

Smart Home Monitoring and Controlling Using Internet of Things

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Abstract- The process of controlling or operating various equipment, machinery, industrial processes, and other applications using various control systems and also with less or no human intervention is termed as automation. There are various types of automation based on the application they can be categorized as home automation, industrial automation, autonomous automation, building automation, etc. Home automation or smart home is the residential extension of building automation. It involves the control and automation of lighting, heating (such as smart thermostats), ventilation, air conditioning (HVAC), and security, as well as home appliances such as washer/dryers, ovens or refrigerators/freezers. They use Wi-Fi for remote monitoring and are a part of the Internet of things. Modern systems generally consist of switches and sensors connected to a central hub sometimes called a "gateway" from which the system is controlled with a user interface that is interacted either with a wall-mounted terminal, mobile phone software, tablet computer or a web interface, often but not always via internet cloud services.

Index Terms- Automation, Wi-Fi, web interface, lighting, heating, ventilation, air conditioning(HAVC), Gateway.

1. INTRODUCTION

Home automation is a step toward what is referred to as the "Internet of Things," in which everything has an assigned IP address, and can be monitored and accessed remotely. Homes of the 21st century will become more and more self-controlled and automated due to the comfort it provides, especially when employed in a private home. A home automation system is a means that allow users to control electric appliances of varying kind. The first and most obvious beneficiaries of this approach are "smart" devices and appliances that can be connected to a local area network, via Ethernet or Wi-Fi. However, electrical systems and even individual points, like light switches and electrical outlets, were

also integrated into home automation networks, and businesses have even explored the potential of IP-based inventory tracking. Although the day is still far off when you'll be able to use your mobile browser to track down a lost sock, home networks are capable of including an increasing number of devices and systems. The Internet of things (stylized Internet of Things or IOT) is the internetworking of physical devices, vehicles (also referred to as "connected devices" and "smart devices"), buildings, and other items—embedded with electronics, software, sensors, actuators, and network connectivity that enable these objects to collect and exchange data. In 2013 the Global Standards Initiative on Internet of Things (IoT-GSI) defined the IoT as "the infrastructure of the information society." The IoT allows objects to be sensed and/or controlled remotely across existing network infrastructure, creating opportunities for more direct integration of the physical world into computer-based systems, and resulting in improved efficiency, accuracy and economic benefit in addition to reduced human intervention. When IOT is augmented with sensors and actuators, the technology becomes an instance of the more general class of cyber-physical systems, which also encompasses technologies such as smart grids, smart homes, intelligent transportation and smart cities. Home automation refers to control the home appliances by using computer technology. Computer Systems enables from remote control of lighting through to complex micro-controller or computer based networks with various degrees of intelligence and automation. Home automation provides security, energy efficiency and ease of use hence, it is adopted more. It also provides remote interface to home appliances to provide control and monitoring on a web browser.

Home automation systems face four main challenges; these are high cost of ownership, inflexibility, poor

manageability, and difficulty in achieving security. The main objectives of this research is to design and implement a home automation system using IoT that is capable of controlling and automating most of the house appliances through an easy manageable web interface. The proposed system has a great flexibility by using Wi-Fi technology to interconnect its distributed sensors to home automation server. This will decrease the deployment cost and will increase the ability of upgrading, and system reconfiguration.

II. RELATED WORK

Many Authors designed home automation systems by using different technologies.

Pooja Patel, Mitesh Patel, Vishwa Panchal & Vinit Nirmal [1], main aim of the project is to develop a system that will provide remote control of home appliances and also provide security against the mishaps when the home host is not at home. This paper is mainly concerned with the automatic control of light or any other home appliances using internet. It is meant to save the electric power and human energy. This project is made with the help of controller and raspberry pi. The various appliances connected to the micro controller and sensor is connected using wireless network.

Nisha Sangle, Shilpa Sanap, Manjiree Salunke, Sachin Patil [2], home automation system uses portable device as user interface, monitoring and controlling home appliances will be the demand of new era .main objective to developed proposed system is to provide remote level control and monitoring by means of few communication protocol like this Wi-Fi, Zigbee. This system uses wireless technology to avoid wired connection between appliances and the gateway. It helps to do complete monitoring and control functionalities of the home environment using wireless sensors and actuators modules than just the switching ON/OFF functionality provided by similar systems. Multiple appliances can be control and monitor using IoT in propose system web portal will play an interface between appliances and android app to be develop.

Kaushik Ghosh, Rushikesh Kalbhor, Disha Tejpal, Sayali Haral [3] IoT (Internet of Things) is fast emerging technology which involves interaction among things through internet without human interference. It has made human life easier and

comfortable. Now-a-days digital devices in home are increasing rapidly due to which there is a need of accessing and controlling the devices remotely. This paper represents an affordable and flexible home control system using an Arduino, web server with IP connectivity for interacting with devices and appliances remotely using Android based Smart phone app. It demonstrates the usefulness of the system using devices such as light switches, temperature sensors, and water-level sensors.

