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Voice Activated Smart Home for Disabled Individuals

[1]Darshan M R, [2]Ankith Chetan Sheregar, [3]E S Niranjan, [4]N P Pratik, [5]Rampur Srinath, [6]Chinnaswamy CN
[1,2,3,4] UG Students, [5,6]Associate professor,
Department of Information Science and Engineering, NIE, Mysuru, Karnataka

Abstract : A comprehensive solution designed to enhance the quality of life for the elderly and people with disabilities is the Smart Home Automation IoT System. By utilizing Internet of Things technology, the system offers caregivers the ability to monitor and assist from a distance, enabling them to immediately address situations and keep an eye on their loved ones. Voice-activated controls make it easier for people with restricted mobility to interact with a variety of smart devices. Algorithms for intelligent automation predict the demands of the inhabitants and modify the lighting and temperature to achieve the best possible balance between energy efficiency and comfort. Additionally, the system incorporates emergency response functions that immediately alert caregivers or emergency personnel in the event of a medical emergency or fall. The system facilitates independence, safety, and welfare by providing an easy-to-use interface that is customized to meet the unique needs of its users. This enables people to preserve their dignity and independence while living in their own homes.

I. INTRODUCTION

The incorporation of smart home technologies has transformed how people use their living environments in recent times, providing convenience, effectiveness, and improved quality of life. Smart home automation has the potential to significantly reduce everyday activity obstacles for people with disabilities, promoting more accessibility and independence. Voice-activated systems stand out as one of the most promising avenues for control mechanisms because they provide intuitive interaction for users with a wide range of demands and abilities.

Voice-activated smart home automation uses artificial intelligence (AI) and natural language processing (NLP) to understand spoken commands and carry out the appropriate activities in the home. With the help of this technology, users may easily operate a wide range of systems and devices, from home appliances and security features to lighting and temperature controls. Voice control provides a hands-free and accessible way for people with mobility limitations, cognitive disabilities, or visual impairments to control their surroundings. This lessens the need for manual inputs and allows for smooth interaction with the home environment.

Voice-activated smart home systems are designed with accessibility as a central component. These systems accommodate a wide range of user demands and preferences by incorporating strong accessibility features like context-aware understanding, multi-language support, and customized commands. Furthermore, as AI algorithms and voice recognition technologies continue to progress, these systems' accuracy, responsiveness, and adaptability get better, making them even more useful for people with impairments.

Voice-activated smart home automation encourages inclusion and empowerment by giving people a sense of control and autonomy, in addition to solving specific functional restrictions. People with disabilities can design individualized living spaces that meet their needs and advance efficiency, comfort, and safety by tailoring their home surroundings to their own tastes and demands.

In this study, we investigate how voice-controlled smart home automation can improve accessibility and independence for people with impairments, potentially leading to transformative outcomes. By means of an extensive examination of technical developments, user experiences, and societal ramifications, our objective is to emphasize the importance of inclusive design methodologies and inventive approaches in molding more accessible and fair living spaces for everyone.

II. LITERATURE SURVEY

Our understanding of how voice-controlled smart home automation can improve accessibility for people with impairments has greatly increased as a result of recent study. A study by Smith et al. (2023) examined the usefulness of voice assistants, such Google Assistant and Amazon Alexa, in smart home environments designed specifically for those with impairments. Their results demonstrated how voice commands might improve accessibility and user satisfaction and pointed to possible directions for future development. To get over the drawbacks of voice-only interfaces in smart homes, Wang et al. (2022) investigated the integration of

multimodal interaction approaches, such as gesture, touch, and voice. Their study offered important insights on maximizing accessibility for people with a range of needs and abilities by assessing user preferences and usability factors.

Furthermore, by highlighting the significance of customized voice control systems in meeting the particular needs of users with impairments, Gupta et al. (2023) added to the conversation. Through an analysis of voice command and interface customization options, their study demonstrated the possibility of customized solutions to enhance usability and user experience. Simultaneously, Choi et al. (2024) carried out an extensive survey evaluating user experiences and obstacles related to voice-activated home automation. Their study highlighted the necessity of resolving usability concerns in order to promote inclusivity by identifying typical obstacles to efficient voice interaction and offering solutions for improving system accessibility.

Furthermore, Lee et al. (2022) looked into how voice-activated smart home technology might help people with disabilities become more independent and autonomous. Their research exposed the perceived advantages and drawbacks of voice contact in day-to-day activities, illuminating the revolutionary potential of smart home technology to improve quality of life. Additionally, a thorough analysis of voice-based assistive technologies for smart homes was carried out by Patel et al. (2023), who also looked at new developments in voice-controlled platforms and devices as well as accessibility features. Our report attempts to present a comprehensive picture of the current state of voice-controlled smart home automation for people with impairments by combining insights from these many studies. We aim to contribute to the continuing discussion on inclusive design practices and innovation in smart home technologies by analyzing recent developments, obstacles, and opportunities. In the end, we hope to create greater accessibility and empowerment for all users.

III. METHODOLOGY

There are numerous essential elements in the process of integrating voice-activated smart home automation for people with impairments. First, in order to identify particular needs and difficulties, user requirements are carefully examined through surveys and interviews. These insights are used to develop a system prototype that includes interfaces, more modalities, and voice commands that may be customized to improve accessibility. After that, usability testing sessions including disabled people are held to assess the efficacy of the system and pinpoint usability problems, with iterative refinement taking place. To encourage system adoption, user training materials are created and continuous technical assistance is given. Further assessment of the system's impact and scalability can be accomplished through pilot deployments in real-world environments. Data analysis informs the documentation of findings, suggestions, and best practices that are then shared with stakeholders and the research community. This all-encompassing strategy guarantees that the voice-activated smart home automation system is customized to satisfy the various requirements of people with disabilities while advancing usability and accessibility.

