Voice-Driven Contact Manager: Empowering the Visually Impaired through Speech

[1] Chinnem Rama Mohan, [2] Patan Habeeba, [3] K. Akhila,

[4] T. Lekhasri, [5] P. Lahari

[1] *Associate Professor, Department of CSE, Narayana Engineering College, Nellore, Andhra Pradesh, India*

[2, 3, 4 & 5] *UG Scholars, Department of CSE, Narayana Engineering College, Nellore, Andhra Pradesh, India*

Abstract: *The independently Living Technology for Contacts Management through Voice for the Blind serves to enhance the quality of living and the existing accessibility technologies for visually impaired people. Bridging the technology gap, the contact management system is completely voice activated and facilitates ease of use and independence among the blind. The application incorporates voice commands and communication which provides a unique combination and complete experience. The Android Contact Application for the Blind fills that gap. Operating to provide voice enabled contact management services. Users are empowered to make phone calls autonomously by voicing the contact's name or number, sends SMS messages to pre-defined phone numbers, and can add new contacts through voice inputs. Moreover, the application provides multilingual support and gives instructions in five different languages. It also provides speech recognition and text to speech services which increases the hands-free experience with the phone as all interactions do not require use of the touch screens. The work is created with a systematic approach featuring voice command interpretation, management of contact information, management of phone calls and SMS messages, as well as multilingual guidance and support. The processing of voice commands ensures that the system actions will correspond to the given commands, which provides a pleasant experience for the users. The backend system ensures that contact information data storage and retrieval are handled in a simplistic fashion so that the user experience is intuitive. The aim of the work is to enable users with vision disabilities to communicate without having to use interfaces because of the hands-free capability. The implementation of this technology makes it possible for people with vision disabilities to use interfaces hands-free which greatly enhances accessibility, but the most important fact is that this works towards making technology accessible for all. It is possible that this solution can be improved by making it easier to use and enhancing the functions provided for users with visual disabilities.*

Keywords: *Accessibility; Voice Recognition; Speech-to-Text; Text-to-Speech; Contact Management; Multilingual Support.*

I. INTRODUCTION

The advancement of assistive technologies has led to an improvement in how people with disabilities are able to use the digital world. One major problem that blind people face is communication and contact management [1]. This is primarily because traditional systems pay too much attention to the graphical user interface which is of little use. This application tries to overcome these challenges through a voice-operated contact management system. Thus, users can initiate calls, send SMS messages, and even add new contacts using only their voice.

The application further provides multi-users multilingual voice commands enabling users to talk in different languages. It incorporates speech recognition and text-to-speech technologies, thus minimizing the need for visual aids [2].

II. EXISTING WORK

Assistive technology has recently developed to help individuals who are visually impaired. Tasks such as calling and interacting with other people are possible with the use of cell phones. Smartphones have a wide range of features to aid visually impaired users, like screen readers and voice assistance. However, smartphones often do not provide a good experience when dealing with contacts, which creates usability issues [3].

Screen reader services like Talk Back and Voice Over are integrated within Android and iOS. Making a phone call or adding a new contact is mundane but challenging for blind users. The Google Suite, Siri, and Alexa integrate hands-free voice calling but do not manage phones on the user's behalf without constant internet connectivity.

Third party software has been created for visually impaired people integrating phone calls, SMS, and contact management. Some of these apps use AI-powered speech recognition to optimize efficiency and accuracy.

Despite their potential applications, most of these innovations have user interfaces that are either much too complicated, demand upwards of two permissions, or perform all processing in the cloud, which makes them unusable for users looking for simple offline alternatives. The lack of extensive multilingual support makes these applications unusable to those who do not speak any of the supported languages [4].

DISADVANTAGES

Dependent on Gestures and Touch Navigation: Many screen reader solutions require specific gestures and screen navigation, which can be difficult for visually impaired individuals.
In need of an Internet Connection: Voice-based programs like Google Assistant, Siri, and Alexa require an Internet connection to perform orders.
Inadequate Contact Managing Features: Voice assistants can make calls and send messages, but lack extensive contact management features.
Composite Interfaces: Some apps have sophisticated interfaces that require multiple steps to complete the task.
Limited Multilingual Support: The existing tools only provide voice support for widely spoken languages.

