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RESEARCH ARTICLE OPEN ACCESS

AUDITORY LIBRARY GUIDE: A DIGITAL SOLUTION FOR VISUALLY IMPAIRED READERS

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ABSTRACT

This paper's main objective is to use the Auditory Library Guide to assist visually impaired people in finding and accessing library books. People with visual impairments have trouble locating the book in the library. Although library services for these individuals were insufficient up until now, everyone now understands how important it is to make information accessible to those who are visually impaired. In light of this, a method is suggested and created to enable them to utilize library resources. Through the use of text-to-speech conversion and voice recognition technology, they can utilize the system to access the library and hear the contents of the books.The purpose of this study is to improve the social issues faced by visually impaired persons and to help them read library books like everyone else.

I. INTRODUCTION

For people with visual impairments, such as the blind, deaf blind, or those with low eyesight, braile [1] is an essential touch-based writing system. Braille can traditionally be read on paper with raised dots or on computer and smartphone-connected refreshable Braille displays [2], [3]. A computer interfaced with a Braille embosser, a Braille writer, an electronic Braille note taker, or a slate and stylus can all be used to create the system. The visually handicapped should have access to the world in other ways as well, even though Braille has been a game-changer for their literacy and communication [4].Everyone with a disability should be treated as an equal member of society through education.

The "Auditory Library Guide" is a ground-breaking tool designed especially for blind readers in a time when technological advancements are changing accessibility for people with impairments [5], [6]. Libraries serve as a resource to quench anyone's curiosity and offer a wealth of information relevant to users' interests. Knowledge expansion is free for everyone, but it requires certain facilities, especially for those who are blind or visually impaired. For example, it can be difficult to find certain books or bookshelves, and it can be difficult to figure out where the book rack is [7], [8]. The current study made use of digital technology to get around these challenges. As a result, it offers consumers easily accessible and reasonably priced assistance in looking up books and titles [9-11].

I.1 RESEARCH OBJECTIVE

This study helps people with limited eyesight become more self-reliant and transparent when browsing for books in libraries. People from all over the world prefer to speak in their mother tongue since it is easier to grasp and more convenient. Given that India is a multilingual and multireligious country, the primary focus of this study was on Indian languages. For visually challenged people, a Tamil-specific library search engine was developed that enables them to comprehend their needs in their home tongue. For additional South Indian languages including Malayam, Telugu, and Kannada, a similar approach was implemented. To provide broader usage worldwide, this approach also takes into account widely used languages like English, Hindi, Urdu, Thai, etc.This program may be developed for mobile users in the future. This research was completed without any external sponsorship and It's a simple attempt to assist visually impaired peoples in searching for books in libraries.

II. LITERATURE SURVEY

Founded in 1882, the National Library for the Blind (NLB) [1] aims to provide a well-rounded library experience for those with visual Pustakalaya sense issues in the UK. On January 1, 2007, it became a part of the RNIB National Library Service. India's first and biggest collection of easily available books is Sugamya [12]. The Indian government, blind organizations, and the visually impaired were collaborating to address the lack of e-books for those with print disabilities. A group of Indian non-profit organizations called the DAISY Forum of India (DFI) [13] is dedicated to creating and disseminating accessible reading resources for people with print difficulties. Their objective is to give equal access to information in one's own language without delay or extra cost. It seeks to end the "Book Famine" that affects people with print impairments. They have access to just a small portion of published material—less than 1%. Their educational and employment prospects are hampered by this shortage.

By [4] created a PC-based Braille system that enables many users to read different texts in multiple languages simultaneously.. It works well and is simple to use. By [4] created computer games for kids with low vision that make it simple to use Braille displays and include important reception features with multiple displays, such as text writing and dot raising. More than 5,000 books, periodicals, and articles about blindness are available in the special library at the Louis Braille Memorial Research Centre (LBMRC) [14]. It allows membership to everyone, even those outside of Mumbai, and gets journals from all over the world. One of the nation's most valuable resources is the library, which is now digitizing its holdings. An autonomous voice recognition system for kids was created [15]. It extracts features related to speech recognition and learning vocal tract envelopes [11], [16]. The project employed CNN-based audio modeling for feature extraction, PF-STAR for children, and WSJCAMO for adult datasets.

