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# ASSISTIVE COMMUNICATION FOR VISUAL AND SPEECH IMPAIRMENTS

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## INTRODUCTION & AIM

In the field of assistive technology, designing communication solutions tailored for individuals with visual impairments (VI) and speech impairments (SI) is essential. These individuals face significant challenges in expressing themselves clearly and being understood in everyday interactions **(see Fig.1)**. Our proposed solution addresses these challenges through an integrated system that combines multimodal interfaces and real-time processing to facilitate effective communication. Leveraging advanced assistive technologies offers promising avenues to overcome these barriers, enabling more seamless communication and greater autonomy.

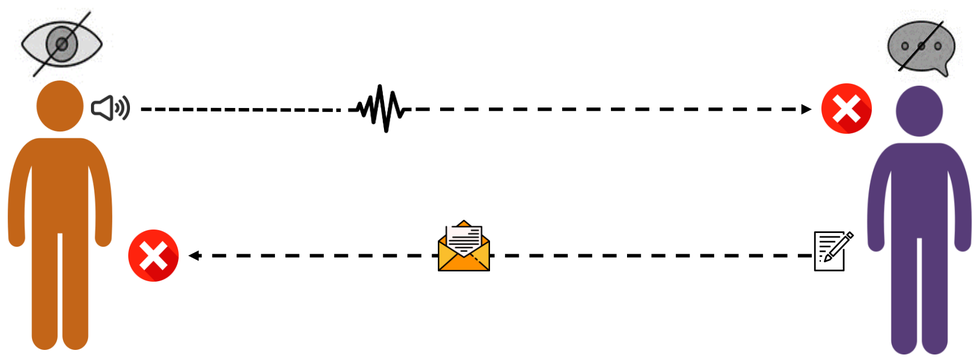

**Fig.1** Problem Context Diagram.

## METHOD

This project adopted a user-centered design methodology, beginning with deep research on visual and speech impairments to identify the daily challenges experienced by individuals with these disabilities. Based on these insights, prototypes incorporating conversion between text and speech were developed **(see Fig.2).** Usability testing was conducted in controlled and real-world settings to evaluate and refine the interface and interaction flow, ensuring compliance with accessibility standards and alignment with user needs.

