

Controlling of Home Appliances Using Internet of Things

P.V. Leela Siva Prasad¹,

G. Sai Mounika, J. Lakshmi prasanna ,

G. pravallika, G. Ramu, K. vamsi Krishna²

¹Assistant Professor of ECE, SACET, CHIRALA, AP, INDIA.

leela.prasad0@gmail.com

²Under graduate students of department of ECE,

ST.ANN'S COLLEGE OF ENGINEERING AND TECHNOLOGY, CHIRALA, AP, INDIA

gmounika964@gmail.com, prasanna2451997@gmail.com, guntipravallika97@gmail.com, ramugunji74@gmail.com,

kasturivamsikrishna@gmail.com.

Abstract—In this new millennium of modern technology, everything is getting automated. Manual work is replaced by machines which reduced the burden on human beings. Nowadays humans have made internet an integral part of their everyday life without which they are helpless. Internet of Things (IoT) is a network of networks in which each object is identified by a unique identity that allows devices to connect, sensed and controlled remotely across a network infrastructure. In this paper we focus on controlling of home appliances by using internet of things. The devices connected to the cloud server are controlled by admin by giving commands. The controlling can be done by using Arduino. This whole system using Internet of Things (IoT) will be used to control home appliances from anywhere in the world by using internet connection. The system designed is economical and can be expanded as it allows connection and controlling of a number of different devices. Internet of Things (IoT) is an emerging technology that is making our world a global village. An IoT based Home automation is also one of such examples. In IoT based home automation various things such as lighting, home appliances, computers etc., all are connected to the Internet and allowing user to monitor and control things regardless of time and location constraint. This paper uses ThingSpeak IoT Platform for controlling home appliances through internet. The proposed system presented in this paper is used for controlling of home appliances through Internet of Things (IoT).

Keywords— *Internet of thing (IoT), Home automation, Cloud computing, Wi-Fi Module (ESP8266), Arduino.*

I. INTRODUCTION

The recent scenario shows that humans are discovering new methods which will reduce human work and increase comfort. Research had been going on new technologies exploring new facts which are useful for humanity. In olden days the invention of machines itself is great achievement. But later controlling of that machines by using remotes is a new invention and now automation means we can control things from anywhere by single click through internet. The meaning of automation changes with time based on technology. As internet became a part our life everything is connected to internet. Because internet provides advantages like flexibility, unlimited storage, accessibility etc., In 1990's almost every home consisted of electrical appliances such as television, heater, air conditioner, washing machine, induction, electronic security systems and other electronic and electrical devices but they are manually operated making a smart home but now smart home means all the appliances can be controlled through internet automatically. According to a survey in 2011 IOT is mainly used for the development of smart cities and digital agriculture. According to China Communication Standards Association IOT is three layered structure: The first layer is called sensing layer which is mainly used for collecting information; The second layer is network layer which is used for information transmission and processing and The third layer is application layer which is used for storage and decision making [1]. The main concept of

Internet of things is that it can create a virtual connection between a hub or a network and electronic and electrical objects. It is also used to exchange the information between different devices by using sensors, software, actuators. To establish connection between devices we use wireless communication technologies such as Wi-Fi, Bluetooth etc., and cloud computing technologies, like IOT, smart home is possible and it's main goal is to make devices more aware, interactive and efficient for a better and safer world [2].

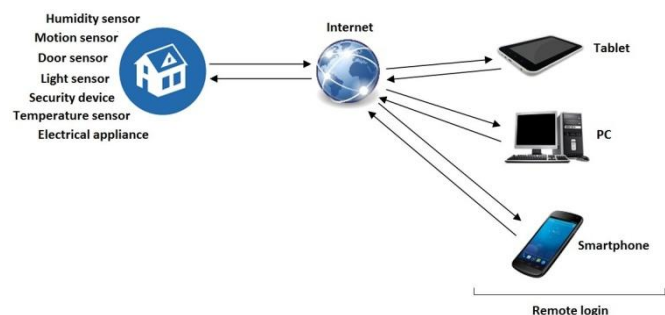


Fig. 1: Proposed home automation system

As IOT technologies have evolved in recent years, most of the older inventions started adopting the IOT technologies for

