A

Synopsis report on

“Energy Efficient IOT- Based Smart Home ”

Submitted by:

Mr. Nagane Abhijit Shantaram

Mr. Mutkule Abhijeet Kashinath

Mr. Kolhe Pranjal Milind

Mr. Pathak Vinayak Vijay

Under The Guidance of:

Dr. V. A. Dhotre

For The Award of The Degree of
Bachelor of Engineering

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

SKN SINHGAD COLLEGE OF ENGINEERING

(PUNYASHLOK AHILYADEVI HOLKAR

SOLAPUR UNIVERSITY)

2020-2021

Synopsis

Name of college : SKN Sinhgad College of Engineering , Korti, Pandharpur.

Name of Department : Computer Science & Engineering.

Name of Students : Mr. Nagane Abhijit Shataram
Mr. Mutkule Abhijeet Kashinath
Mr. Kolhe Pranjal Milind
Mr. Pathak Vinayak Vijay

Name of Guide : Prof. V. A. Dhotre.

Title of Project : "Energy Efficient IOT- Based Smart Home ."

Abstract:

This project revolves around creating a smart home system prototype with the main focus being the ability to lock/unlock a door through the internet. The system consists of a central device, a server and an Android application.

The central device is a microprocessor, in this case, a Raspberry Pi that connects to the Internet and receives an order to control a motor which in turn turns the lock with the help of gears. The ability to rotate the motor in both directions is achieved by the use of an H-bridge. The server manages users and devices, and handles the communication between the application and the central device. Users and devices are stored in a database on the server. The application is a frontend which presents the user with a list of devices to interact with.

The main prototype where the Raspberry Pi acted as a central device was abandoned due to time and resource constraints. It was instead used to control the motor directly. This brought up some problems concerning powering the device using batteries. The software of the prototype is mostly working but due to the same time limitations not all planned features could be implemented.

Introduction:

Today, technology has become an integrated part of people's lives. It has, and continues to influence many aspects of daily life and has allowed better social interaction, ease of transportation, the ability to indulge in entertainment and media and has helped in the development in medicine. The creation of many devices such as mobile phones and computers have caused many people to rely on technology to communicate with their friends, store information such as pictures, movies, documents, and music . The internet has become a common interface that many devices use in order to simplify the daily life of many people. The Internet has given people the ability to search for information, store their own information in the cloud while also giving them better ways of managing information. From the time of its introduction, the amount of people that use mobile phones and the internet to communicate with other people has increased dramatically to become one of the major means of communication.

Smartphones have allowed people to connect to the internet without the need for a computer, while still offering the same functionality but through different means. With the introduction of better hardware and better software, smartphones have become powerful devices and have become an important part of people’s daily lives. A major aspect is how the smartphone is able to connect and communicate with other devices. For example, smartphones can be used as a mouse for a computer, or it can connect to the speakers of cars allowing consumers to play their own music. There are many applications of this sort. A field that is recently gaining popularity is home automation which can also use smartphones as information or functionality hubs.

IoT has provided the applications to turn non-smart device into smart device, which allow users to access these devices through the Internet. It converts the home into smart home and provides more robust method of controlling the home appliance. Also, the security can be added with the help of installed camera in the home, which can be traced through the Internet. Thus, user can monitor their home and can turn ON/OFF their appliances which will definitely going to save both the electricity and electric bills.

Other features that can be included in the smart home for security purpose is to include the sensors and cameras that can prevent the intruder from entering into your home. Also,making the system more intelligent, that can turn on the light and fan of the room as soon as it detects the presence of the person. With this motivation, we develop IoT based homeautomation system which uses voice as well as web-based service for controlling the home appliance. Also for security purpose, the user-define command are set which enables tooperate the system.

