

Literature Survey for IoT Based Smart Home Automation: A Comparative Analysis

Dr. Kamlesh Rana¹, Deepak Sonker², Bharti Aggarwal³

¹Professor SOEIT, Sanskriti University, Mathura, Uttar Pradesh, India

²Associate Professor, Department of Computer Application, Tecnia Institute of Advanced Studies, Delhi, India

³Associate Professor, Department of Management Science, Tecnia Institute of Advanced Studies, Delhi, India

Correspondence should be addressed to Dr. Kamlesh Rana; dean.cse@sanskriti.edu.in

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ABSTRACT- Since a few years, smart devices have become an integral part of our daily lives. As a result, on smart devices, offering facilities and security is becoming more important. The goal of this article is to create a home automation system that works with Android mobile devices. Wi-Fi allows the mobile device and the system to communicate with one another. Current studies discuss the IoT-Based Smart Home Automation. Any suitable device may load the mobile application and interact with the system. Commands to turn on/off electrical equipment such as lights, fans, and air conditioners, as well as setting timers, can be delivered simply and fast from mobile devices through a simple and pleasant GUI application that is straightforward to use for any average user. The system then acts and responds to these orders by performing the tasks specified in the commands and informing the user of the outcome. Within Wi-Fi range, the user may also view the result on an Android mobile application. As a result, developing a home automation system for a luxury living that strives to create an advanced home automation system utilizing Wi-Fi technology is a solid option.

KEYWORDS- Arduino Uno, Automation, Equipment, Home, System.

I. INTRODUCTION

Technological improvements and innovations are commonplace in today's society, and people's living standards are rising as well[1]. People's lives have been inspired by mobile phones in recent years. In recent years, the mobile phone has emerged as the most important aspect of people's lives. Humans can conduct a range of jobs, both on and off the internet, with the help of these smart gadgets, like as make our homes and companies smarter and more elegant. We demonstrated a novel method for connecting and controlling electric devices like fans, air conditioner, and lights using an Iphone app and a Wi-Fi module[2].

To communicate the data given by the apps, the Wi-Fi transmitter employs radio waves. Wi-Fi data is converted into an electronic signals, which is then sent via the antenna; Wi-Fi is based on radios signals technology[3]. This signal

is sent to the Controller. The data is then manipulated and operations are performed by the Arduino. This controllers may be connected to the Relaying terminals of different switches to transfer the current after producing the magnetic field. We might be able to use networks for vast access in the future, for example, as part of Intelligent City projects. The system's reliability may be ensured by adding new appliances at any time. The greatest often misspelled word in the field of electronics is automating. Because of the quest for automation, several modern technologies have been revolutionized[4]. They were given a greater weight than other technologies because of their user-friendliness. These might be utilized to replace obsolete switches that create flames and, in some situations, fires in the home. The gadgets in the house are controlled by a unique automated system that takes advantage of Wi-Fi.

Home automation is particularly significant in today's world because of its ability to be used in a variety of locations with great accuracy, saving money and time by reducing human effort. The primary goal of this technology is to automate the control of domestic appliances such as lights, fans, doors, and air conditioners[5]. This study article goes into great depth on home automation and security systems that use Arduino and GSM, as well as how we can manage home appliances using an Android application[6].

When a person enters the home, the number of people entering the house is increased, and in Home Automation mode, appliances are switched on, but in Security Mode, the security light is tuned on along with the alert[7]. On the LCD panel, the number of people who have entered the residence is also shown. When the room becomes empty, i.e., the number of people in the room drops to zero, the appliances are shut off, making the system more energy efficient. Furthermore, a person may operate his home appliances using an android application on his phone, reducing the amount of manual labor required. Simultaneously, if someone enters when security mode is activated, an SMS would be sent to the home owner's phone, indicating the presence inside the house. The alarm may be turned off by sending a text message or using an Android app[8].

A. Component Required

1) Humidity Sensor

Humidity detectors are electrostatic devices that measure moisture in their surroundings and transform the data into an electronic message. Moisture detectors come in a variety of shapes and sizes, as well as different purposes, with some being constructed into foldable gadgets and others being part of larger integrated phones. Moisture detector are extensively utilized in a number of situations applications, including meteorological, medicine, cars, HVAC, and industry[9].

Humidity sensors are classified into two categories, each of which calculates humidity using a different method: humidity levels sensors and absolute humidity sensors. The greatest quantity of moisture to calculate absolute humidity, air at a constant temperatures is analyzed to live humidity information at the same temperatures. Humidity level detectors must measure temperatures in order to calculate relative humidity at 100%, on the other hand, is assessed independently of temperature[10].

