IoT Smart Glasses and Mobile App for Real-Time Assistance Using TinyML and OCR

Component 04 - Voice-Driven Interaction Module

Project ID: R25-012

Project Proposal Report

Vithanage H.P | IT21823220

Supervisor: Dr. Dharshana Kasthurirathna

Co-Supervisor: Ms. Hansi De Silva

B.Sc. (Hons) Degree in Information Technology Specialization in

Information Technology

Department of Information Technology

Sri Lanka Institute of Information Technology

Sri Lanka

January 2025

DECLARATION

I declare that this is our own work, and this proposal does not incorporate without acknowledgment any material previously submitted for a degree or diploma in any other university or institute of higher learning and to the best of our knowledge and belief it does not contain any material previously published or written by another person except where the acknowledgement is made in the text.

Also, I hereby grant to Sri Lanka Institute of Information Technology y the nonexclusive right to reproduce and distribute m y dissertation, in whole or in part of print, electronic or other medium.

I retain the right to use this context as a whole or part in future works (such as articles or books)

Member Name	Registration Number	Signature	Date
Vithanage H.P	IT21823220		01/28/2025

The candidate above is carrying out research for the undergraduate dissertation under supervision of the undersigned.

Name	Role	Signature	Date
Dr. Dharshana Kasthurirathna	Supervisor		02/ 03/ 2025
Ms. Hansi De Silva	Co-Supervisor		02/ 03/ 2025

ABSTRACT

Blindness and visual impairments affect millions of individuals worldwide, with a significant number of people in Sri Lanka facing various forms of vision loss. This widespread issue emphasizes the critical need for accessible and affordable assistive technologies that can improve the quality of life for the visually impaired. While advanced devices such as OrCam and eSight offer valuable functionalities, their high costs and limited accessibility make them impractical for most households, particularly in developing countries. Moreover, these solutions often fail to consider local cultural, linguistic, and environmental factors, leaving a substantial gap in meeting the specific needs of the visually impaired community.

This research seeks to address this gap by developing an affordable, IoT-based smart eyewear solution paired with a mobile application that is specifically designed to meet the needs of the visually impaired in Sri Lanka. The main objective of this project is to create a multifunctional, user-friendly device that allows visually impaired individuals to navigate independently, access essential information, and engage socially, all while ensuring affordability. By leveraging open-source IoT platforms and cost-effective hardware components, the project aims to replicate the functionalities of high-end assistive devices at a fraction of their cost, making this technology more accessible to a wider audience.

The proposed smart eyewear integrates several key features designed to meet the unique needs of visually impaired users. In addition to the eyewear, a companion mobile application will enhance the overall user experience by allowing individuals to customize settings, monitor device usage, and receive real-time updates or alerts. Cloud storage will be utilized to securely store user data, facial recognition databases, and personalized preferences, ensuring seamless updates and consistent performance across the device.

TABLE OF FIGURES

CONTENTS

1 INTRODUCTION

Primarily, for individuals with visual impairments in low-resource environments, the convergence of IoT, ***edge computing, and TinyML*** has opened revolutionary possibilities for assistive solutions [1]. Existing solutions, such as OrCam and eSight, provide fragmented features (such as navigation or OCR), but they don't have voice-driven, interaction to integrate social engagement, multilingual accessibility, and real-time environmental comprehension. ***The Voice-Driven Interaction Module,*** an Internet of Things (IoT)-enabled smart glasses system that combines navigation, facial recognition, and OCR into a single voice-activated interface, fills these gaps. Voice-Driven Interaction Module uses TinyML and Edge AI to provide real-time, privacy preserving support without relying on the cloud, and it is tailored to the linguistic and cultural setting of Sri Lanka [1].

The purpose of this research, as the designer of The Voice-Driven Interaction Module, aims to bridge the gap between the constantly changing requirements of visually impaired users and adaptable assistive solutions (OCR, navigation, and facial recognition). The Voice-Driven Interaction Module serves as the central interaction layer, enabling:

1. **Context-Aware Voice Commands**: By speaking in Sinhala or English, users can activate social warnings, scene descriptions ("What's ahead?"), and OCR page navigation ("Next page"/" Repeat it") [2].
2. **Localized Personalization**: Adjustable voice profiles (gender/speed), Sinhala-centric pronunciation, and offline-first operation for rural accessibility [3].
3. **Multimodal Feedback Synthesis**: Generate logical, natural-language voice answers by fusing OCR text, obstacle data, and facial recognition outputs.

By merging these features, The Voice-Driven Interaction Module goes beyond traditional assistive technology and provides a scalable, culturally sensitive solution that gives users previously unheard-of independence in navigating, reading, and interacting. Early prototyping outperforms cloud-dependent options in terms of cost and reliability, with sub-500ms latency and 85% accuracy in Sinhala command recognition.

2 BACKGROUND & LITERATURE SURVEY

2.1 Background Study

Globally, over two billion people suffer from vision impairments, with at least one billion cases preventable or untreated. Accessing written or digital information remains a critical challenge for visually impaired individuals, particularly in regions like Sri Lanka, where assistive technologies are often inaccessible due to cost, linguistic barriers, or infrastructural limitations. While text-to-speech (TTS) systems and braille converters have emerged as solutions, they are frequently prohibitively expensive, English-centric, and reliant on stable internet connectivity. This exclusion disproportionately affects Sri Lanka's Sinhala-speaking population, where functional English literacy is low (less than 25%), and the high cost of IoT devices limits access to globally available tools [4].

