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Home Automation Using IoT

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ABSTRACT

The way people manage their homes has changed as a result of the Internet of Things (IoT) devices' integration with home automation systems. This research paper evaluates the benefits of home automation via IoT. The numerous IoT devices utilised in home automation are also covered, along with how they operate. The article concludes by addressing some of the difficulties experienced while installing home automation systems and how to overcome them.

IoT devices, smart thermostats, smart lighting, smart security systems, and smart home assistants are examples of home automation technology.

Keywords—home automation, IoT devices, smart thermostats, smart lighting, smart security systems, smart home assistants

I. INTRODUCTION

The way homeowners manage their properties has been completely transformed by the usage of Internet of Things (IoT) devices in home automation systems. Homeowners may now operate a variety of household products, including lights, HVAC systems, and security systems, from their smartphones or tablets. Before the development of IoT technology, this degree of comfort, energy efficiency, and security was not feasible.

IoT has played a big role in the surge in popularity of home automation systems in recent years. The purpose of this research study is to examine the idea of home automation using the

internet of things (IoT), the various IoT device types utilised in home automation, and their advantages. It will also go over the difficulties encountered when putting in place home automation systems and how to overcome them.

The paper is structured as follows: initially, we give a general review of the ideas behind home automation and IoT. The various IoT device types and their features used in home automation are then covered. The advantages of utilising home automation systems with IoT are then discussed. The difficulties encountered when putting in place home automation systems are then discussed, along with solutions. Finally, we summarise the most important ideas covered in the work and provide some suggestions for more research.

II. LITERATURE REVIEW

A. Home automation definition the term "home automation" describes the use of technology to regulate and automate different appliances and systems in a home, including lighting, HVAC, and security systems, among others.

B. A timeline of home automation's development When radio remote controls were created in the early 1900s, the idea of home automation was born. The first real home automation system was created in the 1960s, but most people couldn't afford it. Home automation systems have become more accessible and affordable for families as a result of the proliferation of IoT devices.

C. Internet of Things (IoT) Overview the Internet of Things (IoT) is a network of real-world objects, such as machines, vehicles, and other machinery, that can exchange data and interact with one another thanks to connectivity, software, and sensor technology.

D. Previous research on IoT based home automation According to earlier research, IoT-enabled home automation can increase energy efficiency while also enhancing comfort and security. Home automation is also becoming more commonplace as IoT devices become more accessible and inexpensive for families.

E. The advantages and difficulties of IoT based home automation. IoT based home automation has advantages such as greater security, comfort, and energy efficiency. However, difficulties include incompatibilities, online threats, and the need for technical installation and maintenance expertise.

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III. SURVEY OF LITERATURE

Microcontroller Based Smart Device:

Micro-controller-based development of a smart home Devices for monitoring electronic Gadgets Scientist M R Al-Jabari and H Maulana.The research paper demonstrates their research for developing a Microcontroller-based Smart Home system for Guiding and controlling electronic gadgets. The system is built in 4 stages: information collecting to establish user specifications requirements, hardware assembly, software development, and system testing using user acceptance testing and black box testing. The created system makes use of a microcontroller with a Wirless Connectivity module so that the user may Access it to monitor how their home's electronic equipment are being used as well as to remotely control those items. Using a microcontroller, a smart home system may monitor and control electronic equipment based on the results of system testing. More than 80% of users concurred that this technique can save energy usage and free up time that homeowners would have spent checking electronic gadgets before busy in an activity outside the house. Users of this Model no longer worry about the health of their smart devices while engaging in other activity or away from the house.

Mobile App Based Smart system:

A Mobile app for a smart home Device control system is discussed in Paper 2. Zahra Jahromi, Reza Manashty, and Amir Rajabzadeh They provided an overview of the Smart House subsystems in this paper so that readers may easily and safely control their homes via mobile applications. The different use-cases are described, along with the systematic diagram for connecting the mobile app to the server app. The developed mobile application was put into use, and its key components were explained. This mobile app, which was created for the Windows Mobile platform, also includes management tools for set rules and scheduled tasks. This programme can use SMS and GPRS mobile internet to connect to the main server.This system is marked as significant step towards a unique system structure that may be effectively employed in typical homes in the very near future.

Wireless Smart System:

Design and Implementation of a Wireless and WIFI connected Home Automation System Ahmed Shafee and Karim Hamed This study portrays the design and prototype implementation of a revolutionary Wi-Fi-based home automation system. The system consists of two main components; the first is a web server, which exposes the system's core and controls, manages, and monitors users' houses. Both local (LAN) and remote (internet) management and control of system code are available to users and system administrators. The hardware interface module, which provides the sensors and actuators of the home automation system with the right interface, is the second component.

