Home Automation Using IOT

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Abstract: *In this era of digitization and automation, the life of human beings is getting simpler as almost everything is automatic, replacing the old manual systems. Nowadays humans have made internet an integral part of their everyday life without which they are helpless. Internet of things (IoT) provides a platform that allows devices to connect, sense and control remotely across a network infrastructure. In this paper we focus on home automation using IOT. The IOT devices controls and monitors the electronic, electrical and the mechanical systems used in various types of buildings. The devices connected to the cloud server are controlled by a single admin which facilitate a number of users to which a number of sensor and control nodes are connected. The admin can access and control all the nodes connected to each user but a single user can control only the nodes to which the user itself is connected. This whole system using Internet of Things (iot) will allow mobile devices and computers to remotely control all the functions and features of home appliances from anywhere around the world using the internet connection. The system designed is economical and can be expanded as it allows connection and controlling of a number of different devices. Advancement in technology has not only transformed our life but also extended in every sphere of our way of living. Most of the electronic devices are manually monitored on regular basis to ensure the optimal operation. To install new application specific devices not only increases the cost but also replaces the old device. Here we propose a system, which can monitor and schedule any old electronic device through a mobile application and its operation can be optimized by saving time and energy.*

Keywords: Arduino UNO, ESP wi-fi module, Thing speak, relay module.

I. INTRODUCTION

With the advancement of automation technology, life is getting simpler and easier in all aspects of life. In today's world automation systems are been used everywhere rather than those complex manual systems Here our project deals with such an automatic kind of system called as the Home Automation which is also considered as an important application of internet of things. With in rapid increase of the number of users IOT is considered as an emerging internet technology

As we all know an automated home is called as a smart home. A home automation system will monitor/control home attributes such lighting, climate and other appliances. It may also include security such access control and alarm system. When connected with the internet, home devices are an important constituent of the IOT. An home automated system typically connects all the controlled devices to a central hub or gate way.

Now – a – Days the home automation systems are getting popular with the everyday use of internet. It is considered as one of the power saving system, with the use of such automated system we can also save our time and that time can be utilized for doing some productive work. Let us consider an example, that in the morning you are in a hurry leaving for office and half a way you realize that you forgot to switch the fan, now rather than going back home and turning it off you can turn it off through the servers by connecting it to the servers this saves you time and electricity too. Another example is that we have to start our motor daily to fill the overhead water tank. The motor is kept ON till the tank gets overflowed. This is wastage of water and energy. If we can schedule the motor prior, will turn it ON and after some time we will turn it off, then it will save a lot of water and energy. So, we aim to design a system which can overcome these issues and provide protection from damage saving time and energy.

With the help of traditional mechanisms of security and safety and intelligent monitoring and control smart homes are managed. The paper will gives an overview about how a smart home can be made with help of present technologies.

II. LITERATURE SURVEY

Paper 1: Development of Smart Home System to Controlling and Monitoring Electronic Devices using Microcontroller, H Maulana and M R Al-Jabari

The paper shows they study to build Smart Home system using a microcontroller for controlling and monitoring electronic devices. There are 4 stages of building the system, it starts from Information gathering to generate user specification requirements, followed by assembling hardware, developing software, and system testing using black box testing and user acceptance test. The built system utilizes Microcontroller that equipped with Wi-Fi module so the user can use the system to monitor usage of electronic devices that exist in their home and also can control the electrical appliance via the internet. Based on the results of system testing, Smart home system to control and monitor electronic devices using the microcontroller. More than 80% of user agreed that this system can reduce the power consumption and save time used by homeowners to check electronic devices before doing an activity outside the home. With this system users no longer feel worried about the status of their electronic Devices while doing activities outside the home.

