



**ITEJ**  
**Information Technology Engineering Journals**  
 eISSN : 2548-2157

**ITEJ** Information  
 Technology  
 Engineering  
 Journals

Url : <https://syekhnurjati.ac.id/journal/index.php/itej>  
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## A Review: Development of an IoT-Based Smart Home Monitoring System for the Comfort of People with Disabilities

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**Abstract**— The advancement of the Internet of Things (IoT) has revolutionized smart home technology, providing enhanced comfort, security, and accessibility, particularly for people with disabilities. This review explores the development of IoT-based smart home monitoring systems designed to improve the quality of life for individuals with mobility, sensory, or cognitive impairments. By integrating IoT sensors, automation, and artificial intelligence (AI), smart home systems can provide real-time monitoring, adaptive control of household appliances, and emergency response mechanisms. The study highlights key technologies such as voice-controlled assistants, smart sensors, and remote accessibility features, which enable seamless interaction with home environments. Additionally, challenges related to data privacy, security risks, and affordability are discussed, along with potential solutions. The findings suggest that IoT-enabled smart home systems significantly enhance the independence and well-being of individuals with disabilities, emphasizing the need for continued innovation and policy support in this field. **Keywords**— Disability, Smart Home, Google Assistant, IoT.

**Keywords:** IoT, Smart Home, Assistive Technology, Disability Support, Home Automation, AI-Driven Monitoring

### I. INTRODUCTION

The development of technology in the Internet of Things (IoT) era has opened up vast opportunities to create smarter[1][2][3], more efficient, and inclusive home environments. IoT enables physical devices to connect and communicate, allowing various household appliances to be controlled automatically through the internet[4]. This technology forms the foundation for smart home development, which not only increases comfort but also helps meet the needs of users with physical or sensory limitations, such as people with disabilities[5][6][7].

People with disabilities often face challenges in accessing and operating household appliances due to limited mobility, non-user-friendly device designs, and sensory barriers. These challenges can reduce their independence and comfort at home[8][9]. Therefore, a system is needed to improve accessibility and comfort for them. One promising approach is the integration of IoT technology with voice recognition, enabling household

appliances to be controlled by voice commands. This technology offers a simpler and more practical solution compared to conventional methods such as manual switches or web-based applications[10][11].

This study aims to develop an IoT-based monitoring and control system for household appliances designed specifically for the comfort of people with disabilities. The system uses voice recognition technology via Google Assistant and the MQTT protocol to control devices such as lights, fans, and window curtains. The implementation of this system not only provides easy access but also supports the independence of people with disabilities in their daily activities, in line with the mandate of Law No. 8 of 2016, which guarantees independent living and accessibility rights for people with disabilities[12][13][14][15].

## II. METHOD

### A. Systematic Literature Review (SLR)

The SLR method was used to examine research on IoT-based automation systems, including smart home applications and automation devices[16][17]. The process began by formulating research questions encompassing aspects of technology, the role of sensors in monitoring, and the impact of IoT on efficiency and accessibility. Literature searches were conducted using keywords such as "smart home automation system" and "IoT-based device control" in databases like IEEE Xplore, Shinta, Google Scholar, and relevant journals from the past five years[18][19][20].

### B. Research Questions

Tabel 1. Table Caption

ID	Research Questions	Tujuan
RQ1	How can IoT technology be implemented to automate household devices in supporting the independence of people with disabilities?	The objective is to identify effective IoT application methods for controlling household devices such as lights, fans, and window curtains automatically.
RQ2	How can the MQTT protocol be optimized to ensure efficient data transmission in smart home systems?	This aims to guarantee the reliability and efficiency of communication between devices in IoT home networks.
RQ3	What specific needs of people with disabilities must be considered in designing an IoT-based smart home system?	The goal is to identify accessibility and comfort requirements to produce inclusive and disability-friendly designs.