2) Arduino Uno

The ATmega328P microcontroller is a microprocessor that is utilized in the Arduino Uno. Device (datasheet). It has 14 electronic pins input/output ports, 6 analogue ports, a 16 MHz ceramics resonator, USB, power, an ICSP header, and a reset key. It comprises all you need to get began with the microcontroller; simply connect it to a computer through USB or use an AC-to-DC conversion or battery to power it. You can play about with your Uno without worrying about creating an error; in the worst-case scenario, you may lose it, we could change the microchip for a few bucks and start again. It is better understood in Figure 1.

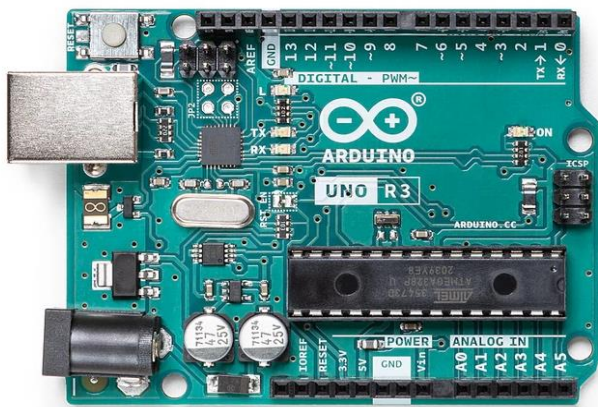


Figure 1: Diagrammatic Representation of Arduino Uno [SHOPIFY]

3) WI-FI Module

The module is based on IEEE 802.11 specifications from the Organization of Electrical and Electronics Engineers. It has a transparent transmission mode and supports a variety of network protocols. Between the conversions, the Wi-Fi module is integrated based on the universal serial port,

Ethernet, and wireless network interface. The modules incorporate all of the necessary RF components, eliminating the need for costly RF design and testing. Sensors and switches are easily connected to the module's I/O ports or UART interface. We utilized the ESP8226 Wi-Fi module in this project. Espressif Systems, based in Shanghai, manufactures the ESP8266, a cheap Wi-Fi chip that includes a full TCP/IP stack and a microprocessor module. It is better understood in Figure 2.

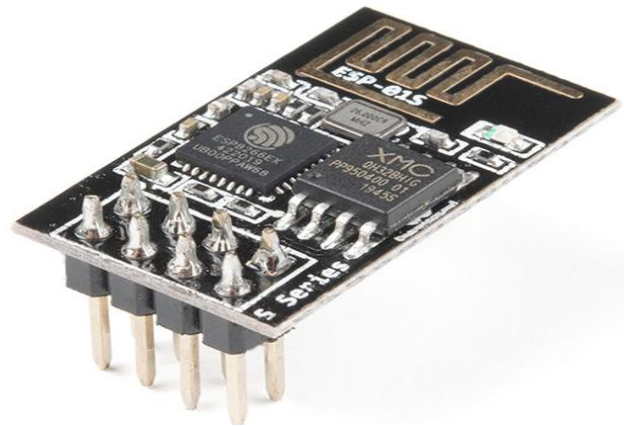


Figure 2: Diagrammatic Representation of Wi-Fi module [SPARKFUN]

4) Ultrasonic Sensor

An ultrasonic sensors is a gadget that uses ultrasound sounds vibrations to determine ranges to an objects. A transmitter generates and gathers ultrasonic waves in ultrasonic sensors, which communicate data concerning an item's proximity. It is better understood in Figure 3.



Figure 3: Diagrammatic Representation of ultrasonic sensor [ELECTRONIC HUB]

5) Light-emitting Diode

A light-emitting diode (LED) is a semiconductors light source that generates light when current runs through it. Electrons in the semiconductors mix with electron holes, producing electricity in the form of photons. The colors of the light (equivalent to the intensity of the photons) is dictated by the energy necessary for electrons to pass the band gaps of the semiconductors. White light is created by

utilizing numerous semiconductors or a coating of light-emitting phosphorus on the semiconducting gadget.

6) *Fame Sensor*

A flame sensor detects a faint DC signal from the AC power provided to the ignitor, which is corrected to DC via the flaming rectifying phenomena, which converts the polarity of electricity transmitted via a flame to DC. In our project, this detector is utilized to sense a fire in the home and then transmit a warning via buzzer.

7) *Relay*

A relay is an electrically operated switch. An electromagnet is employed in many relays to mechanically activate a switch, although strong switches and strong relay various mechanisms are also utilized. Whenever a single small indication is needed to function a circuit, or when numerous circuits may be controlled by a single signal, relays are used.