III. PROPOSED WORK

The suggested solution is a complete voice-controlled Android contact application designed to assist blind individuals in managing their contacts and effectively communicating with others.

It will provide consumers with a robust experience using voice commands instead of touch-based navigation. Voice commands enable users to call and add contacts, send SMS messages, and switch languages. The technology improves the clarity of voice instructions and helps the user through the system's commands [5].

Ted primarily addresses the inadequacies of current contact management choices for visually impaired users. It eliminates the problem of difficulty in navigation, decreases the learning curve, and provides an entirely voice-operated experience, making communication simple and accessible [6].

ADVANTAGES

Voice-based System: The voice-enabled functionality ensures visually impaired customers can communicate without visual identification.

Offline Functionality: Voice-based programs like Google Assistant, Siri, and Alexa require an Internet connection to perform orders.

Multilingual support: The user can use this application even without an active internet connection on a smartphone.

User-friendly Interface: The user interface of the system is simple to use because it is built for visually challenged users.

Optimized for Low-End Devices: While many modern applications demand high-end hardware specs to function, the proposed system is also suitable for low-end device users.

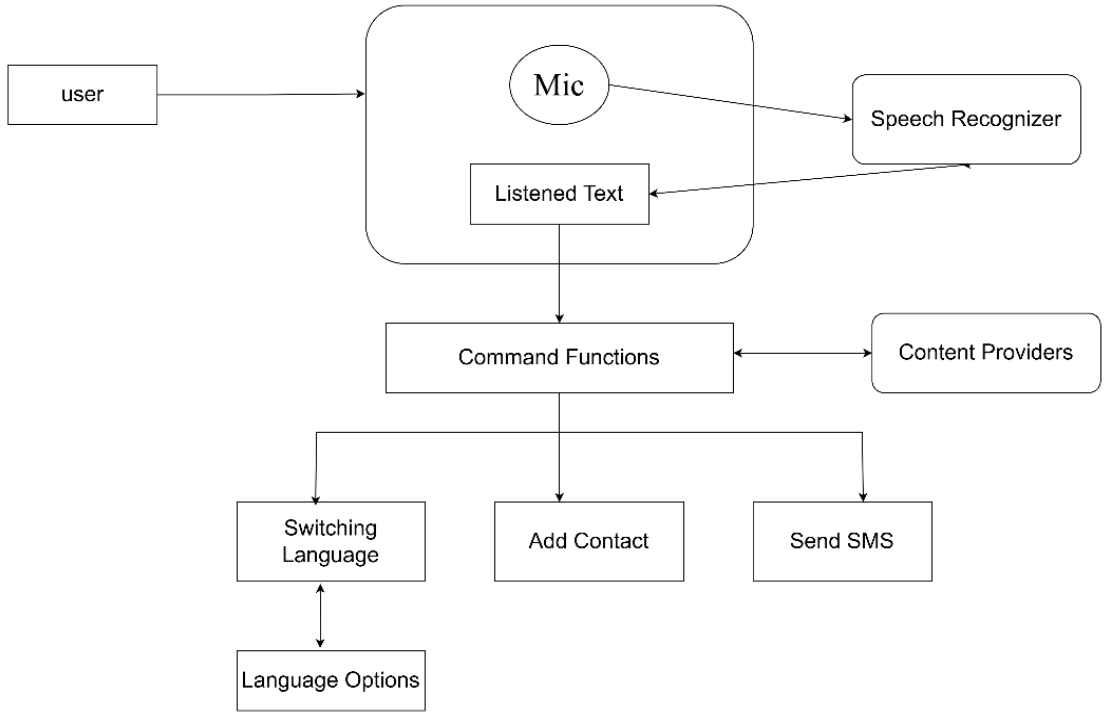

Fig-1: Architecture Design

An Android contact application for blind people operates on a well-organized system that uses voice commands to manage contacts and messages efficiently. The user will converse using vocal instructions, which the speech recognizer will transform into text. The heard phrase is now parsed and given to the function module, which determines an action based on the user input. The system allows you to switch languages, create contacts, and open SMS instructions [7].