### C. Pencarian Literatur dan Kriteria Pemilihan

#### 1) Literature Search

Literature was searched using keywords such as "Automatic plant watering system" in databases like IEEE Xplore, Shinta, and Google Scholar within the past five years. Relevant articles were selected through three stages: abstract review, full-text reading, and applying inclusion criteria (e.g., IoT technology and prototype implementation) and exclusion criteria (e.g., studies without practical aspects)[21][22][23][24][25].

#### 2) Selection Criteria

##### a) Inclusion Criteria

- IoT-based systems designed for household applications, using communication protocols like MQTT[26].
- Systems designed to support people with physical, sensory, or cognitive disabilities[27].

- Systems designed to support people with physical, sensory, or cognitive disabilities[28].
  - Systems designed to support people with physical, sensory, or cognitive disabilities[29].
- b) Exclusion Criteria
- Systems not based on IoT or not utilizing modern communication protocols like MQTT[30].
  - Systems designed for general users without considering the needs of people with disabilities[31].
  - Systems designed for general users without considering the needs of people with disabilities[32].
  - Systems designed for general users without considering the needs of people with disabilities[33].

**D. Flowchart**

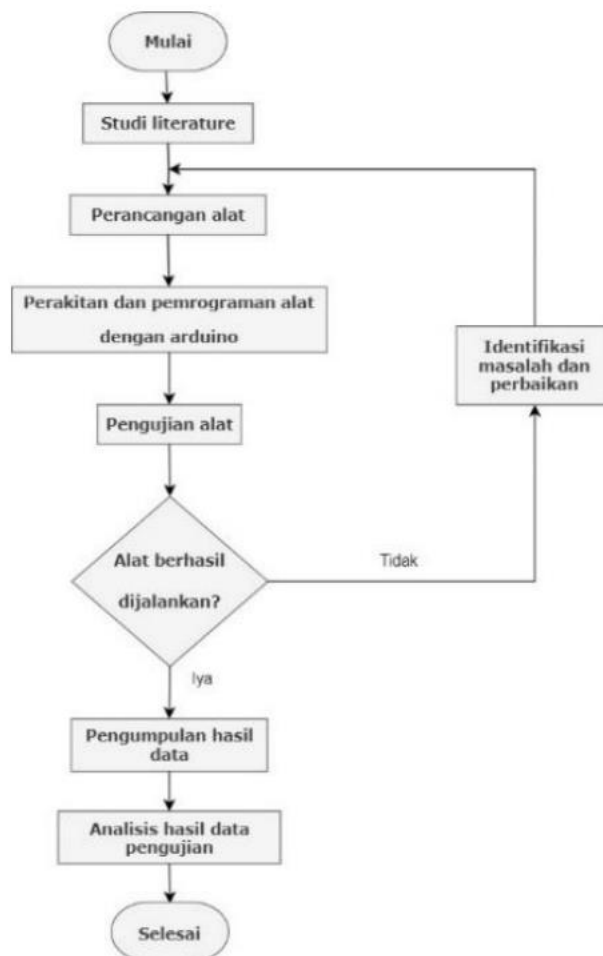


Figure 1. Flowchart[34]

### E. Block Diagram

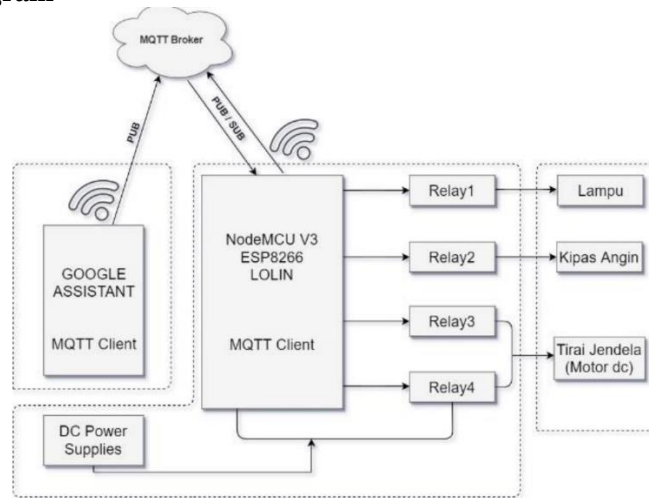


Figure 2. Blok Diagram[34]

## III. ANALYSIS PROCESS

### 1. Identification and Formulation of Research Questions

Determine the focus of the research, formulate relevant research questions, and direct subsequent processes to address the main research needs.