According to the authors, CNN can distinguish between the voices of children and adults, and PF-STAR yielded better results than the adult dataset [13], [17]. By [18] provided a detailed summary of speech recognition feature extraction methods and their usability [19], [20]. Using the weighted scoring method, the author attempts to illustrate the benefits and drawbacks of multicriteria analysis of different approaches [14]. The key ideas of speech processing, contemporary voice recognition technologies, difficulties, and their constraints were covered by Olamilekan et al. (2024) [21]. Signal analysis, pattern recognition techniques, feature extraction, security, virtual assistants, and ethical considerations are all briefly covered by the author [22]. By testing with the Hidden Markov Model, Artificial Neural Network, and its hybrid variants, Recurrent Neural Network, [23] were able to obtain great performance in voice recognition and discovered that the speech data had errors and duplication [15], [24].

Table 1: Comparison of related experiments with the proposed model.

S.No	Author &Year	Models used for the experiment on Low Vision People	Limitation
1.	Sujata et al.,(2022) [25]	Suggest digital voice Assistants such as Google Assistant, Alexa, and Siri	Continuous internet or Wi-Fi support is needed
2.	Mohanta et al., (2020) [26]	Smart phone with an Android application captures pictures and implements through voice control feedback mechanism which helps to identify the obstacles	Image clarity is must for object detection
3.	Yadav et al., (2020) [27]	Voice assistance by commands and instructions carried out by recognition of speech patterns, which produce an outcome via synthetic speech.	Proper and limited comments
4.	Nirmal et al., (2020) [28]	Speech recognition system with a speaker to locate the book location	Proper handling of the speaker
5.	Karthik et al., (2018) [29]	Environment monitoring is done by Raspberry pi , OCR sensors and TTS . Easy communication with society is established by speech or audio.	Sensor monitoring required
6.	Kambhampati et al., (2024) [30]	Voice assistance with Raspberry pi support for the communication	Supporting platforms needed for information gathering like Apps, news forums etc.
7.	Felix et al., (2018) [31]	An Android mobile app that centers on image recognition, currency recognition, e-book, chat bot, voice assistant etc.	Mobile app installation required
8.	Charishma et al., (2023)[9]	Text image scan by OCR, convert to text to speech by TTS and audio listen via speakers	Only the English language is supported
9.	Oureshi et al., (2023)[10]	Object detection by Smart gadgets with AI image processing and notification shared by sound alarm	High cost
10.	Thakur et., (2024)[11]	Utilized Raspberry Pi5, Pi camera module with text to speech converter	Only text to speech conversion

Source: Authors, (2026).

Research Gab

The majority of research has not concentrated on language-specific software for searching library books for visually impaired people.Expensive and requires constant internet or WiFi [32].

II.1 EXPERIMENTAL SETUP

The following procedures are involved in building the experimental setup using PHP, MySQL, Python, and a Raspberry Pi:

MySQL is used to store the book's location and other details in a database.Speech recognition converts speech to text.PHP retrieves the language and book location.The Raspberry Pi keeps an eye on the system and assists in running the database server, web application, and Python scripts that integrate speech processing and text-to-speech (TTS) output [33].The library book search system in this experimental configuration made use of the following frameworks and libraries.

Frameworks

Voice to Text : Google Web Speech API
Text to Voice: pyttsx3 TTS works without an internet connection
MySQL: Database for Book Information Storage
PHP : Backend Processisng
Raspberry Pi : Host the server

Libraries

RPi.GPIO : controls Raspberry Pi
pyttsx3 : TTS engine
Festival + festival-tts : open source speech synthesis system (supports Indian languages)
Marytts : Multilingual voice synthesis

The tasks and software design for this study are displayed in the steps that follow. This system does the following thorough analysis of the experiment conducted by the library's visually impaired patrons.

Insert Book Information

This module adds the locations of the library books as well as their details to the database. Here, the add book module was given the book's location and content, and we were also able to alter the book's location. so that those who are blind or visually challenged can quickly locate the library's books.

