Smart Home System based on I.O.T Technologies

A Project

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BACHELOR OF COMPUTER APPLICATION

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DECLARATION CERTIFICATE

This is to certify that the work presented in the thesis entitled **"Smart home system based on IOT Technologies"** in partial fulfillment of the requirement for the award of degree of **Bachelor of Computer Application** of Institute of Engineering & Management is an authentic work carried out under my supervision and guidance.

To the best of my knowledge the content of this thesis does not form a basis for the award of any previous Degree to anyone else.

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CERTIFICATE OF APPROVAL

The foregoing thesis entitled **"Smart home system based on IOT Technologies"** is hereby approved as a creditable study of research topic and has been presented in satisfactory manner to warrant its acceptance as prerequisite to the degree for which it has been submitted.

It is understood that by this approval, the undersigned do not necessarily endorse any conclusion drawn or opinion expressed therein, but approve the thesis for the purpose for which it is submitted.

(Internal Examiner) **(External Examiner)**

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Contents

Abstract

As technology is improving day by day we can see that most of the things are getting done by machines. In our project, we have created a Smart Home using IoT technologies. Our paper represents how we have made an automated smart home system using flexible home control. We have stored the coding on the Arduino board and by using the HC-05 Bluetooth module we are controlling the appliances such as LED lights and a fan. DC motor is used for operating the fan. By just pressing a single button on our smartphone application we can control all the appliances. Our project will be very helpful to the elderly people who don't have to travel long distances to use the smart home devices.

Chapter 1

1.1 Introduction

Smart home systems have become more prevalent in our life since they offer us a better quality of life and convenience. A smart home is a house that uses inter-connected devices to enable the remote monitoring and control of household appliances and systems. With the help of different sensors and devices, a person can access any service the smart home provides from a single location. We can access different devices like lights, fans, television sets, air conditioners, etc wirelessly by pressing a button on a smartphone. Our project presents the working of a smart home system using Bluetooth technology and its implementation. Bluetooth is a popular wireless standard that is used for many smart home devices like portable speakers, wireless earphones, smart locks, etc. The advantage of using Bluetooth is that it consumes very little power compared to wifi which gives Bluetooth-powered devices excellent battery life.

Chapter 2

2.1Background Studies

The main objective of this project is to create a smart home system using Bluetooth to see whether Bluetooth can be a viable replacement for wi-fi in smart homes.

2.2 Literature Survey

In [1] the study, illustrates the smart home architecture that focus how to control home appliance remotely paper also describes that with the help of intelligent terminals we can detect smoke, fire, gas leakage and successfully implement the security features in our home. In [2] the research suggested the smart home system. The whole system was design with the help of Raspberry Pi microprocessor and uses the services provided by the amazon (Alexa). The system has the ability of capturing the voice commands and processes them. The purposed system helps in designing and implementation of smart home model. Davidovic et al. [3] illustrate a smart home system. The system is built by using different sensors, which are connected with Raspberry Pi Microcontroller. The Bluetooth module is used for communication. To control the devices remotely a user friendly android based interface was also used or developed. In [4] prototype for designing a smart home control system is presented. The presented system includes Hardware design and software design for smart homes. Hardware implementation consists of sensors, relays, software implementation includes interface for users that can be mobile app or website. Further, the study in [5] focuses on the security of smart home. Initially describe the smart home setup, different technologies used in smart homes and different benefits of smart

homes. Then discuss issues relating to Smart Home protection, security, and threats of smart home environment like Fire protection, access control, authentication, etc.

In [6] the study, states a resilience framework that helps the IOT app developers to provide services in dynamic Fog IOT environment. The framework restricts spread of failure and the helps to avoid the whole application from restart when failure arises. The framework also recovers applicative and infrastructure entities by re-configuring, restoring the application to its consistent state. IOT based smart home system [7] is introduced by the author. Proposed system is related to home security and well-organized energy management is also the part of the system. The basic concept is that home appliances control remotely through mobile phones; Wi-Fi is used for connection. The other studies [8] [9] are presented a user friendly smart home system. With the help of microcontroller, sensors, acuraters, Bluetooth and WiFi module a user friendly smart home environment is design and implemented more effectively and efficiently. Furthermore, author [10] presented a smart home architecture that was based on IOT. User can control their smart home by interacting the different IOT devices through their smart phones, tablets and pcs. Moreover ,a smart home threat model is also presents that focus on there is internal and external adversaries. Internal adversaries are inside the smart home environment and external adversaries are trying to interact via internet. In addition, smart home cyber flaws like eavesdropping, DOS, software exploitation are also discussed. Another research presented a review [11]of numerous usability measurement models by Azham Hussainet al. The author describes the pros and cons of various models which was helpful in measuring the usability of mobile applications. Ranjana

