IJRAR.ORG E-ISSN: 2348-1269, P-ISSN: 2349-5138

INTERNATIONAL JOURNAL OF RESEARCH AND ANALYTICAL REVIEWS (IJRAR) | IJRAR.ORG

An International Open Access, Peer-reviewed, Refereed Journal

ULTIMATE AI COMPANION FOR SMARTER HOMES

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Abstract : The emergence of artificial intelligence (AI) has ushered in a new era of home automation and changed the way we interact with our environment. In the context of home automation, artificial intelligence refers to the development of systems that intelligently control all aspects of home appliances and architecture, such as lighting, heating, security, hearing and entertainment. An important application of artificial intelligence in home automation is the use of smart assistants, devices powered by artificial intelligence that can understand and respond to commands.

These assistants use natural language processing (NLP) algorithms to interpret user commands and manage connected devices accordingly. With simple commands, they can adjust the lighting, adjust the thermostat, activate security and even order food. In recent years, artificial intelligence-supported home automation systems have become smarter thanks to advances in machine learning and deep learning. These systems can analyze data from sensors and user interactions to understand family routines and preferences to increase efficiency, improve security measures, and provide personal > Information.

However, as in all artificial intelligence applications, ethical issues are also important in the world of artificial intelligence-supported home automation. Proper guidelines and regulations, as well as development and deployment, are also crucial to ensuring the fair use of internal intelligence. Concerns about privacy, data security, and biases in AI algorithms need to be addressed to build trust and protect the health of residents. In summary, AI-powered home automation has great potential to improve the convenience, efficiency and comfort of our daily lives. By incorporating ethics into development and implementation, we can leverage the benefits of AI to improve our environment while reducing risks and ensuring customer privacy and security are protected.

1. INTRODUCTION

In an age driven by technological innovation, our lives are constantly evolving. Seamlessly integrating the latest technology into our daily lives has the potential to improve our quality of life, increase safety and reduce our environmental footprint. With this vision in mind, we are introducing our comprehensive Android and web-based application platform designed to improve your daily life. Our new solutions represent the integration of Home Automation and Next Generation Artificial Intelligence (AI). It is more than an app; This is a change. The design has many features and capabilities that redefine the way we interact with our homes, making them more intuitive, responsive and secure. Imagine a home where you can express your needs and carry out your orders effortlessly. Our platform leverages artificial intelligence for speech recognition and natural language processing (NLP), allowing you to control a variety of home appliances and tasks with voice commands. This is the future of intelligent life right now. But our commitment to your security goes beyond simplicity. We use the power of advanced sensors and smart algorithms to detect potential dangers in your home. Our system not only identifies potential threats, but also determines their severity and location. It provides practical advice such as evacuating in a crisis, calling the police, and even using a fire extinguisher. Your safety is our priority.

2. HISTORY AND FUTURE

2.1 HISTORY

From the early 1900s to World War II –

The period when automation was new Man's reliance on machines began in the mid-1700s with the advent of the Industrial Revolution. However, it was not until the early 1900s that automation entered our homes and began to impact our daily lives. For example, the first vacuum cleaner was invented in England in 1901 by Hubert Cecil Booth. This is also a time when factory workers and managers in cities and towns cannot afford the high cost of household services and are looking for a simple, affordable option. Thus, the demand for modern home appliances such as vacuum cleaners, toasters, blenders and sewing machines began to reach wealthy families during this period. On the other hand, these paved the way for what we call home networking today.

Great advances have been made –

In 1960, the world's first home computer, the ECHO IV or Electronic Computer Home Operator, was introduced. Said to have been invented by an engineer named Jim Sutherland, this device can control the temperature in your home, turn appliances on and off, and create things. ECHO IV attracted media attention when its performance was questioned. The most popular cartoon series, "The Jetsons", first defined "futuristic life" for a generation in the early 1960s, specifically on September 23, 1962. In 1975,

Pico Electronics, a Scottish company, developed the first home automation technology. X10. It is still used today and allows people to control many things at home. Thanks to the X10 system, customers can control all equipment and materials coming from the supplier and complete the job. The only problem is that the system is vulnerable to electricity as it relies on large amounts of electricity. In 1984, the National Association of Home Builders coined the term "smart home" to describe the concept of "using technology to make homes better.". At that time, "smart home" was also called "network architecture", which was the beginning of the connection between computer control and architecture.