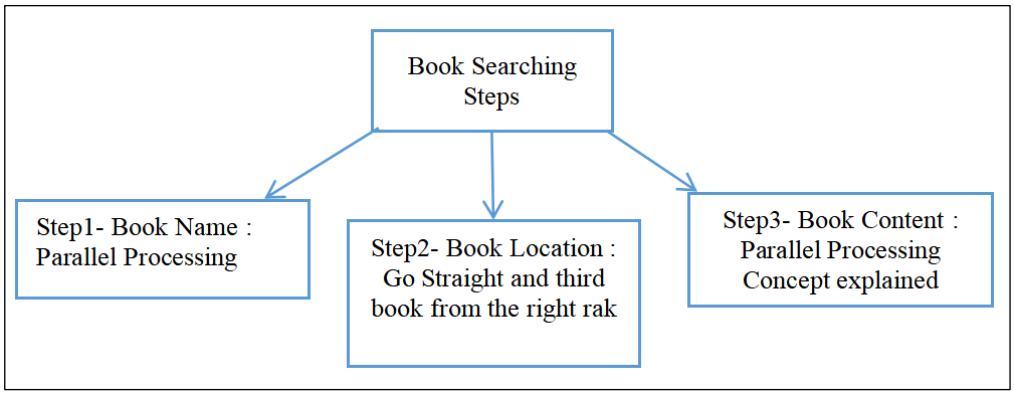

Figure1: Feeding Book Information.
Source: Authors, (2026).

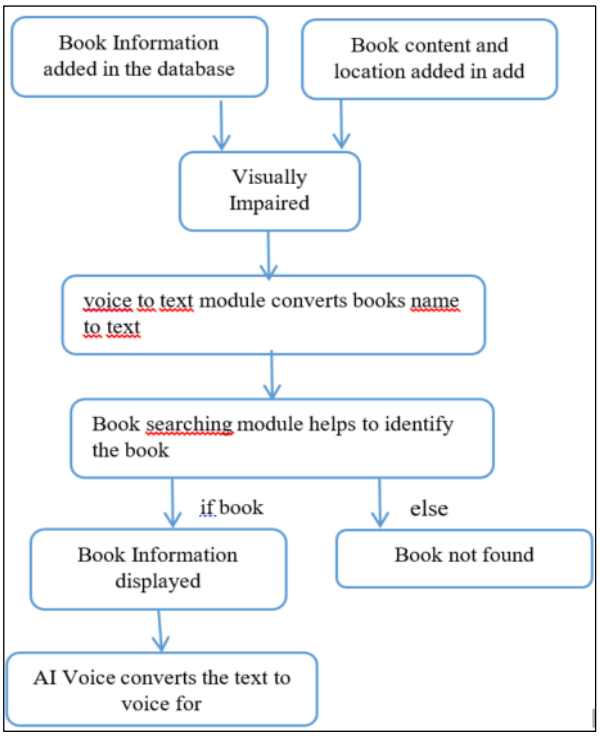

Figure 2: Workflow of the VA model.
Source: Authors, (2026).

Voice to Text

The name of the book is converted to user-spoken text using this speech to text module. We'll turn this voice recognition into text. The voice notes of the visually impaired were saved using the buttons below.

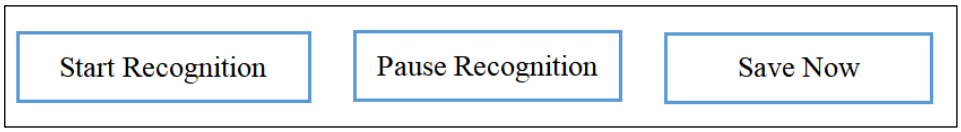

Figure 3: Voice to Text.
Source: Authors, (2026).

To find the voice-to-text converted book name in the database, utilize the Book Searching Module. The system will indicate the book's location inside the library if it is located. If the book's content is likewise accessible, the system reads the entire book. The system will say "Book not found" if the book is not available.

Text to Voice

An AI voice provides users with information about the book based on the database's information that matches the keyword [34], [35]. From the selection of languages provided, the visually challenged person will choose their own [16], [36-38]. There are various languages available for this voice conversion[17].