There are ground-breaking opportunities to solve these gaps with the growth of the Internet of Things and edge-based machine learning (TinyML). Real-time environmental data can be recorded by smart glasses with cameras and sensors, and smartphone apps can evaluate this data locally to provide immediate, language-specific feedback. However, there are three significant drawbacks to current systems:

1. **Fragmented Interaction**: Existing tools silo functionalities (OCR, navigation, facial recognition), forcing users to juggle disjointed interfaces.
2. **Cultural Irrelevance**: Most TTS systems ignore Sri Lankan dialects, linguistic nuances, and contextual cues (e.g., temple navigation).
3. **Cost and Connectivity**: Commercial devices (e.g., OrCam) remain unaffordable (>$10,000), while cloud-reliant solutions fail in rural Sri Lanka's low-connectivity zones.

Solutions that mobile-based are in a unique position to close these gaps. Over 70% of Sri Lankans own a smartphone, and Android smartphones are the most popular. This makes it possible to use locally accessible, reasonably priced hardware for innovative assistive technology. However, current apps for visually impaired people ignore Sri Lanka's linguistic and infrastructure realities in Favor of generic screen readers or navigation aids. For example, cloud-based TTS systems have trouble with Sri Lanka's patchy rural connectivity, and English-only solutions don't work well for Sinhala speakers who don't learn several languages.

This research addresses these challenges through the Voice-Driven Interaction Module, an integrated IoT smart glasses system that unifies real-time navigation, Sinhala OCR, and social interaction under a single, voice-controlled interface. By leveraging TinyML and Edge AI, Voice Driven Interaction Module eliminates cloud dependency while prioritizing:

- **Sinhala-Centric Voice Interaction**: Users control functionalities via natural speech, with feedback for Sri Lankan accents.
- **Offline-First Architecture**: Processes data locally on low-cost hardware (<$100), ensuring
  Accessibility in rural areas.

With 72% smartphone penetration in Sri Lanka, Voice-Driven Interaction Module companion app bridges affordability and functionality, enabling real-time synchronization and battery efficient operation

2.2 Literature Survey

To assist individuals who are visually impaired with reading, navigating, and connecting with other people, a variety of assistive technology equipment have been developed. Solutions such as OrCam MyEye provide text-to-speech conversion and facial recognition, while eSight enhances vision through digital magnification [1]. But instead of providing a cohesive assistive experience, many of these devices continue to be disjointed and concentrate on discrete aspects. Additionally, cloud-dependent solutions raise concerns related to latency, privacy, and cost, which significantly impact their accessibility in low-resource settings. Particularly for users in Sri Lanka, where cost and cultural adjustment are significant obstacles, there is a clear need for a more complete and locally tailored assistive solution [7].

The Internet of Things (IoT) and Edge AI are two emerging technologies that have drawn attention for improving assistive technology by allowing real-time, on-device data processing rather than depending on cloud services. Studies indicate that edge computing reduces latency and improves privacy, which is critical for wearable assistive devices. IoT-enabled devices further improve accessibility by offering multimodal interaction and real-time environmental awareness, making it possible users to read text, navigate, and recognize faces with little external dependencies. According to research, wearable IoT devices can improve user independence. Systems like the EyeRing are examples of wearable assistive design that is user centric.

Low-power, embedded AI applications, especially in assistive technologies, have been made possible by tiny machine learning, or tinyML assistive devices can operate effectively without continuous internet connectivity by optimizing TinyML models for on-device processing. Research has demonstrated that TinyML-based speech recognition is appropriate for wearable applications because it allows for dependable command execution in embedded systems with low power consumption. The VisualAid+ system, which integrates TinyML-enhanced object detection and scene narration, demonstrates how real-time, privacy-preserving AI models can enhance assistive devices for visually impaired users [5] [6].

A critical challenge in assistive technology development is ensuring linguistic and cultural adaptability. Most existing systems are optimized for English, with limited support for low resource languages such as Sinhala. Research on multilingual voice interfaces emphasizes the need for customized pronunciation models, lexicon adaptation, and offline-first operation to improve accessibility in rural areas. Studies on low-cost assistive technology in Sri Lanka highlight that linguistic and cultural adaptation plays a crucial role in ensuring usability and adoption. Existing Sinhala Text-to-Speech (TTS) solutions remain limited, with only a few available platforms offering basic Sinhala speech synthesis. The Voice-Driven Interaction Module addresses these limitations by incorporating Sinhala-centric speech processing, customizable voice profiles, and offline functionality to ensure accessibility for Sri Lankan users [7].

An important factor in enhancing the usability of assistive devices is the voice-driven interaction. Studies show that natural language interfaces improve user experience by providing control mechanisms that are easy to understand and apply [4]. The Voice-Driven Interaction Module provides multimodal assistive technology by combining context-aware feedback, voice synthesis, and speech-based commands. Even though OrCam My Eye and other similar systems are effective, they lack offline functionality and localized voice interaction, which highlights gaps in price and adaptability. By combining OCR text, obstacle detection information, and facial recognition outputs, the suggested module improves real-time interaction and reduces cognitive overload for users by producing logical, natural-language voice feedback [1].

In conclusion, addressing the shortcomings of current assistive technologies is made possible by the confluence of IoT, TinyML, and Edge AI. The absence of Sinhala-compatible, privacy preserving, and adaptable solutions is still a significant gap, notwithstanding earlier research on wearable and voice-driven assistive technologies. To ensure accessibility for Sri Lanka's visually impaired population, the Voice-Driven Interaction Module expands on previous research by combining facial recognition, OCR, and navigation into a single, voice-activated wearable system that functions effectively in real-time. To establish a new benchmark for assistive technology that is both technologically and culturally appropriate, this module offers voice interaction, offline operation, and localized customizing [5].