Change in Thinking Speed –

From the 1990s to the Present The 1990s were an important period in the history of home automation. The creation of microcontrollers allows us to imagine the future where smart homes are the norm. The concept of smart home has also begun to influence popular culture. For example, Disney's 1999 film The House depicts a family completely controlled by artificial intelligence called PAT. But it wasn't until 2000 that the smart home revolution began to gain momentum. In 2010, Tony Fadell, best known as the creator of the iPod, founded his own company, Nest, to create advanced, Wi-Fi-enabled smart devices such as smoke alarms and heating. Two years later, SmartThings, an application for monitoring and controlling smart devices, home appliances, TVs and speakers, was registered on the server.

Samsung Innovation's In 2014 –

Samsung spent $200 million to acquire the company in 2014. That same year, the Taiwanese tech giant joined forces with Dell and Intel to form the Open Interconnect Alliance, a business model that defines the connectivity required for millions of IoT devices worldwide. Fast forward a few years, and the home automation industry has surprised the home industry with the emergence of AI-based smart home speakers such as Google Home, Amazon Echo devices, and more recently, Apple Home Pod. Just like smart speakers, robot vacuums, smart lights, cameras and locks have become part of the way we carry out daily tasks, and we're proud of them. Smart home is not considered one of our ideas as many companies are launching different types of smart home products. In fact, given the rapid advancement in technology, Jason's life is quite possible.

2.2 Future

The future of home automation: How the Internet of Things is changing daily life.

Are you looking for a new, simple home? Here, you wake up in the morning not by the sound of an alarm clock, but by your bed pulling you forward, the light in the room being adjusted, the curtains being opened and your tea being ready. Surprisingly, this is not the result of a science fiction novel or someone's dream; It is the future of home automation and is changing your daily life. Here you will gain insight into the future of home automation and learn how integrated technologies such as the Internet of Things (IoT) will change your daily life.

Important Smart Home Statistics –

There are approximately 300 million smart homes in the world, and by 2028, the number of active households in the smart market will reach 785.2 million users. According to data from Research Institute Statista, the number of active users in the smart home industry will reach 785.2 million. The number of smart home users is expected to increase by 11.43% from 2022 to 2028, and the market value is expected to increase by US$ 231.6 billion in 2028. It is expected that the USA will generate the highest revenue in the smart home market in the global market. Approximately US$30.86 billion in 2022. America's passion for technology and innovation is leading the way.

The Internet of Things is a game changer in everyday life-

The Internet of Things (IoT) connects everyday devices to the Internet, allowing data to be simulated and shared instantly. It has the ability to change where we live. Through the magic of connectivity, it has evolved from enhancing your travel to adding complete comfort to your home. IoT is the main driver of home automation. It allows you to instantly collect and track information about many areas of your life. Whether on holiday or at work, you can manage your home easily and safely.

3. WHAT IS HOME-AUTOMATION

Home automation refers to the integration of various technologies and home systems to automatically control and manage energy use, daily activities, and electrical appliances. This includes many functions, from adjusting temperature and lighting to scheduling household tasks and monitoring security cameras via connected smart devices and apps.

People can enjoy many benefits by using an electric generator at home, increasing the comfort, safety and efficiency of their daily lives. For example, the ability to control home appliances and systems via smartphones or commands can provide greater comfort and convenience, allowing homeowners to manage their homes even when they are remote.

Additionally, using electricity at home helps increase energy efficiency and save costs. Smart thermostats reduce energy use and energy costs by adjusting heating and cooling according to living standards and outdoor weather conditions. Likewise, the electric generator can adjust brightness and hours to increase energy efficiency while providing adequate lighting. In addition, the home automation system ensures safety through real-time monitoring and warning of danger or disruption. Smart security cameras, audio sensors and door locks give homeowners greater visibility and control over their properties, preventing unauthorized access and making it easier to respond to emergencies.

In addition to these advantages, the use of electricity at home can also contribute to the value of the house and contribute to the creation of a modern and sophisticated house. As the availability and capabilities of smart home devices and technology continue, homeowners have more flexibility to customize and expand their automation systems to meet their needs.

In summary, home automation represents the transition to control and continuous automation systems. Improve all aspects of family life. Thanks to technology and connectivity, people can achieve greater comfort, energy efficiency, security and peace of mind in their homes, ultimately improving their lives is good.