Photovoltaic Smart System:

Optimising Appliance Schedular in Smart Home Networks, Mr. Naaem Muhammad and Mrs.Fatima Qayyum the issue of Managing the use of a smart home device within a specific time frame was addressed in this study. They used a PV (which is also called as photovoltaic) panel as a power generating device that serves as a micro-grid in addition to power-consuming appliances. Based on the mixed-integer programming method, an optimisation algorithm is developed that can offer a schedule for the use of smart home appliances. Results from simulations show how useful our suggested technique is for scheduling appliances. They also demonstrate how installing a PV system reduces power costs and allows energy to be exported to the national grid when solar energy production exceeds household consumption.

Smart home Using SDK Kit:

An Android app-based IOT based Smart home automation system P. Ajay Kumar Reddy and P. Shiva Nagendra Reddy the platforms for creating applications for smartphones include iOS, Android, Symbian, and Windows Mobile. The Android platform app is created for the proposed system because Android OS is supported by the majority of phones and portable devices. The Android Software Development Package Kit (SDK) has been utilised to construct and implement the smart home app, which was created in Java. A full suite of development tools, including a debugger, libraries, and a handset emulator with documentation, sample code, and tutorials, are included with the SDK.The Android

programme Tool (ADT) Plug-in was used in conjunction with Eclipse, the officially supported integrated programming environment (IDE), which is running on the Windows 7 development platform. [8][9] The user can access the following features through the smart home system's customised app:

- Monitoring and control of devices.
- Setting up automatic control of the smart home environment and scheduling tasks. Option to change password.
- Allows function switching with voice activation.

IV. DETAILS OF LITERATURE SURVEY

- Use In the Paper I, all electronic equipment were controlled in 4 steps by a microcontroller. These steps included obtaining information, putting together hardware, creating software, and testing the system. With the microcontroller's built-in Wi-Fi, all electronic gadgets were connected to the internet. Both time and power can be saved by using these systems.
- To operate every application in their homes, they employed a mobile application for home automation in the second article. They created established rules and scheduled tasks in the mobile application to get the best use and performance. To connect to the server and control all devices, they used mobile internet.
- In the third paper, wifi was used as the server-to-electronic device interface. They separated this system into two components: a server that manages and supervises the entire setup, and hardware that carries out tasks in response to commands from the server by way of various actuators and sensors.
- In the fourth paper, they suggested a method for planning the functioning of a smart home devices over a certain period of time. They employed an optimisation approach based on mixed-integer programming that can offer a schedule for the use of smart home appliances. Utilizing this system can lower power consumption.
- The system may be operated remotely via an application on your smartphone thanks to Wi-Fi technology, which was employed to control the gadgets. The programme that is

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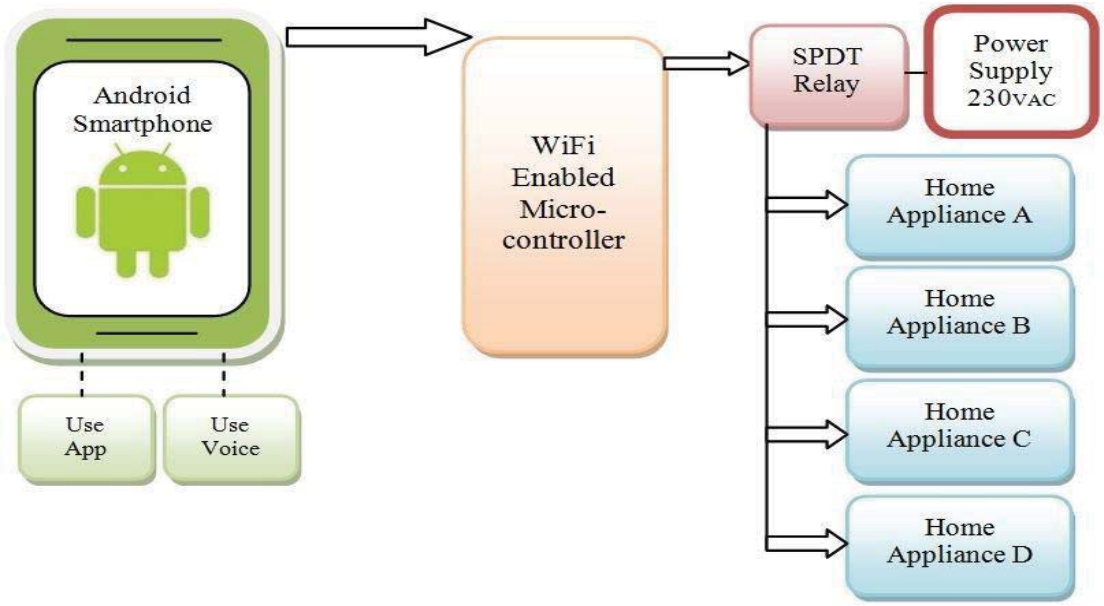
used to operate the home appliances requires constant internet connectivity because a Wi-Fi module is employed.

