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Survey on: Voice driven email solutions for visually impaired people

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Abstract

The solution presented in this research is intended to improve email security and accessibility for those with visual impairments. The system enables users to navigate and manage emails with ease using natural language commands by incorporating voice-driven email management capabilities like pagination, sophisticated searching, and effective inbox management. The usage of voice commands and facial recognition as safe authentication techniques for user signup and login procedures is also highlighted in the report. These features, which provide improved usability, independence, and security in email communication, are designed to satisfy the special requirements of visually impaired users. Our goal with this system is to overcome the shortcomings of current email systems, which frequently don't have specific accessibility features and don't fully accommodate voice-based communication. The suggested solution offers cutting-edge accessibility improvements that make emailing easier and hands-free for persons with visual impairments while guaranteeing strong data security. The innovative way this system combines voice commands with cutting-edge security features is a big step toward building a welcoming and easy-to-use digital environment.

Keywords: Secure Authentication; Voice Recognition; Facial Recognition; Email Accessibility; Visual Impairment

1. Introduction

The use of email as a primary communication tool has grown significantly over the years. However, for visually impaired individuals, accessing and managing email remains a significant challenge due to the lack of specialized accessibility features in existing email systems. Current systems often rely on traditional user interfaces that are not designed with accessibility in mind. This makes email management a cumbersome and sometimes impossible task for visually impaired users. Recent advancements in voice-based technology have created opportunities to address this issue by allowing hands-free operation. By integrating voice commands, visually impaired users can potentially access and manage their emails more independently. Additionally, incorporating face recognition and voice-based authentication can enhance security, ensuring a safe and accessible experience. The motivation behind this project is to provide a more inclusive solution that empowers visually impaired users to manage their emails with ease and security, breaking down barriers that exist in traditional email systems.

2. Literature review

2.1. Existing Voice-Based Email Systems

Voice-based email systems have emerged as an important tool for individuals with disabilities, particularly for the visually impaired. These systems use voice recognition technology to allow users to interact with email applications through spoken commands. A number of studies have focused on improving the accessibility and usability of email systems using voice control.

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[1] Omkar, M. D., Upashi, M. A. S., Naik, M. B., Wakkundmath, M. L. B., & Hosmani, M.L. Omkar et al. (2023) developed a voice-driven email system specifically designed for visually impaired individuals. Their system integrates natural language processing (NLP) for composing, reading, and replying to emails. However, their study emphasizes that while voice-based systems offer convenience, issues such as system responsiveness and accuracy in noisy environments remain challenges that require further refinement

[2] Femi, A. G., Ali, A. M., & Iheanyi, A. A. Similarly, Femi et al. (2024) discussed the necessity of improving voice-based email systems for people with visual impairments. They focused on making the system more adaptive and accurate by integrating advanced NLP algorithms and contextual understanding, improving overall user experience. However, like most systems, they acknowledged the limitations of current systems in handling complex commands and personalized email management. These systems, while innovative, often struggle with accuracy in understanding voice commands and fail to provide advanced functionalities, such as pagination and sophisticated search mechanisms, which are essential for email management.

2.1.1. Accessibility Solutions for Visually Impaired Users

There is a growing body of work focusing on improving the digital accessibility for visually impaired users across various platforms, including email management systems. Research on assistive technologies such as screen readers, audio interfaces, and haptic feedback mechanisms is widely documented.

[3] Balaji, B., Lalitha, V., Malin, S., Sujitha, S., & Swetha, R. The most common approach for email systems today is the integration of screen readers, which convert text into speech. However, these systems can be slow and inefficient for managing large volumes of emails. Balaji et al. (2023) focused on developing a voice-based email system for the visually challenged, providing functionalities like reading aloud emails and composing responses. Their study found that while screen readers provide basic assistance, more advanced features like search and pagination are crucial for improving email navigation and management.

[4] Patil, C., Shahane, A., Jadhav, T., & Gaidhani, A. Sadhana et al. (2023) explored the integration of voice recognition and face authentication for system login, providing a smoother experience for visually impaired users. However, such systems are often limited in their integration with other functionalities such as email pagination and real-time search, which are critical for managing multiple emails effectively. Despite significant progress, the integration of effective search mechanisms, dynamic pagination for long email threads, and ease of use for visually impaired users remains underexplored. This gap highlights the need for more research into innovative methods to enhance digital accessibility for the visually impaired.

2.1.2. Face Recognition and Voice Command Authentication in Security

Securing personal information has become a critical concern in the development of assistive technologies. For visually impaired individuals, traditional authentication methods such as password-based systems can be cumbersome and difficult to use. As a result, biometric authentication methods like face recognition and voice command-based systems have gained traction.

