

Smart Home Using Artificial Intelligence



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Abstract- Making our lives easier these days involves a lot of people using smart homes. One command is all it takes to complete a task in a smart home, which makes it easier to access electric appliances and other home appliances swiftly without the need for human labor. The cornerstone of this smart home strategy is artificial intelligence (AI). The idea of a smart phone can be implemented with AI by attaching sensors to our devices, allowing us to operate them solely with a button or voice command.

Keywords – DTMF; artificial intelligence (AI); arduino; IoT (Internet of Things); RASPBERRY PI; GSM (Global System for Mobile); Wi-Fi (Wireless Fidelity); Bluetooth; X10; RF (Radio Frequency) Technology

I. INTRODUCTION

Future homes will be designed and built using the smart-home concept, which has been around for many years. The main objectives of home automation are controlling, management and co-ordination of home appliances in a comfortable, effective and secure way. It contains large number of sensors which can be monitored. In contrast, artificial intelligence is developing as a field of study that enables the creation of automatic systems and decision-making that is based on case studies. For practically all autonomous systems, AI offers an improved alternative using decision-making and reasoning. The sensor can be specialized in measuring temperature, humidity, light, and movement the system also supports voice command for naïve users with command sensing .it decodes the users' voice command and extracts the exact meaning of his command. The appliances are connected to this board through relays, and the design is based on a standalone Arduino BT board. The reason for developing home automation using artificial intelligence means user can easily controlled electronics appliances. So, the problem in saving electricity can be resolved, and main motto is to uses the home automation without being use internet. Imagine the myriad of things that a house could be aware of: it could be aware of the presence of its inhabitants (together with their identities), what they are doing, and even what every item in the house is doing. The ability to analyse the facts a human would examine before making a choice is necessary if you want the house to think like a human. Consider artificial intelligence as computer power that can carry out exceptionally difficult activities that would otherwise need a human brain to complete. A light might be activated by a motion sensor. A truly smart home is one that not only connects devices to their users, but also understands the people who live in it and their needs. If a home

had artificial intelligence, it might take into account the time of day, the person walking around the house, and where she was walking in order to decide which light to turn on and for how long. The ever-growing uses of AI will alter not only the way we work, but also the way we live in our homes.

II.HISTORY

The first smart homes weren't built; they were only concepts. The concept of home automation has been explored in science fiction for decades. Many talented authors, including Ray Bradbury, envisioned interactive dwellings that seemed to run themselves in the future. The automated home that Bradbury envisions in his foreboding short tale "There Will Come Soft Rains" keeps running even after humans have vanished. When you think about the actual advantages of home automation, it's all well and good being frightening, but then the concept starts to feel more comfortable than eerie. Despite the fact that the concept of home automation has been around for a while, true smart houses have only just come into existence. This history focuses on hardware, or actual discoveries that preceded the smart homes we are familiar with today and can expect from the near future. The first all-purpose home automation network technology, known as X10, was created in 1975. It is an electronic device communication protocol. It continues to be the most accessible and largely employs electric power transmission wiring for signalling and control, where the signals contain quick radio frequency bursts of digital data. A 16 channel command console, a lamp module, and an appliance module were all available as X10 devices by 1978. The first X10 timer and the wall switch module followed shortly after.

III. GENERATIONS OF HOME AUTOMATION SYSTEM

According to Li et al. (2016) there are three generations of home automation:

- A. *First generation:* Wireless technology with proxy server, e.g. ZigBee automation;
- B. *Second generation:* Artificial intelligence controls electrical devices, e.g. Amazon Echo;
- C. *Third-generation:* Robot companion that communicates with people, e.g. Robot Rovio, Roomba.

IV. LIST OF PLATFORMS TO BUILT A SMART HOME

Ranging from a list of platforms, some of them are as follows:

- Nest
- HomeKit
- Wink
- Z-Wave
- Zigbee
- SmartThings
- Brillo

These are just a handful list of platforms which you can inculcate in building your smart home.

V. SOME DEVICES TO USE FOR CREATING A SMART HOME

A. Some aspects of daily usages in a smart home with examples:

1. *SMART GATEWAY*: Zigbee project gateway, WIFI+ Project Gateway.
2. *SMART LIGHTING*: Smart bulb lamp, Smart Socket, Smart wired and wireless Switch, Scene Switch, Radar Induction Switch.
3. *SMART APPLIANCE*: Smart Wall Socket, Smart Mobile Socket, Smart Remote Control, Air Conditioner Assistant
4. *SMART DOORAND WINDOW*: Control panel, smart curtain, environmental sensors, Intelligent window opener, intelligent lock, wireless magnetometer, Smart sensor, smart controller.
5. *BACKGROUND MUSIC*: music host, control panel.

