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HOME AUTOMATION USING IOT

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Abstract: Home automation, also known as smart house, involves wirelessly managing and operating various home appliances such as lights, fans, doors, refrigerators, and washing machines. This includes all devices connected to the internet and considered part of the internet of things. Home automation in IoT is becoming increasingly popular due to its numerous benefits. Home automation can be easily achieved by connecting electrical gadgets to the internet or cloud storage, making it simple and comparable also affordability. Customized portals are used to access IoT in a user-friendly manner, with the cloud serving as the front end. We can effortlessly automate our home with a phone from anywhere. The purpose of this paper is to construct and design a home automation system using the Arduino and a Bluetooth module. With the Android application, the home automation system provides simple and reliable technology. Home appliances such as fans, bulbs, air conditioners, and automatic door locks are controlled by a home automation system that uses an Arduino Uno with a Bluetooth module. The article primarily focuses on monitoring and controlling smart homes via Android phones, as well as providing a security-based smart home when individuals are not present at home. This article focuses on controlled household appliances in smart homes that are user-friendly, low-cost, and simple to install.

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KEYWORDS:Smathome,IOT,Automation,Ardiuno,Module,Relays

1.INTRODUCTION:

The internet of things (IoT) technology enables internet-based control of hardware devices. Here, we suggest using IoT in Home appliances can be controlled remotely via the internet, automating modern dwellings. Nowadays, everyone has a smartphone and wants to control everything from it. Everyone knows how to control a mobile phone, making it simple to use and understand. Lights, fans, switches, and refrigerators are all controlled by a Bluetooth-enabled remote using an Arduino. Home automation design will grow simpler and more popular as more people utilize smart phones. In this device, we utilize Arduino, which is the most often used device for automation. Arduino is a hardware device that connects a computer to a project model, allowing us to control it using Arduino code. Arduino is a microcontroller that functions similarly to the human brain, processing input before performing logical and mathematical operations on it.. Arduino is linked to the Bluetooth module, which receives information from the user. Arduino also attached a relay, which receives information from the Arduino and functions as a switch. Bluetooth technology is wireless radio transmissions over short distances that provide the required technologies for intelligence and control. This creates a personal area network in the home environment, allowing all of these gadgets to be interconnected and monitored via a microcontroller with Arduino and a smart phone. Home automation involves computerized or automatic control of certain electrical and electronic equipment within a building.

2.NEED OF THE STUDY:

Home automation with IoT has the potential to provide enormous economic benefits by opening up new avenues for innovation, job development, and economic expansion. Governments, organizations, and people may support technological improvements, stimulate entrepreneurship, and help to establish a healthy ecosystem of IoT-enabled goods and services by investing in research and education in this field. The aging of the population in many countries due to demographic shifts calls for the development of technologies that support independent living and help people age in place. IoT-enabled home automation systems can help with

everyday tasks, monitor health indicators, and facilitate remote caregiving, all of which help older people age gracefully in familiar environments and retain their autonomy.

3.LITERATURE SURVEY:

[1] Vikram.N, Harish K.S, M.S, Umesh, Aashik, Kumar (2017) propose to build a Wi-Fi based Wireless Sensor Network (WSN) that monitors and controls environmental safety and electrical parameters of a smart interconnected home. This is accomplished by leveraging the ability of home appliances to be interlinked, in which each microcontroller communicates with other microcontrollers via the RF module provided, with one microcontroller configured as the 'Hub' and the others configured as sensor nodes working and communicating with one another in a tree network topology. Data is delivered and received from the server using the Wi-Fi module.

[2] Pirbhulal, Zhang, Alahi,Ghayvat, Mukhopadhyay, Zhang, Wu (2017) propose a system using sensor hubs, intended to gather information by utilizing Wireless Fidelity technology as a remote medium, save and store the information detected on the server (i.e. Thing Speak server), which is later transmitted to the goal hub after appropriate verification. Before sending the detected information to server, the information is scrambled utilizing Triangle Based Security Algorithm (TBSA) that is proposed here which depends on non-right edge triangle key age technique that creates confirmation key (K) used to give one of a kind verification to information transmission between both the hubs, i.e. source and destination. Utilizing TBSA, the ciphertext which was produced from the source hub is communicated to the server just if there is coordinate between source hub ID and server ID, to keep the potential aggressors away.

