A Review on Home Automation Technique Based on IoT

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ABSTRACT: Home automation system using the internet of things IoT is one of the topic that is gaining a lot of traction these days. Because it provides a number of benefits that enable individuals to do their tasks quickly and successfully. The term "home automation system" refers to the process of checking, maintaining, and managing all of our home apps and permissions using just our hands and no other machinery. This article discusses several home application approaches and how we can manually operate all of the apps via remote controllers. This method is highly significant in society for all individual, but notably for those who are physically handicapped. This article gives an overview of IoT-based household gadgets that can make life simpler for people. IoT-based devices are utilized in a variety of applications. IoT-enabled household appliances may be conveniently controlled from a far. IoT-based devices may be operated from a far without the need for human intervention. Several studies have been conducted on the use of IoT devices in home automation platforms. The review paper will help you to understand IoT, IoT architecture, the benefits of IoT, and how IoT-based devices for home automation operate. Furthermore, this review paper can assist you in learning about various technologies and protocols.

KEYWORDS: Bluetooth, IoT, Home Automation, Sensors, Wi-Fi.

1. INTRODUCTION

The Internet of Things IoT refers to improved network services. Everything nowadays is networked and Internet of Things IoT based. The smart connection of home apps and allowances is referred to as home automation. It also refers to the capability of remotely monitoring and controlling home applications. Fans, TVs, bulbs, buzzers, and other household gadgets are given unique addresses and applications that are connected to the common gateway and common home application product. It not only regulates home applications and allowances, but also PCs, laptops, mobile phones, and other devices, resulting in automated systems. This IoT implementation refers to the cost-effective and flexible use of internet protocols such as Wi-Fi, Bluetooth, and ZigBee. Not only is the home automation system managed and monitored in this article, but the home environment is also controlled and monitored on a continuous basis in order to track energy usage and save money on power bills [1].

This article employs a variety of techniques, including turning on and off lights, fans, air conditioning, bulbs, buzzers, and so on. Using Wi-Fi and Bluetooth-based remote control systems, we can go wherever we want. Some folks want a home automation system that will offer them with a great deal of enjoyment. It will be a fantastic helper for them. The home automation system has received a lot of attention, and numerous studies and advancements are now underway. Fingerprint sensors, voice assistants, and other new technologies are also presented. The initial element of the home automation system is an android application that we provide a great deal of functionality for the people's demands. The Arduino is the second portion. It is the most important aspect of the entire implementation and produces sufficient and meaningful results. To create a system that would be extremely beneficial for anyone who has to accomplish work on their own without the assistance of others.

As a result of this, we created a home controller system that employs a wired connection, as well as a WI-FI module, Bluetooth, and the internet. Mobile phones and cloud connections are also key sources for this system. We are analyzing and regulating all of the apps utilizing the cloud page as a key reference. It may also be utilized in various ways, such as a wireless connection without internet or a WI-FI module with only a small range of blue tooth. It may be quite beneficial for employees as well as physically challenged individuals who do not require assistance or rely on others. We can control the programs we want from wherever [2]–[5]. The Internet of Things IoT is a broad term describing an ecosystem in which many equipment operate automatically. Because these appliances are connected to sensors and the Internet, it is feasible. It has been