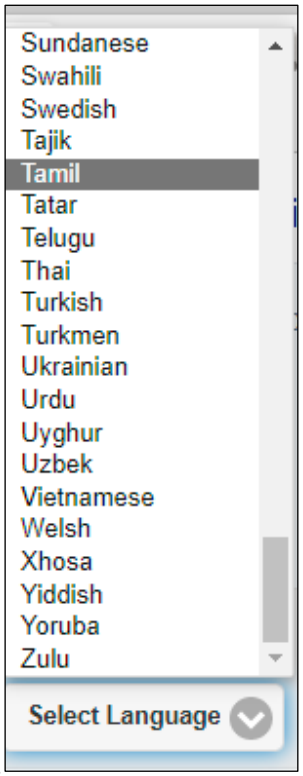

Figure 4: Text to voice language selection.
Source: Authors, (2026).

III. MATERIALS AND METHODS

This section contains screenshots of the proposed project's implementation. The administrator will be the primary user who serves as a librarian, allowing readers to explore the system. He or any other user can enter the first section of storing the library's book details, which are accessible via the dashboard. He inputs the book's location in the library and has the ability to add or remove books. The braille books that are organized in the shelves in the proper sequence are accessible to the visually impaired person who can follow instructions. Through text-to-speech technology, visually challenged people can enjoy digitally stored books and hear them in the language of their choice.

The process of adding book information to the speech recognition system is depicted in Figure 1. It gives visually impaired persons the location and details of the book. Figure 2 illustrates how the book's title is converted to user-spoken text using the voice to text module. The AD converter will be used to turn this voice recognition into text. The voice notes of the visually impaired person were saved using the buttons below. The visually impaired person's voice notes are started using the START RECOGNITION button, and their discussion is stopped using the PAUSE RECOGNITION button.. Lastly, the SAVE NOTE button is used to record the voice notes of visually challenged people, which are then stored in the internal memory to determine the book's placement in the library.

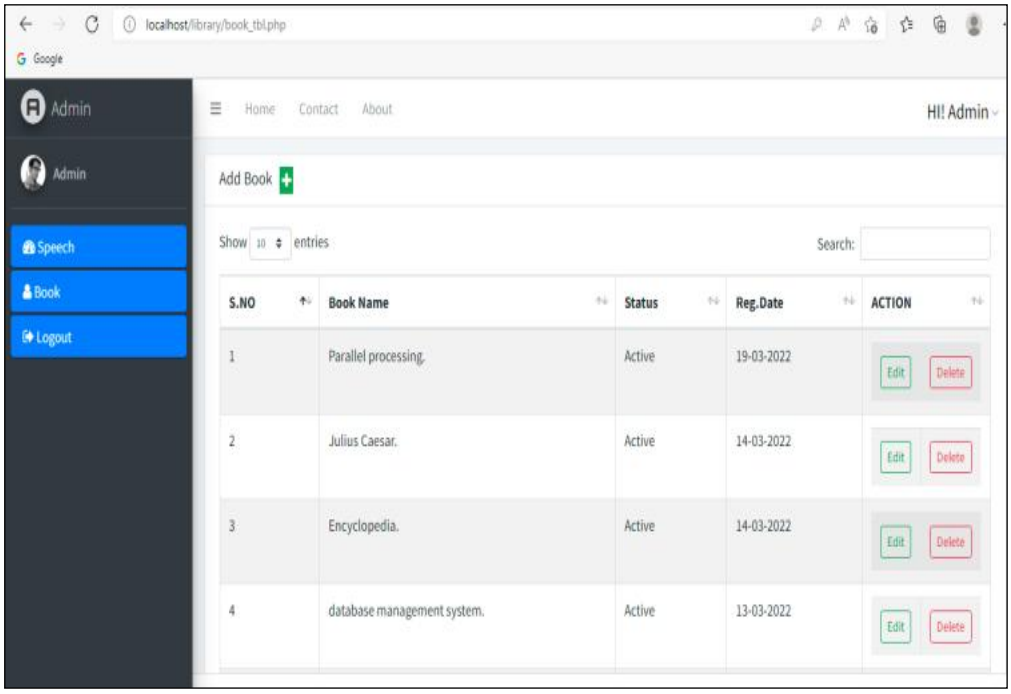

Figure 5: This screenshot shows the book's details added in the library by the Admin.
Source: Authors, (2026).