Sharma et al. [12] describe how smart application of living can fulfill the need of elderly people. Cognitive problems are examined that are faced by elderly peoples and how their daily life is affected by these problems. Role of HCI in smart living for elderly peoples is also discussed in [13] author design and implement SH system to monitor power-consumption in the real time. Intel Galileo board is used for the said purpose. Additionally, a study is described in [14], the survey related to IOT technologies used in smart cities. Radio frequency identification and wireless sensor network is also discussed. RFID is used for labeling and tagging the devices, a unique identification no is assign to each device. WSN collect data from physical locations with the help of sensors. Likewise, the architecture [15] used for smart home is presented which was based on cloud platform. The home appliances are control from anywhere and also use services of the cloud to provide home data, which can be used by various service provider and applications. Raspberry PI was used as gateway to control home appliances.

Chapter 3

3.1 Proposed Methodology

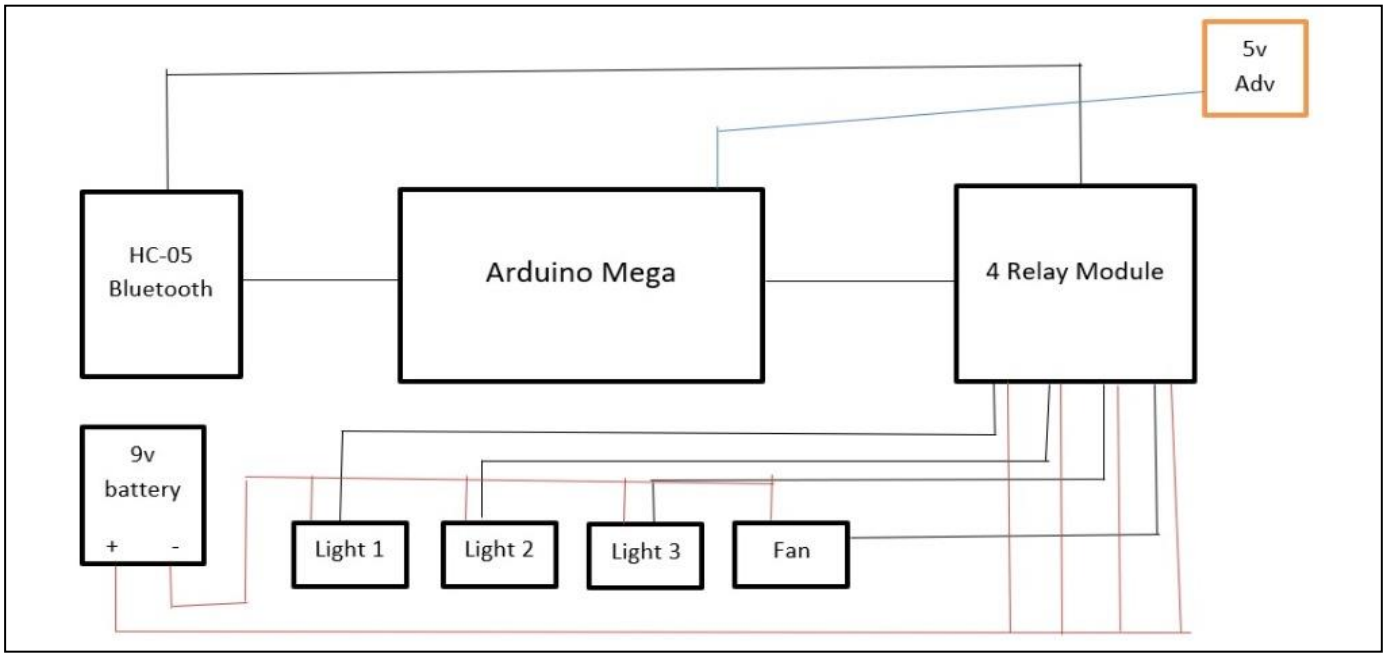

Fig 1.Circuit diagram

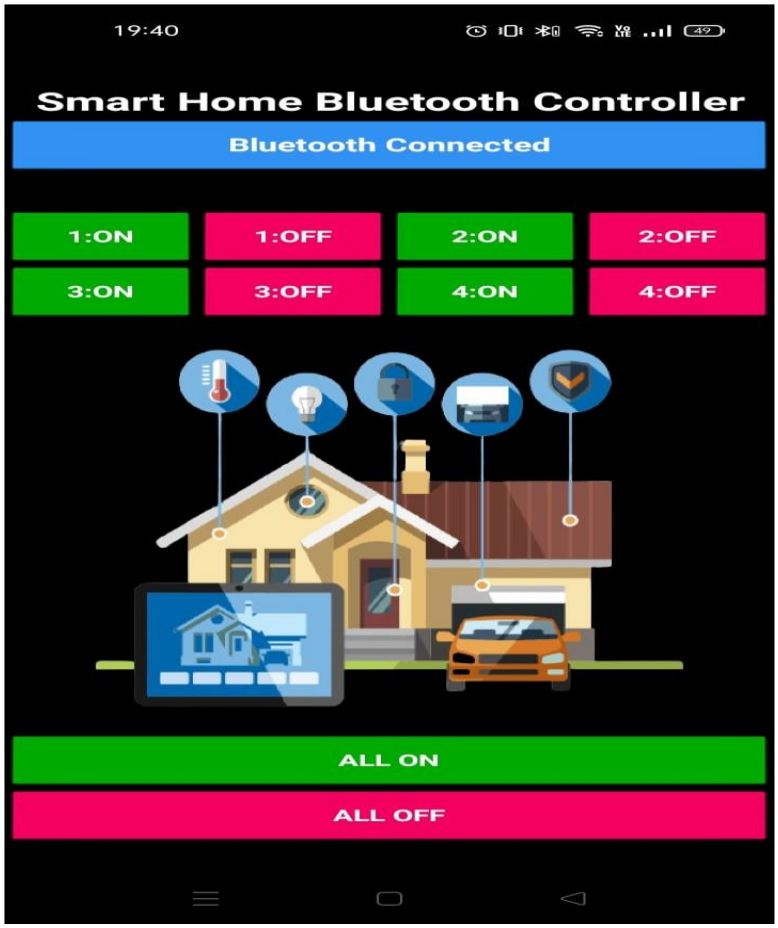

Fig 2.Home page of app

Nowadays with the help of Arduino board, Battery and Bluetooth it is possible to make a user friendly smart home system. In our project we are representing an efficient and more effective smart home system with a cost effective IOT base smart home model that is affordable and fulfil the needs of home users. The things that are used for making the model are HC05 Bluetooth module,4 Channel Arduino relay board, Breadboard, Arduino Uno, Dc motor and lights are used.Dc motor is used for operating the fan. The lights and fan are