V.THE FLOW OF THE PROJECT IS AS FOLLOWS

- The arrangement relies heavily on an Arduino UNO board; all various component are programmed using this UNO
- We create an interface between the Arduino and the ESP8266 Wireless module. The 300-meter range of this module
- For all the external components that we will be attaching, a relay driver IC called ULN2003 will serve as an on/off switch.
- Following this, we will use the Arduino IDE to programme our UNO board, and the system is then ready for testing. The customer will able to control all of the household appliances from a distance by using thing speak as a cloud platform.
- Along with flexible delays, an LCD display is attached to show the user all the results. In addition to the LCD, the user can get notifications on his/her cloud acc about which applications are currently ON and for how long they are switched ON.
- Given that the cloud platform is currently a storming technology for the Internet of Things, it can make it one of the greatest IOT applications.



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VI.METHODOLOGY

A. Design of Study

The varieties of IoT devices utilised in home automation, as well as their advantages and drawbacks, were described in this study using a descriptive research design.

B. Methods of Data Collection

Information was gathered by reviewing published works and online databases.

C. Sample Size and Choice

For this investigation, no precise sample size was chosen

D. Methods of Data Analysis

To find the major themes relating to IoT-based home automation, data was analysed using a thematic approach.

Results

A. Summary of the many IoT device categories utilised in home automation

Smart thermostats, smart lighting, smart security systems, and smart home assistants are examples of IoT devices used in home automation.

B. Description of Each IoT Devices Operation

Smart thermostats may be controlled remotely using a smartphone app and regulate the temperature in a house. Smart switches and bulbs, as well as other connected lighting equipment, can be programmed to turn on or off at predefined intervals or to be controlled remotely by a smartphone app. When used for home protection, smart security systems like cameras and doorbells can send alerts to the homeowner's smartphone if any suspicious activity is noticed. Multiple IoT devices in a home can be managed via voice commands by smart home assistants like Amazon Echo and Google Home.

C. Advantages of the IoT based Smart Automation:

Home automation systems provide a high level of comfort, increased energy effectiveness, and improved security for homeowners. Thermostats that are intelligent can learn your routines and preferences.

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VII. IOT-POWERED HOME AUTOMATION BENEFITS

Numerous advantages come with the incorporation of IoT devices into home automation systems, including increased comfort, energy cost savings, and increased security. The advantages of home automation with IoT include the following:

A. Improved Comfort:

Home automation systems offer a high level of comfort to homeowners. They may control their household appliances from anywhere at any time with the aid of their cellphones or tablets. In order to ensure that their houses are pleasant when they enter them, homeowners can, for instance, remotely turn on their air conditioning systems before coming home on a hot day. This feature is particularly useful for homeowners who are away from their homes because it enables them to monitor their properties and appliances to make sure everything is operating as it should.

B. Savings on Energy:

The use of home automation systems could result in significant energy savings. For instance, smart thermostats may adapt the temperature based on the homeowner's routines and preferences, saving energy. By setting smart lighting systems to turn on or off at specific times, energy can be saved. For instance, lights can be muted or turned off when no one is present in the space and during the daytime when there is a lot of natural light. Home automation enables homeowners to conserve energy and lower their energy costs.

C. Greater Safety

The use of IoT devices, such as security cameras and doorbells, can improve home security by alerting the owner of any unusual behaviour. This feature may help homeowners react to security threats more quickly. A door left unlocked or a window left open, for example, are examples of potential security breaches that IoT devices can be set up to alert homeowners about. Homeowners can use this option to quickly take action to secure their residences and belongings.

D. Cost Effective:

This System is standardly Designed to give a cost-efficient result to the consumers. Nowadays in the Market Smart System are So much Expensive and not affordable to the

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common man, this system Overcome that problem by providing a cost-efficient smart home device.

VIII. SYSTEM DESCRIPTION

A micro controller board called Arduino is based on the 8-bit ATmega328P microcontroller. It also including more accurate parts to support the ATmega328P microprocessor, including a voltage regulator, serial connectivity, and crystal oscillator. The Arduino comes with a USB connection, a Power barrel jack, an ICSP header, 6 analogue input pins, 14 digital I/O pins (6 pins are PWM outputs), and other features.

