Automating Home using IoT

Vaibhav Bishnoi[1] Prakshali Jain[2] Manvi Jindal[3] Prashant[4] Nidhi Tyagi[5]
[1,2,3,4]Student [5]Faculty
[1,2,3,4,5]Department of Information Technology
[1,2,3,4,5]MIET, Meerut, India

Abstract— In today's world, the automation is a significant player in the field of technology and plays an important role in each and every individual's life. As time is considered equivalent to money and technology is a boon to reduce human efforts, every individual want to get the work done in fast, time saving manner which demands less efforts and make things as easier as possible. Smart home automation paves the way to have the "things" in your homework automatically, which will make one's life even more comfortable. In today's era of 21st century, many of the things are becoming automated. As technology is advancing so does houses and they are also getting smarter. This research paper discusses the fundamental of IOT (Internet of Things), which is a new burning technology in the market and a design for home automation system that makes the home smart.

Keywords: Automation, Arduino, Microcontroller

I. INTRODUCTION

Today's era is the era of automation. In 21st century, many of the things are becoming automated. With advancement of automation technology, all the aspects of life are getting more simple and smart. Now a days, automatic systems are being preferred over manual system due to its property of being operated on their own and requiring less human involvement. Over the past decade, there is a rapid increase in the number of users of internet and now internet has become the Internet a part and parcel of life, and IOT is the one of the latest and emerging internet technology. IOT is a network of everyday object which can communicate and exchange data -from industrial machine to consumer goods. All such everyday objects can communicate to each other, share information and complete their task without your involvement. This characteristic makes the things "smart".

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. This process is called HOME AUTOMATION and such home is refffered as smart home. It is mean to save the electric power and human energy. The home automation system requires the internet connection and using that an authenticated user can operate the system in the way he wants from anywhere around the globe. This is what makes the Automated system differ from the other conventional systems.[1]

The paper presents a Home Automation System using ARDUINO via IOT that employs the integration of arduino programming, cloud networking, wireless communication, provide the user with remote control of various lights, fans, and other appliances within their home. This system is designed to be low cost and expandable allowing a variety of devices to be controlled. Figure 1 represents the general block diagram of home automation. Where number of appliances are connected to the Wi-Fi enabled microcontroller. As technology is advancing so houses are also getting smarter. The houses are generally converting from normal switches to automatic controlled switches or system which involves wireless control devices. Figure 1 shows the general block diagram of Home Automation.

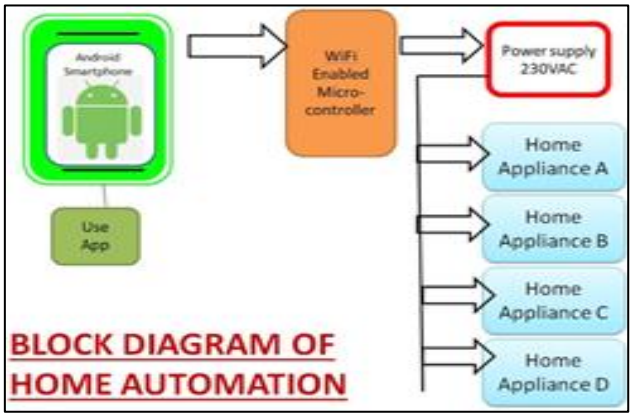

Fig. 1: Block Diagram of Home Automation

The home appliances are can be the fan, light, washing machine etc. The user can switch on/off or increase/decrease the speed of fan, turn on or off light and many more appliances at home through smart phone or tablet. So this is implemented using ardunio board, IDE and relay. The devices are controlled through different wireless communication standards such as Blue-tooth, Zig Bee, GSM are used by the home automation system to exchange the data. In earlier days conventional wall switches which were located in different parts of the house, makes it difficult for the user to go near them to operate. It becomes more difficult for the elderly or physically handicapped people to do so. Automation helps to make the things easier, save time, and reduce efforts. To control and monitor the houses through Internet requires big and heavy computers. Use of mobile phones or tablet help to controlled the appliances where ever needed. This helps to reduce the installation cost, reduce human efforts and becomes more scalable and flexible. Android based home automation helps the user to provide secure and configurable home automation system.