3.1 WORKING

Home automation has a complex network of hardware, communications infrastructure, and electronic interfaces designed to seamlessly integrate modern devices with the Internet. Thanks to the integration of sensors and Wi-Fi connection, each device becomes a part of this communication system and can be controlled remotely via smartphone or tablet wherever you are. This new technology allows users to perform tasks such as lighting a room, securing access points, or adjusting environmental settings such as temperature, all remotely from handheld devices. At the heart of a home automation setup are three key components: sensors, controllers and actuators.

Sensors play an important role by constantly monitoring the environment, such as measuring light levels, temperature changes or movement. The information collected by these sensors creates input for automatic adjustments based on user preferences, ensuring pleasant and efficient work.

The controller forms the basis of integrated home automation. Whether from a PC, tablet or smartphone, users can easily send and receive messages about the status of various systems, providing unprecedented control from wherever they are.

Actuators represent the last link in the chain and convert the controller's digital commands into physical action. They can use light switches, motors, or electric valves, each carefully programmed to perform a specific function based on remote instructions received from the controller.

Together, these elements form the backbone of the home automation ecosystem that seamlessly weaves convenience, efficiency and security into the fabric of daily life. By harnessing the power of connectivity and intelligent automation, people can transform the way they interact with their homes and unlock new levels of comfort and convenience.

3.2 What features are available through home automation systems?

Home automation has transformed daily life by providing many conveniences and new features that increase the security, comfort and functionality of the home. Among the many features available, some of the bests are:

i. Fire and Carbon Monoxide Monitoring: Advanced technology integrated into home automation systems provides early detection and warning of people in danger by constantly monitoring signs of fire or dangerous carbon monoxide.

ii. Remote lighting control: Homeowners can adjust lighting from anywhere using a smartphone or voice command, providing optimal lighting conditions and saving energy without the need for manual intervention.

iii. Thermostat Control: Home automation extends to security control, allowing users to adjust the thermostat to maintain the desired temperature and increase energy efficiency, increasing comfort and reducing energy costs.

iv. Appliance management: Homeowners can easily manage their household chores and schedule by managing appliances in areas like the washing machine, dishwasher, and oven, so the product stays nice and easy.

v. Security Systems and Cameras: Home security solutions provide real-time video monitoring, motion-detection, alarms, allowing users to instantly monitor their vehicles and eliminate threats, providing a sense of security and peace of mind.

