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Revolutionizing IOT based Home Automation using Arduino

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Abtsract: ***With increased involvement of technology in our interpersonal lives, home automation is a growing concept and a popular one. Nowadays, Internet is mixed with almost all our daily chores or at least that is the goal so why leave our homes behind? Our team has created an affordable and adaptable home automation system that is grounded by a smartphone-controlled robot. The aim of this project is to use the Arduino board with a Bluetooth module to design a home automation system. The transmission of information between the smartphone and Arduino occurs via a wireless medium, with added security measures to prevent unauthorized access to the household appliances. By incorporating the latest technology, this home automation system provides convenience, security, and safety for households where time is limited. The main focus of this design is to allow the control of smart homes using smartphones, providing a security- focused solution for when residents are away. Our goal is to make home appliance control simple and user- friendly,with an econimic and simplistic engineering design using Bluetooth technology. This system can handle various devices automatically, including appliances like vacuums, light bulbs, and automatic doors.***

Keywords: technology, automation, Bluetooth, communication, security, Arduino Uno, Relay, and home appliances.

I. INTRODUCTION

The integration of state-of-the-art technology into a residential property creates what is commonly known as a Smart Home, which serves to augment the levels of comfort, convenience, security, and energy efficiency via the installation of sensors that carefully monitor an array of parameters, coupled with selectors that carry out designated tasks.[1] The purpose of a home automation system is to reduce human labor by using automatic technologies. Due to rapid advancements in technology, smartphones are used to control home appliances, and automation can work with precision and a low error rate.[2] An always-available environment is defined as one where each appliance or device can be accessed and controlled through an operation. Home automation systems are designed to increase convenience by allowing users to control their everyday appliances via wired or wireless connections.[2] Home automation systems are designed to increase accessibility for controlling daily used appliances, whether through wired or wireless connections.[4] The term "wired" refers to appliances that are connected to a central regulator of the home automation system, while "wireless" suggests that home appliances are connected wirelessly to the central regulator or remote-control unit. Certain appliances such as TVs, DVD players, and air conditioners may have their separate remote-control units. [5] Home automation systems reduce the need for physical labor and save time and energy.[3] While home automation systems were previously limited to labor-saving machines, the current focus is to provide installations for seniors, individuals with disabilities, and those who have difficulty turning electrical appliances on or off.[4] A Bluetooth and smartphone-based wireless home automation system is a cost-effective and easy-to-install option for households. [5] Bluetooth is a wireless technology that operates over a short range and is utilized to create local networks for exchanging data between fixed and mobile devices within a specific area.[6] Consumers are attracted to this wireless life and don't like seeing packets or cables running along their houses or office at any given point. Contingent on the class of Bluetooth device, connection ranges from 10 measures to 100 measures at the unlicensed, encyclopedically available 2.4 GHz frequency. Speed is 3 Mbps. This is why, we decided to propose the idea of Home robotization with the help of Bluetooth. [10] The home robotization system is the use of information technologies and control systems to reduce mortal labor.[11] The swift advancement of technology has led to the adoption of smartphones for controlling household appliances. Automated systems have the potential tooperate with flexibility, efficiency, and minimal errors.[7]

II. RELATED WORKS

The primary goals of the work include automating a home's doors and lights using an application connected to a web page that includes control buttons for every door, window, and led as well as two controlled doors with physical buttons and sensors.
The following was accomplished for these:

Gunputh, S., Murdan, A. P., & Oree, V. [12] Presents a smart house as the extension of building automation for the home. The computerization and supervision of systems like lighting, heating, ventilation, air conditioning, and security that enhance human comfort came first. A wide range of household equipment that relies on Wi- Fi for remote monitoring has lately been added to it. The widespread use of smarthome systems as a result of technological advancement has raised living standards.