[3] Pawar, Ramchandran, Singh and Wagh (2016) have proposed a Home Automation System prototype consisting of microprocessor Arduino ATmega328, Wi-Fi module and relays. The central device is the microprocessor that connects to the Wi-Fi module and receives orders to monitor and control the appliances. The server handles the communication between the application and the CPU, managing the users and the appliances. The front-end of the software communication module is an Android application, which serves as a user interface for communicating with the microprocessor. The proposed system consists of a server, client and a communication medium, all of which are managed by the means of socket programming.

[4] Choudhary, Parab, Bhapkar, Jha and Kulkarni (2016) have proposed a mobile and internet based home automation system using Wi-Fi technology to interconnect its distributed sensors to home automation server. In this paper, Arduino Uno R3 has been used as the microcontroller and 8 channel Relay module to control various appliances and other equipment with large current. The proposed system employs a variety of sensors, including a PIR sensor, which uses PIR-based motion detectors to detect movement of people, animals, or other objects, as well as a temperature sensor, which monitors temperature and humidity, motion detection, and video monitoring.

[5] This paper by Cicirelli, Fortino, Giordano, Guerrieri, Spezzano and Vinci (2016) focuses majorly on activity recognition inside a house or a living area and proposes a framework based the Cloud-Assisted Agent-Based Smart Home Environment (CASE) architecture. For activity recognition, the authors have proposed to use two kinds of sensors: environmental sensors, which are installed in fixed positions inside the house, and mobile sensors, which are in this case, wearable sensors worn by humans, and give dynamic changes with the changing positions of the people around the house. Activity recognition is done in four phases: data acquisition through the sensors, feature extraction by filtering the extracted data, activity discovery by using the data from the previous phase along with the previously available data and producing new classifiers, and activity recognition by using these classifiers to recognize high-level activities in real-time. CASE architecture lets these sensors along with the actuators to be integrated with a distributed multi-agent system and a cloud infrastructure. The tasks proposed by this framework include the detection of presence/activity, environmental measures, power usage, any emergencies, and, in the case of humans wearing wearable devices, the detection of their movements, directions, body posture, vital parameters, and wellness.

[6] Ghavyat, Mukhopadhyay, Gui and Suryadevara (2015) have proposed a wellbeing identification framework for smart homes in light of united deviation after some time that activities to isolate common information from startling information which may represent a hazard to the occupant's wellbeing and riches. In this paper, RF module, which in this case is the Digi Xbee 2nd series based on ZigBee, is used to form a network in Mesh topology. This paper deals with the various aspects of extending their proposed technology towards smart building. It lays down various issues being faced in doing so, including less accuracy due to physical obstructions, and attenuation loss, and presents their potential solutions.

[7] Sagar and Kusuma (2015) propose to build a distributed home automation system using Intel Galileo development board which has a built-in Wi-Fi card port, apart from the hardware interface modules (sensors) used. So, the Galileo development acts like a web server which enables the access of the automation system from the web browsers of either any local PC in the same LAN using server IP or from any PC or mobile device remotely using Internet IP. The network infrastructure used in this paper is WIFI technology. The functions of the proposed system include temperature and humidity, motion detection, fire and smoke detection, light level, on/off control for various appliances.

[8] The paper “Design and Implementation of an IoT Access Point for Smart Home” was published by Chih-Yung Chang; Chin-Hwa Kuo; Jian-Cheng Chen; Tzu-Chia Wang in 2015 Applied Sciences, Vol5 4,Pp 1882-1903 .This paper presents the design and implementation of an IoT access point that supports functionalities of coordination of various wireless transmission protocols.

Based on the existing Wi-Fi access point we have embedded a ZigBeemodule.The only drawback is that the wiring , it can be a real problem here as the connection.

[9] The paper "Smart Home 2.0: Innovative Smart Home System Powered by Botanical IoT and Emotion Detection" was published by Chen, Min; Yang, Jun; Zhu, Xuan; Wang, Xiaofei; Liu, Mengchen; Song, Jeungeun in 2017 Mobile Networks & Application Vol. 22 Issue 6, p1159- 1169. 11p .It is advance in human-centric technologies for creating a better living environment to increase people's quality of life. A mobile cloud system is built to store, manage and visualize the data for the affective interaction between greeneries and home users. Yet the major drawback is the very sensitive sensors utilizes in model can become too expensive.

[10] The paper " IOT based home appliances " was published by Dhobi, Pooja A. Tevar, Niraj in 2017 International Conference on Computing Methodologies and Communication (ICCMC) Computing Methodologies and Communication (ICCMC), 2017 International Conference on. :648- 651 Jul, 2017. Many components in this technique have been given the smart control. This is low cost in comparison to other applications. Yet the major drawback here is the individual remote control provided with android phone, so for a particular application we have an individual control tool...