using their advantages that's why at present these technologies are used in most of the applications of people's daily routine. The IOT technology had become more popular because nowadays humans are using internet mostly which had raised the standards of living and also the standards of mobile communications[4]. In this emerging field of internet of things, sensors are used to collect information and a hub or controller is used to control all the sensors [5]. The demand for home automation through internet of things has increased because of flexibility to access from anyplace and also due to the popularity of internet [6]. The IOT has disadvantages like security issues. [5]. So researchers are finding methods to increase the security [7]. Based on internet of things some new technologies are going to be the most effective in future. they are wireless sensor networks, nanotechnology, miniaturization [8]. With the development of technology the world had become a small village so even you are at miles of distance away from your home you can control your appliances very easily irrespective of distance because we are internet [9]. Recent advancement in cloud computing and data analytics allows intelligent systems to process and analyze the data in a more efficient manner [10]. As internet has its disadvantages besides advantages like security issues there is a small risk in connecting home appliances to internet. Home automation through IOT is a forward step because here in this model the appliances can be controlled by a single application programming which uses Internet Protocol (IP) addresses, and used to control appliances by using IoT web platform [3]. New methods are developing in home automation mainly based on two concepts they are compatibility and usability. Using these IoT technologies in fields like wearable electronics and collecting information from security cameras needs safety because the information should be confidential. So secure communication has to be focused. The sensors advanced sensing functionalities and their increasing accuracy enable the development of smart home applications that offer advanced automation. The most essential element that is required for making a smart home is an IOT based information centre which will act as a platform for the architectural building block of the whole system. The IOT architecture enables smarter, connected and personalized healthcare and wellness services to the persons in smart homes. IOT based home automation is applying new technology to make the housework and household activities more convenient, comfortable, healthy, green, safe and economical. A Gesture-based control, using vision or wearable sensors, is another important branch of IOT based remote control. Connectivity is the backbone of IoT that is established by communication standards variety of wireless network protocols are being used in smart home applications. In the IOT networks, some of the devices are embed on quotidian objects and therefore they must have small size, restricted computational resources and energy constraints [3]. In Fig 1, it shows that internet is connected to both home as well as the other devices such as either mobile or laptop or computer. By using this internet all home appliances are controlled with the help of IoT platform. Here we use different type of internet there is no need to connect the same internet to home as well as client. We can operate it from anywhere in the world. So here the main essential elements are IoT platform and Internet.

II.SYSTEM ANALYSIS

A. Proposed system feature

In this paper the designed model of home automation satisfies the requirements of human beings in today's world. The main advantage of our model is flexibility i.e., we can control the home appliances from anywhere easily. Sometimes we may forget to switch off our home appliances which will result in power wastage. By using this we can reduce such power wastage. To control these appliances we are using Arduino and a Wi-Fi module for connecting it to internet. We have different IoT public platforms to use. we have used thingspeak. On that public platform we can create our channel based on our requirements. we can make our channel private or public based on application. As home is a private property we made it private. For applications like industries, factories we can make it public. It needs an login id and password to enter the thingspeak account .we have to be careful to set a strong password for security purpose. In present world saving power is a major issue on which most of the countries are focusing. our home automation system provides 100% efficiency as it saves time, helps to manage energy consumption which in turn saves money and provide optimum security to the user making the user's home a safer and a smarter place to live in.

B. Network architecture

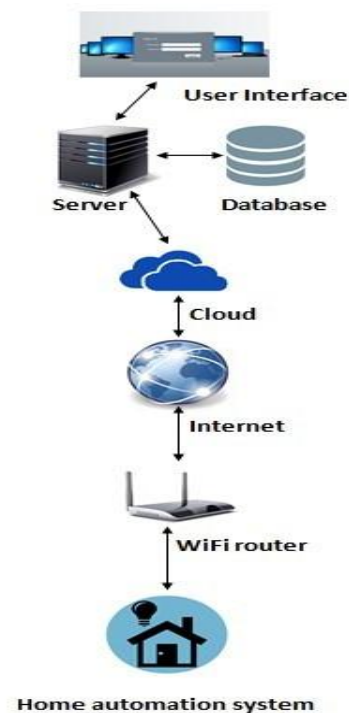


Fig. 2: Network architecture

From Fig 2, server is the heart of the above network architecture. The main component for any IoT rooted operation is server. In this paper cloud server is used for data storage and control. Here we need to create a virtual connection between the server and the IOT devices. Here we used point-to-point web socket for many ways to make a internet connection. For communicating with IoT devices we used a programming language known as PHP which is used to create the point-to-