8) *DC Motor*

A revolving electronic device that transfers electricity power into mechanical energy is referred to as a DC motor. In the most common types, a magnetic field is employed to create pressure. Usually each DC motor contains an inner component, either electrically or electronics, that shifts the flow of electricity in one of the motor's segments on a regular basis.

B. Software used

1) *Arduino IDE*

The Arduino Interactive Developer Infrastructure is a cross-platform software for Microsoft, mac, and Linus that uses C and C++ functions. It's used to write and publish applications for Arduino-compatible devices, as well as additional vendor development boards that have third-party core support. The IDE's source code is Version 2 of the GNU Free Commons License is used. The Arduino IDE provides specific code structure guidelines for the technology C and C++. Wiring projects is a piece of software that is along within the Arduino IDE and lets you to do a number of simple input and output activities. To initiate the sketching and the main programming loop, user-written code only needs two basic functions, which are created and linked into a functioning cyclic executive program using the GNU toolset, which is included with the IDE version. The avrdude program is used by the Arduino IDE to convert readable into a hexa textual document, which is then downloaded to the Arduino device via a loading program.

2) *C programming*

C computing is Dennis M. Ritchie built the UNIX operational systems in 1972 using a procedural, analytical, overall computers programmer languages he designed at Bell Telecommunication Laboratory. C is the most widely used programming language. It, together with Java, stays at the peak of the attractiveness ranks. Coding languages, which is also very popular and extensively used among current software professionals.

3) *Android app*

An Android app is a component of Android application which operates on a phone or an emulator. An APK file, that

the term "Android pack" is also used to refer to it. Android applications are developed in Kotlin, Java, or C++ and run within the Virtual Machine. Android Studio is the official developer environment.

C. Advantages of smart home

- You can manage all of their house devices from one spot. In this scenario, the convenience aspect is really important. The ability to combine all of your home's devices through one platform is a big step forward for home management and technology. In theory, all you'll require is a basic understanding of how to utilize one app on your smartphone or tablet to control a variety of functions and devices across your home. This make it easier for new customers to gain the features they need for their home.
- The ability to adapt to new equipment and devices whenever it came to incorporating fresh gadgets, utilities, and various technologies, smarter house setups are highly flexible. Even though you equipment appear to be cutting-edge right now, newer, more beautiful models will be developed as time goes on. As you replace outdated gadgets or learning about new technology that match your indoor and outdoor locations, you'll surely contribute to your gadget collection. It will make your job as a householder a lot easier if you can easily incorporate these newcomers, and it will also help you keep current with the latest lifestyle innovations
- Increasing your home's degree of security. When you integrate security and monitoring features into your intelligent house network, your house security may improve. There are many options available, but just a few thousands are presently being studied. For example, house after returning to bed, automatic system may link movements detectors, security cameras, automatic gate lock, and various physical security measures across our house so that you can control them all from a one cellphone device. You may select to get security notifications on all of your devices.at various intervals of the day, and you can monitor behaviors in actual life weather you're at house or halfway across the globe.
- Home operations Remote control is possible. Don't undervalue the benefit of becoming able to oversee your home's functioning from away. On a very hot day, your home may cool down just in time for you to return after returning from work If you're in a rush to get supper started but are still at the supermarket, your ovens may start to warm while you're traveling home. You should also check to see when the lights were left on, who was at your front gate, and if you had switched off everything of your equipment while you were gone.
- A higher level of energy efficacy Based on how you utilize smarter-home technology, you may make your home more energy efficient. For example, a programmable smart thermostat may provide you more precise controls over your room's heating and cooling by understanding taking into account your schedule and weather preferences, it will recommend the most power setting across the day. As the sun sets, lights and operated

blinds may be programmed to move to a night mode, or lights can turn on & off immediately as you arrive or exit the room, wasting no energy.