4.METHODOLOGY:

Home automation using IoT (Internet of Things) is the integration of smart devices and sensors in a home to automate and remotely control numerous tasks and services. IoT technology allows these devices to connect to the internet, communicate with one another, and be controlled remotely via a smartphone, tablet, or computer. home automation refers to a network of controllable devices that work together to make your house easier to manage, customizable, efficient, and secure. This device has five primary pieces. Arduino, Bluetooth module, relay drivers, Android app, and step-down transformer. First, we supply power to the step-down transformer, which steps down the input voltage and delivers it to the Arduino via the VIN pin. The Bluetooth module is also attached to the Arduino via Rx and Tx pins, which provide information to the microcontroller. The microcontroller reads the information and sends it to the relay drivers, which function as switches. We transfer the program to Arduino as required, and it then does various mathematical and logical operations to control the relay drivers.

A. Architecture of the Device:

The user will communicate with the Android application using the Arduino Uno's Bluetooth module. This concept is highly durable and scalable, allowing for optimum efficiency, safety, and securely adding smart home appliances with the least amount of human effort. The Bluetooth signal has the most efficient energy for connecting any signal without losing information and with the fewest harmonics. The fundamental component of the home automation system is an Arduino board with a microprocessor. People must have a mobile application with a proper connection. It should be utilized with multiple appliances that function together. The Arduino board is setup for each home appliance using microcontroller code. We may use the Microcontroller to control the electromagnetic relay, which acts as a switch to receive signals from the Arduino via the Bluetooth module HC-05. When the signal is transmitted from the transmitter as a datasheet to the relay, the relay acts as a switch and controls several smart home appliances simultaneously. There are three key aspects of this home automation. Which was given below,

1. Arduino Uno
2. Bluetooth HC-05
3. Relay Drivers

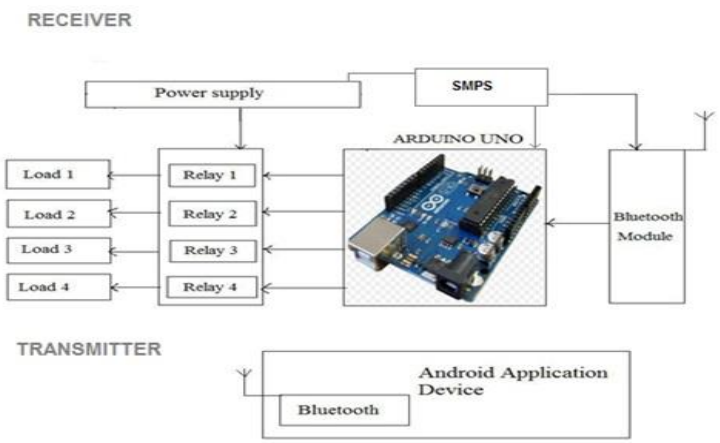

Fig 4a - Arduino Uno Working

B. Description of Hardware:

1. Arduino Uno:
The Arduino Uno is a microcontroller chip-dependent on the Atmega328 (datasheet) with 14 computerized I/o pins, 6 of which can be used as yields and 6 as simple information sources. It has a 16 MHz clay resonator, a USB port, a power jack, and a reset button. The microcontroller contains 32kB of ISP flash memory, 2kB RAM, and 1kB

Fig 4b (1)- Arduino Uno

2. Bluetooth Module:
HC-05 Bluetooth module is used to link the microcontroller to the Android application. Bluetooth receives information from the user and sends it to the microcontroller (Arduino uno). It is straightforward to use the Bluetooth Serial Port Protocol (SSP), which is developed for wireless serial connection setup. The serial port module's Bluetooth has Advanced Bluetoothv2.0+Enhanced Data Rate @ 3Mbps modulation with a 2.4 GHz radio receiver and BB (base band). The Bluetooth Rx and Tx pins are connected to the Arduino Tx and Rx pins, respectively .The HC-05 module is a simple Bluetooth SPP (Serial Port Protocol) module designed for easy remote sequential association setup. It uses CSR Blue Canter 04-External, a single-chip Bluetooth framework with CMOS innovation and AFH (Adaptive Frequency Hopping). It has an impression as small as 12.7mmx27mm.