point web socket and a web application and is used for taking logical decision. By this internet connection is done between the home automation system and the server. From these connection IOT devices will be able to send and receive information to the cloud server. Here the received data of the server is stored in the database and is present along with the server. With the help of the web browser the user may go through all the data stored in the database of the server at anytime. For providing security to our devices an unique login id and password is provided to each user at the time of installation. In thingspeak platform it provides user id as well as one link to control the devices. By using this login id and password or by using that link any user can go through the data of their connected devices and can change the status of the appliances like fan, light etc. The above devices should be connected to the main server only the admin can have the access to change the status of any devices connected to the main server. The above operation should work only when the internet connection is available. If there is no internet access then the whole system operation does not work and it shows an error. Here internet plays the major role and it is the heart of the whole system. This proposed model will provide full security when the IOT devices and the user are connected to the internet.

III.SYSTEM DESIGN AND IMPLEMENTATION

A. Software design

For creating a point-to-point web socket and a web application PHP programming language is used. After creating the socket, with the help of the internet connection it is connected to the cloud server. Check whether the whole system is in online or not, make sure that the whole system should be in online. After it is connected to the internet it gives us the notification. As we are using public free platform i.e thingspeak in this we can control the appliances by using the link and that link clearly shows the status of the devices. If the user want to change the status of devices he/she need not to login to their accounts by using this link they can change their status of the devices. When we are changing the status of the devices it will refresh the data and it can change the status as we required. Here the refreshed data will be send to the control user interface. The refreshed data in the control user interface should be displayed on the control screen. In this platform after the creation of account there is no need to login expect for the creation of new channels. All appliances can be controlled by using that link. Here the user can send the command to the connected IoT devices. User can control all the electrical and electronic appliances in every part of the home. By clicking on that link we can change the status of each appliances. This will continues until the internet is connected to the IoT devices.

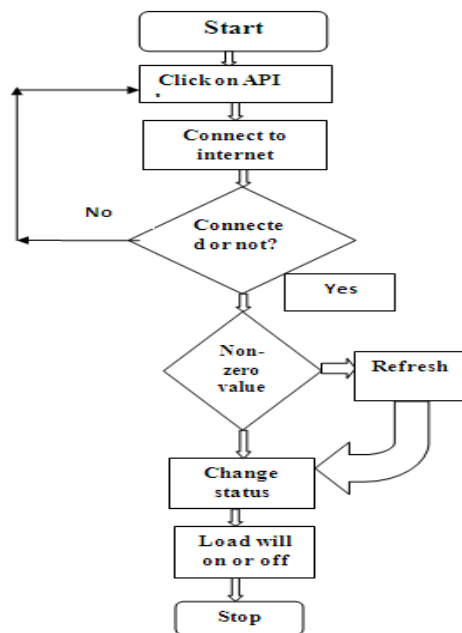


Fig. 3: Flowchart for IoT platform

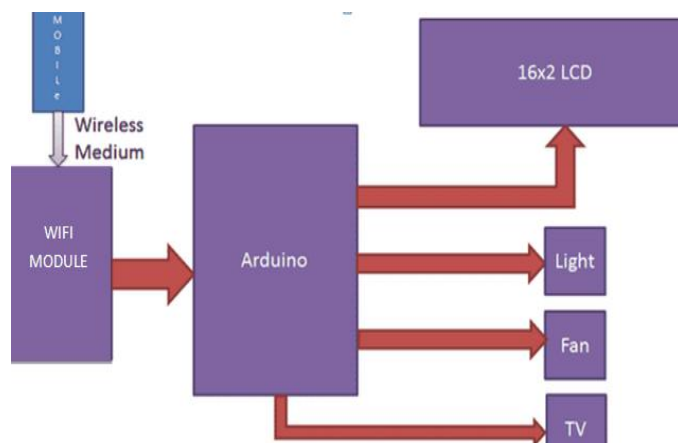


Fig. 4: Functional block diagram

The total working process of software design is as shown in Fig 3. If we are connected to the internet then it will send notification. If the design is not connected to the internet make sure that the design is connected to internet. When the internet is connected to our device it will send some notifications like non zero value. If the zero value is present then reset the API key. Then after change the status of the loads. So that devices may turn on or off according to the status.