Shirley, D. R. A., Sibi, T., Praveen, S., & Ragul, B. [14] There is a mobile app for the home automation system that enables you to monitor it from a phone or tablet. Among other things, it can manage the lighting, ventilation, air conditioning, and smart security locks. Bluetooth or Wi-Fi are used to remotely operate various devices. A smart home has the following appearance: automating the capability to control objects across the house with a straight forward button press or voice command. Several activities, such as turning on and off a light at your convenience, were both easy and economical. Others, like sophisticated security cameras, demand a lot more cash and resources. Some people think that technology is playing a bigger and bigger role in our lives.

Chekired, F., Canale, L., Tadjer, S., Louni, A., Bouroussis, C. A., & Tilmatine, A. [14] Presently, scientists and technicians are working on innovative methods and technological solutions aimed at reducing energy consumption, especially in residential areas. The article being presented describes the creation of an automation system based on a microcontroller for a smart home that combines safety measures like gas leak and smoke detection with automatic lighting and temperature sensors for thermal comfort. This system's application, which relies on an Arduino-Mega controller, involves running a complete algorithm. Using the Arduino IDE software, the C++ programme is translated into the microcontroller's instruction set. The Proteus programme is used to implementthe control circuit and the simulation.

Alsbou, N., Thirunilath, N. M., & Ali, I [16] This research presents a simulation- based home automation system. A cloud-based platform will be used to automate and remotely operate the system. The recommended system allows the user to regulate the temperature, humidity, and intrusion detection in their house. The technology sends notifications to the user's phone via SMS and emails as part of continual monitoring.The ability to operate various household appliances via a mobile phone, as well as access relevant data, is made possible by the inclusion of cloud functionality within the system. solution is for remote monitoring and care of elderly andhandicapped individuals with limitedmobility.

Balaji, B., Priya, R., & Revathy, R. [17] This study demonstrates a dependable and flexible home automation system that uses the Internet of Things and Arduino. For the purpose of allowing authorised users to control the devices, this system makes use of WiFi and IP connectivity. The household appliances like a fan, light, etc. are operated by this system rather than a server. Additionally suitable for industrial automation, this system. With the use of a smartphone or voice commands, the user of this system may operate any equipment in their home. This makes it easier for the user to use household equipment. Additionally, this system receives signals from the appliances that remotely state their status. The effectiveness of this technology has been examined under various environmental circumstances.

III. EXISTING SYSTEM

Using an Arduino, a home can be automated to oversee and manage variousa spects ,illumination, temperature, entertainment equipment, and appliances, among other things [18] An online home automation system may also incorporate security features such as access control and alarm systems, making it an integral part of the Internet of Things.("IoT"). We exhibit an Arduino-based, highly scalable, inexpensive, and versatile home automation system that can combine equipment and appliance automation, thermal comfort control, and energy management. [19]

Drawbacks of existing system:

1) Extremely expensive to fully equipa home with smart devices.
2) As a result of growing security worries, smart home security software and equipment areproliferating.
3) Dependency on Internet

IV. PROPOSED SYSTEM

Home automation is a method of intelligently managing household equipment for the convenience of consumers. Adhering to specific guidelines for the use of equipment makes life simpler for users while also conserving energy. [20] The controls for home appliances can range from basic actions, such as dimming lights using a remote, to more complex operations, such as creating a network of devices that can be managed through a single controller or even remotely using a mobile phone from anywhere in the world.[21] Apart from algorithmic automation, users have the option to operate equipment using buttons, mobile devices, the internet, or infrared remote controls to fulfill their specific needs. A group of devices and sensors can communicate with each other and make decisions regarding their operations. [22]