Fig 4b (2) Bluetooth HC-05

3. Relay Drivers:
A relay is an electromagnetic switch that defers two electrical circuits and connects them magnetically. When the Arduino transmits a signal, the relay driver receives the signal and begins its operation. They are typically used to connect an electronic circuit (operating at low voltage) to an electrical circuit that operates at extremely high voltage. For example, a hand-off can convert a 5V DC battery circuit into a 230V AC mains circuit. In this technique, a small sensor circuit can power a fan or an electric knob. A transfer switch can be divided into two sections: information and yield. When a small voltage from an electronic circuit is applied to the loop in the information area, it produces an attracting field. This voltage is referred to as the working voltage. Generally used transfers are available in a variety of working voltages, including 6V, 9V, 12V, 24V, and so on. In a basic hand-off, there are three contactors: normally closed (NC), normally open (NO), and normal (COM).At no info express, the COM is related with NC. When the working voltage is supplied, the transfer curl charges and the COM's contact turns to NO. There are other transfer topologies available, such as SPDT and DPDT, each with a different number of changeover contacts. By using a genuine blend of contactors, the electrical circuit can be turned on.

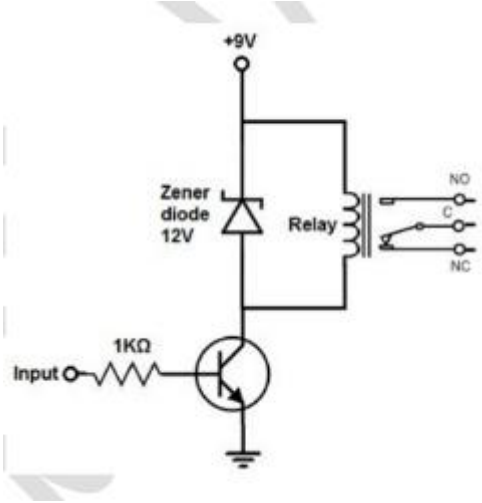

Fig 4b (3) Relay circuit diagram

So, in order to drive the hand-off, we employ a transistor, which requires far less power to drive the transfer. Because the transistor is an intensifier, the base lead receives sufficient current to generate an increased current stream from the transistor's emitter to the collector. If the base receives appropriate control, the transistor will connect the emitter to the collector and power the transfer. When power is transmitted to the relay, it acts as a switch, allowing us to turn on or off home equipment by electromagnetic action.

Fig 4b (4) Relay module

5.IMPLEMENTATION:

To set up an Arduino using an HL-05 sensor and a relay, first connect the HL-05 and relay modules to the Arduino according to their specifications. Install and incorporate the essential libraries for the HL-05 sensor into your Arduino code. Set the sensor and relay pins to their default values using the setup function. Use the sensor's features to read and store data such as temperature and humidity. Using digital Write (), you can control the relay and activate it based on the sensor data. In your sketch's main loop, iterate continuously through the reading and relay control processes. Finally, thoroughly test your system to ensure correct functionality and safety precautions, and fine-tune your code as necessary for peak performance.