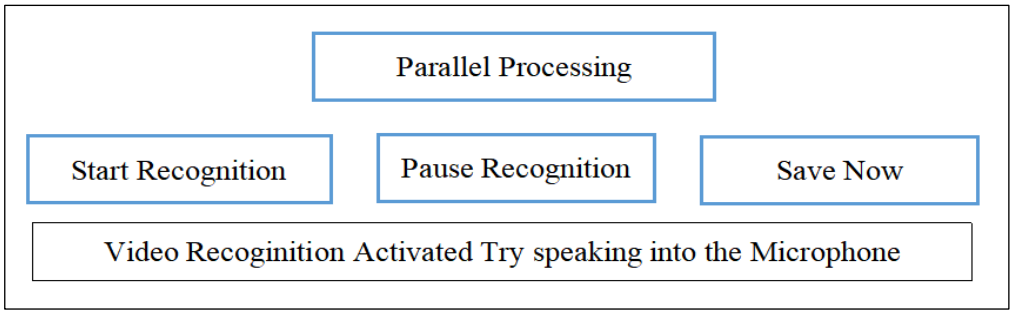

Figure 6: Voice Recognition by parallel processing.
Source: Authors, (2026).

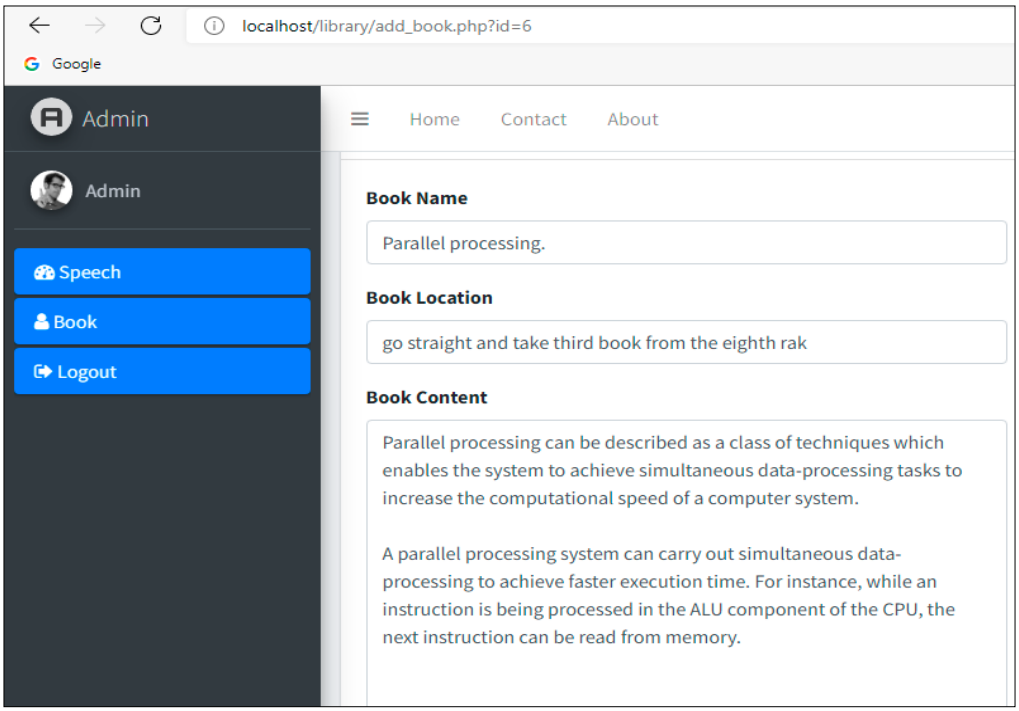

Figure 7: This screenshot shows the particular book content and book location stored already.
Source: Authors, (2026).