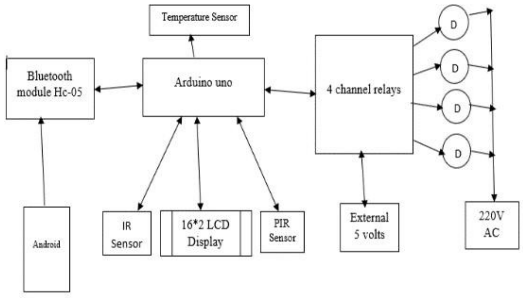

Fig 1: Block Diagram of Home Automation System

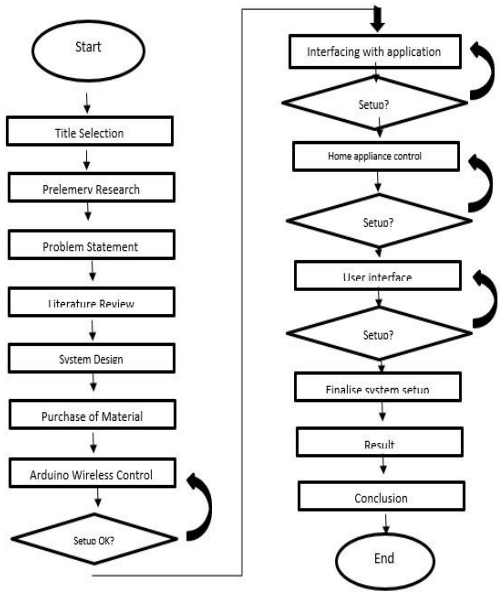

Fig 2: Flowchart steps of Home Automation System

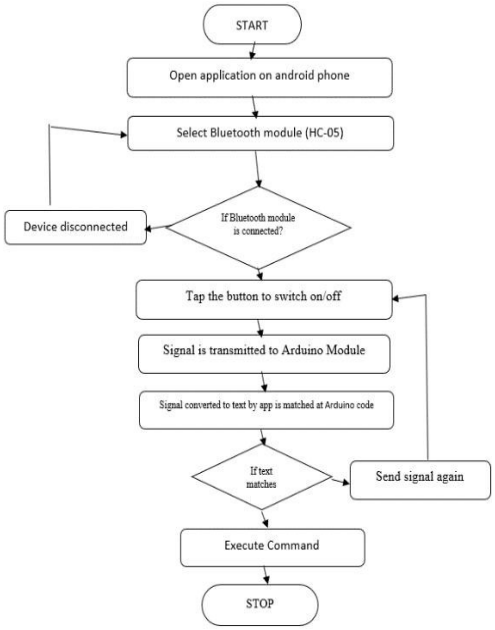

Fig 3: Flowchart for Home Automation System

V. CONCLUSION

It is unambiguous that a smartphone, especially an Android smartphone, can operate the wireless home automation system.

1) It is feasible to develop and deployit economically. [23]
2) Can be a safe and user-friendly way to manage home appliances, particularly for the elderly and disabled.
3) This project's main emphasis is on ensuring the safety and security of home automation by using automated and controllable home automation technology inside a smart home that can be accessed from anywhere in the world through servers.
4) The technology is designed to help individuals with disabilities maintain control over their smart homes, which results in energy conservation and power savings. [24]

This paper clarifies the fundamentals of computer-based home appliance control. This project's major goal is to aid persons with disabilities and to maintain lives easier. Both security and energy
savings are achieved. [25]

VI. RESULT ANALYSIS

Through the utilization of Arduino and Bluetooth technology, we successfully executed the implementation of a home automation system that was both amenable to users and cost-effective in nature. It is user-friendly in the sense that anybody can use an android screen with just a click of a button, and it is cost-effective in the sense that it will cost precisely what the project requires within the budget. [26] Because of its ease of use, affordability, and simplicity, it will be a fantastic alternative for home automation. The widespread adoption of Bluetooth technology and its incorporation into almost every smartphone has made it more convenient to operate within a reasonable range. [27]

The ability to turn on or off all of the working components at once is highly practical. This feature allows management in clam coms to be substantially enhanced and a lot of energy to be transported. [28] The model, as shown in Fig. 4, has been used and functions as expected.