B. Some devices which are available in the market:

1. Amazon Echo
2. Philips Hue
3. TP-Link HS200
4. Ecobee4
5. NetGear Arlo Q
6. Char-Broil Digital Electric Smoker with Smart Chef Technology
7. Perfect Bake Pro
8. Ecovacs Deebot N79S

C. About some devices:

Wink Hub 2 supports smart home protocols including Bluetooth LE, Kidde, Lutron Clear Connect, Wi-Fi, Z-Wave, and more. This can be your best option if you want to have a completely integrated smart home with wall and kitchen appliances that work together.

Ranging from a pool of IoT (Internet of Things) devices which can change the dynamics of your house, Amazon Echo can be the best option. With a designing around your voice, it has 7 microphones and comes with a beam-forming technology for performing various operations. With the all-new Amazon Echo, one can switch off or on the lights without the need of lifting your finger. Also, it can be connected to Alexa for providing the daily news updates, weather conditions, play music and so much more.

Either, you can go for a Nest Thermostat or a Philips Hue Light bulb and can add a great amount of Intelligence to your existing home.

The easiest way as of today is buying a hub i.e. buying yourself an Amazon Echo or a Google Home and then picking the rest of the kit which is compatible with your current home system.

D. The different components that can be combined to create a smart house include:

- 1) Bluetooth module- With the aid of an Android app, we may connect the app to the Bluetooth module (HC05) in order to deliver a voice command to the Arduino board.
- 2) Relay Module – A Relay is used for controlling high voltage electrical appliances like light or fan. without relay module we cannot control high voltage appliances.
- 3) PIR SENSOR - A human movement is picked up by a PIR sensor within about 10 meters of the sensor.

4) Light Intensity Sensor Light Intensity sensor provide light intensity of the room and send to the Arduino.

5) Arduino Board - Arduino is a backbone of this project; Arduino board collect all data from the components and decide whether turn on or turn off electrical appliances. In Arduino digital pin no 7 provide output for the PIR sensor and Humidity sensor.

6) Humidity sensor - This sensor measures the room's temperature and humidity and transmits the results to the Arduino board.

VI. ACCESSIBILITY OFFERED THROUGH HOME AUTOMATION

A. Controls and settings for appliances:

Apps allow for remote control of appliances from any location.

B. Distributed automation and cost-effectiveness:

Modern solutions provide you the freedom to install and manage just the necessary equipment, as opposed to having to automate your entire house or workplace.

Any experienced electrician can quickly and easily install home automation equipment, giving them instant control over a variety of devices.

C. Adaptation to voice-activated technology:

For further user convenience, a number of modern home automation systems interact effortlessly with already-existing products like Google Assistant and Amazon Alexa.

VII. BENEFITS

A. Safety and Security

When everyone has left the house, it automatically locks the doors and activates the alarm. One of the top objectives for customers is the protection of their family and possessions. By offering autonomous home protection solutions with learnt adjustments like "night mode" capabilities and reminders that fit the consumers' families, you may better satisfy the demands of your customers. Similar to this, an AI-powered system creates a database of recognized people through your social media contacts and house visits, enabling it to distinguish between family members, visitors, and guests. False alarms will be significantly reduced thanks to this method. These self-monitored security systems with cameras, sensors, and motion detectors can quickly determine whether an intruder is present and can even contact emergency services. This does away with the necessity for human oversight.

B. Energy and Cost Management

When everyone has gone to bed, the smart devices can detect it and turn the TV off, dim the lights, and reduce the power of the A/Cs for the evening to conserve energy. Saving energy is essential for the environment as well as our wallets. Energy efficiency has recently gained attention due to the intensifying global climate change and energy challenges.

We typically consider energy efficiency when purchasing home appliances, but what about times when they are not in use yet continue to use energy and drive up the cost of electricity? It is often referred to as "Phantom load" or "Vampire energy". By managing smart thermostats, smart plugs, and automated lighting sensors, an AI-powered home automation can lower energy usage and carbon footprints.

So if you forgot to switch off the lights upstairs or went to play outside without turning off the television, no worries! Your AI home automation system will take care of it.

Wasting energy impacts the environment and wastes money. The proper smart home helps to manage both by, automatically regulating thermostats, lighting, and water to match our lifestyles.

C. Comfort and Entertainment

When a user returns home from a run, the system will switch on the air conditioning to prepare the house for them.