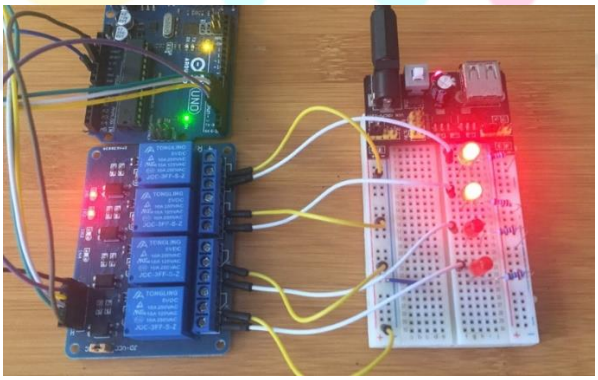

Fig 5(a) Arduino with Relay module

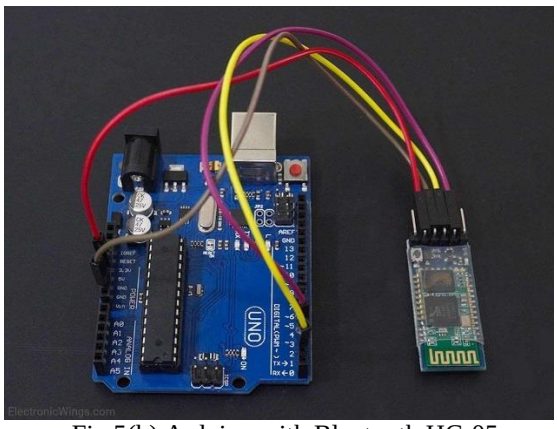

Fig 5(b) Arduino with Bluetooth HC-05

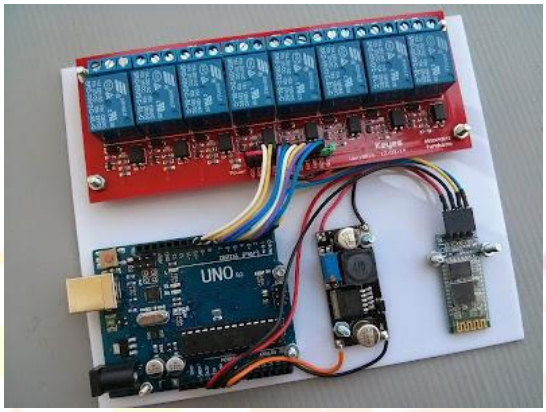

Fig 5(c) Arduino with Both Relay module and Bluetooth HC-05

Thus Arduino, when combined with Bluetooth and a relay module, creates an adaptable system for wireless control applications. The Arduino serves as the central controller, receiving wireless commands via the Bluetooth module and controlling the relay module accordingly. The Bluetooth module allows for communication with external devices such as cellphones and PCs, offering remote control capabilities. Meanwhile, the relay module functions as an interface between the Arduino and electrical equipment, allowing circuits to be turned on or off based on commands received. Users can establish seamless communication and remote control over numerous electrical equipment using a well-structured hardware setup and a coded Arduino sketch. This implementation has applications in a variety of industries, including home automation, industrial automation, and IoT solutions, demonstrating the adaptability and scalability of Arduino-based systems in modern technology.

6.RESULT:

According to the proposed approach and the final conclusion of this article will result in the development of home automation. This project resulted in the creation of an automation system that allows us to effortlessly operate home equipment such as lights, fans, tube lights, air conditioners, and bulbs. One of the goals of this project is to achieve smart automation at a minimal cost. This document also includes information about the Arduino Uno, Bluetooth controller, and relay module. And information regarding their work is provided. Along with the component of home automation, the benefits have also been highlighted. The system is simple and secure for access by any user or intruder. Also, this configuration automates operations and improves energy efficiency in houses, offering users an adaptable and cost-effective home automation option. Regular monitoring and changes ensure that the system is reliable and efficient. Moreover, the Arduino Bluetooth relay arrangement promotes creativity and experimentation while also being convenient. It invites both fans and professionals to investigate the realms of wireless communication and automation, pushing the limits of what is possible in the field of electronics. This portal promotes collaboration and information sharing in the maker community by allowing users to communicate ideas, code snippets, and project experiences. The effectiveness of the Arduino Bluetooth relay project is ultimately determined by how well it achieves its intended goals and satisfies the specific needs of its customers. In terms of technical functionality, the project can be extremely effective if it successfully enables wireless control of electrical devices, allows for seamless communication between the Arduino and external devices via Bluetooth, and provides dependable switching capabilities via the relay module

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7.CONCLUSION:

The preceding information can be used to conclude that home automation is a unique type of technology that regulates home appliances without the need for further effort. And in this article, we demonstrated how home automation is created, addressed technique, and explored its potential applications. And in the future, new technology that decreases human effort can be introduced,

which is currently being investigated, and we discussed it. And we've developed a device that is small in size, inexpensive, has a higher capacity, has a longer lifespan, and can receive signals from a greater distance. The purpose of this research paper is to develop a technology that saves electricity while improving human life style. In conclusion, the combination of Arduino, HL-05 sensor, and relay modules opens up an immense number of possibilities for home automation aficionados. By merging these components, users can create complex systems that automate a variety of tasks using environmental data. Whether it's altering room temperature, activating lighting in reaction to motion, or remotely controlling appliances, this arrangement allows users to build a unique smart home experience that meets their specific needs. Furthermore, the low cost and accessibility of Arduino components make this technology widely available, democratizing innovation and allowing people all over the world to contribute to the development of technology-driven solutions. As technology advances, the Arduino Bluetooth relay setup remains an essential tool for prototyping and building cutting-edge applications that improve our lives and define the future of connectivity and automation. With the ability to develop and customize functionality, Arduino-based home automation projects provide limitless options for creativity and improvement. As technology advances, so do the potential and applications of Arduino-powered home automation systems, ushering in a new era of convenience, efficiency, and connectivity for households around the world.

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