done to remotely control and manage various gadgets or appliances. Several IoT device apps have been created to make the consumer's life easier. Parts of IoT is shown in Figure 1.
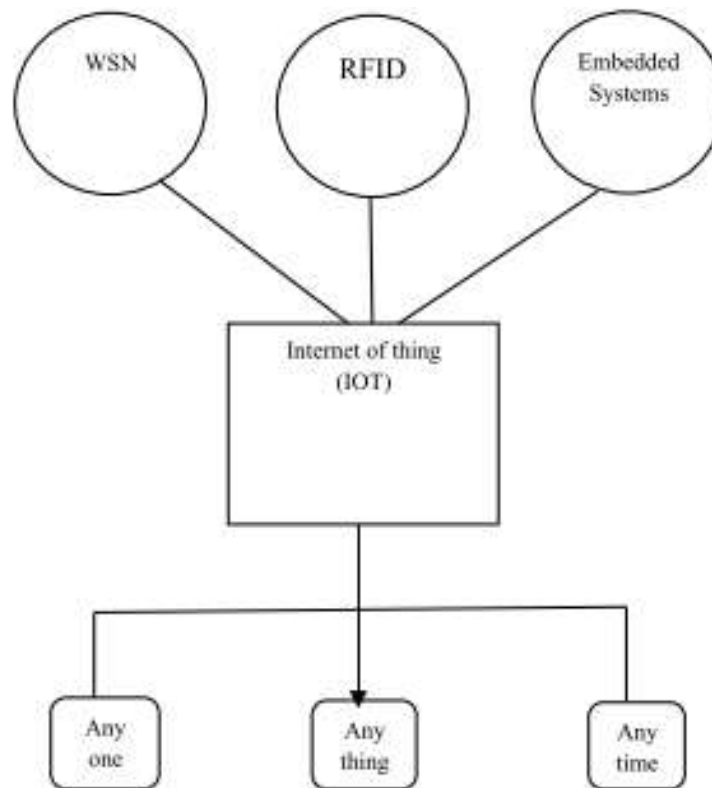
Figure 1: Illustrates the parts of internet of things which can be used by a user for home automation.

For home automation, there are a variety of IoT-based devices. Home automation allows you to operate your household equipment from afar. Here are some of the advantages of IoT-enabled home automation:

1.1. Better Monitoring of Devices:

There is no need for user involvement while using IOT devices. Device-to-device communication allows the user to keep processes as transparent as possible. These gadgets are utilized in places where there is a high degree of job similarity.

1.2. Efficient & Saves Time:

The user can save significant time by using IOT devices. By utilizing such IOT devices, the user is able to avoid performing the same tasks on a regular basis. Device-to-device communication helps users to increase their productivity. As a consequence, precise findings are produced in a large number of cases.

1.3. Saves Money:

It is possible to make the best use of energy and resources. This technique can be implemented. It is important to keep an eye on the gadgets in order to do this.

1.4. Better Quality of Life:

All AI-based applications are effective in improving our daily lives. These technologies may be used to increase our comfort, convenience, and management. As a result, it is self-evident that our lives will improve.

1.5. Smart Environment:

To manage temperature, humidity, and fresh air within the house, a preset program may monitor the opening and closing of windows and blinds based on the location of the sun and wind flow. To reduce air pollution, we might track emissions from companies and automobiles.

1.6. Health Monitoring:

IoT-based devices are increasingly being utilized to identify health-related concerns. These IoT gadgets are used in hospitals to give help to doctors. Furthermore, such gadgets are beneficial to both older folks and handicapped individuals.

1.7. Cons of IoT:

There is no question that the internet is the way of the future, and that all disciplines in which humans are involved have extensive IT and internet applications. At the same time, we don't expect everyone to be an IT specialist, which puts individuals who aren't familiar with the area at a disadvantage, exposing them to exploitation.

2. LITERATURE REVIEW

Ahmed ElShafee et al. presented a design and prototype implementation of new home automation system that uses Wi-Fi technology as a network infrastructure connecting its parts. The suggested system is made up of two primary parts: the server (web server) and the system core, which maintains, regulates, and monitors the users' homes. Users and system administrators can manage and control system code locally (LAN) or remotely (internet). The second component is the hardware interface module, which offers a suitable interface to the home automation system's sensors and actuators. Unlike most other home automation systems on the market, the suggested system is scalable, meaning that a single server may handle a large number of hardware interface modules as long as Wi-Fi network connectivity is provided. A wide range of home automation devices, such as power management and security components, are supported by the system. The suggested solution outperforms currently existing home automation systems in terms of scalability and adaptability. As a result, they came to the conclusion that the home automation system's needed aims and objectives had been met. The prototype shows the fundamental level of home appliance control, and the system design and architecture were explored. And remote monitoring is already in place. Finally, their solution outperforms commercially available home automation systems in terms of scalability and adaptability [6].

