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Customizing Home Appliances Using IoT

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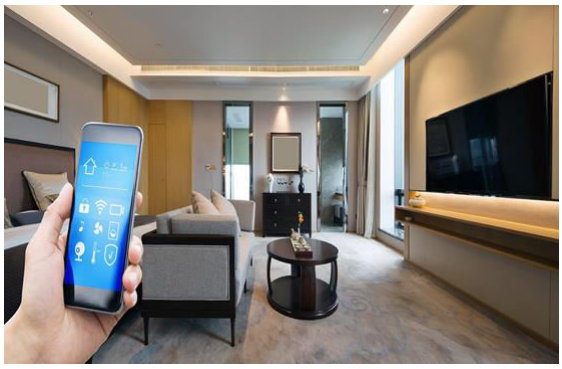
Abstract
Electricity became a part of modern life and one cannot think of a world without it. Electricity has many uses in our day-to-day life. It is used for lighting rooms, working fans and domestic appliances like using electric stoves, A/C and more. All these provide comfort to people. In factories, large machines are worked with the help of electricity. Essential items like food, cloth, paper and many other things are the product of electricity. The Bluetooth wireless technology is set to revolutionize the way people perceive digital devices in our homes and office environment. Now they are no longer just the individual devices; instead, with the embedded Bluetooth technology, they form a network in which appliances can communicate with each other . Today we are living in 21st century where automation is playing important role in human life. Home automation allows us to control household appliances like light, door, fan, AC etc. It also provides home security and emergency system to be activated. Home automation not only refers to reduce human efforts but also energy efficiency and time saving. in one's home helps to promote security, comfort, energy efficiency, and convenience. Another benefit of home automation systems is the amount of labour, time, energy and materials that is saved. The main objective of home automation and security is to help handicapped and old aged people which will enable them to control home appliances and alert them in critical situations. The automation of features Integrating a home with internet is a trending technology going on in today's world. Before we used switches to control the gadgets in our homes, but now in this IoT a mobile application is used to control the gadgets in home like fans, AC, fridge, CCTVs, lights, etc.... This is what which makes it attractive to people. This study aims on the use of IoT in smart homes.

Key Words: Internet of Things, Smart homes, Technology, Home appliances.

Introduction

The term 'Internet of Objects' (IoT) is found in the article by David Brock, who is a researcher in the Auto-ID group. IoT is a concept that seamlessly integrates the virtual world's information technology with real objects. With this technology, the real world becomes more accessible to both business and everyday scenarios through computers and devices connected to the network. IoT, which has a much more potential than managing business processes more effectively and efficiently, also reveals a more comfortable life style [1]. IoT contributes the internet connection and remote management of mobile appliances, incorporated with a variety of sensors. Each and every equipment which we use daily in our homes can be made automated and can be controlled through mobiles. Combining technologies in order to generate a best of breed product, already appear in recent literature in various ways. Merge cloud computing and IoT to show how the cloud computing technology improves the functionality of the IoT. In this chapter we explain the integration of classic smart home, IoT and cloud computing. The traditional wired electric control is a great system, but it can be difficult to Control the areas of access. Often the range of a wireless network reaches outside the physical boundaries of an organization. The concept of remote

controlling is also very the traditional wired electric control is a great system, but it can be difficult to Control the areas of access [2]. Often the range of a wireless network reaches outside the physical boundaries of an organization.



The concept of remote controlling is also very prominently used in home security systems, surveillance systems, intrusion detection mechanisms etc. Also, if we have a large organization or building with several electrical appliances are installed. Home automation based on IoT gives lots of flexibility compared to wired. IoT based automation consists of sensors and servers through which the commands given by us from mobile or wireless switch is reached to the device. coming to the configuration of IoT in your home Wi-Fi and gate way plays key role. The gate way is connected through an ethernet cable in your home. The gateway receives commands and communicates with the output in cloud network. Because of this it is very easy to communicate with gateway through mobile application. All you need is an uninterrupted internet connection 24/7, that to in a range of 2.4GHz [3]. The IoT based home automation consists of several smart devices for different applications of lighting, security, home entertainment etc. All these devices are integrated over a common network established by gateway and connected in a mesh network. Which means flexibility operating features are provided to the customers to operate the appliances. some of the smart sensors in home automation acts as sensor hubs.