Vinay sagar K N,Kusuma S M [4] Internet of things is a growing network of everyday object-from industrial machine to consumer goods that can share information and complete tasks while you are busy with other activities. Wireless Home Automation system(WHAS) using IoT is a system that uses computers or mobile devices to control basic home functions and features automatically through internet from anywhere around the world, an automated home is sometimes called a smart home. It is meant to save the electric power and human energy.

Mamata Khatu, Neethu Kaimal, Pratik Jadhav, Syedali Adnan Rizvi [5] IoT coverage is very wide and includes variety of objects like smart phones, tablets, digital cameras and sensors. Once all these devices are connected to each other, they enable more and more smart processes and services that support our basic needs, environment and health. Such enormous number of devices connected to internet provides many kinds of services. They also produce huge amount of data and information.

YAN Wenbo, WANG Quanyu, GAO Zhenwei [6] It aims at helping people manage the home appliance freely and build an autonomous environment in home or work area. This paper introduces a wireless solution based on Internet protocol. Based on this approach, we design a smart home system with the implementation of related software and hardware. People can use smart phones or tablets to control or monitor the home appliances both locally and remotely. We come up with the concept of Smart Units and Home Proxy. Low cost WiFi module is used to build Smart Units.

Swati Tiwari, Rahul Gedam [7] The paper proposes an implementation of IoT (Internet of Things) based smart home automated system to remotely control the home appliances using Wi-Fi. A low cost Wi-Fi module ESP8266 along with ATmega 328 MCU is

used to build Smart Units. The user can remotely operate home appliances like lights, fan, door lock etc. through Telnet. The lights in any room can be controlled from any place in the house, within the wifi range, through telnet by using a single keyword. Rajeev Piyare [8] This paper presents a low cost and flexible home control and monitoring system using an embedded micro-web server, with IP connectivity for accessing and controlling devices and appliances remotely using Android based Smart phone app. The proposed system does not require a dedicated server PC with respect to similar systems and offers a novel communication protocol to monitor and control the home environment with more than just the switching functionality.

Dhakad Kunal, Dhake Tushar, Undegaonkar Pooja, Zope Vaibhav, Vinay Lodha[9] Smart Building not only refers to reduce human efforts but also energy efficiency and time saving. In this ASP.NET is used in which appliances are connected to sensors and sensors give status of appliances to the web. Here electric appliances are operated by the website. The main objective of home automation and security is to help handicapped and aged people that will enable them to control home appliances and alert them in critical situation.

Rutuja Ekatpure, Devendra Ingale [10] Home automation is the automatic control and monitoring of household appliances and residential house features like TV, fans, lights, doors, gate and even the windows. Events can be programmed to be triggered under specific conditions (such as depending on the sensors data), and this can be used in reducing the total energy consumed by some appliances. On the other hand, the system can suggest smart task scheduling. In simple installations, domotics may be as straightforward as turning on the lights when a person enters the room.

Prof. R.S. Suryavanshi, Kunal Khivensara, Gulam Hussain, Nitish Bansal, Vikash Kumar[11] Any system, thus, developed which has support of the ubiquitous Android –enabled devices will be much appreciated. Our project is based on this idea along with the much-needed Automation System interfaced with the Android Systems. We have harnessed the easy-to-understand Android GUI to a constructive work whereby we see to it that the home is automated and energy is saved. This makes our home intelligent enough to save electricity, which is the need of the

hour. We have elucidated this idea into realization with the help of Wi-Fi technology, which really offers easy and really much awaited Home Automation Systems (HASs).

Raqibull Hasan, Mohammad Monirujjaman Khan, Asaduzzaman Ashek, Israt Jahan Rumpa [12] In this paper, design and implement of a microcontroller based home security system with GSM technology have been presented and analyzed. Two microcontrollers with other peripheral devices which include Light Emitting Diode (LED), Liquid Crystal Display (LCD), Buzzer and Global System for Mobile Communication (GSM) Module are responsible for reliable operation of the proposed security system. In addition, a mobile phone is interfaced with microcontroller through a Bluetooth device in order to control the system.

Malik Sikandar Hayat Khiyal, Aihab Khan, and Erum Shehzadi Software Engineering Dept., Fatima Jinnah Women University, Rawalpindi, [13]. This paper mainly focuses on the controlling of home appliances remotely and providing security when the user is away from the place. The system is SMS based and uses wireless technology to revolutionize the standards of living.

Vishwajeet H. Bhide [14] In this paper we will see how to provide fully smart environment condition monitoring by various sensors (Temperature, Humidity, Light and Level) for providing necessary data to automatically adjust the comfort level in homes by optimize use of energy.

