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9940 572 462

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ijirset@gmail.com

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# Smart Home with Safety Automation System

Mrs. Archana Burujwale<sup>1</sup>, Arya Barsode<sup>2</sup>, Prathmesh Pattewar<sup>3</sup>, Anushree Shekokar<sup>4</sup>,  
Govind Vasave<sup>5</sup>

Professor, Department of Computer Science and Engineering (Artificial Intelligence), VIT, Pune, Maharashtra, India<sup>1</sup>

Students, Department of Computer Science and Engineering (Artificial Intelligence), VIT, Pune,

Maharashtra, India<sup>2,3,4,5</sup>

**ABSTRACT:** This project introduces a Smart Home Automation System that contains enriched features, designed to provide homeowners with comprehensive control, security, and peace of mind. By integrating different sensors, microcontrollers, and user-centric mobile applications, this system enables real-time monitoring of various environmental conditions and proactive responses to potential safety hazards. Key sensors, including temperature, humidity, gas and flame detectors, are strategically positioned throughout the home to continuously gather data on various important parameters. This data is processed by microcontrollers, which analyse and interpret the information, triggering appropriate responses and actions based on predefined thresholds and rules. Leveraging the Google Firebase real-time database, the system ensures seamless synchronisation and accessibility of home environment data through the mobile application. Users can remotely monitor sensor readings, receive instant alerts about safety hazards, and control connected devices directly from their smartphones, empowering them with an efficient solution for greater control over their living spaces. This system not only enhances the convenience and comfort of users but also prioritises the safety and security of residents.

**KEYWORDS:** automation, user-centric, sensors, microcontrollers, convenience, safety, real-time database.

## I. INTRODUCTION

Smart Home Automation Systems in recent years have gained significant attention and there have been multiple advancements in the technology. It has become increasingly feasible to integrate various household systems and devices into a unified, automated ecosystem. Many people all around the world use these automation systems to increase convenience and comfort. Automation systems can be used to turn on or turn off a light in your home, or it can even be used to detect and respond effectively to hazards like fires, intrusions, and even environmental dangers. Smart bulbs and lighting systems allow users to control the brightness of the lights from their phones. These lights can also change brightness automatically based on the time of the day.

Developing a simple and intuitive interface allows homeowners to easily manage and monitor their smart home systems. These automation systems can be remotely accessed, allowing users to monitor and oversee their homes' security status from anywhere, and at any time. In our mobile application, users can view real-time data from sensors, receive alerts about the safety of their homes and take immediate action to address any issues directly from their smartphones quickly. In case of safety hazards or any abnormal conditions, the system sends instant notifications to the user's mobile application.

Home automation systems are useful for elderly individuals. These systems can enhance their safety and convenience. According to multiple studies performed it was found that older adults (defined as those above the age of 65) are at a higher risk of disabilities. For instance, automated lighting in homes can reduce the risk of falling in the night or voice-activated devices can simplify daily tasks. These systems can be helpful to multiple users to easily perform different activities in their homes without any difficulty. As stated above automated systems simplify daily tasks, improve energy management and also enhance quality of life. As of 2024, around 57% of households all around the world use at least one smart home device. Some systems monitor user habits and optimize heating and cooling schedules in different seasons. Voice-activated smart devices enable users to access a vast amount of content through many voice commands(eg: streaming movies), here users can operate devices without actually touching them.

## II. LITERATURE SURVEY

Smart home automation is now a very demanding area and a lot of research is being done on these systems so that these automated systems can contribute to comfort in modern homes. With the internet being an essential part of broad communication in modern life, IoT has allowed homes to interact with all appliances. With increasing personal threats to home occupants and property damage, it is crucial to have an effective system to keep track of security in the home and the environment.[5] An approach for controlling home appliances based on intelligent decision-making, which used the support vector machine for its intelligent decision-making and blockchain technology for the security of IoT devices.

A algorithm to monitor and control the home and its environmental conditions, motion sensors, and electrical appliances were also proposed. The algorithm was used to monitor the power consumption of different appliances in the home through the Wi-Fi module and was also applied to create an alarm to detect the gas level in the home[6]. A smart home automation system to sense if any home appliances are on or off. The system uses visual machine intelligence and sensors. Using visual monitoring, the desired home appliance is switched to the desired state, and an update is sent to the user about the status of the device.

There is a Bluetooth-based smartphone application for the control of home devices, doors, and overall home monitoring. This system automatically can switch off the lights at night, detect gas and smoke, and also control home appliances like fans, and light bulbs. The system also locks and unlocks the door of the home automatically via an authentication module. The communication between the user's smartphone and the hardware is done via Bluetooth connectivity.

There is an Android application that uses the Firebase database to transmit sensor data, receive commands, and automatically control various devices in the living space. Automatic control of lights in the system is based on feedback from the light-dependent sensors in the home. The work also incorporates the detection of motion. This system also incorporates a reduction in home energy consumption through automated behavior programmed into the system.