IOT (Internet of Things) may be defined as a networking of physical objects that contain electronics implanted within their structural design in order to communicate, sense and interact among each other or with respect to external environment. IOT is connecting everyday things embedded with electronics, software and sensors to the internet enabling them to collect and exchange data. IOT can also be seen as unification of technologies such as low power embedded systems, cloud computing, big data, machine learning and networking.[1]

II. IOT TECHNOLOGIES

Several well-known technologies correlates and combines to make the IOT technology work efficiently. [1]

- Low power embedded system. There are some embedded hardware system such as Raspberry pi, Intel Galileo etc. which has low power consumption and high performance. These technologies go hand in hand to increase the opportunities for application developers to deploy systems that require few, battery changes and reducing the lifetime cost of deploying wireless sensors.
- Cloud computing. When the IOT generates large amounts of data, there are many cloud service providers which allow data transfer through the internet, that means facilitates a way to navigate the data. Cloud computing enables user to store, manage and access the data and programs from a centralized location which can be accessed from anywhere and anytime.
- Big data. Big data implies a large set of structured, unstructured or semi-structured data and helps analyzing those data to get the idea and references for the business requirements. The role of big data in IoT is to process a large amount of data on a real-time basis and storing them using different storage technologies.
- Networking connection. The basis of IOT technology is Wireless Sensor Networking. A sensor network is a network of many disposable, active and low-power devices also called nodes. These nodes can be anything of the real world that can sense, process and communicate. A wireless sensor network consists of wireless sensor nodes connected wirelessly. These sensor nodes consist of sensing, computing, communication, actuation and power components.

III. ARDUINO

The Arduino Uno is an open-source microcontroller board based on the Microchip ATmega328P microcontroller. The board is equipped with sets of digital and analog input/output pins that may be interfaced to various expansion boards (shields) and other circuits. The board has 14 digital I/O pins, 6 analog I/O pins, shown in figure 2, and is programmable with the Arduino IDE (Integrated Development Environment), Arduino boards are able to read inputs - light on a sensor, a finger on a button, or a Twitter message - and turn it into an output - activating a motor, turning on an LED, publishing something online.[2][4]

Fig. 2: Arduino Board [2]

IV. PROPOSED HOME AUTOMATION LAYOUT

Approach taken is to automate the day-to-day activities which consumes human time and energy. There are different modules in the layout as discussed below:

A. Plant Monitoring & Control System

In this system, we have used different components like LDR (light Dependent Resistor), DHT11 (Digital Humidity and Temperature), arduino board, etc. The purpose of this is to detect and alert the user about the adverse effects of extensive light, temperature and humidity and also to facilitate watering of plant automatically whenever needed. [5]

B. Light Going ON/OFF by CLAP

Some 5 to 10 years back one can't imagine that just by clapping we can switch the lights, fans, etc. On and Off. Well, in this system we are going to make this happen in real life. This could happen by using the sound sensor. When we clap there is a sound generated by our hands. The sensor on sensing this sound will generate some visible output. Isn't it amazing!![4]

C. Smart Dustbin

One thing we hate about throwing garbage in the dustbin is that we have make physical contact to open the lid of the dustbin. Smart dustbin is smart enough to sense the person coming towards it and the lid will automatically be opened. Plus it will indicate that the dustbin is full and it's time for user to empty the dustbin.[8]

D. Smart Washing Machines & Microwave

Standing beside these appliances and waiting for timer to go off is really a tiresome task. What if we have a washing machine smart enough that powers on automatically once the dirty clothe level reaching a specific point? And it automatically goes off after the timer set. Wouldn't it be so time saving? Yes, in this project we are making it happen. [6]