H. Santhi, Gayathri.P [15] one of the topics sudden interests gaining popularity day by day is that of home because of its innumerable advantages. One can achieve home automation by simply connecting home appliance and electrical devices to the internet or cloud. The reason for this surge in demand of network enabled home automation is reaching the zenith in recent days for its simplicity and comparable affordability.

Safa.H, Sakthi Priyanka.N, Vikkashini Gokul Priya.S, Vishnupriya.S, Boobalan.T[16] The paper proposes a novel security system based on Open source cloud server “things speak .com” and a low cost esp8266 Wi-Fi module. The project includes a PIR module which constantly monitoring the Home or Work space to be monitored .When the PIR module detects a intruder it sends a signal to the Atmega 328p microcontroller and the controller is

connected to a Esp8266 Wi-Fi module and also to a alarm system.

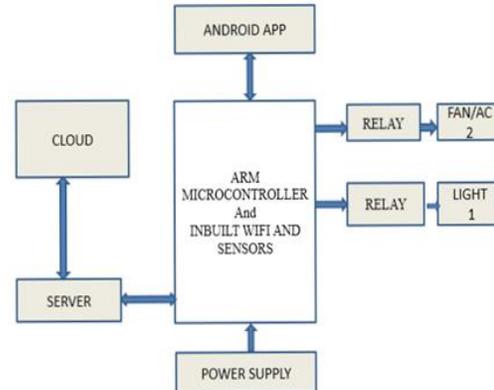
Thoraya Obaid, HaleemahRashed, Ali Abou-Elnour, Muhammad Rehan, Mussab Muhammad Saleh, and Mohammed Tarique[17] In this paper ZigBee based wireless home automation systems have been addressed. There are two main parts of this paper. In the first part a brief introduction of the ZigBee technology has been presented and in the second part a survey work on the ZigBee based wireless home automation system has been presented.

C.Bruhathireddy,Dr.G.N.Kodandaramaiah,M.Laksh mipathy[18] The aim of this project is to develop a system that will provide remote control of home appliances and also provide security against intrusion when the home host is not at home. This paper is mainly concerned with the automatic control of light or any other home appliances using internet.

III. PROPOSED WORK

This little chip contains a CC3100 chip (the updated version of the CC3000, with many bugs fixed) along with an ARM processor, all within the same enclosure. And it's all compatible Start your design with the industry's first Wi-Fi CERTIFIED single-chip microcontroller unit (MCU) with built-in Wi-Fi connectivity. Created for the Internet of Things (IOT), the SimpleLink CC3200 device is a wireless MCU that integrates a high-performance ARM Cortex-M4 MCU, allowing customers to develop an entire application with a single IC. With on-chip Wi-Fi, Internet, and robust security protocols, no prior Wi-Fi experience is required for faster development. The CC3200 device is a complete platform solution including software, sample applications, tools, user and programming guides, reference designs, and the TI E2E™ support community.

The applications MCU subsystem contains an industry-standard ARM Cortex-M4 core running at 80 MHz The device includes a wide variety of peripherals, including a fast parallel camera interface, I2S, SD/MMC, UART, SPI, I2C, and four-channel ADC. The CC3200 family includes flexible embedded RAM for code and data and ROM with external serial flash bootloader and peripheral drivers.



The Wi-Fi network processor subsystem features a Wi-Fi Internet-on-a-Chip and contains an additional dedicated ARM MCU that completely offloads the applications MCU. This subsystem includes an 802.11 b/g/n radio, baseband, and MAC with a powerful crypto engine for fast, secure Internet connections with 256-bit encryption. The CC3200 device supports Station, Access Point, and Wi-Fi Direct modes. The device also supports WPA2 personal and enterprise security and WPS 2.0. The Wi-Fi Internet-on-a-chip includes embedded TCP/IP and TLS/SSL stacks, HTTP server, and multiple Internet protocols.

The power-management subsystem includes integrated DC-DC converters supporting a wide range of supply voltages. This subsystem enables low-power consumption modes, requiring less than 4 μ A of current.

IV. CONCLUSION

The internet of things involves an increasing number of smart interconnected devices and sensors (such as cameras, biometric, and medical sensors) that are often transparent and invisible. The home automation using Internet of Things has been experimentally proven to work satisfactorily by connecting simple appliances to it and the appliances were successfully controlled remotely through internet. The designed system not only monitors the sensor data, like temperature, gas, light, motion sensors, but also actuates a process according to the requirement.

FUTURE WORK

Using this system as framework, the system can be expanded to include various other options which

could include home security feature like capturing the photo of a person moving around the house and storing it onto the cloud. This will reduce the data storage than using the CCTV camera which will record all the time and stores it. The system can be expanded for energy monitoring, or weather stations. This kind of a system with respective changes can be implemented in the hospitals for disable people or in industries where human invasion is impossible or dangerous, and it can also be implemented for environmental monitoring.

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