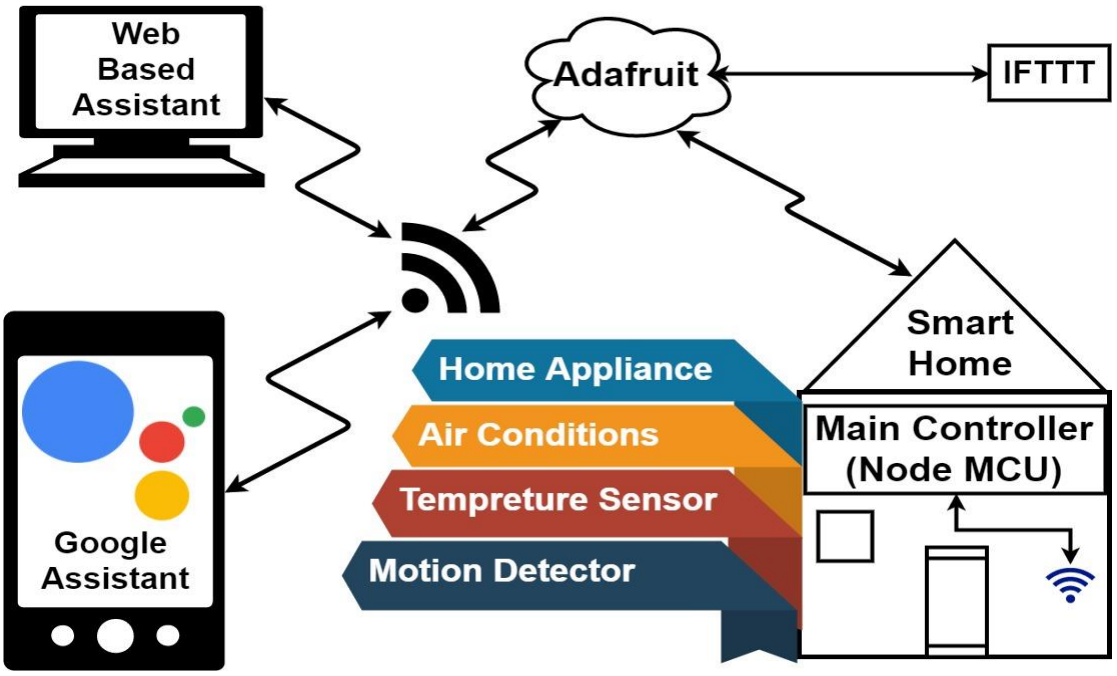

Fig.. Smart home automation system architecture

SYSTEM DESIGN AND IMPLEMENTATION

Speech is one of the most important inputs used for manmachine interaction. Therefore, to make smart home more user friendly, Google assistance along with web based application can be used to control the home system. The advantage of multimodal is that in the presence of the noisy background surrounding the performance of theGoogle assistance degrades. Hence, in such scenario web based application can be helpful in controlling the appliance of the system. Thus, the proposed model is designed toprovide better flexibility and making the system more robust.

Figure shows the general architecture of the smart homeautomation system. As shown in the Figure the smart home can be implemented with main controller unit (Main switching of the home circuit) that is connected with the 24-hour availableWi-Fi network. To ensure, that the Wi-Fi connection do not turn off, the main controller is programmed to establish automatic connection with the available network andconnected to the auto power backup.

LITERATURE REVIEW:

In this section, discussed different Home Automation System with their technology with features, benefit and limitations they have. “The Figure” shows Basic Architecture of Remote Home Automation.