In functional block diagram (Fig 4) we are using LCD display for showing the status of each device. Here we connected the devices like fan, light, TV. Not only these three devices we can connect any home appliances to this circuit. The main component we used in block diagram is Arduino which will take commands from Arduino through wireless medium. Clearly Fig 4, shows the functional block diagram and working

of hardware design. In fig 4, all loads acts as relays to control all relays we need a relay driver as shown in Fig 5.

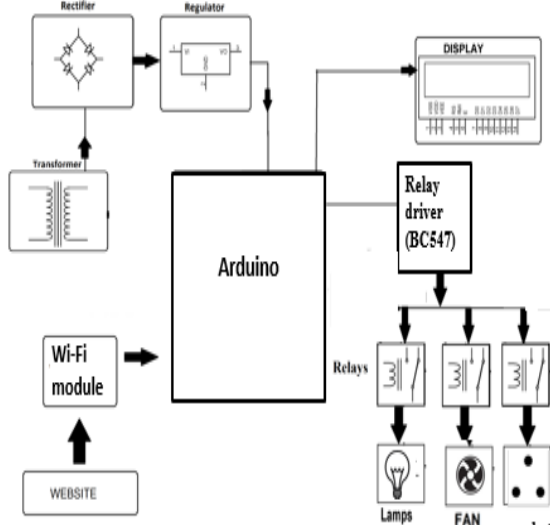


Fig. 5: Basic block diagram of controlling of home appliances using IoT

The full description of this project is shown in Fig 5. Here we are using step down transformer and rectifier which is used to convert alternating current into pulsating direct current. For the controlling of voltage regulator is used. After connecting the hardware design by using website we can control all the appliances in home.

B. Implementation setup

Here we have designed an experimental setup for controlling of home appliances using Internet of things (IoT) as shown in Fig 6. In the experimental setup the main components we used are Arduino and relay driver. Here BC547 transistors acts as relay drivers because of its switching capability. We have tested home appliances on our experimental setup. This experimental setup is worked without any errors.

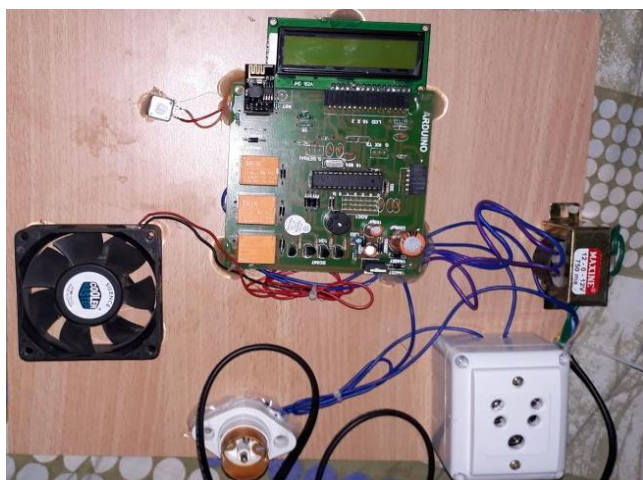


Fig. 6: Experimental setup

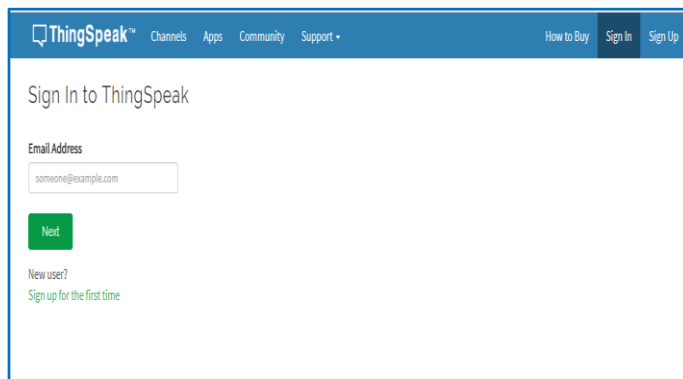


Fig. 7: Login screen

Fig 7 shows the login screen for IoT platform. Here we are using thingspeak which is used by all. In this platform we need to create an account for controlling our home appliances. In case we does not have an account in this website we can create an account as new user. So that we can easily control our devices through this website. This platform is not only used for Arduino analysis. It is also used for MATLAB analysis because it is the open IoT platform which is as shown in fig 8.