Paper 2: A Mobile Application for Smart House Remote Control System, Amir Rajabzadeh, Ali Reza Manashty, and Zahra Forootan Jahromi

In this paper they presented an overview of the Smart House subsystems necessary for controlling the house using a mobile application efficiently and securely. The sequence diagram of the mobile application connecting to the server application and also the use- cases possible are presented. The designed mobile application was implemented and the important sections of it were described. The facilities to manage the scheduled tasks and defined rules are also implemented in this mobile application that was developed for use in Windows Mobile platform. This application has the capability of connecting to the main server using GPRS mobile internet and SMS. This system is expected to be an important step towards a unified system structure that can be used efficiently in near future regular houses.

Paper 3: Design and Implementation of a WiFi Based Home Automation System, Ahmed El Shafee, Karim Alaa Hamed

This paper presents a design and prototype implementation of new home automation system that uses Wi-Fi. The proposed system consists of two main components; the first part is the server (web server), which presents system core that manages, controls, and monitors users' home. Users and system administrator can locally (LAN) or remotely (internet) manage and control system code. Second part is hardware interface module, which provides appropriate interface to sensors and actuator of home automation system. Unlike most of available home automation system in the market the proposed system is scalable that one server can manage many hardware interface modules as long as it exists on WiFi network coverage.

Paper 4: Appliance Scheduling Optimization in Smart Home Networks, Fatima Qayyum, Naaem Muhammad

In this paper, they proposed a solution to the problem of scheduling of a smart home appliance operation in a given time range. In addition to power-consuming appliances, they adopted a photovoltaic (PV) panel as a power-producing appliance that acts as a micro-grid. An optimization algorithm, which can provide a schedule for smart home appliance usage, is proposed based on the mixed-integer programming technique. Simulation results demonstrate the utility of our proposed solution for appliance scheduling. They further show that adding a PV system in the home results in the reduction of electricity bills and the export of energy to the national grid in times when solar energy production is more than the demand of thehome.

Paper 5: An IOT Based Home Automation System using Android application P. Shiva Nagendra Reddy ,P. Ajay Kumar Reddy

There are several platforms for developing smart phone applications such as Windows Mobile, Symbian, iOS and Android. In the proposed system, the Android platform app is developed as most of the phones and handy devices support Android OS. Java programming language using the Android Software Development Kit (SDK) has been used for the development and implementation of the smart home app. The SDK includes a complete set of development tools such as debugger, libraries, and a handset emulator with documentation, sample code and tutorials. Eclipse (running on Windows 7 development platform), which is the officially supported integrated development environment (IDE) has been used on in conjunction with the Android Development Tools (ADT) Plug-in to develop the smart home app. [8][9] The designed app for the smart home system provides the following functionalities to the user: • Device

control and monitoring. • Scheduling tasks and setting automatic control of the smart home environment. • Password change option. • Supports voice activation for switching functions

III. SUMMARY OF LITERATURE SURVEY

- In the first paper, they used microcontroller to control all electronic devices in 4 stages. These stages were information gathering, assembling hardware, developing software, and system testing. All electronic devices were connected to internet with inbuilt Wi-Fi of microcontroller. Using these system power and time can be saved.
- In the second paper, they used mobile application for home automation so as to control all the application in their houses. They designed scheduled tasks and predefined rules in the mobile application so as to achieve optimum usage and performance. They used mobile internet to connect the server so as to control all devices.
- In the third paper, they used wifi to interface between electronic devices and the server. They divided this system in two parts, one is the server which controls and monitor the entire system and other one is hardware which performs task based on inputs given by server using different sensors and actuators.
- In the fourth paper, they proposed a solution for scheduling of a smart home appliance operation in a given time range. They used an optimization algorithm, which can provide a schedule for smart home appliance usage, is proposed based on the mixed-integer programming technique. By using this system power consumption can be reduced.
- Wi-Fi technology was used to control the devices which uses an application on your smart phone, the system can be controlled even remotely. Disadvantage: Since a Wi-Fi module is used the application that is used to control the home appliances need to be connected to the internet at all times.