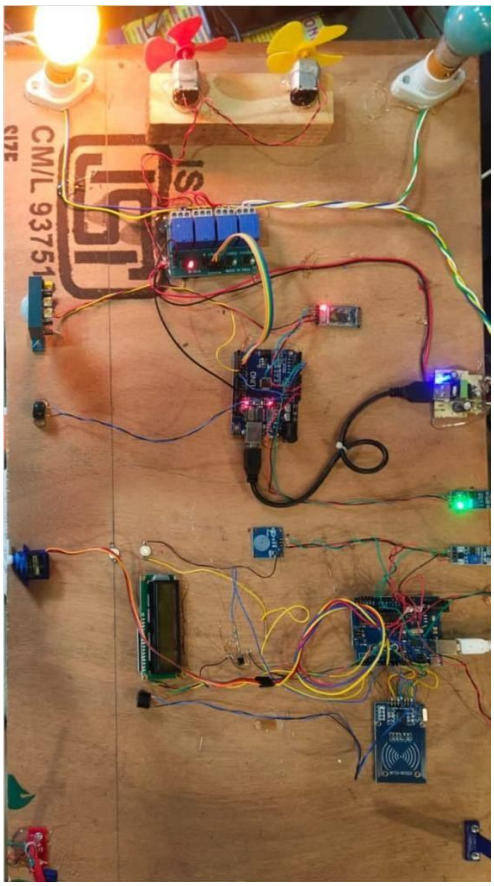

Fig 4: Home Automation System setup

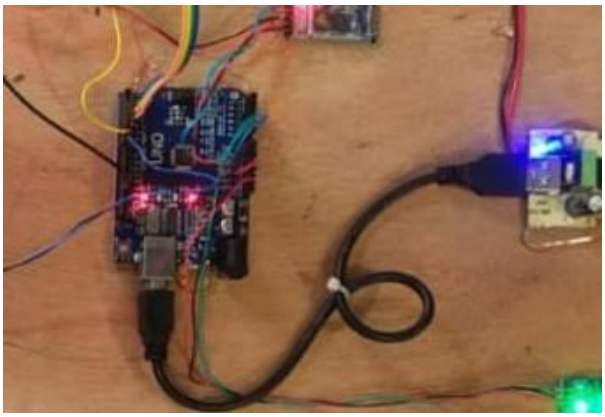

Fig 5: Arduino setup

Fig 6: HC-05 Bluetooth module setup

This particular smart home automation system is operated remotely via an Android OS smartphone, utilizing an Arduino board endowed with advanced Bluetooth technology. [29]

1) This particular household automation arrangement, which incorporates an Arduino board empowered with Bluetooth technology, boasts the capability to be operated from a remote location through any smartphone device that is compatible with the Android operating system.
2) A state-of-the-art approach to home automation is using smartphones as remote controllers. One has to utilise a smartphone app to handle all the appliances, which allows them to perform several tasks with various gadgets across their
3) house from a distance. [31]
4) Absolute command of gadgets and appliances, even when they're distant.
5) Conserves energy by automatically turning off superfluous lights and fans when no one is around. [32]

VII. LIMITATIONS

1) Many security issues are likely to emerge, necessitating the creation of security software and hardware specifically designed for smart homes. [33]
2) If hackers gain access to these programs, they could be able to break into your home, which might have serious security implications.[34]
3) Even though the majority of smart home devices are now affordable for most people, fully equipping a house with smart devices is still somewhat pricey. [35]
4) A technology-savvy family will benefit from convenience more quickly from a smart home, but for everyone else, it will take some time to read user manuals and figure things out before the benefits of ease become apparent. [36]
5) Due to a general mismatch between the breadboard required for particular testing and the relay pins, soldering relay modules and connecting them proved challenging.

VIII. FUTURE SCOPE

1) Smart home automation promotes energy efficiency. Compared to traditional equipment, smart home appliances utilize the least amount ofenergy.
2) A notable advantage is its cost- effectiveness as the lifespan of smart appliances is longer compared to regular gadgets, resulting in savings. [39]
3) Solar energy and captured water may both be used to power home automation gadgets. It is therefore extremely sustainable. [40]
4) On the primary interface, an electronic fingerprint system for identification may be used to attain high-security levels. [41]
5) It is conceivable that an electronic communication platform, such as a messaging or email system, may be established to notify users about the present state of the system.

