MRHD, Government of India.

References

1. A. Z. Alkar and U. Buhur, "An internet based wireless home automation system for multifunctional devices", IEEE Transactions on Consumer Electronics, vol. 51, pp. 1169-1174, 2005.
2. Muhammad Izhar Ramli, Mohd Helmy Abd Wahab, Nabihah, "TOWARDS SMART HOME: CONTROL ELECTRICAL DEVICES ONLINE", Nornabihah Ahmad International Conference on Science and Technology: Application in Industry and Education (2006).
3. N. Sriskanthan and Tan Karand, "Bluetooth Based Home Automation System". Journal of Microprocessors and Microsystems, Vol. 26, pp.281- 289, 2002.
4. Jitendra Rajendra Rana and Sunil N.Pawar, Zigbee Based Home Automation (April 10, 2010).
5. R. Piyare and M. Tazil, "Bluetooth based home automation system using cell phone", in Consumer Electronics (ISCE), 2011 IEEE 15th International Symposium on, 2011, pp. 192-195.
6. S. V. A. Syed Anwaarullah, "RTOS based home automation System using android", international journal of advanced Trends in computer science and engineering, vol. 2, pp. 480-484, 2013.
7. D. Giusto, A. Iera, G. Morabito, L. Atzori (Eds.), The Internet of Things, Springer, 2010. ISBN: 978-1-4419-1673-0.
8. National Intelligence Council, Disruptive Civil Technologies – Six Technologies with Potential Impacts on US Interests Out to 2025 –Conference Report CR 2008-07, April 2008, <http://www.dni.gov/nic/NIC_home.html>.L. Atzori et al. / Computer Networks 54 (2010) 2787–2805 2803
9. INFISO D.4 Networked Enterprise & RFID INFISO G.2 Micro & Nano systems, in: Co-operation with the Working Group RFID of the ETP EPOSS, Internet of Things in 2020, Roadmap for the Future, Version 1.1, 27 May 2008.
10. INTERNET Auto-Id Labs, <<http://www.autoidlabs.org/>>.
11. Deepali Javale, Mohd. Mohsin, Shreerang Nandanwar, and M. Shingate, "Home Automation and Security System Using Android ADK", International Journal of Electronics Communication and Computer Technology, vol. 3, pp. 382-385, 2013.
12. Amul Jadhav, S. Anand, Nilesh Dhangare, K.S. Wagh "Universal Mobile Application Development (UMAD) On Home Automation", Marathwada Mitra Mandals Institute of Technology, University of Pune, India Network and Complex Systems ISSN 2224-610X (Paper) ISSN 2225-0603 (Online) Vol 2, No.2, 2012
13. The EPCglobal Architecture Framework, EPCglobal Final Version 1.3, Approved 19th march 2009, <www.epcglobalinc.org>
14. K. Sakamura, Challenges in the age of ubiquitous computing: a case study of T-engine – an open development platform for embedded systems, in: Proceedings of ICSE'06, Shanghai, China, and May 2006.
15. M. Presser, A. Gluhak, and The Internet of Things: Connecting the Real World with the Digital World, EURESCOM mess@ge – The Magazine for Telecom Insiders, vol. 2, 2009, <<http://www.eurescom.eu/message>>
16. M. Botterman, for the European Commission Information Society and Media Directorate General, Networked Enterprise & RFID Unit –D4, Internet of Things: An Early Reality of the Future Internet, Report of the Internet of Things Workshop, Prague, Czech Republic, May2009.