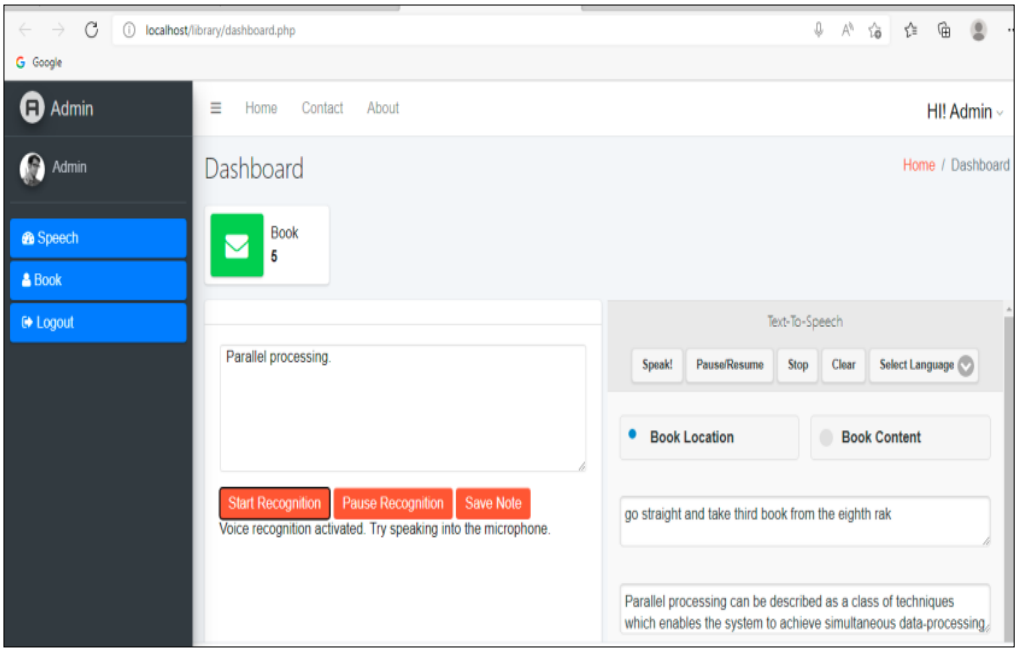

Figure 8: This screenshot shows the voice recognition.
Source: Authors, (2026).

The visually impaired person's voice notes are started using the START RECOGNITION button, and their discussion is stopped using the PAUSE RECOGNITION button. Lastly, the SAVE NOTE button is used to record the voice notes of visually challenged people, which are then stored in the internal memory to determine the book's placement in the library. Since the primary focus of this study was Indian languages, India is a nation with a diverse population in terms of religion and language. For those who are blind or visually challenged, a Tamil search engine was specifically created. Similar to those developed for Malayalam, Telugu, and Kannada, this application software helps the Tamil people in their own tongue. This study focuses on the mother tongues of various Indian states since it is easy for people to converse in their mother tongue everywhere, which makes things easier to understand, also adheres to established languages, such as Hindi, English, Tulu, and others.

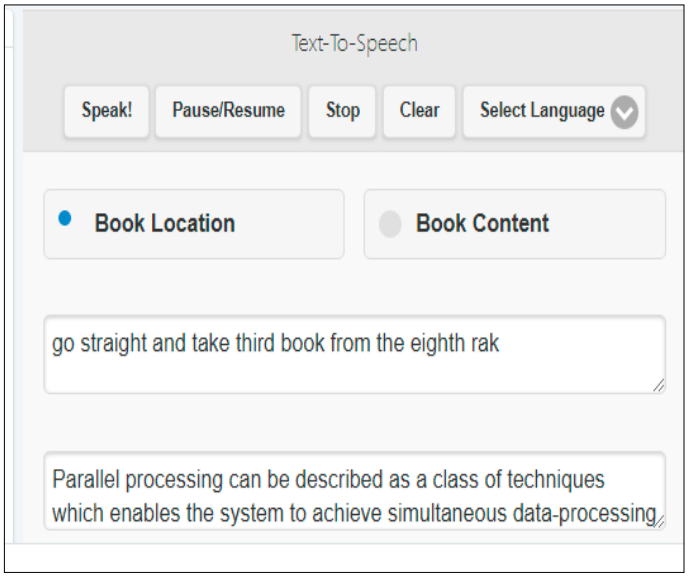

Figure 9: This screenshot shows the Text-To-Speech conversion.
Source: Authors, (2026).