E. Door Locking

This module can be very useful for door security, personal identification, attendance system and much more. The whole system works under a simple algorithm called matching algorithm, which is used to compare previously stored templates of fingerprints against visitor's fingerprints for authentication purposes. In this, only when an authorized person places a finger on the sensor, the door unlocks. [9]

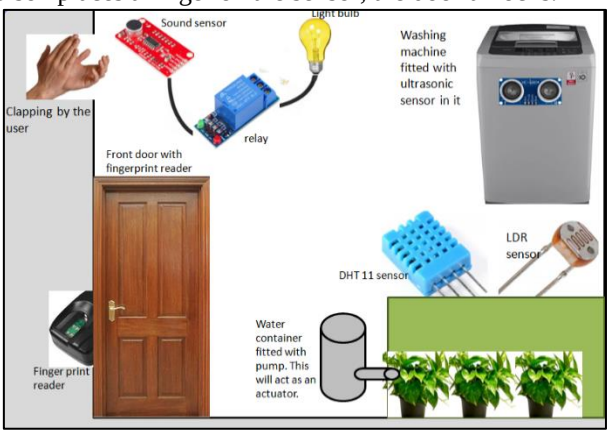

Fig. 3: Home Automation Layout

The following diagram (Figure 3) shows the various modules of the home automation system. At top left corner is the light on/off by clap module. At top right corner is the Smart washing machine module. Below it is the plant monitoring and control system. And at the bottom left corner is the Door locking system using fingerprint senor. Thus, the diagram provides an insight of how such modules can be integrated to make our home smart and make our lives even more comfortable. The above image provides an insight flow the above image provides an insight flow of control in a plant monitoring system. The system will start with reading the data from DHT11 and LDR sensor. The data will be will the temperature and Light intensity being received by the plant at a given point of time. Then the system will check whether the temperature is up to the mark or is higher than recommended. If is it normal the system is stable else the system will make the actuator works and the water will be given to the plants automatically. In such a manner, all other modules will also work.

V. ADVANTAGES OF HOME AUTOMATION SYSTEM

In recent years, wireless system like Wi-Fi, Bluetooth has become more and more common in daily life as well as in home networking. Also in home and building automation systems, the using wireless technologies provide several advantages that could not be achieved using a wired network. Some of them are as follows:[1]

A. Reduced Installation Cost

Wireless technology reduces the use of wires and cables. Installation cost are significantly reduced due to no cabling. Wired solutions requires cabling, where materials as well as the professional laying of cables is expensive.

B. System Scalability & Easy Extension

Adding or replacing a new node to the network becomes easy in IOT. Deploying a wireless network is especially advantageous when, due to new or changed requirements, extension of the network is easy avoiding tedious cabling extensions.

C. Aesthetical Benefits

This attribute helps to full aesthetical requirements as well. For example representative buildings with all glass architecture and historical building where design or conservatory reasons do not allow laying of cables.

D. Integration of Mobile Devices

Associating mobile devices such as PDA's and smart phones with the automation system become possible everywhere in the wireless networks,

VI. CONCLUSION & FUTURE WORK

By applying Home automation system in their home, we can make the life of the people more comfortable. It makes the physical devices smart and it makes them behave like living entities which can sense, communicate and process the information. If added the more advanced features, the system can enhance its functionality. Notifications can be sent to family members on mobile device to control the home appliances remotely, secondly a user can get a SMS on his phone when someone enters his house or when he is out of some grocery item in his refrigerator. All such things is possible using a GSM modem. A GSM modem [7] works as an intermediate between the mobile phone and the smart thing. It is a specialized type of modem in which SIM card can be inserted, and operates over a subscription to a mobile operator, just like a mobile phone. One more exciting variation in smart things is when these "things" are capable of interacting with the mobile applications. Like for example, switching on a washing machine by clicking on the app in the smart phone. For this purpose, one have to establish a web server. The primary function of a web server [3] is to store, process and deliver web pages to clients. Through these web pages the user can interact with the appliance remotely. The communication between client and server takes place using the Hypertext Transfer Protocol (HTTP).

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