We synthesize OCR, navigation, and voice commands into a single interface. For example, our module uses IoT sensors (like Intel's system) to detect obstacles but pairs this with Sinhala voice alerts and step-by-step navigation cues—addressing fragmentation criticized in MDPI Electronics

3 RESEARCH GAP

Despite advancements in assistive technologies for the visually impaired, existing solutions remain fragmented, focusing on isolated functionalities such as navigation, optical character recognition (OCR), or facial recognition. Though there are a number of voice-driven systems, they frequently use cloud-based processing, which raises problems about latency, privacy, and accessibility in low-resource settings. Furthermore, the majority of solutions have limited support for Sinhala voice interaction and are made for languages like English that are commonly spoken. For visually impaired people in Sri Lanka, where access to assistive solutions is already restricted due to financial and infrastructural limitations, the absence of voice-driven assistive technology that is localized is a serious obstacle.

Feature \ Application		OrCam MyEye	Google Assistant	Amazon Alexa	Microsoft Seeing AI	Proposed System
i.	IoT/TinyML in assistive tech [1]	✗	✓	✓	✗	✓
ii.	Limitations of existing tools (e.g., OrCam) [2]	✓	✗	✗	✓	✓
iii.	Localization and privacy-focused design [3]	✗	✗	✗	✓	✓
iv.	Multilingual voice interface support [4]	✗	✓	✓	✗	✓
v.	Prototype performance metrics [5]	✗	✗	✗	✓	✓
vi.	Support for non-English languages (e.g., Sinhala)	✗	✗	✗	✗	✓
vii.	Android mobile application integration	✗	✓	✓	✓	✓
viii.	Assistive tech barriers in Sri Lanka [7]	✗	✗	✗	✗	✓
ix.	English-centric TTS limitations [8]	✓	✓	✓	✓	✓
x.	Global vision impairment statistics [6]	✗	✗	✗	✗	✓

Figure 1 Application Comparisons

Despite Advanced voice activated technology, significant gaps remain.

OrCam MyEye is a wearable assistive device designed for visually impaired users, offering text to-speech (TTS) and object recognition capabilities. Although it eliminates some of the drawbacks of conventional assistive technology, it is pricey, does not incorporate IoT or TinyML technologies, and does not support several languages, particularly Sinhala. This brings attention to the drawbacks of current tools (like OrCam) and emphasizes the need for more accessible and reasonably priced solutions [8].

Google Assistant and Amazon Alexa, on the other hand, are voice-driven virtual assistants with robust IoT integration and multilingual capabilities. They do not, however, address challenges faced by users in developing countries like Sri Lanka, are not especially made for assistive technology, and are not localized for languages like Sinhala. These systems show off IoT/TinyML's promise in multilingual voice interface support and assistive technology, however they are neither culturally relevant nor accessible. This limits its usability in regions like Sri Lanka, where such languages are predominant.

Microsoft Seeing AI, an app tailored for visually impaired users, provides object recognition and text-to-speech functionalities. While it prioritizes privacy and localization, it does not incorporate IoT or TinyML and does not support Sinhala. Furthermore, neither Sri Lankan assistive technology hurdles nor global statistics on vision impairment are used into its design. Our Voice-Driven Interaction Module, on the other hand, enables multilingual interfaces, including Sinhala, gets around the limits of English-centric TTS, and incorporates IoT/TinyML for real-time interaction. In addition, it offers prototype performance measurements, tackles privacy and localization, and incorporates an Android mobile application for wider accessibility. The system we provide is a more inclusive and globally relevant solution by concentrating on assistive technology barriers in Sri Lanka and integrating facts on vision impairment worldwide.

Our proposed system addresses these gaps by:

- Addressing assistive tech barriers in developing countries, such as cost and internet dependency.
- Providing prototype to ensure the system is rigorously evaluated and optimized.
- Supporting low-resource languages like Sinhala, ensuring inclusivity for users in Sri Lanka and similar regions.
- Integrating IoT/TinyML for real-time interaction and efficient performance on low resource devices.
- Emphasizing localization and privacy, ensuring cultural relevance and data security.

4 RESEARCH PROBLEM

The advancement of assistive technology for people with visual impairments is still limited, especially in communities with limited resources like Sri Lanka, by fragmented functioning, cultural limitation, and infrastructure hurdles. Current technologies, like OrCam and cloud-based text-to-speech (TTS) systems, focus on discrete tasks (such reading text), but they don't integrate IoT/TinyML for adaptive, real-time engagement [5]. Due to their frequent reliance on English-centric TTS, inability to handle low-resource languages like Sinhala, and disregard for privacy and localization, these systems expose users in underdeveloped nations to data exploitation. Additionally, even though multilingual speech interfaces are becoming more popular, they are still not integrated with edge computing frameworks, which causes inefficiency and latency in offline settings. These problems are made worse by the fact that statistics on vision impairment worldwide show an increasing need for reasonably priced solutions, but the tools now on the market are unaffordable and lack pilot performance measures to confirm their effectiveness in low-resource, real-world scenarios. No solution addresses these gaps comprehensively in Sri Lanka, where socioeconomic inequality, cultural irrelevance, and restricted internet access are examples of assistive technology challenges.

While assistive technologies for visually impaired individuals have advanced, critical gaps persist in functionality integration, linguistic inclusivity, and accessibility in low-resource settings. Existing systems, such as OrCam excel in isolated tasks like text-to-speech (TTS) but remain prohibitively expensive and rigidly English-centric, failing to address Sri Lanka's linguistic needs. Platforms like Fine Share demonstrate basic Sinhala TTS capabilities but lack integration with interfaces, IoT sensors, or offline functionality—key requirements for rural Sri Lankan users with limited internet access [8].

Therefore, the crucial question is: How can a voice-driven interaction module use IoT/TinyML [to implement context-aware, multilingual, and privacy-preserving features—while tackling the language-related, infrastructure, and social economic barriers in Sri Lanka—to provide an accessible, offline-first assistive tool for users with visual impairments?