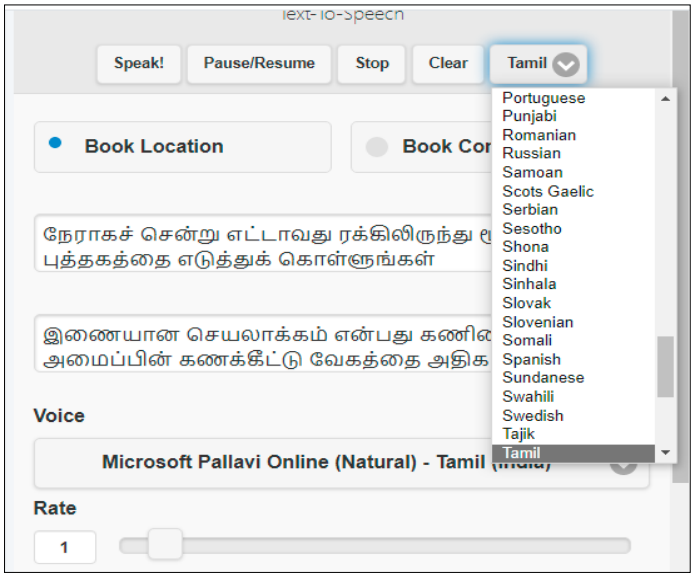

Figure 10: This screenshot shows the text to speech conversion using the language Tamil.
Source: Authors, (2026).

So the content of the book will also be converted into the selected language.

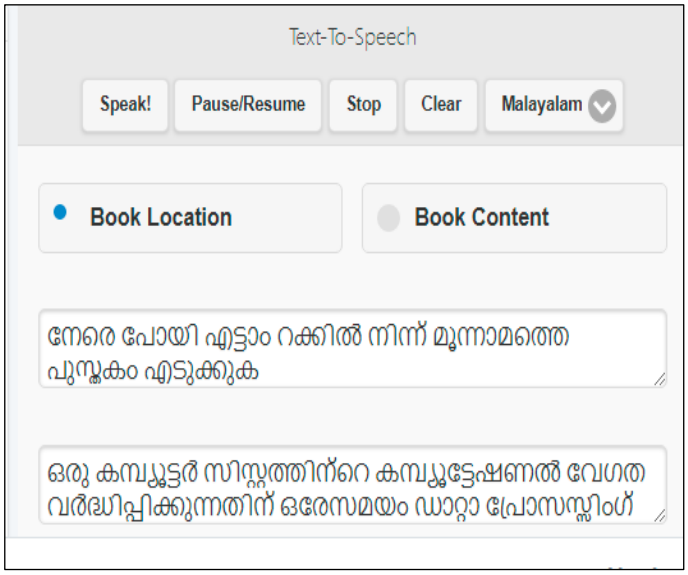

Figure 11: This screenshot shows the text to speech conversion using the language Malayalam.
Source: Authors, (2026).

III.1 EXPERIMENTAL VALIDATION

Accuracy: This system provides directions for looking for books in different languages in the library with a 97% accuracy rate. The findings are acquired by doing several trials with various personalities..

Response Time (Latency): Voice to text responses typically take less than two seconds..

In order for this system to identify user displeasure with a beep, we have coded it to take into account more than three search tries, an average search time exceeding ten seconds, and many speech problems [38], [39].

Usability Testing: To determine the software's comfort level, a number of visually impaired individuals evaluated it; for 95% of searches, no beep sound was detected. Thus, this study came to the conclusion that this approach is appropriate for those who are blind or visually impaired. The software's result is displayed in the code part that follows.

```
speak(f"System Accuracy: {accuracy:.2f} percent.")
speak(f"Average Response Time: {avg_latency:.2f} seconds.")
speak(f"User Satisfaction Score: {usability_score:.2f} percent.")
speak("Thank you for using the book finding system.")
```

Figure 12: Implementation details of Usability Testing.
Source: Authors, (2026).

```
System Accuracy : 97%
Average Response Time:0.2
User Satisfaction Score:99%
Thank you for using the book finding system
```

Figure 13: Outcome of Usability Testing.
Source: Authors, (2026).