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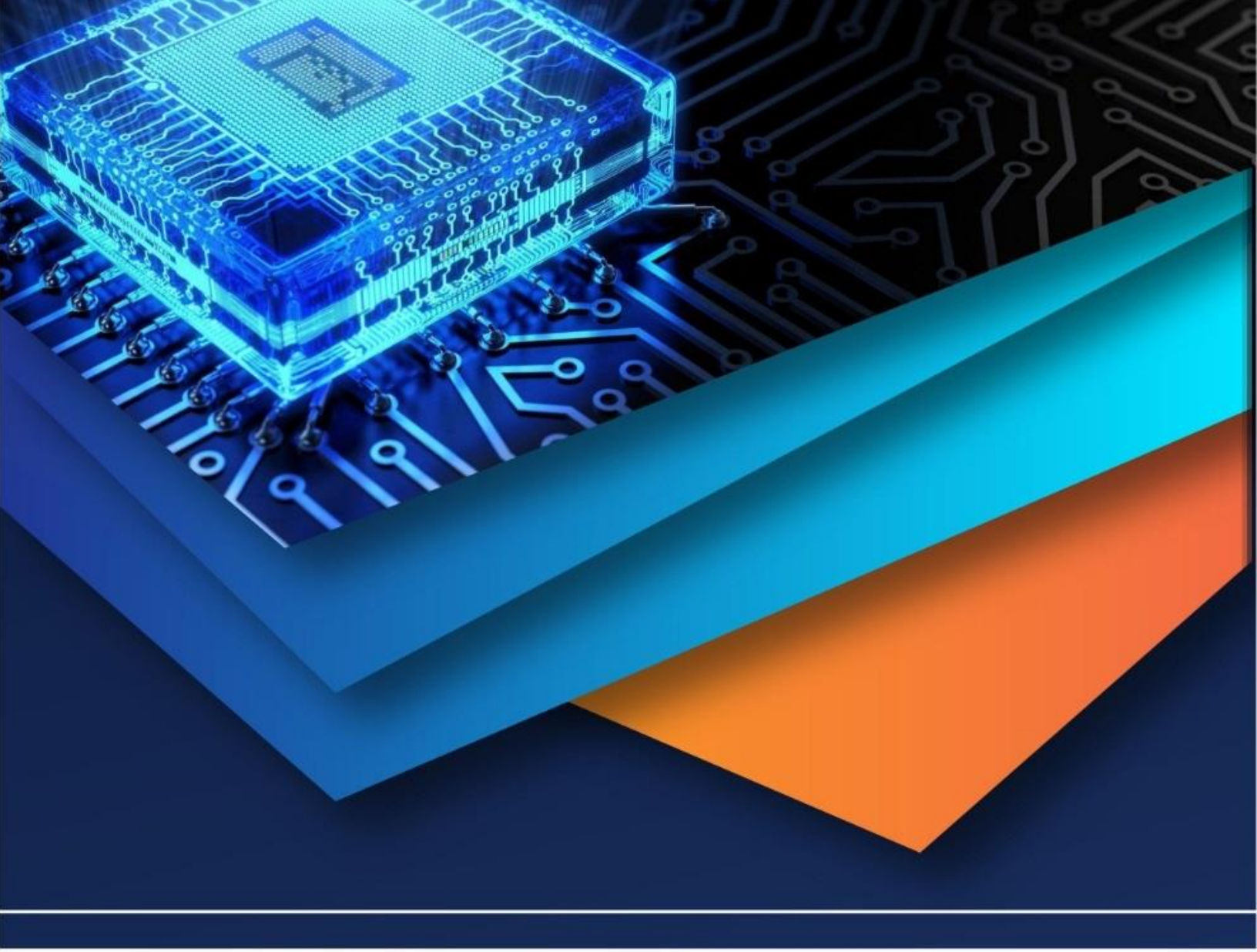

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