Vinay Sagar et al. designed a system to be low-cost and extensible, allowing it to control a wide range of devices. By connecting basic appliances to the Internet of Things, home automation has been experimentally proved to operate well, and the appliances have been successfully controlled remotely over the internet. The authors of this article describe a Home Automation system (HAS) based on Intel Galileo that uses cloud networking and wireless communication to enable users with remote control of lights, fans, and appliances in their homes while also storing data in the cloud. On the basis of sensor data, the system will alter automatically. This system is meant to be low-cost and extensible, allowing it to control a wide range of devices [7].

Neha Malik et al. discussed the various intelligent home automation system and technologies. Home automation is the process of remotely monitoring and managing household equipment. With the Internet's and its applications' never-ending expansion, there's a lot of promise and scope for remote access, management, and monitoring of network-enabled equipment. This article examines a variety of intelligent home automation systems and technologies from a variety of perspectives. The work was focused on the home automation idea, in which smart devices are used to manage and monitor operations. Home automation systems and technologies with a central controller (Arduino or Raspberry Pi), cloud-based, Bluetooth-based, SMS-based, ZigBee-based, mobile-based, RF Module-based, web-based, and Internet performance are all reviewed. The work was focused on the home automation idea, in which smart devices are used to manage and monitor operations [8].

3. IOT TECHNOLOGIES AND PROTOCOLS
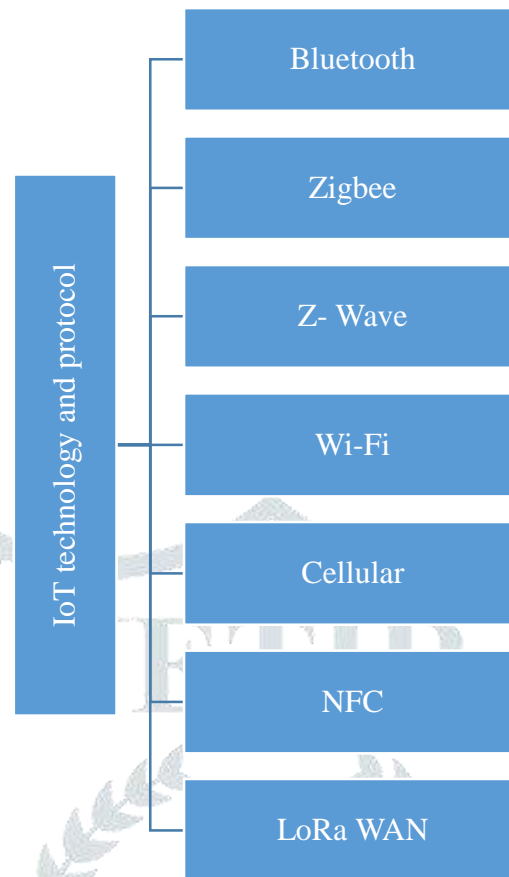
Figure 2: Illustrates the various IoT protocols and Technology

Several Communication Protocols and Technology used in the internet of Things. Some of the major IoT technology and protocol (IoT Communication Protocols) are Bluetooth, Wi-Fi, Radio Protocols, LTE-A, and Wi-Fi Direct as shown in figure 2. These IoT communication protocols cater to and meet the specific functional requirement of an IoT system [9], [10].

3.1. Bluetooth:

Protocols / Technology for short-range IoT communications. Bluetooth is a technology that has grown in importance in the computing and consumer goods sectors. It is predicted to be critical for wearable goods in particular, which will link to the IoT once again, albeit in many cases via a smartphone. The new Bluetooth Low- Energy (BLE) – or Bluetooth Smart, as it is currently known – protocol is an important IoT standard. Importantly, while it has a range comparable to Bluetooth, it has been engineered to use much less power.