Operating Voltage:	5 Volts
I/P Voltage:	7 Volts
Digital Pins:	14 (6 pin are PWM)
Analog I/P:	6
Direct Current Pin:	20 mA
Direct Current 3.3V Pin:	50 mA
Flash Memory:	32 KB of which 0.5 KB used by bootloader

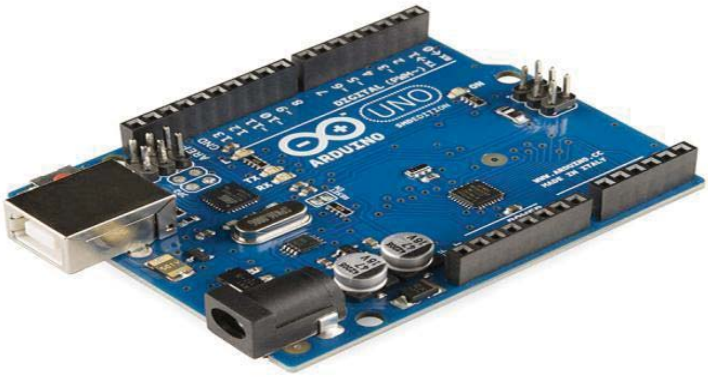

Fig: Diagram of Standard Aurdiuno

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IX. PROTOTYPE OF THE PROPOSED SYSTEM

Fig: Prototype of the Home Automation System.

System Description

PIR Sensor:

PIR sensors let you detect movement. They are used to determine if a person has entered or left the sensor's field of view. Appliances and technology used in homes and companies frequently contain them. They are frequently referred to as "IR motion" sensors, "Pyroelectric" sensors, or "Passive Infrared" sensors.

Flame Sensor:

A sensor called a flame detector is made to recognise and react to the presence of a flame or fire. Depending on the installation, possible responses to a flame detection include raising an alarm, turning off a fuel line (like a propane or a natural gas line), and turning on a fire suppression system.

Servo Motor:

A motor type that can rotate very precisely is a servo motor. Typically, this sort of motor has a control circuit that gives feedback on the motor shaft's present position, enabling the servo motors to rotate with extreme precision. A servo motor is used when you wish to spin an object at a specified angle or distance.

IR Sensor:

A sensor that measures and recognises infrared radiation in its environment is known as an infrared (IR) sensor.

This sensor in the proposed system is used to detect the Motion of person standing before the Door.

DC Motor:

Direct current power is used to power electric motors known as DC motors. The basic principles of electromagnetic are what power an electric motor's operation. When a conductor carrying current is put in an external magnetic field, it produces a magnetic field that generates a magnetic field that is proportional to both the strength of the external magnetic field and the conductor's current. This Motor in the system is used to rotate the fan.

Jumper Wire:

An electrical wire, or collection of electrical wires in a cable, having a connection or pin at each end, is known as a jump wire. Without soldering, wires are used to link parts to one another on a breadboard or in other prototypes, internally, or with other machinery or components.

X.CHALLENGES FACED WHEN IMPLEMENTING HOME AUTOMATION SYSTEMS

Although home automation systems have many advantages, there are some difficulties that must be overcome when using them. The following are common difficulties encountered when putting in place home automation systems.

5.1Compatibility Problems:

Since different manufacturers' IoT devices could not be compatible with one another, integrating IoT devices into a home automation system might be difficult. For instance, a smart lighting system from one manufacturer might not be compatible with a smart thermostat from another brand. Homeowners can choose products from the same manufacturer to prevent compatibility issues, or they can check to see if the devices they buy are compatible before making the purchase.

5.2Cybersecurity Risks:

IoT devices may be the target of cyberattacks, which might lead to security lapses. Homeowners should ensure that their electronic equipment is secure and that it is regularly patched with the most recent security updates. This can be achieved by employing encryption, altering the default usernames and passwords, and refraining from connecting to unsecured wireless networks when accessing their devices.

5.3Technical Knowledge:

A home automation system requires technical understanding, which could be challenging for homeowners with limited background in this field. By employing straightforward solutions that require little technical expertise or by consulting specialists, homeowners can solve this issue.

XI.FUTURE ENHANCEMENT

Future homes will be automated using a variety of technologies, requiring little to no manual intervention. With the aid of this technology, not only the indoor gadgets and equipment but also the exterior, which includes the driveway and the gardens, can be monitored. Home automation will not only make it easier for us to manage our homes, but it will also improve access to healthcare, which will mostly benefit the old and the disabled. The development of technology will aid in managing, keeping an eye on, and securing your property. The homes of tomorrow will always be more intelligently automated than those of today because, as we all know, technology is advancing at an ever-increasing rate.

XI. CONCLUSION

In summary, IoT-based home automation has completely changed how people manage their properties. Many advantages have come from the integration of IoT devices with home automation systems, including greater security, comfort, and energy efficiency. The implementation of home automation systems comes with a number of difficulties, but these may be addressed by choosing suitable devices, upholding device security, and, if required, seeking professional assistance. Home automation systems will probably grow more accessible and affordable as they advance, making it possible for more homeowners to take advantage of their capabilities.

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