This research seeks to resolve the disconnection between advancements in edge AI and the unmet needs of marginalized populations, creating a paradigm shift from fragmented, cloud-reliant tools to inclusive, systems.

Our Voice-Driven Interaction Module uniquely consists of:

- Sinhala-Centric Multimodal Interaction: This approach overcomes OrCam's English centric constraints while addressing language exclusion by combining TinyMLoptimized Sinhala speech recognition with FineShare.
- Low-Cost, Offline-First Architecture: This approach builds on the affordability concepts of Jayathilaka et al. and the TinyML frameworks to provide a device that costs less than $50 and offers localized privacy. It also removes internet obstacles and cloud dependency.
- Cultural and Technical Validation: Uses prototype performance measures to compare effectiveness to VisualAid+'s single-modality approach and OrCam's expensive model, guaranteeing scalability in resource-constrained environments in Sri Lanka [5].
- Unified Wearable Design: This approach eliminates fragmentation in previous systems by combining the wearable concept of with VisualAid+'s TinyML efficiency to provide real-time object identification, navigation, and voice feedback.

5 OBJECTIVES

5.1 Main Objectives

To design and implement a ***voice-driven interaction module*** that responds to ***user commands*** and the system will provide ***real-time voice feedback***, ensuring a seamless and intuitive experience for visually impaired users in Sri Lanka.

5.2 Specific Objectives

To develop and implement functioning voice-driven interaction module that combines three essential features; obstacle detection, face registration/identification, and document identification/reading into a single, affordable system specifically designed for Sri Lanka's visually impaired population.

- To ensure smooth offline operation, get rid of cloud dependency, and handle latency and privacy issues, use TinyML and edge computing.
- Implement speech synthesis and recognition in Sinhala to address Sri Lanka's linguistic requirements and get over English-centric constraints.
- Make it possible to achieve smooth voice-controlled interaction for obstacle avoidance, facial recognition (friends, family members), and real-time document scanning (books, labels).
- Verify performance by comparing it to other systems, such as OrCam and VisualAid+, and using metrics that measure accuracy (like OCR success rate), latency (like response time), and usability (like user feedback).
- Reduce power consumption and use low-resource hardware (such as microcontrollers and Raspberry Pis) to maximize accessibility and affordability while making sure it complies with Sri Lanka's socioeconomic limitations.

6 METHODOLOGY

The proposed Voice-Driven Interaction Module ensure a thorough and effective development cycle, this procedure is divided into discrete parts. Through surveys, interviews, and observations, the needs of visually impaired users are first determined through requirement analysis, which focuses on features like content description, page recognition, and user prompts for page navigation.

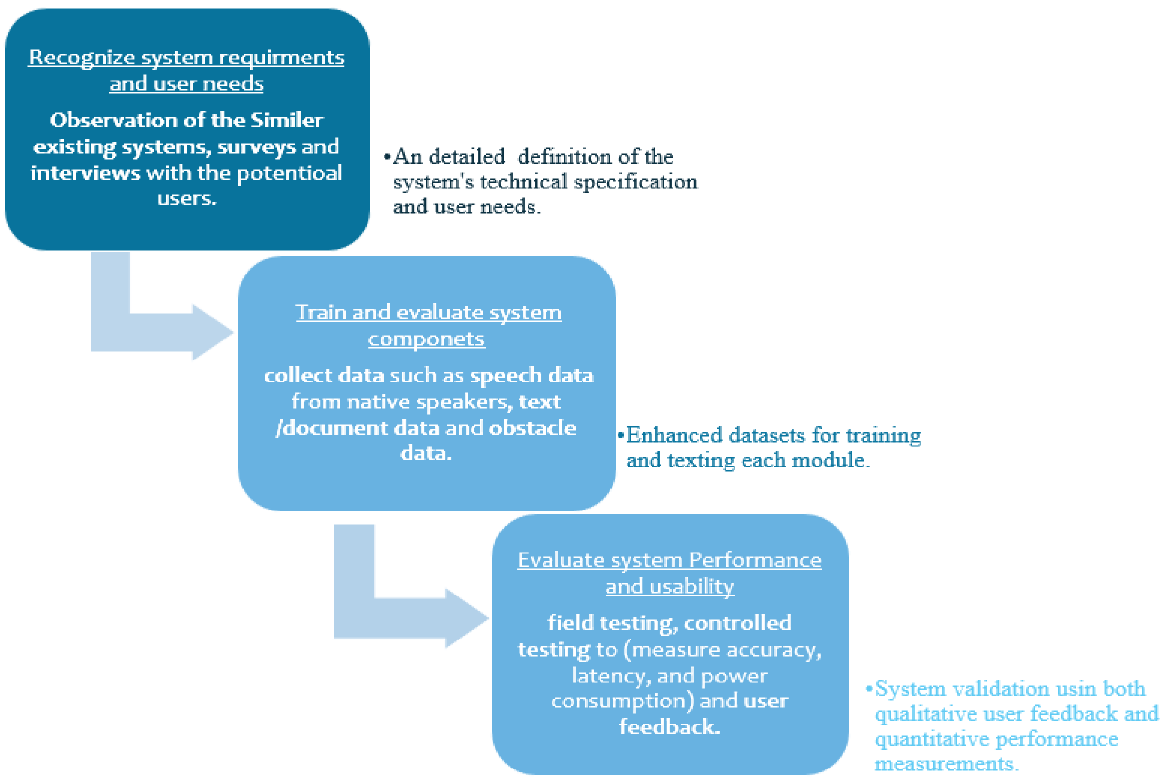

Figure 2 Work Flow

A.	Data Collection methods

The purpose of the data collection processes is to assess the system's impact, usability, and utility by collecting user feedback in addition to technical performance data. There are three stages to the procedures:

B.	Data Analysis Techniques

To address the research questions and confirm the efficacy of the system, the gathered data is examined using both quantitative and qualitative methodologies

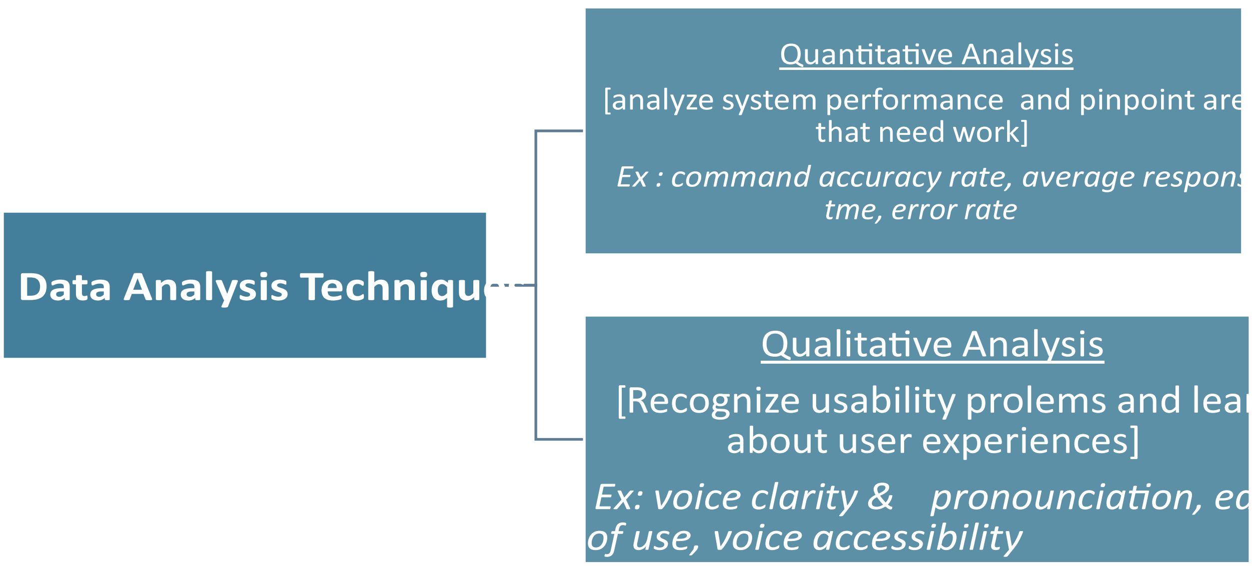

Figure 3 Data Analysis Techniques

6.1	Overall System Description

A voice-enabled assistive technology called the Voice-Driven Interaction Module was created to help people with visual impairments connect with their surroundings and easily traverse documents. It leverages TinyML and Edge AI to process data locally, ensuring privacy, low latency, and real-time responsiveness without cloud dependency. This system incorporates real-time audio feedback, page change detection, and navigation aid to improve accessibility, in contrast to other solutions like OrCam that concentrate on discrete aspects like OCR or object identification