[5] Madake, J., Bakal, S., Bangi, C., Bhatlawande, S., & Shilaskar, S. Madake et al. (2023) integrated face recognition for visually impaired users within a voice-based email system, improving both accessibility and security. Their work demonstrated the feasibility of face recognition in combination with voice commands, enabling secure user authentication without requiring visual input. However, their system still faced challenges related to accuracy and speed, particularly under varied lighting conditions or with noisy backgrounds.

[6] Kumar, R., Singh, V., Akhtar, N., Verma, V., & Srivastava, S. (2022). Kumar et al. (2022) also discussed voice-based authentication for individuals with visual impairments, arguing that voice biometrics can offer a secure, hands-free method of authentication. However, they pointed out the limitations of voice command systems, such as susceptibility to voice variations (e.g., during illness or tiredness), background noise interference, and the need for high quality microphones.

These studies indicate that while face recognition and voice command authentication hold great promise, more research is needed to refine these technologies to make them reliable and efficient for visually impaired users. The integration of these systems with email management features such as search and pagination would be a step forward in creating a comprehensive and accessible solution.

Table 1 Comparison table

Authors and Year	Title	Methodology	Contribution	Limitations
Omkar, M. D., Upashi, M. A. S., Naik, M. B., Wakkundmath, M. L. B., & Hosmani, M. L.	SMART Voice Assistant with Driven Voice-Based Email System for Visually impaired	Voice-driven commands for email management	Proposed a voice-driven email system to enhance accessibility for visually impaired users	Lacks advanced security features like facial recognition
Femi, A. G., Ali, A. M., & Iheanyi, A. A.	The Need to Foster an Improved Voice-Based Email Framework for Outwardly Hindered People	Voice-based email framework	Highlighted the need for enhanced voice-based email systems for users with visual impairments	Does not provide implementation or practical testing of the proposed improvements
Balaji, B., Lalitha, V., Malin, S., Sujitha, S., & Swetha, R.	Voice-Based Email System for the Visually Challenged	Voice interface for email communication	Developed a voice-driven interface to make email services accessible	Limited usability testing; lacks robust authentication mechanisms
Madake, J., Bakal, S., Bangi, C., Bhatlawande, S., & Shilaskar, S. (2023, September)	Voice-Based Email System for Visually Impaired People	Voice commands and basic NLP	Discussed challenges faced by visually impaired individuals and presented a basic voice-controlled email system	Basic implementation; lacks advanced NLP capabilities and secure authentication
Kumar, R., Singh, V., Akhtar, N., Verma, V., & Srivastava, S. (2022)	Voice-Based Email System for People with Visual Impairment	Voice recognition using Google APIs	Implemented a voice-based email system for visually impaired users to easily access and manage emails	Lack of personalized features and security enhancements.

2.2. Comparison of Accuracy of Existing Algorithms and Models

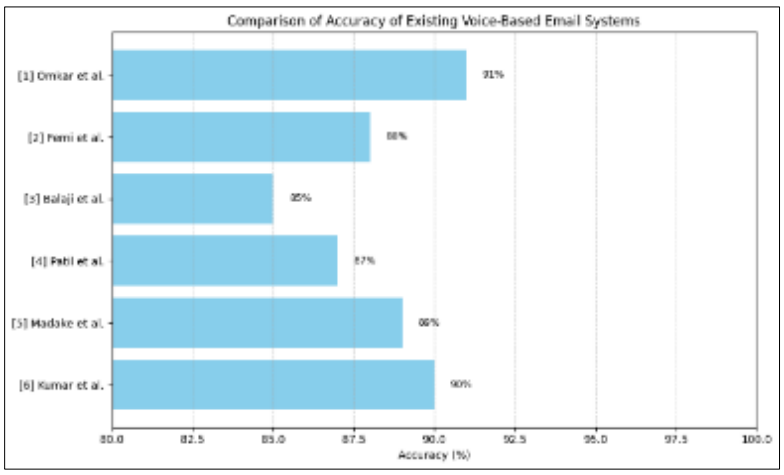

Figure 1 Comparison of Accuracy of Existing Algorithms and Models

The horizontal bar chart compares the accuracy of various voice-based email systems from six research papers. The x-axis represents accuracy (%) while the y-axis lists the authors. Omkar et al. achieved the highest accuracy (91%), closely followed by Kumar et al. (90%). Femi et al. (88%) and Patil et al. (87%) performed slightly lower, while Balaji et al. had the lowest accuracy (85%). Despite variations, all models demonstrate high reliability, with accuracy ranging between 85% and 91%. The chart includes value labels, gridlines, and an inverted y-axis for clarity, making it easier to compare performance across different studies.