IV. SYSTEM DESIGN AND IMPLEMENTATION
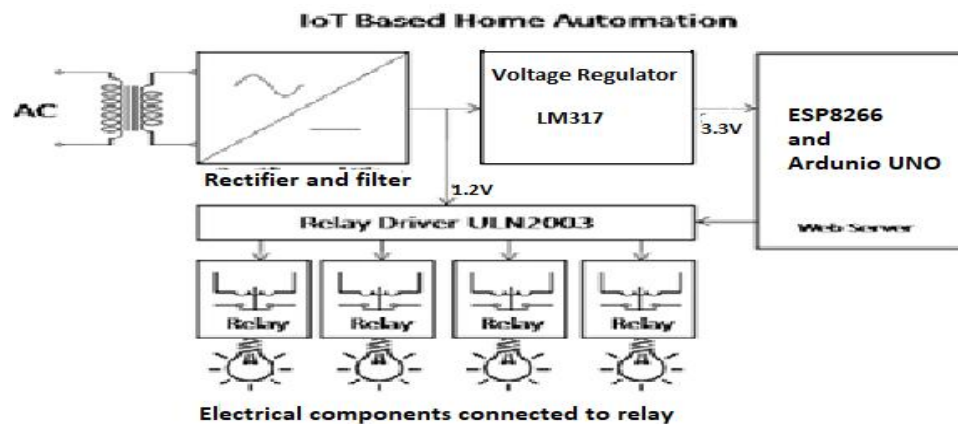
The working of our project is as follows

- There is an Arduino UNO board which plays the crucial role in the setup all the other components are programed through this UNO board
- We will be providing an interfacing of Arduino UNO with the WIFI module ESP8266. This module has a range of 300m
- There is an relay driver IC ULN2003 which will be acting as on/off switches for all the external components that we will be connecting.
- After this we will be coding our UNO board using Arduino IDE and the setup is ready to be tested. By using thingspeak as a cloud platform the user will be able to control all the home appliances from remote location.
- There is an LCD display provided to display all the results to the user along with flexible delays, apart from the LCD provided in the setup the user can also receive all the messages on this or her cloud account that which application is currently ON ant the time duration for which it is switched ON.
- The cloud platform can make it one of the best application of IOT as it is currently an enabling technology of Internet Of Things

V. FLOW CHART
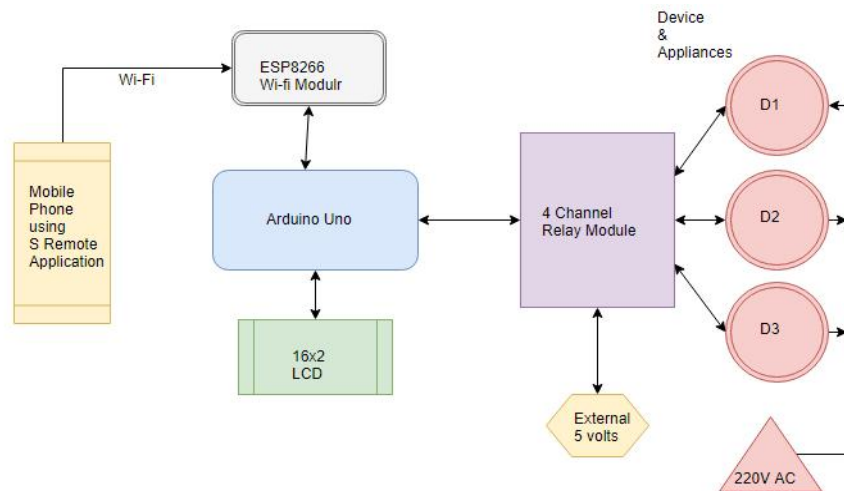
VI. SYSTEM DESCRIPTION

6.1 Arduino UNO

Arduino Uno **is a** microcontroller board based on 8-bit ATmega328P microcontroller. Along with ATmega328P, it consists other components such as crystal oscillator, serial communication, voltage regulator, etc. to support the microcontroller. Arduino Uno has 14 digital input/output pins (out of which 6 can be used as PWM outputs), 6 analog input pins, a USB connection, A Power barrel jack, an ICSP header and a reset button.