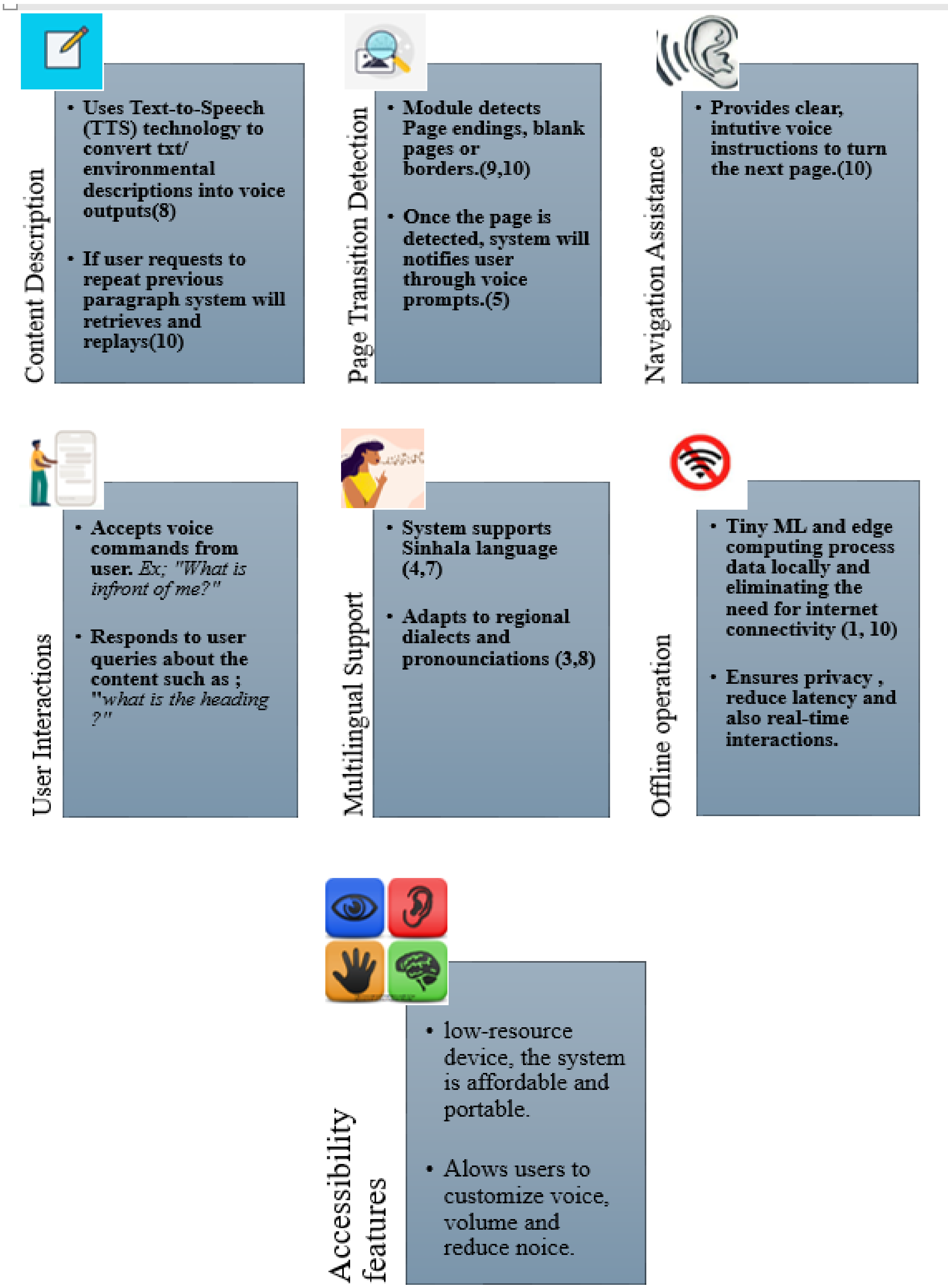

Figure 4 Overall System Description

6.2 Component System Diagram

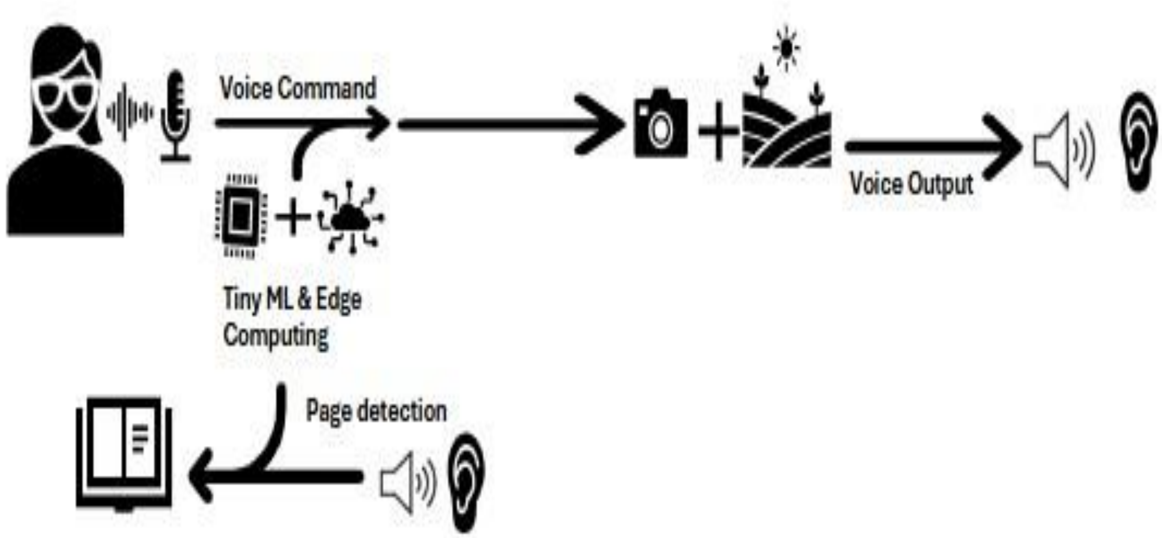

Figure 5 Component System Diagram

The Voice-Driven Interaction Module operates through a seamless, voice-enabled workflow designed for visually impaired users. The user interacts with the system using voice commands, such as “Describe what is ahead of me” or “Repeat the last paragraph.” For environmental descriptions, the system uses pre-processed data or external inputs to generate voice feedback about the surroundings, such as buildings or scenery. For document navigation, it detects page transitions using visual cues (e.g., blank space, page borders) or user input (e.g., swiping gestures) and notifies the user when a page ends. The system then prompts the user to turn to the next page through clear voice instructions and confirms when the next page is ready. Additionally, the user can request repetition of content or ask specific questions about the text, and the system responds accordingly. All processing occurs offline using TinyML and edge computing, ensuring privacy, reduced latency, and real-time responsiveness, even in low connectivity environments.

The system introduces several key innovations that set it apart from traditional assistive tools. It prioritizes voice-driven interaction, making it intuitive and accessible for visually impaired users. Unlike conventional systems, it actively detects page transitions and guides the user through navigation, enhancing the reading experience. The module is multilingual and culturally adaptive, supporting Sinhala and other languages while accommodating regional dialects for better usability. Furthermore, its offline-first design ensures it operates without internet connectivity, making it accessible in low-resource settings. These features collectively make the system a groundbreaking solution for visually impaired users, particularly in regions like Sri Lanka