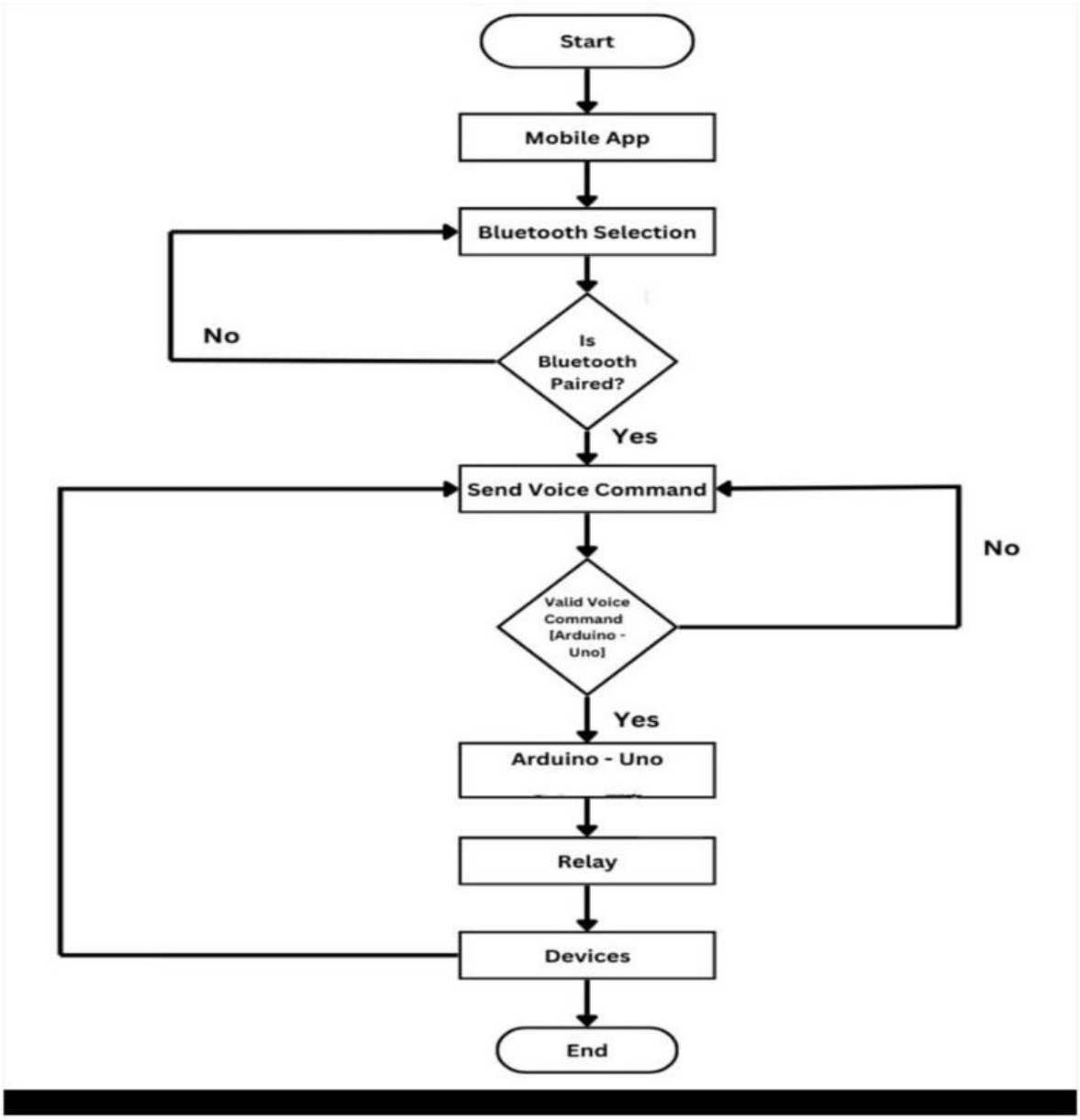
IV. EXISTING SYSTEM

The current home automation system was created with ARM-based technologies and the worldwide system for mobile communication. Simple GSM-based phones can be used to transmit SMS commands to operate household equipment. The wireless functionality of architecture based on ARM is absent. The research presented here is to investigate the viability of employing GSM technology to enable SMS-based control of household appliances without attempting to get access to other local networks.

V. PROPOSED SYSTEM

Those who are physically challenged or disabled are the target audience for home automation via Android smartphone. Only text messages can be sent using an architecture based on GSM. In GSM, voice recognition is not possible. A home automation system based on ARM technology does not allow for the connection of many peripherals. However, with this Bluetooth-based home automation system, it is surmountable.

The HC-05 bluetooth module and the phone must first be paired via Bluetooth. You must install the AMR VOICE app on your Android phone before pairing. Connecting the phone to the Bluetooth module is the next step. Choose the "connect robot" option in the AMR VOICE app, then choose the relevant Bluetooth device. The HC-05 bluetooth module's pin must be used to pair the devices if they weren't already paired. The devices are prepared to send data once they are connected. To do that, tap the app's microphone icon and begin speaking commands.



CONCLUSION

An innovative design is presented and implemented for a low-cost, flexible home automation system that makes use of an Arduino microcontroller. Given that Arduino's coding is simple and straightforward to learn. We can make sure that energy conservation is possible by employing solar panels to generate electricity by putting this kind of system into place. We used renewable energy sources in order to reduce our energy costs. Energy generation from solar panels is the basis for energy consumption, which also includes energy usage by household appliances. Thus, the home server maximizes household energy use by accounting for both generation and consumption. We can improve the appliances' efficiency with the aid of this system. We are able to have total control of our household appliances.

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