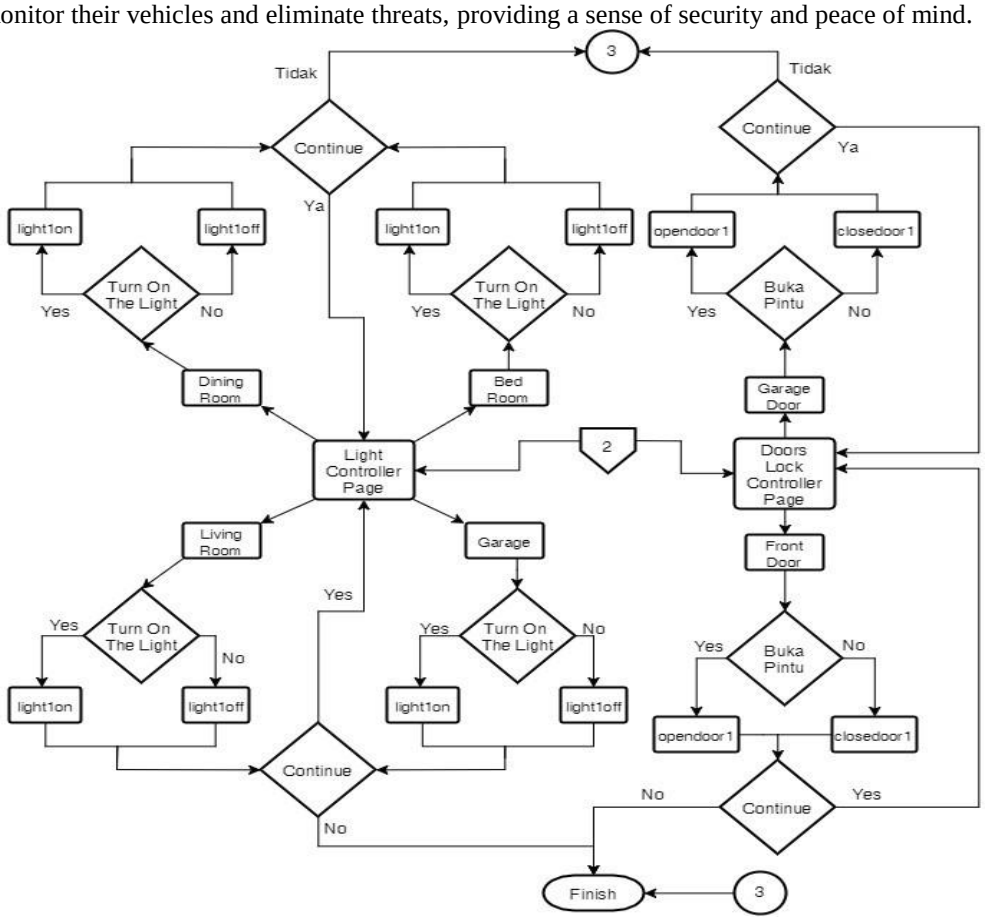

Fig 1: Home automation flow chart

vi. Instant Alerts: Instant text and email alerts to alert homeowners to unusual or emergency situations, take action, and resolve issues quickly, even remotely.

vii. Self-Assistant Integration: Seamless integration with popular personal assistants enables hands-free and intuitive control of home automation tasks from commands, enhancing simplicity and practicality.

viii. Keyless Entry: Keyless entry systems provide secure entry to your home via a smartphone app or keypad, eliminating the need for physical keys and giving occupants, family and confidants greater flexibility in controlling access.

ix. Voice control: Voice recognition technology can easily control many home automation functions with voice commands, providing an easy, hands-free way to interact with smart devices and machines.

Essentially, home appliances represent a revolutionary change in today's lifestyle, offering a combination of technology and unparalleled convenience to improve the quality of life of homeowners.

3.3 What are the benefits of home automation?

A home automation system is a simple solution for the operation of your home and provides many advantages in terms of convenience, comfort, security and energy efficiency:

a. Remote access: Harnessing the power of mobile devices such as laptops, tablets, and smartphones, home automation allows users to control their home environment from anywhere with an Internet connection. Whether it is adjusting the temperature, ensuring security or controlling the lighting, remote access makes home management unique and easy.

b. Comfort: Personalize your living space with customizable automation settings designed to improve comfort and ambiance. From adjusting your thermostat to maintain the perfect temperature throughout the day to setting up your smart speakers to greet you with soothing music when you arrive, home automation transforms you into a warm and inviting place to suit your preferences.

c. Convenience: Simplify daily life and streamline daily tasks with automatic scheduling and remote control at home. By using the device to activate at specific times or control settings remotely from a smartphone app, homeowners can save more time and perform maintenance more efficiently.

d. Enhanced security: Keep your home safe with advanced technologies like smart gas detectors, carbon monoxide detectors and pressure detectors. A home automation system can provide peace of mind and prevent damage by providing early detection and immediate warning of potential hazards.

e. Energy efficiency: Use a home energy system to increase energy efficiency and promote a more efficient lifestyle. By using smart lighting that adjusts brightness based on occupancy or adjusting thermostats to save energy during periods of inactivity, homeowners can significantly reduce energy costs and reduce their environmental footprint.

In fact, home automation represents a change in modern lifestyles, allowing people to create a personal, efficient environment according to their specific needs and preferences. Home automation seamlessly integrates technology into daily life, increasing comfort, convenience, security and sustainability, ultimately enriching the home's quality of life.