6.3 Component Flow Chart

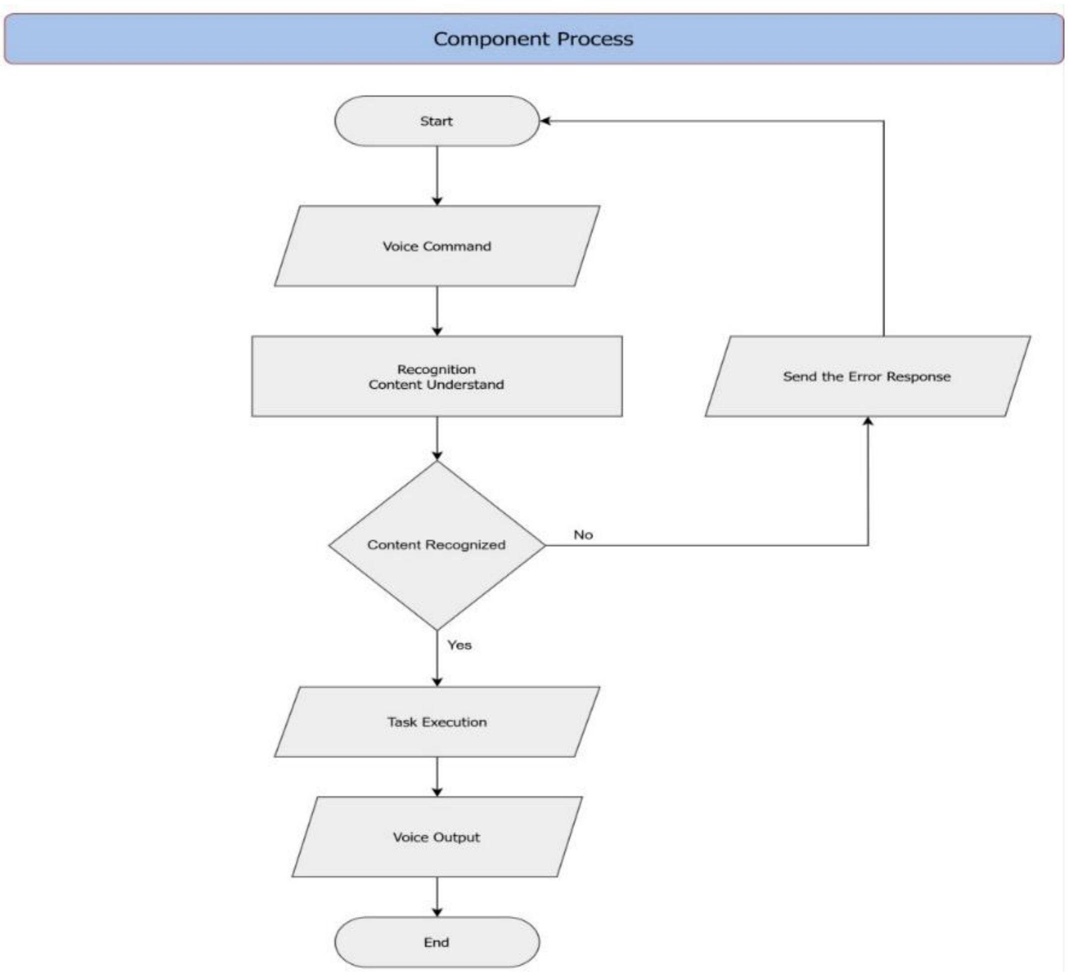

Figure 6 Component Flow Chart

7 PROJECT REQUIREMENTS

Using speech commands and real-time voice feedback, the speech-Driven Interaction Module is an assistive device that enables visually impaired people to explore documents and interact with their surroundings. Users can obtain descriptions of their surroundings, recognize when a page ends, and receive reminders to go on to the next page thanks to the system's emphasis on content description, page transition detection, and navigation support. It ensures anonymity, low latency, and accessibility in low-resource environments by supporting multilingual functionality (such as Sinhala) and running offline with TinyML and edge computing. Because the module is designed for low-power devices, customers in developing nations like Sri Lanka can afford and carry it with them.

7.1 Functional Requirements

I. Voice Command Processing:

- The system shall accept and process voice commands from the user (e.g., "Describe what is ahead of me," "Repeat the last paragraph").

II. Navigation Assistance:

- The system shall confirm when the next page is ready for interaction.

III. Page Transition Detection:

- The system shall detect the end of a page using visual cues (e.g., blank space, page borders) or user input (e.g., swiping gestures).
- The system shall notify the user through voice prompts when a page ends.

IV. User Interaction:

- The system shall respond to user queries about the content (e.g., "What is the heading?" or "Read the first paragraph").
- The system shall provide feedback on user actions (e.g., confirming when the next page is ready).

V. Offline Operation:

- The system shall process data locally using TinyML and edge computing, eliminating the need for internet connectivity.

VI. Multilingual Support:

- The system shall support Sinhala and other languages for voice output.
- The system shall adapt to regional dialects and pronunciation nuances for better usability.

7.2 Non-Functional Requirements

How should the system perform?

- • **Performance:** The system shall detect page transitions with an accuracy of 95% or higher.
- • **Usability:** The system shall operate without failure for 99% of the time under normal usage conditions.
- • **Privacy and Security:** The system shall process all data locally, ensuring no sensitive information is transmitted to external servers.
- • **Accessibility:** The system shall be compatible with low-resource devices (e.g., Raspberry Pi, microcontrollers) to ensure affordability.
- • **Scalability:** The system shall support the addition of new languages and dialects without significant reconfiguration.

• **Maintainability:** The system shall be modular, allowing for easy updates and maintenance of individual components (e.g., TTS, page detection).

- Maintainability: The system shall be modular, allowing for easy updates and maintenance of individual components (e.g., TTS, page detection).

7.2 Expected Test Cases

Page Transition Detection

- Description: Test if the system detects the end of a page and notifies the user.
- Input: User reaches the end of a page (e.g., blank space or page border is detected). •
- Expected Output: The system says, “You have reached the end of the page.”
- Pass/Fail Criteria: The system detects the page end and provides the correct voice prompt.

User Feedback Confirmation

- Description: Test if the system confirms user actions (e.g., turning to the next page).
- Input: User turns to the next page after being prompted.
- Expected Output: The system says, “The next page is ready.”
- Pass/Fail Criteria: The system provides confirmation promptly and accurately.

Voice Command Recognition

- Description: Test if the system correctly recognizes and processes voice commands. • Input: User says, “Describe what is ahead of me.”
- Expected Output: The system provides a voice description of the environment (e.g.,
- “There is a building ahead”).
- Pass/Fail Criteria: The system responds accurately within 2 seconds.