3.2. Zigbee:

ZigBee is a wireless technology that is comparable to Bluetooth and is mostly utilised in industrial environments. It offers low-power operation, high security, resilience, and high performance in complex systems, and it is ideally positioned to take advantage of wireless control and sensor networks in IoT applications. The most recent version of ZigBee is version 3.0, which effectively unifies the different ZigBee wireless protocols into a single standard.

3.3. Z-Wave:

Z-Wave is a low-power RF communications IoT technology that is largely used in home automation for goods such as lighting controls and sensors. Although Z-Wave employs a simpler protocol than some others, allowing for faster and easier development, Sigma Designs is the sole manufacturer of chips, as opposed to many suppliers for other wireless technologies like ZigBee and others.

3.4. Wi-Fi:

Wi-Fi connection is one of the most common IoT communication protocols, and for many developers, it's an easy choice, especially considering the widespread availability of Wi-Fi in homes and LANs. There is a large existing infrastructure that allows for rapid data transport and the handling of large amounts of data. The most prevalent Wi-Fi standard in households and many companies right now is 802.11n, which has a range of hundreds of megabits per second and is great for file transfers but may be too power-hungry for many IoT applications.

3.5. Cellular Network:

GSM/3G/4G cellular connectivity capabilities may be used by any IoT application that demands operation over extended distances. While cellular can certainly deliver large amounts of data, particularly in 4G, the cost and power consumption will be prohibitive for many applications. However, sensor-based low-bandwidth-data applications that transfer extremely little quantities of data over the Internet may find it perfect.

3.6. NFC:

Near Field Communication (NFC) is an Internet of Things IoT technology. It allows for simple and secure communication between electronic devices, particularly smartphones, allowing customers to do transactions without having to be physically present. It allows the user to connect electronic gadgets and access digital material. It basically expands the capabilities of contactless card technology by allowing devices to communicate data across a distance of less than 4cm. G.

3.7. LoRaWAN:

LoRaWAN is a widely used Internet of Things IoT technology that addresses wide-area network (WAN) applications. The LoRaWAN standard was created to give low-power WANs the functionality they require to allow low-cost mobile secure communication in IoT, smart city, and industrial applications. Data speeds range from 0.3 kbps to 50 kbps, and it is designed to fulfil low-power needs and handle huge networks with millions of devices.

4. DISCUSSION

The demand for IOT is growing at the same rate as the demand for the internet. Different IoT-based gadgets or appliances are utilized to cut down on time waste by allowing users to control their equipment from any distance with no delay. There are numerous Internet of Things IoT technologies that may be utilized for both residential and industrial automation. In general, IoT device applications are classified into many categories based on their use in various industries. In the consumer industry, there are various IoT applications. A variety of applications were employed to achieve business goals. These are quite useful in the industrial sector. Many IoT applications are also employed in infrastructure spaces. The Internet of Things IoT is an extension of the present internet that allows items to communicate and connect with one another. This article gives an overview of IoT-based household gadgets that can make life simpler for people. IoT-based devices are utilized in a variety of applications. IoT-enabled household appliances may be conveniently controlled from afar. IoT-based devices may be operated from afar without the need for human intervention. Several studies have been conducted on the use of IOT devices in home automation platforms. The review paper will help you understand IoT, IoT architecture, the benefits of IoT, and how IoT-based devices for home automation operate. Furthermore, this review paper can assist you in learning about various technologies and protocols.

5. CONCLUSION

The Internet of Things IoT has a far broader use in all aspects of life. People's lives are growing busier, as we all know. As a result, the use of IOT-based products is quickly rising, as these devices or appliances make our lives easier and more comfortable. IoT-based devices are utilized in a variety of industries, including industry, commercial organizations, hospitals, and so on. IoT devices are utilized for home automation, among other applications. IoT-enabled household appliances may be conveniently controlled from afar. Artificial intelligence and the internet of things are two concepts that can be integrated to make life easier and more comfortable. In recent years, the Internet of Things has played an increasingly important role, and home mechanization has made a significant contribution, resulting in houses becoming smarter in the future years.

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