IV. EXPERIMENTAL RESULT

The development and implementation of the Android Contact Application for the Blind has been improvised as the easiest way to communicate for visually impaired people. This application has brought many changes and potential features for users. The user can utilize every feature without relying on others for communication. The contact application has been developed to allow visually impaired people to make calls and access the other contact functionalities on their mobile devices, like everyone else. The enhanced functionalities of this application have provided greater independence for blind individuals, allowing them to perform tasks such as making calls using a contact's name or phone number, adding new contacts, sending text messages, and independently searching for specific contacts to verify their existence. The application has been designed to guide users in multiple languages, making it easier for them to understand the commands before taking action [8].

Home Page Actions:

- The system consists of a Home Page and three main modules: a Calling Module, an Add Contact Module, and a send SMS Module.
- The Home Screen, also known as the Splash Screen, is the first page of the application that appears when the user launches it.

- The Screen begins with voice commands providing prior instructions to the user before moving on to other modules.
- It provides all the necessary commands that are required to perform any functionality in the application.
- It allows the users to learn about all the modules integrated into this application and the specific commands for each module.
- The system features multilingual functionality, enabling users to understand the commands in five languages.
- If the users do not comprehend the commands immediately, they can command to Repeat instructions.

Home Page Screens:

Fig 2: Splash Screen

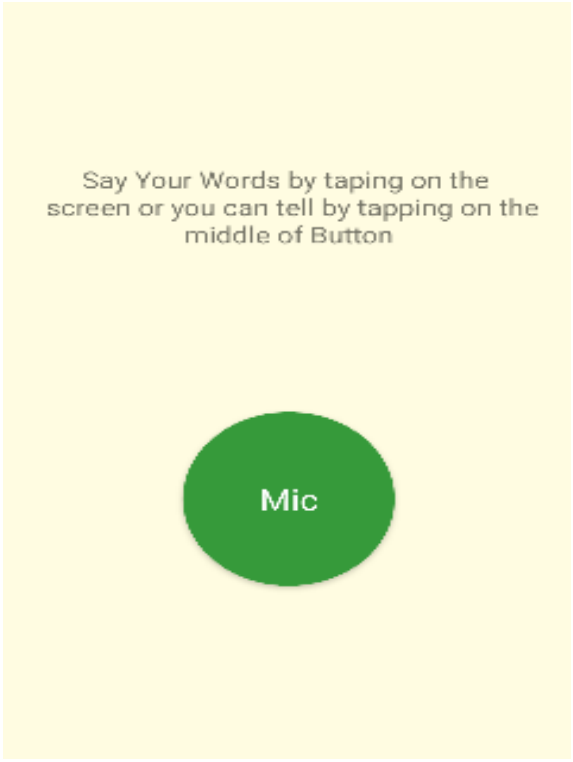

Fig 3: Home page

After receiving the application, the user is greeted with a Splash Screen displaying a welcome message and is then smoothly directed to the home page where the instructions are displayed. The page instructions are Call a number, Ring contact name, add contact, Send SMS, and Switch to language_ name.

As the user provides a speech command, the system automatically retrieves the appropriate workspace and performs the necessary tasks. For instance, when a user speaks Add Contact, the system has already confirmed the action and is in the Add Contact module. The system works this way with all modules in the application.

Calling Actions:

The user's task regarding calling has been simplified as the feature has been designed with usability in mind. The user can make a call by either the contact's name or mobile number. In the case that a contact is not saved in the user's mobile, they can search using a number. For a call to be made using a contact name, the user has to give the command Ring contact_name, or in the case of mobile number usage, the user has to say Call mobile_mobile_number. In the event the user utters a contact name which is not saved, the system will respond, "Contact name not found, please try again."

Calling Page Screens:

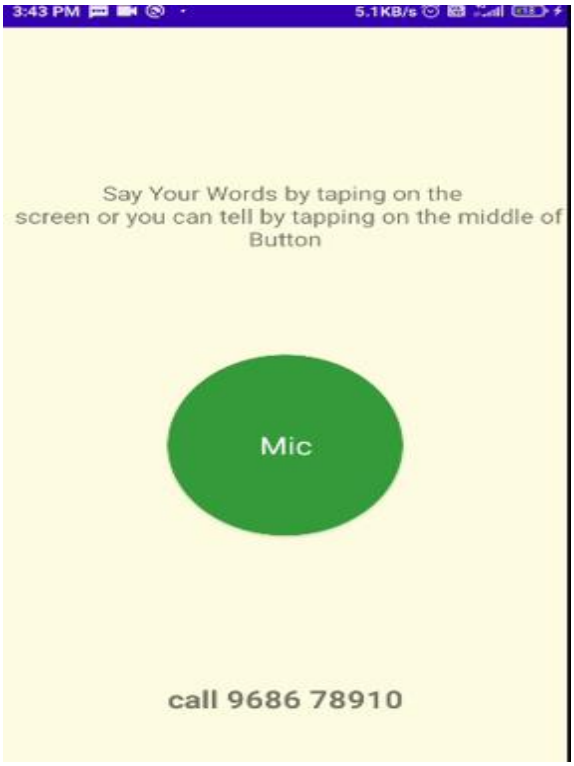

Fig 4: Calling via Number

Fig 5: Contact not found

Add Contact Actions:

In order to add a contact, the user has to issue the commands "Add Contact" followed by the associated mobile number and name they wish to set for the contact. These contacts are stored within the mobile device's internal memory rather than relying on external databases. This way, user information is protected as no external company or source can access their data.

The system starts with a warm welcome on the Add Contact page and specific voice commands required for adding a new contact. The user has to say the command "The name is contact_ name and the mobile number is mobile_ number." Once the user provides the contact's name and mobile number, the system will repeat the details and ask whether to add the contact or cancel the action. Upon the confirmation of the user, the system will add the contact successfully otherwise, it will cancel and command with the voice message to tell again the details. This module provides security and reduces complexity for visually impaired people while adding contacts through voice commands.

Add Contact Screens:

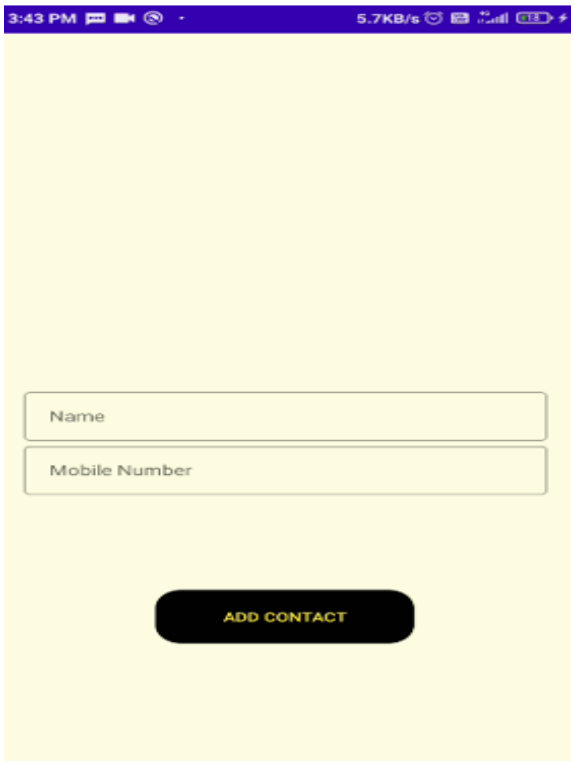

Fig 6: Add Contact Screen

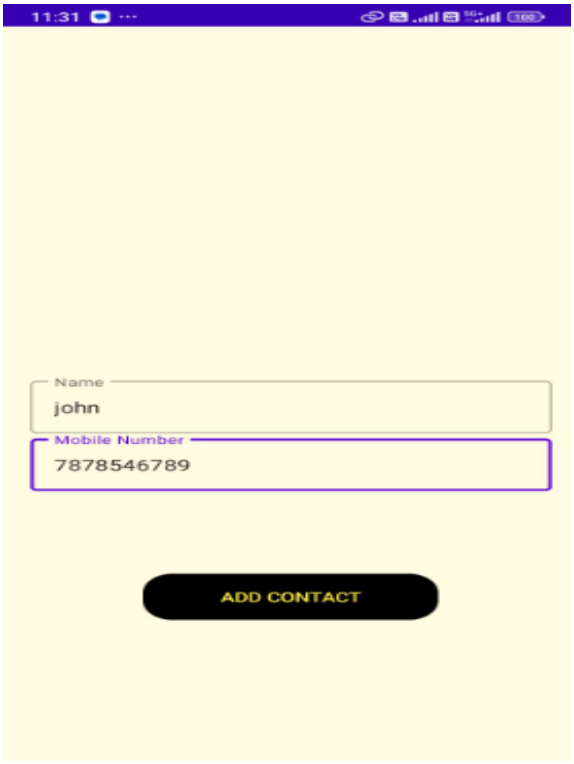

Fig 7: Contact Added

Send SMS Actions:

The Send SMS module enables users to send messages in the form of voice to any mobile number independently without relying on others. The visually impaired people can use this feature easily and send voice messages without manual typing. Even though the user sends a voice message, the receiver will get the message in the text format. Additionally, the sent messages will be stored securely in the memory of the mobile itself without using any external database.