These are basically the signal repeaters of signal bouncers which that are located in the midway between the hub installation location and the sensors that are at a distant location. For such long distances, these sensor hubs play an important role to allow easy transmission of signals to sensors that are far away from the main controller but in closer proximity to the sensor hub. The commonly used sensor hubs in IoT based Home Automation system are Smart Plugs. Most of the IoT based Home Automation systems available today work on three widely used wireless communication protocols: Wi-Fi, ZigBee and Z-Wave.

The ZigBee and the Z-Wave controllers are assigned a network ID which is distributed over other sensors in the network. The communication amongst devices take place in a mesh topology where there is no fixed path for the signals transmitted from the controller to the sensors and vice versa [4]. Depending on the availability of the shortest path the signal from the controller will travel to the target sensors either directly or through signal hops. If any intermediate sensor in the pathway is busy or occupied the signal will trace another path within the mesh network to reach the final destination.

Note that sensors with different Network IDs cannot communicate with each other over common channel. The Cloud-based-Networking system involves storage and maintenance of data over the Internet location. This gives users the flexibility to have access to the data from any location on the planet. As a result of this, in IoT based Home Automation systems users over the cloud network can send commands to the hub even from a distant or remote location. The hub will further send the signal for the intended sensors to trigger and perform the user-requested action.

Once the action is performed, the hub will update the status of the action taken to the cloud network and in this way, users can control and monitor every aspect of their smart homes. Real-time monitoring and notifications are one of the key features of IoT based Home Automation systems. Since the hub is connected over the cloud network through the Internet, you can schedule

various events as per your routine activities or daily schedules. The cloud network can receive and store all the user inputs and transfer them to the hub as per the scheduled events.

Once the hub transfers the desired signals to the target sensor and the desired action takes places, it will quickly upload the new status over the cloud notifying user instantaneously [5]. For e.g., the motion sensor will instantaneously notify the user wither through emails, SMS, calls or App notifications when it detects any unwanted motion or intrusion. After receiving such notification, the user can quickly turn on the IP based home security smart camera can check the status of your home even from remote location.

Internet to Work For You:

It is not practically possible to trigger every action one by one in your day long busy schedule. This is where you can put the Internet to work for you. The IF This Then That (IFTTT) Integration helps you in this condition.

This enables you to create cascading effect of actions where the target action will trigger only when the IF condition is satisfied. Some of the examples of IFTTT triggers are like “IF” day temperature above 25 degrees, turn the ACs on and roll-down the curtain blinds. IF Movie Mode is ON, then turn the lights to 10% brightness, IF soil moisture less then specific values, turn the water sprinklers in the garden ON.

There are endless possibilities that you can create with IFTTT triggers and thus make the optimum use of your Home Automation system thereby making optimum use of
energy and simultaneously enjoying a comfortable lifestyle. Every electrical appliance has its own control switch using which a person can turn ON or OFF the appliance. Now, if under circumstances, the user needs to turn ON or OFF the appliances of all or several rooms which might be located far away from each other, it would be little cumbersome.

Controlling Home Appliances from Remote Location:

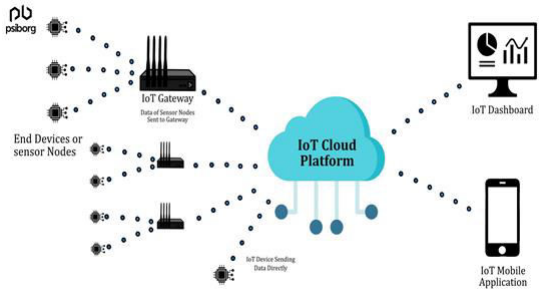
The second feature provided by the home automation system is the remote access to devices and their management. E.g., suppose you are going back to your home and it will take 20 minutes to reach your home. Now u Want to on you AC so that when you reach your home you find your home with comfortable temperature. In such a scenario you need to access your home appliances and also to control them from remote location. The typical structure of home automation system for this type of services is given in below Following are main points to consider about this class of systems:

- Authorizer and Receiver is an electronic system capable to receive the control signal. there exist a number of systems any of them can be used for this purpose. One important thing about this system is that it requires some authorization mechanism to ensure that the request is authorized one. For this purpose, we can use some cryptographic techniques to encode and decode the request so that only authorized user can access the network.
- The decision maker system is an AI based agent that can decide what action should be taken in response to received query. E.g., suppose user just put the query that the room temperature should be x0c. Now, this is the Decision Maker that will identify from its experience that the AC will maintain this temperature. And then it will determine setting of AC regulator corresponding to this particular temperature [6]. Of course, the same system can be implemented by some electronics circuitry but that will be more complex, less flexible and less featured as compared to this learning based (case based) AI agent system.
- The third component of this system i.e., Actuator is similar to the action implementer in the previous system. Microcontrollers as the name suggests are small controllers. They are like single chip computers that are often embedded into other systems to function as processing/controlling unit. For example, the remote control you are using probably has

microcontrollers inside that do decoding and other controlling functions. They are also used in automobiles, washing machines, microwave ovens, toys etc., where automation is needed.

Integrating IOT With Home Appliances

To integrate IoT with home appliances we need a gateway, home-away switch, modular switches, Wi-Fi router with network connection in 2.4 GHz, the load which we want to connect and convert in to automation. Let us take an example of a light. because, now we will give general electrical wiring to a light in a home. We replace the general switches with the automation switches and fix them.



IOT Switches

Gate Way **Home-Away Switch**

We will take a home away switch which comes along with the automation switches as a combo. We will configure the IoT home-away switch with the internet for that we download an application related to the gate way we are using in our mobile. To configure we follow the procedure mentioned in the mobile application. Then the gateway gets configured and later we add all switches to the gate way (The gateway converts information, data or other communications from one protocol or format to another). For all this procedure we require Wi-Fi to get connected with the gate way during its configuration. Then the process of configuration gets completed and the light is ready to operate with both switches provided and with our mobile.

We can create scenes using our mobile application, we can time or lights when to on and when to off using the mobile application, we can also loop lights internally in the mobile application and make all the lights to on at a time. We can operate all this at home by sitting in our office. With this even if we forget to off our light before going to office, we can do it from office by which we can both save electricity and our time. We can operate this from all over the world the only thing we need is that the gate way connected to Wi-Fi. If the internet connection is lost then we can control this using the switches. It is as simple as we connect our mobile to a Wi-Fi.

Let us imagine a situation, A tired software worker returns to their certified IoT smart home after a long working week. The smart security system senses they are alone and initiates the “Friday Night In” sequence. An intercom with a thoughtful, comforting voice suggests they might want to order in tonight [7]. The software worker unloads their things in the kitchen where the smart stove displays a selection of take-outs, rather than its default recipe guide.

After the food arrives they retreat to the living room to watch some TV. The smart TV prepares a selection of Netflix marathons categorized by mood. They choose: “Looking to be cheered up? Feel good Playlist.”

Before starting the program, they review a set of graphs displaying the data from their activity and diet throughout the day. A list of tips for smart living is generated, one of which reads that based on the number of consecutive nights spent alone, they might consider exploring a selection of popular dating sites instead of watching TV.

With an inadvertent slip of their thumb the request is OK'd and instantly a set of profiles are displayed, each chosen from a generated list of their tracked preferences. A flurry of pings and messages from other stay-at-home hopefuls fills the screen. The smart home intercom exclaims, "You've got mail!" The confused and beleaguered software worker fumbles for the remote and… uh-oh, the TV snaps a selfie in response to the flood of pings.

Their image, sitting in their underwear eating noodles appears briefly on the screen before being whisked off into the ether [8]. The flood of messages doubles, the system freezes causing the smart home to reboot. The house goes dark. See how good it is to imagine in the above mentioned situation. IoT makes it that easy to operate your home.

Advantages:

- Managing all of your home devices from one place. The convenience factor here is enormous.
- Flexibility for new devices and appliances.
- Maximizing home security.
- Remote control of home functions.
- Increased energy efficiency.
- Improved appliance functionality.
- Home management insights.

Disadvantages of Home Automation:

- Security Issues.
- Extremely expensive.
- Greater acceptance.

Conclusion

In this study we discussed how the usage of electricity started and how it transformed from switch to remote then remote to Bluetooth and from Bluetooth to ZigBee and finally to automation and how IoT -a type of automation is used in integrating home appliances to make it smart home. We discussed about gateway and also the procedure to configure mobile application with gate way, advantages and disadvantages of integrating home appliances with IoT. we also discussed about how a home actually works with IoT using cloud network, we took an example of a software worker. In this article what all we discussed might just like an imagination but if this imagination comes true this can change the entire century.

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