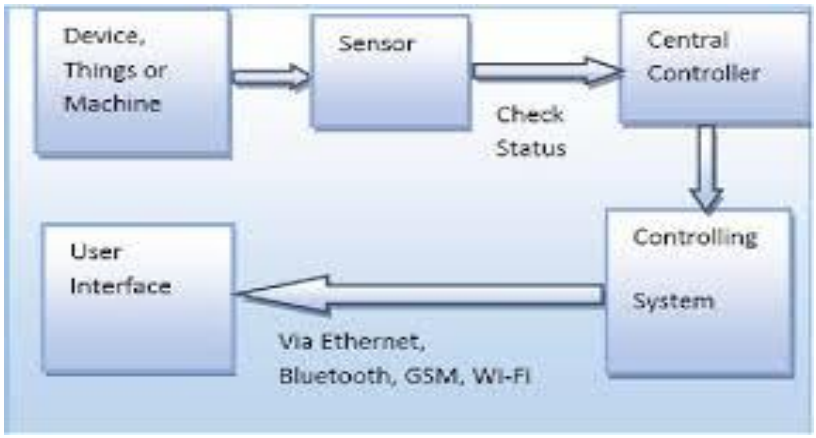

Figure: Basic Block Diagram of Home Automation

The Home automation system that uses Wi-Fi technology. System consists of three main components; web server, which presents system core that controls, and monitors users’ home and hardware interface module(Arduino PCB (ready-made), Wi-Fi shield PCB, 3 input alarms PCB, and 3 output actuators PCB.), which provides appropriate interface to sensors and actuator of home automation system. The System is better from the scalability and flexibility point of view than the commercially available home automation systems. The User may use the same technology to login to the server web based application. .If server is connected to the internet, so remote users can access server web based application through the internet using compatible web browser.

The application has been developed based on the android system. An interface card has been developed to assure communication between the remote user, server, raspberry pi card and the home Appliances. The application has been installed on an android Smartphone, a web server, and a raspberry pi card to control the shutter of windows. Android application on a smartphone issue command to raspberry pi card. An interface card has been realized to update signals between the actuator sensors and the raspberry pi card.

Cloud-based home appliance monitoring and controlling System. Design and implement a home gateway to collect metadata from home appliances and send to the cloud-based data server to store on HDFS (Hadoop Distributed File System), process them using MapReduce and use to provide a monitoring function to Remote user. It has been implemented with Raspberry Pi through reading the subject of E-mail and the algorithm. Raspberry Pi proves to be a powerful, economic and efficient platform for implementing the smart home automation.Raspberry pi based home automation is better than other home automation methods is several ways. For example, in home automation through DTMF (dual tone multi-frequency), the call tariff is a huge disadvantage, which is not the case in their proposed method. Also, in Web server based home automation, the design of web server and the memory space required is ejected by this method, because it simply uses the already existing web server service provided by G-mail. LEDs were used to indicate the switching action. System is interactive, efficient and flexible.

Shih-Pang Tseng et al. proposed Smart House Monitor & Manager (SHMM), based on the ZigBee, all sensors and actuators are connected by a ZigBee wireless network. They designed a simple smart socket, which can remote control via ZigBee. PC host is used as a data collector and the motion sensing, all sensing data are transferred to the VM in the cloud. The user can use the PC or Android phone to monitor or control through the Internet to power-saving of the house.

Problem Statement:

- Sub systems not integrating.
- Too many home automation control apps.
- Sub system suppliers lacking smart knowledge.

Objective:

- To ease daily life by increasing user comfort.
- To manage all your home devices from one place.
- To increase energy efficiency using smart home technology.
- To improve appliance functionality to help run your appliances better.

Proposed Work:

As seen earlier we have already managed to save almost 50% of energy consumption. We can predict 50-60% less energy being used in the lifetime. Every single light bulb, tube will have an interface which will control the operation of that particular light. Some lights offer us the option of intensity variation in the lighting, this can be used with the photo sensor to predict the intensity of a light to be kept during a particular instance which will help in reducing the cost of operation further more.

There already exist some preliminary works which attempt to integrate some aspects of a smart home with the help of ontologies. Retkowitz and Pienkos describe a possibility to integrate heterogeneous services in smart homes. It is based on an ontology mapping for semantically equivalent service interfaces. In the respective system architecture is specified in more detail. Different service layers are exemplified with the help of use cases. Main achievements are the unified service interfaces that enable a continuous specification, configuration and deployment process.