The module initiates with the welcome message followed by the command instructions that have to be said to send a message. The user has to say the command "The mobile number is mobile_ number and the message is message_ to be sent." After providing the mobile number and message, the system will repeat the details spoken by the user and ask whether to send or cancel the action. If the user says confirm, the message will be sent successfully; otherwise, the system will tell to command the details again.

Send SMS Screens:

Fig 8: Send SMS Screen

Fig 9: Message Sent

V. CONCLUSION

This work met its defined goals, delivering a reliable and easy-to-use application for the visually impaired. The use of voice features in the app augments the communication experience by facilitating calls, messaging, and contact management, all done autonomously. The positive results from system testing and real-life usability tests indicate that this application is likely to support visually impaired users for enhance communication. As the project sponsor intended, this effort demonstrates the need for assistive mobile applications. This project has been designed to illustrate the effectiveness of voice commands in addressing the needs of all users. It is possible to construct an inclusive mobile application which responds to the user's voice with hands-free commands, immediate responsive action, and delivers feedback promptly during all stages of the development process. This design positively enhances the experience for users where the visually impaired can manage their contacts independently without assistance.

The voice-activated technology utilized in the project proves effective in achieving digital inclusivity. Its hands-free and automatic communication technology is intuitive, with accurate voice recognition and response automation features. From the evaluation and development to the testing phases, the application proved its capability to recognize commands, act upon them, and provide responses in real-time. This approach in design allows a greater degree of self-management for the visually impaired with contacts, reducing externally provided assistance. The effortless interaction between the user and the device promotes a more advanced digital world with an emphasis on inclusivity and modern assistive technologies.

VI. REFERENCES

[1] bt Aripin, N., & Othman, M. B. (2014, August). Voice control of home appliances using Android. In *2014 Electrical Power, Electronics, Communicatons, Control and Informatics Seminar (EECCIS)* (pp. 142-146). IEEE.

[2] Shishir, M. A. K., Fahim, S. R., Habib, F. M., & Farah, T. (2019, May). Eye Assistant: Using mobile application to help the visually impaired. In 2019 1st International Conference on Advances in Science, Engineering and Robotics Technology (ICASERT) (pp. 1-4). IEEE.

[3] Ţepelea, L., Gavriluţ, I., & Gacsádi, A. (2017, June). Smartphone application to assist visually impaired people. In 2017 14th international conference on engineering of modern electric systems (EMES) (pp. 228-231). IEEE.

[4] Stolcke, A., Zheng, J., Wang, W., & Abrash, V. (2011, December). SRILM at sixteen: Update and outlook. In Proceedings of IEEE automatic speech recognition and understanding workshop (Vol. 5). ASRU: Waikoloa.

[5] Popović, B., Pakoci, E., Jakovljević, N., Kočiš, G., & Pekar, D. (2015, November). Voice assistant application for the Serbian language. In 2015 23rd Telecommunications Forum Telfor (TELFOR) (pp. 858-861). IEEE.

[6] Popović, B., Pakoci, E., Ostrogonac, S., & Pekar, D. (2014, October). Large vocabulary continuous speech recognition for Serbian using the Kaldi toolkit. In Proceedings of 10th Conference on Digital Speech and Image Processing (DOGS'2014) (pp. 31-34).

[7] Stolcke, A., Zheng, J., Wang, W., & Abrash, V. (2011, December). SRILM at sixteen: Update and outlook. In Proceedings of IEEE automatic speech recognition and understanding workshop (Vol. 5). ASRU: Waikoloa.

[8] Kneser, R., & Ney, H. (1995, May). Improved backing-off for m-gram language modeling. In 1995 international conference on acoustics, speech, and signal processing (Vol. 1, pp. 181-184). IEEE.