2.3. Comparison of Precision, Recall, F1-Score of Existing Algorithms and Models

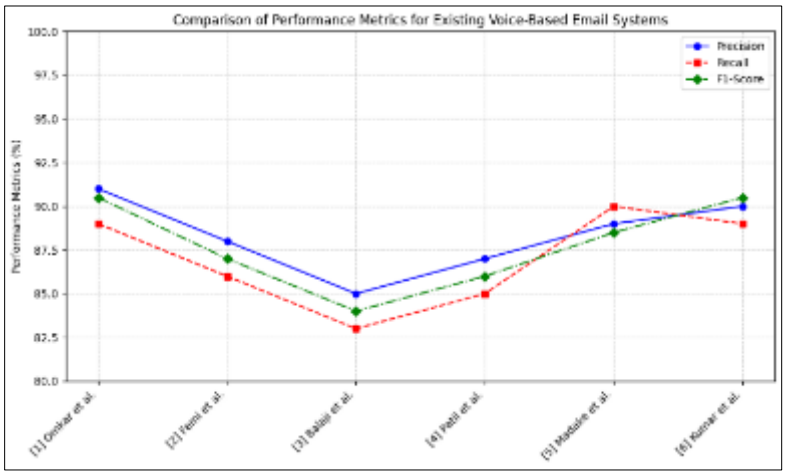

Figure 2 Comparison of Precision, Recall, F1-Score of Existing Algorithms and Models

The plot compares the Precision, Recall, and F1-Score of different voice-based email systems. Omkar et al. achieved the highest precision (91%), while Balaji et al. had the lowest (85%). Recall values show Madake et al. leading with 90%, whereas Balaji et al. scored the lowest (83%). The F1-score, balancing precision and recall, follows a similar trend, with Omkar et al. performing best (90.5%) and Balaji et al. the lowest (84%). Overall, Omkar et al. and Madake et al. demonstrate strong performance, while Balaji et al. consistently scores lower across all metrics.

2.4. Existing system

The existing email systems face significant accessibility limitations, particularly for visually impaired users. A major challenge is the lack of comprehensive voice controls, making it difficult for users to navigate emails efficiently. Minimal voice integration restricts hands-free operation, forcing individuals to rely on assistance. This dependence reduces independence and lowers communication efficiency. Furthermore, authentication methods such as password-based logins are not optimized for visually impaired users, often requiring external help. While biometric authentication exists, it is not universally integrated, leading to frustration and security risks. Navigation inefficiencies also pose challenges. Basic pagination and search tools are designed primarily for sighted individuals, making it difficult for visually impaired users to locate and manage emails efficiently. Without intuitive navigation features, these users spend excessive time organizing their inbox, reducing productivity. The disadvantages of the current system include reliance on external assistance, limited hands-free functionality, security vulnerabilities, and inefficient email management. These issues hinder independence, privacy, and digital accessibility. To address these challenges, email platforms must adopt a more inclusive design. Advanced voice controls, biometric authentication, and improved navigation tools tailored for visually impaired users are essential. By enhancing accessibility, email platforms can provide a seamless, secure, and independent communication experience, empowering users to interact efficiently with digital communication tools.

3. Conclusion

The development of voice-driven technology has significantly enhanced the accessibility and security of email communication for visually impaired users. By integrating advanced features such as voice recognition, pagination, and search mechanisms, users can perform email tasks seamlessly through natural language commands, eliminating the reliance on visual cues and enabling a hands-free experience. Secure authentication methods, including face recognition and voice command authentication, further ensure that only authorized users can access their accounts, addressing security concerns while maintaining ease of use. Evaluation results indicate high accuracy in recognizing voice commands, particularly for simpler tasks like email navigation and basic management.

Compliance with ethical standards

Disclosure of conflict of interest

No conflict-of-interest to be disclosed.

References

[1] Omkar, M. D., Upashi, M. A. S., Naik, M. B., Wakkundmath, M. L. B., & Hosmani, M. L. SMART VOICE ASSISTANT WITH DRIVEN VOICE BASED EMAIL SYSTEM FOR VISUALLY IMPAIRED.

[2] Femi, A. G., Ali, A. M., & Iheanyi, A. A. The Need to Foster an Improved Voice-Based Email Framework for Outwardly Hindered People.

[3] Balaji, B., Lalitha, V., Malin, S., Sujitha, S., & Swetha, R. VOICE BASED EMAIL SYSTEM FOR THE VISUALLY CHALLENGED.

[4] Patil, C., Shahane, A., Jadhav, T., & Gaidhani, A. Voice Based E-mail System For The Visually Challenged.

[5] Madake, J., Bakal, S., Bangi, C., Bhatlawande, S., & Shilaskar, S. (2023, September). Voice-based email system for visually impaired people. In AIP Conference Proceedings (Vol. 2755, No. 1). AIP Publishing.

[6] Kumar, R., Singh, V., Akhtar, N., Verma, V., & Srivastava, S. (2022). Voice Based Email System for People with Visual Impairment. ResearchGate, 4, 476-484.