Second method

This concept was tested with students and nearby medical professionals, and its effectiveness is assessed using user input and satisfaction ratings [40]. In order to achieve this, we created five test questions and used a Likert-scale scoring system on fifteen participants. Method of scoring4-Agree, 5-Strongly Agree, 2-Agree, 2-Disagree, 3-Neutral
Questions for feedback

1. The system was easy to understand and use.
2. The system correctly fetches the information
3. I was able to complete my task within time
4. I would like to recommend this system to others
5. Overall, I am satisfied with this system's performance

Each score is calculated based on a 1 to 5 scale and the satisfaction score is calculated as follows:

1. Add up all five questions' scores.
2. Each user's maximum score is determined by answering five questions. The greatest score (×) = 25
3. The user satisfaction score was calculated as follows: (total score obtained/25) × 100

Ultimately, 93% of participants report that the app is helpful and easy to use, with an average satisfaction score of 87.6% and a mean of 4.8%. This framework analyzed 15 users from different age groups and includes both male and female with different impairment level. The following table 2 and 3 shows the details of 15 participants and outcome of pilot study used to evaluate their performance. Hence this method helps to identify the usability and core functionality of the system which is based on feedback of the system.

Table 2: Demographic Details of 15 users.

Participant ID	Age	Gender	Level of Impairment
P1	22	Female	Moderate
P2	25	Male	Complete
P3	27	Male	Partial
P4	32	Female	Partial
P5	30	Female	Complete
P6	38	Female	Complete
P7	40	Male	Partial
P8	26	Female	Moderate
P9	43	Male	Moderate
P10	41	Male	Moderate
P11	32	Female	Complete
P12	37	Male	Partial
P13	45	Female	Moderate
P14	38	Male	Partial
P15	44	Male	Complete

Source: Authors, (2026).

Table 3: Pilot Study.

Usability Metric	**Observation**
Task completion Rtae	13 out of 15 people completed successfully
Ease of Use(Liker Scale1-5)	Ratings ranged form 3 to 5, median=4
Feedback	93% satisfacation
Observed usability issues	Smooth orientation

Source: Authors, (2026).

This frame work was aligned with the Web Content Accessibility Guidelines (WCAG 2.1) and the Digital Accessible Information System (DAISY) [40]. According to WCAG 2.1 compliance guarantees that all user interfaces are perceivable, operable, and understandable by users employing assistive technologies such as screen readers or keyboard navigation [41], [42]. DAISY support enables synchronized text-to-speech rendering and accessible digital resources, ensuring that visually impaired and multilingual learners can effectively use the system. Incorporate the audio based content or digital reading formats [43].

III.2 ETHICAL AND PRACTICAL CONSIDERATIONS

This software was created especially for college library systems to assist students with visual impairments in finding books. Within a college or institution, session-based interaction manages data security and privacy. However, this solution does not collect personal information, and server-side PHP controls and MySQL authentication verify security.This study improved the usability of non-native speakers of Tamil, Telugu, Malayalam, English, Hindi, Thai, and other languages using multilingual voice-based interaction. Braille keyboards might be included as an additional input option in the future.

III.3 PROS OF PROPOSED MODEL:

The low-cost voice assistance system intended for those with impaired eyesight was found and tested in this study. The application software is installed in any library at the lowest possible cost after it has been constructed using PHP, MySQL, Python, and Raspberry Pi with TTS. The multilingual Voice Assistance (VA), which was primarily created for Tamil language users, was the main focus of this study. Users can easily identify the books in the library by VA thanks to the user-friendly VA system [44], [45].

IV. CONCLUSION

Since voice-based technology is becoming increasingly prevalent in all applications, this paper proposed and implemented a research project that makes use of this technology to give physically challenged people especially blind people a way to use the library to find the location of books and listen to the audio version of those books using the speech synthesis technique.By turning the PDF and documents into audio format, this project can be improved with additional audio books. The library can get more braille books. Analyzing the issue reveals that libraries in Trichirapalli, Tamil Nadu, lack books for the blind and do not use digital technology for this purpose.As a result, this study is the first to offer strategies for helping people with visual impairments increase their knowledge through book reading.

V. AUTHOR'S CONTRIBUTION

Conceptualization: Dr.V.Thamilarasi
Methodology: Dr.V.Thamilarasi
Investigation: Dr.V.Thamilarasi
Discussion of results: Dr.V.Thamilarasi
Writing – Original Draft: Dr.V.Thamilarasi
Writing – Review and Editing: Dr.V.Thamilarasi
Resources: Dr.V.Thamilarasi
Supervision: Dr.V.Thamilarasi
Approval of the final text: Dr.V.Thamilarasi

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