4. SCOPE

The goal is to create a design that will create a wireless remote control from home appliances. The app is designed to run on Android devices and provides features such as mode switching, voice commands, and the ability to view the app's status. Considering its many uses, here are the sources of this model. The system can also be used to monitor electrical equipment in homes, small offices and shops. It is used for remote access to devices on the Internet or internal network. Devices in the above environment can be managed on the internal network or accessed from the network. Construction technology is environmentally friendly. The integrated system uses and develops HAS systems. Using everyday items we can use them in many different ways.

a. Intelligent Automation and Scheduling:
   Advanced automation features that allow users to create schedules and routines for their equipment. Allows users to adjust signals based on various parameters such as time, sensor input or device status. An optimal plan is prepared using energy consumption patterns and targets, along with machine learning algorithms.
a. Energy Monitoring and Management:
   Integrate energy monitoring capabilities to track a device's energy consumption. Provides energy efficiency insights and analysis to help customers identify optimization and cost savings opportunities. Make features like energy consumption and notifications to alert users to overuse or potential waste.
b. Security and Access Control:
   Increase security with features like device authentication, security protection, and end-to-end access. Comply with access control policies to restrict certain functions or manage devices based on user responsibilities and permissions. Integrate security systems and sensors with your home to provide instant alerts and monitoring of unauthorized access or unusual events.
c. Integration with IoT ecosystem:
   Ensure compatibility and interaction with IoT ecosystems and existing models such as Apple HomeKit, Google Home and Amazon Alexa. Provide APIs and SDKs for developers to create integrations with third-party services, devices, and platforms. Explore opportunities for the interaction of connected devices and automation events with other smart home devices and wearables.

d. Localization and Internationalization:
Support multiple languages and regional preferences to meet different users and markets. Improved user interface, date/time and metrics for user location and cultural standards.

e. Accessibility and Inclusion:
Design apps with accessibility features like screen readers, voice commands, and high contrast modes for people with disabilities. Conduct usability testing with diverse user groups to identify and resolve usability issues and ensure customer engagement. Provide options to customize size, button layout, and interaction mode to meet customer preferences and needs.

f. Community participation and user input:
Create a community platform for users to share their experiences, exchange ideas, and request new features or improvements for features. Encourage user participation through forums, social media, and beta testing to foster a sense of ownership and collaboration. Work to monitor user feedback and prioritize specific requests based on user needs and impact on overall user experience.

g. Privacy and Data Protection:
Ensure privacy by establishing standards to protect user data and ensuring compliance with privacy laws such as GDPR (General Data Protection Regulations). Provide users with transparent data practices and clear privacy policies around data collection, storage and sharing. Give users control options to manage their data preferences, including opt-in/opt-out processes for data sharing and privacy.

By integrating more elements into your design, you can create versatile solutions that provide not only the basic functions of remote control but also added value in automation, energy management, security, user experience and scalability.

5. INTERNET OF THINGS

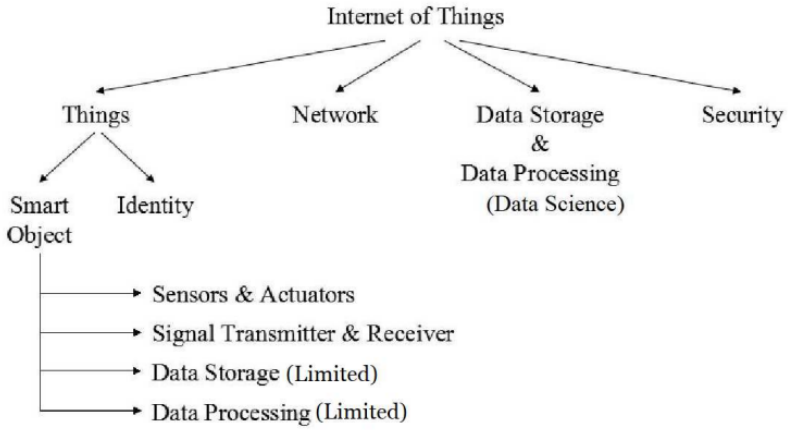

Fig 2: IOT Tree

Until a few years ago, no one could imagine videoconferencing with family members living in different countries. This is a common situation nowadays. The reason for all this is the advancement of technology and the constant emergence of devices with new and advanced features. People can do anything with a single click on their smartphones, whether it's sending an email, paying a bill, transferring money or booking a taxi.

We have had the “Internet of Computers (IoC)” since 1991 and it has grown as more people started using it. With the advent of mobile phones and internet devices, the Internet of Devices began and eventually became larger than mobile phones, computers, laptops and tablets. It was cheaper and more accessible to the middle class. Gartner, Inc. It is estimated that 6.4 billion connectors will be used worldwide in 2016, an increase of 30% compared to 2015 and will reach 20.8 billion by 2020. In 2016, more than 5.5 million new things were connected every day, expanding the scope of the Internet of Things. There are many disciplines related to the Internet of Things, as there are many things constantly interconnected to form the Internet of Things. Therefore, the Internet of Things can be seen as a combination of many fields. IT gives a representative list of some of the sites built on the Internet of Things (many overlapping in content and technology). The Internet of Things is simply the connection between physical (electronic equipment, land, plants, animals, etc.) and people. People use smart devices that can send, receive and analyze information connected to these devices. These smart objects represent things (human or physical) that are connected to the network.