In Chen et al. propose an ontology-based system for a smart meeting room. They introduce several use cases for a meeting room and employ context reasoning. Another approach for ontology-grounded context reasoning is taken in, where the suggested system uses OWL for context modeling. Benta et al. describe a multiagent system working with an ontology mapping of the environment. The work also focuses on context awareness as well as user tracking and especially user behavior. Although these articles show some promising approaches in the field of context modeling and context awareness, architectural or energy deliberations is not sufficiently considered. The authors of propose a system which is based on J2EE and also uses multiple agents in combination with an ontology. The focus of their system is put on the industrial sector, in particular targeting logistics and scheduling applications. Nevertheless, their study is a rare example of the practical application of an ontology-based multiagent approach in a large real-world system.

Hardware Requirement:

- Raspberry Pi 3, Model B, v 1.2, which is the IoT computer that will control the devices that comprise the home automation system
- 433-MHz receiver and transmitter modules, which receive signals from, and transmit signals to, the system
- Wireless electrical outlets that listen for on/off signals in the 433 MHz band and respond accordingly
- Wireless home alarm system with window and door sensors that are controlled by and report status by using signals in the 433 MHz frequency band

Software Requirement:

- IoT device (sensor or actuator) software
- Gateway software
- Smartphone app
- Cloud software

Mr. Nagane Abhijit Shantaram

Mr. Mutkule Abhijeet Kashinath

Mr. Kolhe Pranjal Milind

Mr. Pathak Vinayak Vijay

(Students)

Prof. V. A. Dhotre

(Project Guide)

Prof. N. M. Sawant
(Head of Dept.)
Computer Science & Engg.,
SKN Sinhgad College of Engg., Korti.

REFERENCES:

[1] Stergioua C, Psannis KE, Kimb B-G, Gupta B. Secure Integration of IoT and Cloud Computing. Elsevier, Future Generation Computer Systems, Vol. 78. Part3. January 2018.

[2] Al-Kuwari M, Ramadan A, Ismael Y, Al-Sughair L, Gastli A, Benammar M.Smart-Home Automation Using IoT-Based Sensing and Monitoring Platform, IEEE. 2018. Available from: ieeexplore.ieee.org

[3] Datta T, Apthorpe N, Feamster N. Developer-friendly library for smart home IoT privacy-preserving traffic obfuscation, IoT S&P 18. In: Proceedings of the 2018 Workshop on IoT Security and Privacy.

[4] Mao J, Lin Q , Bian J. Application of Learning Algorithms in Smart Home IoT System Security. American Institute of Mathematical Sciences; 2018. DOI: 10.3934/mfc.2018004

[5] Saeed F, Paul A, Rehman A, Hong WH, Seo H. IoT-based intelligent modeling of smart home environment for fire prevention and safety. Journal of Sensor and Actuator Networks. 2018; (1):11. DOI: 10.3390/jsan7010011

[6] Botta A, de Donato W, Persico V, Pescapé A. Integration of cloud computing and internet of things: A survey. Future Generation Computer Systems. 2016; :684-700

[7] Soliman M, Abiodun T, Hamouda T, Zhou J, Lung C-H. Smart home: Integrating internet of things with web services and cloud computing. In: International Conference on Cloud Computing Technology and Science; IEEE. 2013

[8] Paschke A, Kozlenkov A. Rule-Based Event Processing and Reaction Rules. London: Betfair Ltd; 2009.

[9] Khan NS, Ghani S, Haider S. Real-time analysis of a sensor's data for automated decision making in an IoT-based smart home. Sensors. 2018; :1711. DOI: 10.3390/s18061711

[10] Malik R, Parameswaran N, Ghose U. Rule based event management systems. In: Proceedings of the 25th International Florida Artificial Intelligence Research Society Conference. Association for the Advancement of Artificial Intelligence; 2012