connected with the 4 channel relay board. The coding part is stored in Arduino UNO and using HC-05 Bluetooth module we are able to control the appliances by using an app on our mobile that we have made. With the help of this model the user will be able to control the lights and fan by easily sitting at their home through mobile.

Chapter 4

4.1 Software requirement

- Platform used: I.O.T
- IDE used: Arduino IDE
- Designing tools used: MIT App Inventor

4.2 Hardware Requirement

- Arduino Mega
- Arduino 4 Relay Module Board
- HC-05 Bluetooth Module
- Led Light
- DC Motor
- 9v Battery

Chapter 5

5.1 Result and Discussions

We have created the model for smart home and have observed that Bluetooth can be used in the place of wifi for creating a smart home system but when a large area needs to be covered there are some connection problems and performance issues with the Bluetooth devices because of the low range of Bluetooth. Bluetooth is a good wireless protocol for one-off smart home devices but in the end, wifi is a much more powerful network for covering large areas and has better security compared to Bluetooth as it can provide an additional layer of security by using security protocols like WEP, WPA, WPA2, and WPA3.

Chapter 6

6.1 Conclusion

In this project, we have described the working of a smart home system using Bluetooth. We have created a mobile application and demonstrated the working of the led lights and a fan. We have discussed the advantages and disadvantages of using Bluetooth over wifi and concluded that Bluetooth has a very short range which prevents it from using it in large buildings. The usage of devices that use Bluetooth is expected to grow in the upcoming years so if the range and security improve then the performance of these devices will improve exponentially.