### 2. Literature Exploration

Gather literature sources from trusted databases relevant to the research topic, such as studies on IoT, smart homes, and technology for people with disabilities.

### 3. Literature Selection

Select literature based on predetermined inclusion and exclusion criteria, ensuring only relevant sources are used.

### 4. Data Extraction

Extract important information from the selected literature, such as methodologies, research results, and relevant technological applications.

### 5. Data Analysis

Analyze the extracted data to identify patterns, gaps, or opportunities in the development of IoT-based smart home systems.

### 6. Synthesize Findings

Combine findings from data analysis to gain new insights supporting the research objectives.

### 7. Formulate Recommendations

Develop recommendations based on research findings for better development or implementation of systems, such as IoT solutions for people with disabilities.

## IV. RESULTS AND DISCUSSION

This study aimed to develop an IoT-based smart home system designed to support the comfort of people with disabilities by utilizing voice control through Google Assistant to operate household devices such as lights, fans, and curtains.[34][35] System testing showed that response times for device commands ranged from 2.16 seconds to 2.46 seconds, with the best average response time recorded for opening curtains (1.84 seconds). The system's reliability was high, with only one failure due to internet connection issues out of 30 tests.[36][37][38][39]

The system uses the MQTT protocol to ensure smooth and efficient communication between devices. Tests demonstrated that this protocol provides fast and stable data transmission between devices and Google Assistant, enabling real-time control

of devices. While there were minor failures caused by internet disruptions, the system proved robust in less stable network conditions.[40][41][42]

From an accessibility perspective, the system offers ease of use without requiring physical interaction. Users can issue voice commands that are interpreted by Google Assistant to activate devices as desired. This feature is particularly beneficial for individuals with mobility challenges or other physical limitations. Moreover, the simple interface design and voice control functionality enhance the system's inclusivity and accessibility[43][44][45].

In the context of people with disabilities, this system offers convenience in operating household devices without requiring physical interaction. Users only need to issue voice commands, which are then translated by Google Assistant to activate devices as desired. This is highly beneficial for individuals with mobility challenges or other physical limitations. Additionally, the simple interface design and the use of voice as a control method make the system more inclusive and accessible[46][47].

An important aspect of developing this system is its attention to the accessibility needs of people with disabilities. This research highlights that designs that consider physical, sensory, and cognitive limitations are crucial to creating technological solutions accessible to everyone. With this system, people with disabilities can enjoy a more independent and efficient home environment while supporting the inclusivity principles outlined in Law No. 8 of 2016 on Persons with Disabilities[48][49].

However, this research also found that while the system performs well overall, several aspects can still be improved, such as resilience to internet connection disruptions and the reliability of voice commands in noisy environments. Therefore, further development in network strengthening and voice sensitivity enhancement is expected to improve the system's performance.

Overall, this study successfully developed an IoT-based smart home system that significantly enhances the quality of life for people with disabilities by providing convenience in managing household devices. The system not only demonstrates efficiency in device control but also contributes to advancing the inclusivity of technology in daily life[50][51].

## V. CONCLUSION

This study demonstrates that IoT technology can enhance the comfort and independence of people with disabilities in managing household devices. By integrating Google Assistant for voice control and the MQTT protocol for device communication, the system enables people with disabilities to operate devices such as lights, fans, and curtains without physical interaction. The testing results showed relatively fast response times, with only one failure due to internet connection disruptions. The system was designed to be easy to use with a simple interface and voice control, meeting accessibility needs for people with physical, sensory, or cognitive limitations. This study also highlights that using the MQTT protocol in IoT-based smart home systems ensures efficient and reliable data transmission. Overall, this system provides an innovative solution to improve the quality of life for people with disabilities by creating a more inclusive home environment.

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