Smart Home goods improve a user's life and comfort when they anticipate their requirements and preferences. Knowing the user throughout the day improves the experience with products at home, whether it's brewing coffee and opening the curtains when a user wakes up or getting the house ready for a user's arrival.

VIII. SOME LATEST SMART HOME AUTOMATION PROJECTS

A. ZIGBEE Based Home Automation

- Home Automation using ZigBee Protocol:-This paper presents a home automation system using zigbee and microcontroller. Here a PC is used for controlling the home appliances.
- Wireless Home Automation System Using Zigbee: The automation system controls the appliances wirelessly using zigbee and voice. The system has been tested and verified. 80.05% of these commands were recognized correctly.

B. DTMF Based Home Automation

- Smart homes using DTMF and AVR:-This System explains automation of homes using DTMF technology and Atmega8 microcontroller. DTMF means dual tone modulation frequency. This frequency is used for communication between controller and the home's appliances.
- DMTF home automation without microcontroller:-Home automation can be done without using any microcontroller also. This system provides complete information about home automation without using any microcontroller.
- Home Automation using 8051:-This system uses 8051 microcontroller along with DTMF technology.

C. Home Automation Based On BLUETOOTH:

- Home automation Bluetooth project Using 8051:-Home automation system uses Bluetooth technology here.8051 microcontroller plays a key role in this project. An android device is used for controlling the appliances. This device communicates with the home appliances using 8051 microcontroller.
- Android App Home Automation via Bluetooth Using PIC16F628A Microcontroller:- Here android device is communicated with the PIC microcontroller. This uses a Bluetooth app which can control maximum of 8 appliances.

D. Home Automation Based On WI-FI:

- Home automation project using Wi-Fi (Wireless Fidelity): - This paper describes the Wi-Fi prototype implementation of a revolutionary home automation system. Numerous home automation devices, including power, management, and security components, are supported by this system.
- Android and Arduino Wi-Fi Control Home Devices with ESP8266 : This project show you how to monitor some data in your home precisely using Arduino Wi-Fi shield. Arduino Uno board and the system will form an autonomous solution to monitor one or more sensors in your home.
- The project RASPBERRY PI HOME AUTOMATION WITH WIRELESS SENSORS USING SMART PHONE presents a low cost home control and monitoring system. An embedded microprocessor & microcontroller, with IP connectivity were used for accessing and controlling appliances using Smart phone app. This system doesn't require a server.

E. Home Automation Based On RF (Radio Frequency) Technology:

- Circuit for RF Remote Control of Home Appliances: - Without a microcontroller, the suggested system uses RF technology to control the appliances. In order to create a wireless remote, this project uses RF434 MHz modules. We may operate the appliances with this remote within a 100-meter range.

F. Miscellaneous:

- Project for home automation utilizing Lab View: - This framework shows how to construct a real-time home automation system utilizing Lab VIEW's data collecting tool. This strategy combines hardware and software technologies.
- The article Web and Smart Home Interface Based on Internet of Things GSM (Global System for Mobile) provides an architecture that will allow users to manage and keep an eye on smart devices online. Using GSM and internet technologies, it develops a user interface for the smart home, or it merely develops GSM-based wireless communication from the web server into the smart house.

IX. FUTURE

According to ABI Research, 1.5 million home automation systems had been deployed in the US by 2012. By the end of 2018, there will be more than 45 million smart home gadgets installed in U.S. homes, predicts research firm Statista. According to research conducted in April 2017 by Zion Market Research, the global market for smart homes is predicted to grow to a staggering \$53.45 billion by the year 2022, which will be truly astounding and amazing. By 2021, connected home applications, including those for home automation, security and video surveillance, linked appliances, and tracking, will account for 46%, or nearly half, of all M2M connections, predicts Cisco.

X. CONCLUSION

Having an AI-driven home automation system takes care of convenience, home security, and energy efficiency, giving homeowners piece of mind. The initial investment cost of such an intelligent system that comes with various gadgets is one barrier that the system must overcome in order to gain universal acceptance. Additionally, and perhaps most crucially, these systems need to be extremely secure because even a single hacking effort into a centralized system can result in the loss of sensitive data and an invasion of privacy.

XI. REFERENCES

- 1.Kumar, S., & Qadeer, M. A. (2012). Application of AI in home automation. *International Journal of Engineering and Technology*, 4(6), 803.
2. Prabhu, V., Jena, J., Rode, S., & Pathari, R. (2018). Home automation using artificial intelligence. *International Journal of Recent Trends in Engineering Research*, 4(3), 780-784.