6.2 Future Work

The newest version of Bluetooth Bluetooth5 has 4 times the range, 2 times the speed, and 8 times the broadcasting message capacity over its predecessor which makes it a suitable choice for smart home devices. The number of smart home devices that use Bluetooth is expected to cross a billion units by 2022.

References:

[1] M. Li, W. Gu, W. Chen, Y. He, Y. Wu et.al "Smart home: architecture, technologies and systems," Procedia computer science, vol. 131, no.1, pp. 393-400, 2018.

[2] C. Z. Yue, and S. Ping, "Voice activated smart home design and implementation," In 2017 2nd International Conference on Frontiers of Sensors Technologies (ICFST) ,Shenzhen, China, April, 2017 pp. 489- 492.

[3] B. Davidovic and A. Labus, "A smart home system based on sensor technology," Facta Universitatis, Series: Electronics and Energetics, vol. 29 no. 3, pp. 451-460, 2015.

[4]T. S. Gunawan, I. R. H. Yaldi, M. Kartiwi, N. Ismail, N. F Za'bah, "Prototype design of smart home system using internet of things," Indonesian Journal of Electrical Engineering and Computer Science, vol. 7, no.1, pp. 107-115, 2017.

[5]R. J. Robles, T. H. Kim, D. Cook and S. Das, "A review on security in smart home development," International Journal of Advanced Science and Technology, vol.15, no.1 pp. 210-225, 2010.

[6]U.Ozeer, L.Letondeur, F. G. Ottogalli, G. Sala¨un and J. M. Vincent, "Designing and implementing resilient IoT applications in the fog: a smart home use case," In 2019 22nd Conference on Innovation in Clouds, Internet and Networks and Workshops (ICIN) , Paris, France, 2019, pp. 230-232.

[7] O. Bhat, S.Bhat and P. Gokhale, "Implementation of IoT in smart homes," International Journal of Advanced Research in Computer and Communication Engineering, vol.6, no.12, pp.149-154, 2017.

[8] S. Gunputh, A.P. Murdan and V. Oree ,"Design and implementation of a low-cost Arduino-based smart home system," In 2017 IEEE 9th International Conference on Communication Software and Networks (ICCSN), GuangZhou, China, 2017, pp. 1491-1495.

[9] M. Asadullah, and K. Ullah, "Smart home automation system using Bluetooth technology," In 2017 International Conference on Innovations in Electrical Engineering and Computational Technologies (ICIEECT),

Karachi, Pakistan, 2017, pp. 1-6.

[10] D. Geneiatakis, I. Kounelis, R. Neisse, I. Nai. Fovino, G. Steri et al., "Security and privacy issues for an IoT based smart home," In 2017 40th International Convention on Information and Communication Technology, Electronics and Microelectronics (MIPRO) ,Opatija, Croatia, 2017,
pp. 1292-1297.

[11] A. Hussain, and M. Kutar, "Usability metric framework for mobile phone application," Post Grads Net Home Standford,vol.1, no.1, pp.1-5, 2009.

[12] Sharma, R., Nah, F. F. H., Sharma, K. Katta, T. S, N. Pang, et al. "Smart living for elderly: design and human-computer interaction considerations," In International Conference on Human Aspects of IT for the Aged Population, Las Vegas, NV, USA, 2016, pp. 112-122.

[13] P. Gupta and J. Chhabra, "IoT based smart home design using power and Security management," In 2016 International Conference on Innovation and Challenges in Cyber Security (ICICCS-INBUSH), Noida, India, 2016, pp. 6-10.

[14] H. Arasteh, V. Hosseinnezhad, V. Loia, A. Tommasetti, O. Troisi. et.al "Iot-based smart cities: a survey," In 2016 IEEE 16th International Conference on Environment and Electrical Engineering (EEEIC), Florence, Italy,2016, pp. 1-6.

[15] A. Iqbal, F. Ullah, H. Anwar, K. S. Kwak, M. Imran, et.al "A Interoperable Internet-of-Things platform for smart home system using webof- objects and cloud," Sustainable Cities and Society, vol.38, no.1, pp. 636-646,2018.