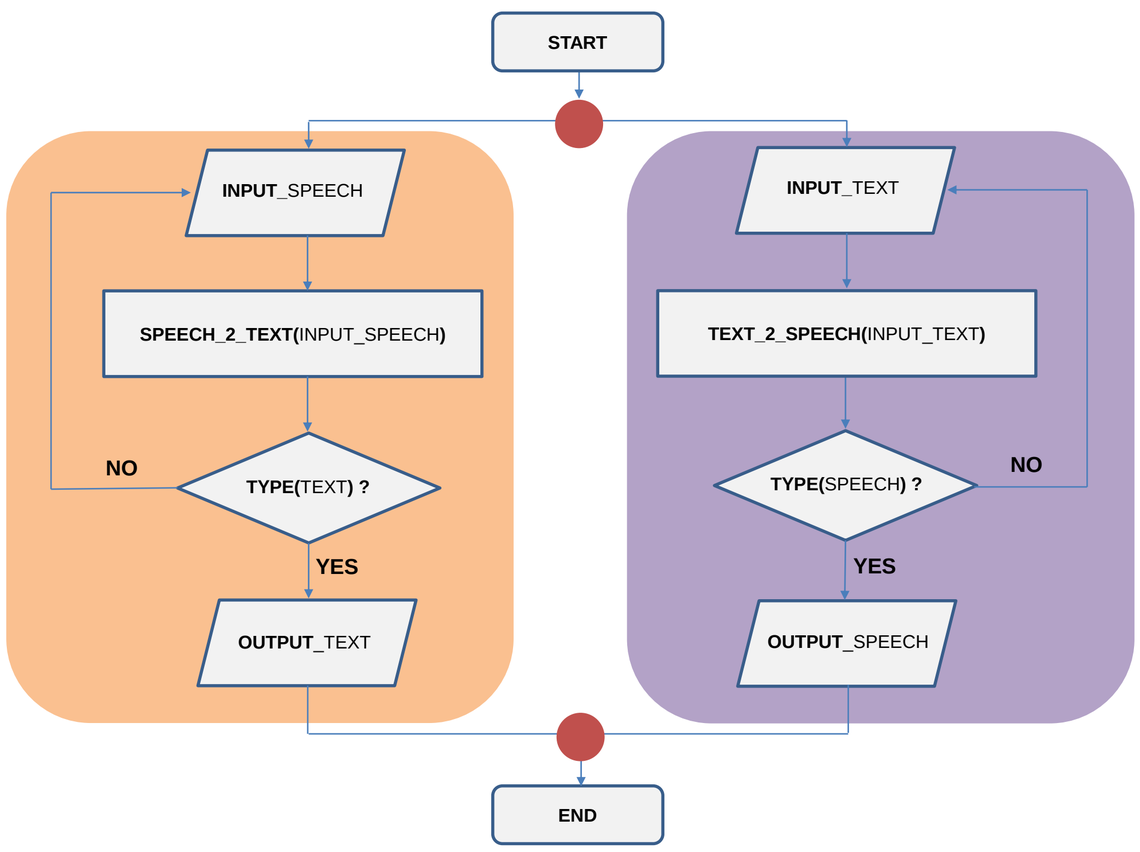


**Fig.2** Activity Diagram.

## RESULTS & DISCUSSION

The proposed solution demonstrated significant improvement in users' ability to communicate independently **(see Fig.3)**. Test participants reported clearer interactions, faster message construction, and reduced frustration. Quantitative metrics indicated that average task completion times decreased from approximately 45 seconds to 28 seconds per message, while success rates in communication tasks increased from 76% to 91%. Feedback highlighted the ease of use, adaptability to various contexts, and the benefits of combining modalities such as voice commands, braille displays, and haptic feedback. Further analysis identified key challenges, including ensuring compatibility across different device models, maintaining low latency for real-time communication, managing battery consumption, and keeping hardware costs accessible.

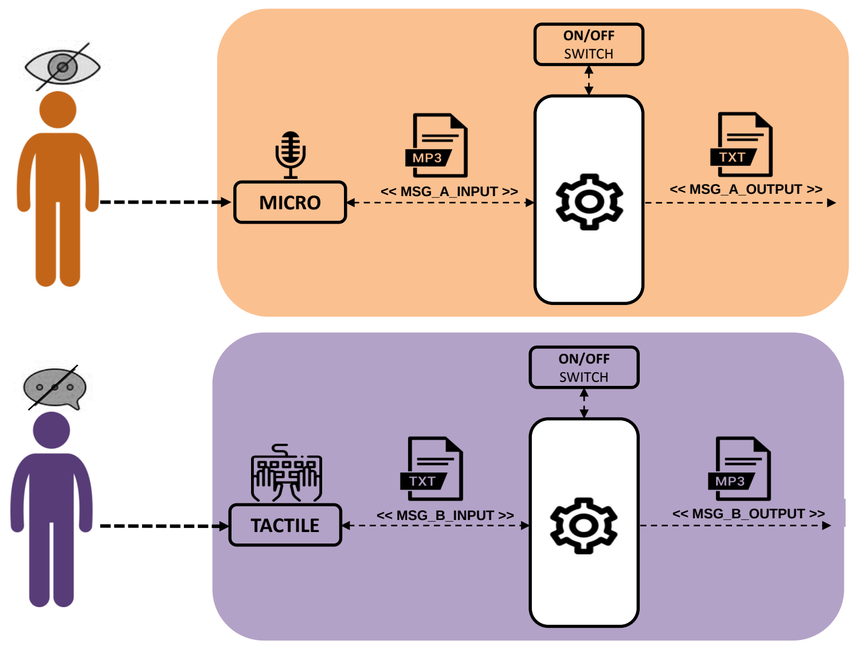


**Fig.3** Cycle of the Methodological Approach.

## CONCLUSION

The findings confirm the feasibility of designing an assistive communication system that effectively supports individuals with visual and speech impairments (VI and SI) in everyday scenarios **(see Fig.4)**. The integration of multimodal interfaces, real-time text and speech conversion, and multilingual support enables clearer interactions and greater user autonomy. Initial user feedback indicated increased confidence and willingness to use the technology regularly. Building on this foundation, the research team has developed the methods and prototypes necessary to refine the system further, with future work planned to enhance real-time performance, expand compatibility across devices, incorporate additional languages, and evaluate long-term usability in diverse real-world contexts.

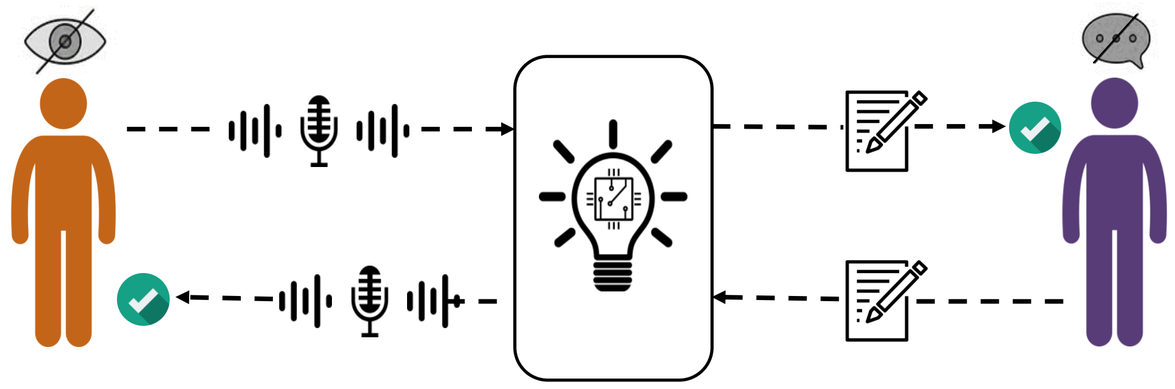

**Fig.4** Key to the Problem.