5.1 AI-IOT

The Internet of Things is a big concept that includes many sensors, actuators, data storage and data processing resources connected together via the Internet. Therefore, an IoT-enabled device can sense its environment, transmit, store, process data, and act accordingly. The final step of the action depends on the completed action. How smart an IoT service is depends on the level of functionality or functionality it can perform. Non-intelligent IoT systems have limited capabilities and cannot be built with data. However, smarter IoT systems will have artificial intelligence and serve the purpose of automation and adaptation. Against this background, some examples of existing IoT services and the artificial intelligence behind them are discussed here.

These are cloud-based voice services that act as personal assistants for users. They do many tasks through third-party apps and other nearby smart devices. They can answer questions, call a taxi, make restaurant reservations, play music, turn the smart light on and off, and perform many other tasks based on the user's voice command.

Here are some voice assistants: -

- Alexa is Amazon's voice assistant and is used in products like Amazon Echo, Amazon Tap, and more. There are special sets called Alexa Skill Kits (ASKs) that can be customized and modified to personalize or enhance specific skills.
- Siri, Apple Inc. For Apple Home-pod which has a similar purpose.
- Google Assistant used in Google Home has the additional feature of identifying up to 6 different users and extracting details about conversations with them.

The ability of these voice assistants to perform multiple tasks is due to the use of various sub-specialties. Automatic remote recognition, word search, speech-to-text conversion, language processing and understanding, situational awareness, emotional control discussion, question and answer, intellectual discussion, etc. Voice assistance is provided regularly, work on time.

In addition to voice assistants and robots, the Internet of Things also includes smart products/devices that make people's work easier. Artificial intelligence, face recognition, speech recognition, voice recognition and expression, deep neural network, transfer learning, smart objects supporting vision in computers and other applications.

Here are some smart devices:-

a. Smart Thermostats:
Research articles often explore the design, optimization, and energy efficiency of smart thermostats that control heating and cooling in homes and buildings. Topics will include machine learning algorithms for temperature adjustment, integration with onboard sensors for energy saving, and user identification habit for personal comfort.

b. Smart lighting:
Academic research focuses on smart lighting that provides functions such as dimming, color control and automatic scheduling. Introductory research will include lighting enhancement and natural light sensor integration. Save daylight and user research on the impact of lighting on health and productivity.

c. Smart Home Security Devices:
Case studies often examine smart home security devices such as cameras, audio sensors, and door locks that provide remote monitoring and access control settings. Topics will include evaluation of secure data transfer encryption protocols, real-time intrusion detection algorithm threats, and usability studies of security management user interfaces.

d. Smart Energy Monitoring Systems:
Research studies are investigating smart energy devices for monitoring and analyzing energy use in homes and buildings. Topics will include the development of non-intrusive maintenance (NILM) algorithms for equipment identification, integration with renewable energy for grid optimization, and user research on electronic feedback mechanisms.

6. CONCLUSION

In summary, home automation platforms using AI are highly effective and usher in a new era of convenience, accessibility, security, utility, and technology. While there may be initial costs and privacy considerations, the benefits outweigh the concerns. The use of technology extends beyond the environment, with applications in aged care, business and smart city development, improving quality of life and supporting greater safety.

This innovative solution not only simplifies daily tasks, but also supports a better lifestyle by meeting the changing needs of today's homeowners. With the use of artificial intelligence, buildings are becoming smarter, more sensitive and better able to meet the needs of daily life.

In addition, artificial intelligence-based home automation has great potential to contribute to a safer and more comfortable future. From top security features to energy-saving plans, these platforms offer benefits that improve the health and well-being of individuals and communities.

In fact, the use of a smart device-focused home automation platform represents a major step forward in terms of efficiency, usability and security. By leveraging the power of AI, homeowners can enjoy a more seamless lifestyle and pave the way for a brighter, safer tomorrow.

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