Fig. 8: Main screen

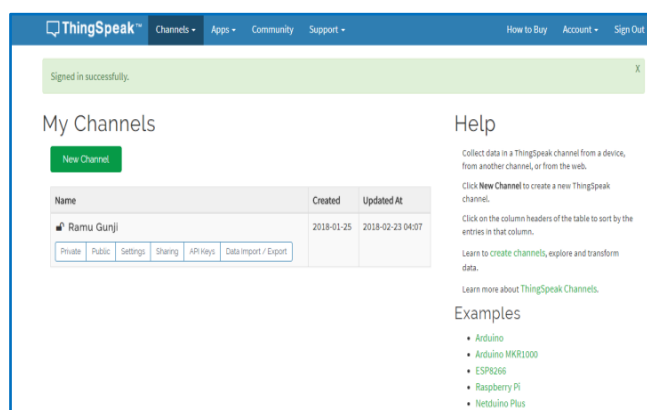


Fig. 9: Main home-automation system web-page

Fig 9 shows that how to create new channels using different devices and it is the main home automation web page. After login into the thingspeak the webpage which we obtained is as shown in above figure. From fig 9 we can create new channels and we can also do new projects on this platform. Iot platform supports many type of components like Arduino, Micro controller, Raspberry pi, MATLAB etc. Here we selected Arduino due to its low cost as well as for easy understanding.

IV.RESULT

Here in this project we have developed an home automation system which was tested by using some devices for many houses by using internet. After keeping the circuit the user install the software in their respected laptops or smart phones. After the software is installed the user have to login/signup in the things peak website. The user have to create the channel in their respected website user who are registered in the website will get a unique id .After creating the channel the website will provide an unique id and password to the users .For handling the appliances each house must have a internet connection.Once the user get their login id and password they can continue with the created channel. When user start the application first a login page will appear as shown in fig.[7]. It will shows whether the user was successfully login. After the user login or logout a home page will appear in which the user can control all their devices connected to the server. Our designed model of home automation can also controlled by using any API key. To operate home automation system user need to go web-page of home automation system then a login page will appeared as shown in fig. [7]. By login to the page the main home automation page will apper as shown in fig. [9] . In this page the user can control their appliances and they also change their security settings. It is possible only when the database is present in the server and the data will also received from the server. After creating an account in thingspeak they provide one link to the user. So that the user may easily control the appliances by using that link and the user can turn off or on the any appliances which are connected to the circuit. This project provides 100% efficiency and make the home smarter. The designed model of the circuit can be operated from anywhere in the world. IoT platform should provide one link by using that link we can operate all the home appliances which are connected to the internet. By using this paper we can say that it will provide 100% efficiency in terms of security as it has a single user who can control all the connected devices by using internet.

V.CONCLUSION

In this paper we mainly focus on controlling of different types devices like machinery, Equipment and other electrical and electronic appliances. This project provides 100% efficiency with low cost. The controlling of such appliances are called as automation which reduces the human work. Internet is the integral part of everyday life for human beings. The experimental setup should totally worked based only on internet. Internet of things is the emerging technology which includes some platforms. These platforms helped us to control

our home appliances using internet. Here this platform will create a network between main server and the loads. By this we can control home appliances very easily and it makes our home smarter to live in. Many IoT paltforms are available for using this we require one user that user must and should have login id and password regarding that platforms. So that our network becomes more secure. And only that user have the authority to change the status of devices. By increasing the number of users under the admin may increase the complexity of the network. The proposed system can be implemented as per user requirement.

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P. V. Leela Siva Prasad is presently working as Assistant Professor with four years of experience in the Department of Electronics and Communication Engineering in St. Ann's college of engineering and technology, Chirala, Andhra Pradesh, India. Completed M.tech from Acharya nagarjuna university and completed B.Tech from Jawaharlal Nehru technological university, Kakinda. Attended four IEEE conferences and published six papers in different National and International journals.



G. Sai Mounika is presently pursuing final semester B.Tech at St. Ann's college of engineering and technology, Chirala, Andhra Pradesh, India.



J. Lakshmi Prasanna is presently pursuing final semester B.Tech at St. Ann's college of engineering and technology, Chirala, Andhra Pradesh, India.



G. Pravallika is presently pursuing final semester B.Tech at St. Ann's college of engineering and technology, Chirala, Andhra Pradesh, India.



G. Ramu is presently pursuing final semester B.Tech at St. Ann's college of engineering and technology, Chirala, Andhra Pradesh, India.



K. Vamsi Krishna is presently pursuing final semester B.Tech at St. Ann's college of engineering and technology, Chirala, Andhra Pradesh, India.