- The appliance's performance has been enhanced. Intelligent houses may also help your devices run more efficiently. A smart TV will aid you in discovering new apps and channels to watch your favorite programs. You won't have to stress regarding your chicken deep frying or undercooking since you'll use a smart oven to cook it to perfection. A well-designed home theater and audio system may make keeping your film and song collection a breeze while entertaining visitors. Finally, adopting automation technologies to connect your appliances and various systems may improve their Efficacy and making your living at homes simpler and more pleasurable.
- Insights towards home management there's certainly much to be said about your capacity to gain knowledge about how your house works. You can track how frequently you view TV, which kind of meals you prepare in the oven, what goods you store in your refrigerator, and how much energy you use over time. You may be able to assess your everyday patterns and actions using these insights, and make changes to lead the lifestyle you wish.
- Measuring the state of one's home temperatures, moisture, lighting, and closeness are all monitored by various devices in a conventional smart home. Each sensor is mainly responsible for a single or several observations. Several monitor temperature and humidity, while others determine the lighting ratios for a certain zone and the ranges between it and each item exposed to it. All detectors enable the user to save and display data, allowing it to be noticed at any moment and from any place. It does this via the use of a signal processing, a communications gateway, and a cloud-based host. Figure 4.
- Controlling home access for public access doors, house entry techniques are often employed. A database holding the identity traits of authorized persons is used in a shared system. When a person approaches the accessibility control system, their identity characteristics are instantaneously captured and matched to the database. The access is granted if it matched the database data; else, it is refused. Cloud services might be used to gather and analyze data from a large number of people in a remote institution. Face recognition technologies, finger prints, and RFID are used by some, while others employ magnet or proximity identification cards.

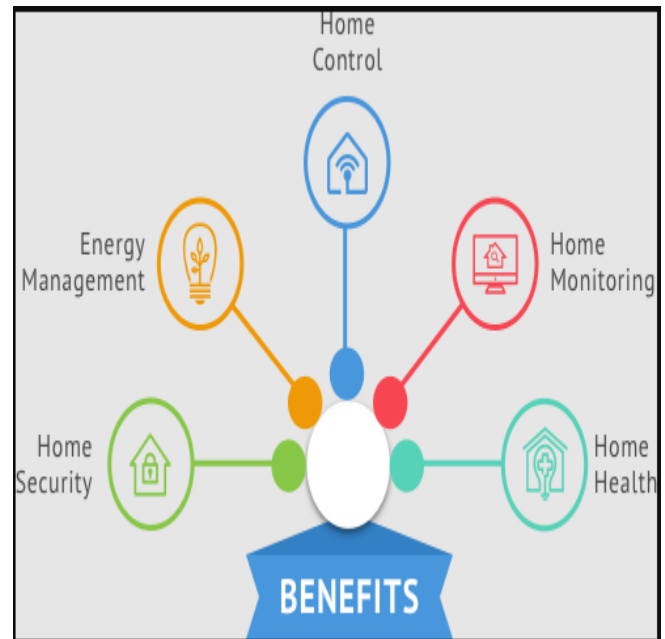


Figure 4: Diagrammatic Representation of advantages of smart home [GLOBETECHSYSTEMS]

II. DISCUSSION

Smart home technology allows homeowners to control smart devices with a cellphone or other networked device, providing security, comfort, flexibility, and cost savings. Smart home systems and devices that are parts of the Internet of Things (IoT) often collaborate, sharing customer use data and automated actions based on the choices of the residents. Smart TVs utilize the internet to access applications that provide information like as on movies and music. On certain smart TVs, speech and gesture recognition is also available. Smarter light fixtures, like Phillips Light Holding B.V.'s Aura, can sense when people are present and adjust lighting accordingly, as well as be controlled remotely and customised. The brightness of clever light bulbs may also be adjusted based on the quantity of daylight available. Smart thermometers with built-in Wi-Fi, like as the Nest from Nest Labs Inc., allow users to control, monitor, and manage home temperatures remotely. These devices also learn from the behaviors of their users and modify settings automatically to provide the best possible comfort and efficiency to their occupants. Smart thermostats may also measure energy use and alert users when filters need to be replaced, among other things.

Users may allow or restrict entrance to guests using Garage door openers and smart locks when residents approach, smart locks detect their presence and automatically open the doors. Smart security cameras allow residents to keeping an eye on their homes when they are away or on vacation. Modern motion sensors can tell the difference among residents, visitors, pets, and burglars, and can inform authorities if they notice strange behavior. Pet care might be mechanized with networked feeds. The usage of connected timers may be used to water houseplants and lawns. Smart coffee maker which can brew you a fresh cup as soon as your alarms sets off;

smart refrigerators that keeps track of expiration dates, prepare shop lists, and even design recipes based on ingredients already on hand; slowed cooks and toasters; and laundry washers and dryers are also available.

III. CONCLUSION

Because of the rapid rise of Web and communications technologies, today's homes have significant computing and communication capabilities. A smart home powered by the Internet of Things is gaining steam as a vital component of the clever and smart towns that are been designed and developed throughout the world. The purpose of a smart house is to improve life conditions, safety, and security while reducing energy and resource consumption. The smart house is critical to the advancement of civilization. The goal of this research is to offer a FLIP-based approach for such a system. The solution described in this article is very adaptable and expandable to meet the demands of users who are concerned about security. The suggested system may be customized to meet the needs of the users.

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