In Home security and safety are important to human health, welfare, mental stability, and peace of mind. For instance, people who have experienced home intrusion might be concerned while away at work about the safety of their living space. This can make the person less productive or efficient in their duties, which could affect their work as well as their health. So, getting continuous updates on one's home and its security while the residents are away will help the users to be more relaxed. On the other hand, while the owner is at home, a security system that alerts the owner of danger would prevent the residents from getting injured and also allow the users to alert the security agencies about the danger. Such scenarios have motivated us to design and develop a system to control home appliances, monitor environment changes, and contribute to the field of the Internet of Things.

## III. METHODOLOGY

The methodology is used to create an environment for users to control different devices and interact with them with the help of a simple user interface in our mobile application. Managing homes when you are traveling or working can be very challenging. Using smart cameras, alarms and other smart devices can make it easier to administer different tasks. These systems speed up response time, improve security, and coordinate activities when you are far away from home. It makes sense that people who use these IOT-based devices have more secure living spaces.

These smart home management applications can be used on various devices like Android mobile phones, laptops, and desktops. Users need to log in or create an account and add important details(like home address)before they start using this system. They need to simply install the application on their personal device and then they can immediately start using it after creating an account.

In this system, the user has to first log in or create a new account. This system contains a user interface that users can use to access different devices inside their homes and control and observe different activities on the mobile application itself. The mobile application retrieves data from the Firebase database in real time, ensuring that users have access to the latest information about their home environment. Users can also view sensor readings, safety alerts, and device statuses directly from the interface of the application. Additionally, users can also control connected devices, such as lights, alarms, or thermostats, remotely through the mobile application.



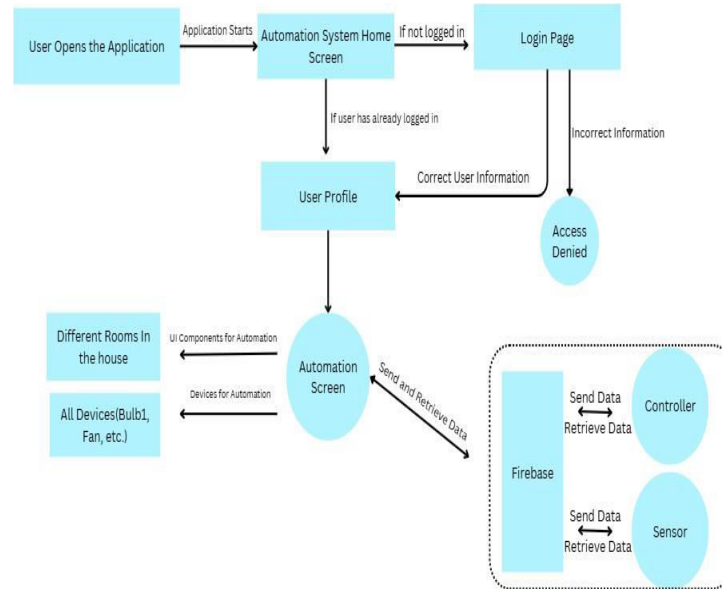


Fig. 1 Backend working of our system.

#### IV. EXPERIMENTAL RESULTS

Figures 2,3,4 show the results of the home automation software. And figure 5 shows the hardware used.

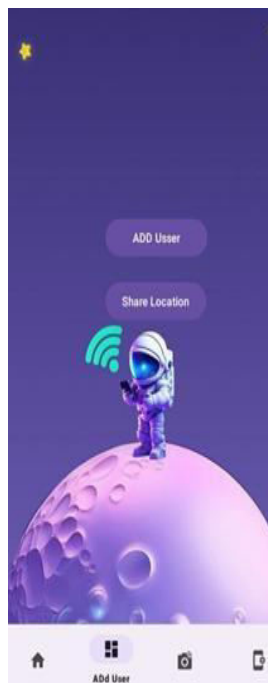


Fig. 2 Login page



Fig. 3 Application Home page

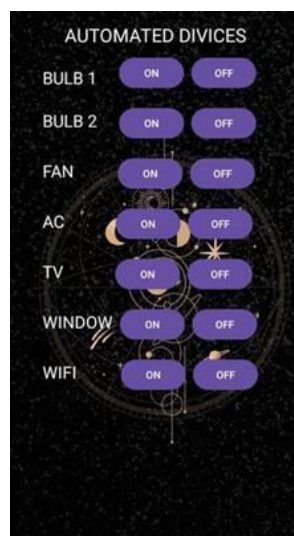


Fig. 4 Device Controls



Fig. 5 Hardware Model

## V. CONCLUSION

In the end, smart homes with safety automation systems represent a significant advancement in residential automation technology, that offers users control and convenience. We firmly believe that our system will help users significantly transform their lives, providing them with a safer, more connected, and efficient living environment. We will surely see more people using automation systems with safety features in the future. Through seamless communication with Google Firebase's real-time database, users can access up-to-date information about their living spaces and receive instant notifications and alerts about potential risks and abnormal conditions. Overall with this project, we demonstrate the potential of smart home technology to transform the way we live. With the current development and innovations, smart home automation systems have the potential to further improve quality of life, promote sustainability, and enhance home safety for users around the world.

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