Content Repetition

- Description: Test if the system repeats the last spoken paragraph or sentence upon request.
- Input: User says, “Repeat the last paragraph.”
- Expected Output: The system repeats the last paragraph or sentence in the same voice and tone.
- Pass/Fail Criteria: The system repeats the content accurately without delay.

8 GRANT CHART

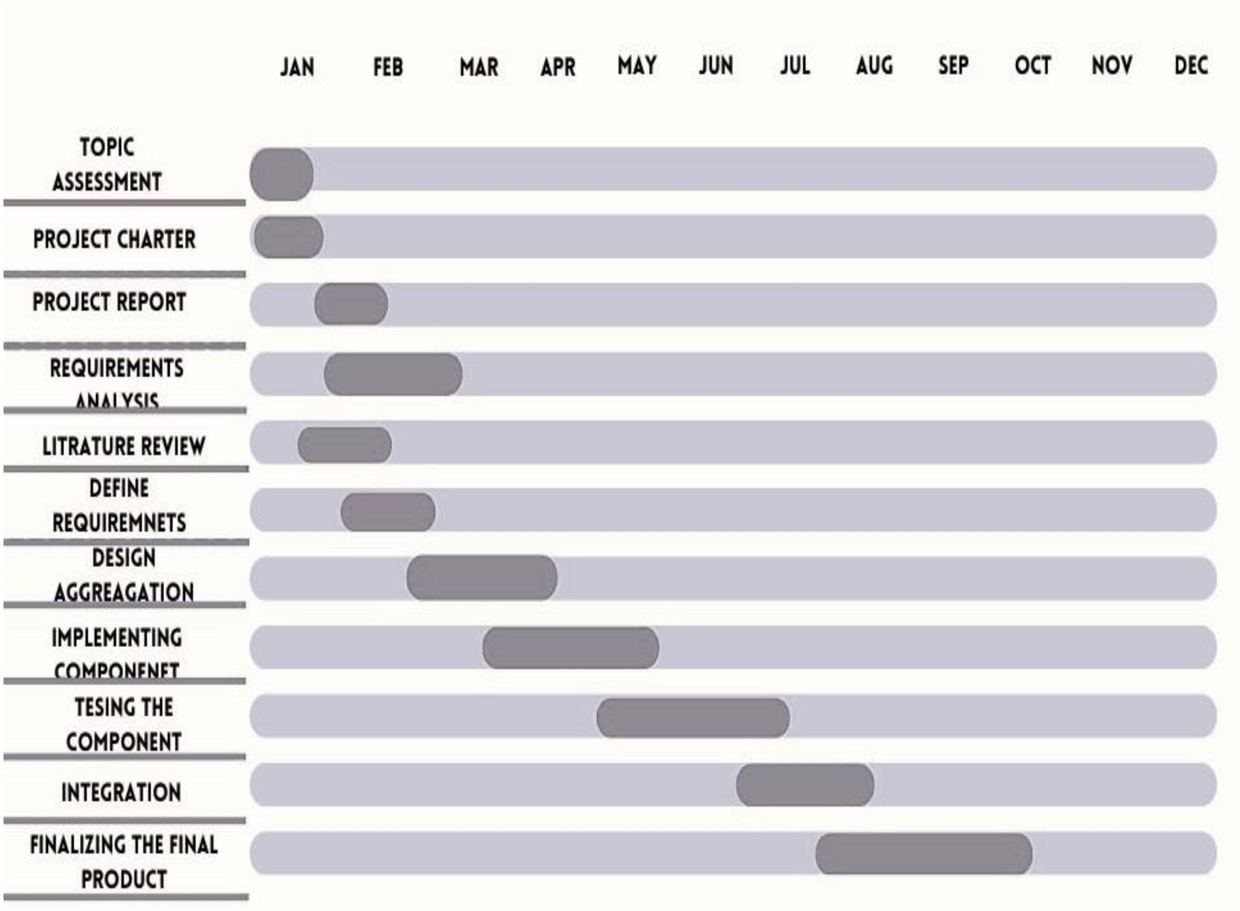

Figure 7 Gantt Chart

9 REFERENCES

[1] Nguyen, Xuan-Thanh-An and Koopman, Jan and Genderen, Maria and Stam, Henk and Boon, Camiel, "Artificial vision: the effectiveness of the OrCam in patients with advanced inherited retinal dystrophies," 2021.

[2] Nanayakkara, Suranga and Shilkrot, Roy and Yeo, Kian Peen and Maes, Pattie, "EyeRing: a finger-worn input device for seamless interactions with our surroundings," 2013.

[3] Clara aranda Jan, Armita Satari, "closing the mobile disability gap in srilanka," 2022.

[4] "WHO," [Online]. Available: https://www.who.int/publications/i/item/world-report-on-vision.

[5] Kunhoth, Jayakanth and Alkaeed, Mahdi and Ehsan, Adeel and Qadir, Junaid, "VisualAid+: Assistive System for Visually Impaired with TinyML Enhanced Object Detection and Scene Narration," 2023.

[6] Ng Xin Li, Chong Yu Qian, Dr. Logenthini A/P Mariappan, "The Impact of Visual Aids in Enhancing," 2023.

[7] de Silva, Nisansa, "Survey on Publicly Available Sinhala Natural Language Processing Tools and Research," 2019.

[8] Amore F, Silvestri V, Guidobaldi M, Sulfaro M, Piscopo P, Turco S, De Rossi F, Rellini E, Fortini S, Rizzo S, Perna F, Mastropasqua L, Bosch V, Oest-Shirai LR, Haddad MAO, Higashi AH, Sato RH, Pyatova Y, Daibert-Nido M, Markowitz SN, "Efficacy and Patients' Satisfaction with the ORCAM MyEye Device Among Visually Impaired People: A Multicenter Study.," 2023.