- Operating Voltage: 5 Volts
- Input Voltage: 7 to 20 Volts
- Digital I/O Pins: 14 (of which 6 can provide PWM output)
- UART: 1
- I2C: 1
- SPPI: 1
- Analog Input Pins: 6
- DC Current per I/O Pin: 20 mA
- DC Current for 3.3V Pin: 50 mA
- Flash Memory: 32 KB of which 0.5 KB used by bootloader

6.2 ESP8266 WiFi Module

The ESP8266 is a low-cost Wi-Fi microchip, with a full TCP/IP stack and microcontroller capability, produced by Espressif Systems in Shanghai, China. The chip first came to the attention of Western makers in August 2014 with the ESP-01 module, made by a third-party manufacturer Ai-Thinker. This small module allows microcontrollers to connect to a Wi-Fi network and make simple TCP/IP connections using Hayes-style commands. However, at first, there was almost no English-language documentation on the chip and the commands it accepted The ESP8285 is an ESP8266

with 1 MiB of built-in flash, allowing the building of single-chip devices capable of connecting to Wi-Fi. These microcontroller chips have been succeeded by the ESP32 family of devices, including the pin-compatible ESP32-C3.
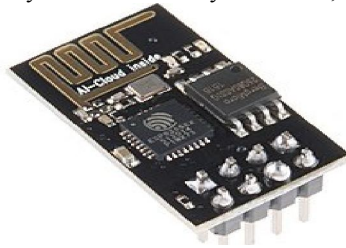
6.3 LCD Display

Liquid crystal display (LCD) has material which combines the properties of both liquid and crystals. They have a temperature range within which the molecules are almost as mobile as they would be in a liquid, but are grouped together in an order form similar to a crystal. The LCD display also possesses 64 bytes of Character-Generator (CG) RAM. This memory is used for characters defined by the user. Data in CG RAM is represented as an 8-bit character bit-map. Each character takes up 8 bytes of CG RAM, so the total number of characters, which the user can define, is eight.

6.4 Relay Module

Relay is an electromechanical device that uses an electric current to open or close the contacts of a switch. The single-channel relay module is much more than just a plain relay, it comprises of components that make switching and connection easier and act as indicators to show if the module is powered and if the relay is active or not.

- Supply voltage – 3.75V to 6V
- Quiescent current: 2mA
- Current when the relay is active: ~70mA
- Relay maximum contact voltage – 250VAC or 30VDC
- Relay maximum current – 10A

VII. TEST RESULTS

The basic software model of iot based home automation is developed. Arduino interfacing and cloud is being used for the process of storing and processing data. The pcb design of the product is simulated and printed. The hardware interfacing of appliances and cloud network is completed. After the successful completion of all the connections of the components to the server the data is send to the server for monitoring the system. By entering the proper IP address of the server, the web page will appear. The server gives the information of all the appliances connected in the house and the current state of the components that if theyare in ON or OFF state

VII. CONCLUSION

The paper gives an overview about smart home which was managed with the help of iot technology. It specifies various technologies used for executing the project. As every class of society has the right to secure their home

considering this the project was made pocket friendly for everyone. The paper also gives an overview about the future scope of the project. In future home automation will be widely used

IX. FUTURE SCOPE

In future the homes will be automated with the help of several technologies such that minimal manual interaction will be used. Not only the internal devices or equipments but also the surrounding of the house which includes parking as well as gardens will be managed with the help of this technology. Home automation will not only help us to manage our houses but will also by the health care services this will be mostly beneficial for the elderly and the disabled. The advancement in technology will help in controlling, monitoring and securing your home. As we know the technology is growing day by day and hence the houses of tomorrow will always be wisely automated as compared to today

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