Project ID:

TMP-23-198

1. Topic (12 words max)

Mobile Base Sinhala Book Reader for Visually Impaired Individuals.

2. Research group the project belongs to

Knowledge Inspired Computing (KIC)

3. Research area the project belongs to

Natural Language Processing (NLP)

4. If a continuation of a previous project:

Project ID	
Year	

5. Team member details

Student Name	Student ID	Specialization
Leader: Jayathunga T.M.	IT20146238	IT
Member 2: Godakanda P.G.S.	IT20129712	IT
Member 3: Semini J.P.D.L.	IT20241346	IT
Member 4: Bhagya H.D.M.	IT20254520	IT

6. Brief description of the research problem including references (200 – 500 words max) – references not included in word count.

Blind people face several challenges when reading books, but the main problem is a lack of accessibility to printed materials. Despite advancements in assistive technology, such as text-to-speech software and Braille displays, most books are still not accessible to blind individuals in an easily readable format. This can limit the opportunities for blind people to gain knowledge, engage in literary experiences, and improve their education and employment prospects.

One issue is the cost of specialized devices and software, which can be prohibitively expensive for many blind people. Even when these tools are available, they may not provide an experience that is comparable to reading a traditional printed book. For example, text-to-speech software can struggle with complex language and formatting, and Braille displays can be slow and clunky.

Another issue is the limited availability of audiobooks and Braille materials. While more audiobooks are being produced, the selection is still limited compared to the vast number of printed books. Braille books are even harder to come by, as the process of translating printed books into Braille is time-consuming and costly. This means that blind people may not have access to the latest best-selling books or popular educational materials.

In conclusion, the main problem that blind people face in reading books is a lack of accessibility to printed materials. Despite advances in assistive technology, there are still significant barriers to overcome, such as the cost of specialized devices and software, the limited availability of audiobooks and Braille materials, and the difficulty in providing a comparable reading experience to that of a traditional printed book. To address these challenges, there needs to be a concerted effort to make books more accessible to blind people and to ensure they have the same opportunities to engage with literature and gain knowledge as sighted individuals.

World Health Organization: https://www.who.int/en/news-room/fact-sheets/detail/blindness-and-visual-impairmen

7. Brief description of the nature of the solution including a conceptual diagram (250 words max)
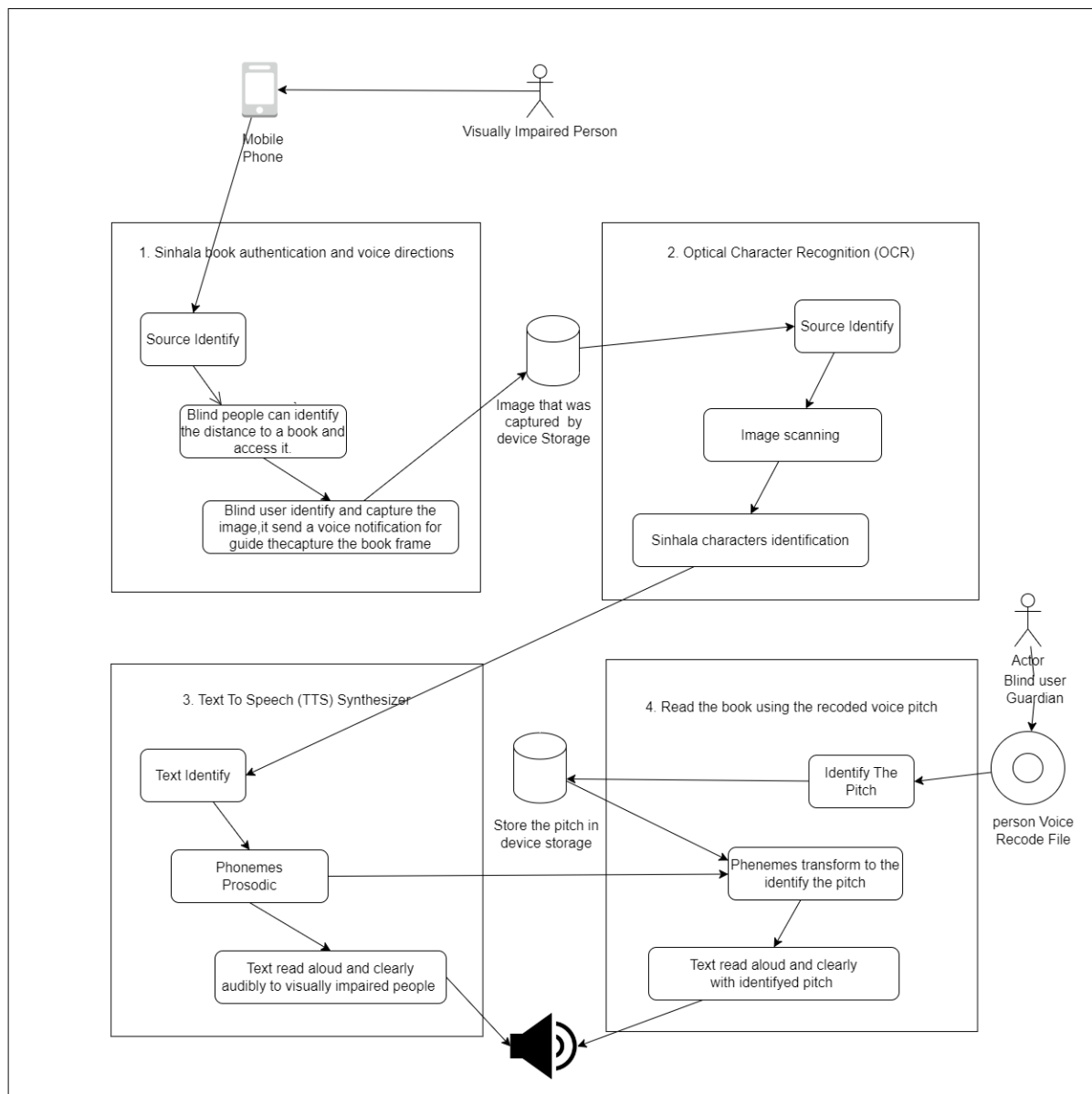
The mobile-based Sinhala book reader for visually impaired individuals can provide a solution using the following technologies:

Sinhala book authentication and voice directions: The blind people can identify the distance from him/her to the book and easily access towards the book. Then after the user touches the book and try to capture the image the system will send a voice message and inform the user about the book frame and how to capture it.

Optical Character Recognition (OCR) Synthesis: Once the app is launched the user can use the app in real-time to scan the document. And the system auditory guides and helps the user to scan the document or the paper to adjust the frame. When the task is successfully completed system translates that to Sinhala and sends it to the system to perform TTS.

Text-to-Speech (TTS): The TTS software can be used to convert digitized text into speech, allowing visually impaired individuals to listen to the book through their mobile devices.

Read the book using the recoded voice pitch: The blind user can select any person's voice from the app. The user has to any preferred voice through the recorder and select that voice from the app. The app will read the rest of Sinhala voices using that pitch.

8. Brief description of specialized domain expertise, knowledge, and data requirements (300 words max)

- Domain Expertise: In Sri Lanka, 1.7% of people over 40 were blind, with Uva, Eastern, Northwestern, and Northern provinces having the highest rates. Cataracts and uncorrected refractive errors are the major contributors to blindness, accounting for 90% of the causes. Braille devices, computer screen readers, and magnifiers, which may be regarded as major advancements in this sector, are now available choices meant to help blind people grasp the context of a written text and reading text.

- Knowledge: Image processing, Text speech, Object Detection, Voice navigation

- Data requirements:

  Text of the books: This would be the primary data requirement, as the books need to be available in a digital format to be displayed on the mobile device.

  Audio files: The mobile application should be able to read the text aloud using text-to-speech technology.

  Text-to-speech engine: The mobile device would need a text-to-speech engine to read the text aloud.

  Book metadata: Information such as the book title, author, publication date, etc. would be needed to properly categorize and organize the books within the application.

  User preferences: The application should store the user's preferences such as font size, reading speed, etc. to provide a personalized reading experience.

9. Objectives and Novelty

Main Objective

A Sinhala book reader for the visually impaired is a software program designed to make reading accessible for individuals with visual impairments. It combines various technologies to provide a seamless reading experience. The device utilizes optical character recognition (OCR) technology to convert the text from a physical book into a digital format. Then, a text-to-speech synthesizer reads the text out loud in the Sinhala language, making it easier for visually impaired users to follow along.

In addition to the text-to-speech synthesizer, the device also includes audible guidance to help navigate the app and identify the distance to the book being read. This makes it easier for visually impaired users to find their place in the book and keep track of their progress. The device also allows users to adjust the reading speed, volume, and pitch of the audio to their liking.

Another useful feature of this Sinhala book reader is the ability to record audio pitch, which is especially helpful for users who may have difficulty reading in a consistent tone. This feature helps users to improve their reading skills and become more confident in their abilities.

Member Name	Sub Objective	Tasks	Novelty
Jayathunga T.M.	Text To Speech (TTS) Synthesizer TTS stands for Text-To-Speech, which is a technology that converts written text into spoken words. It's a useful tool for visually impaired people as well as others who prefer to listen to content instead of reading it.	Here, the main purpose of using Text to speech (TTS) technology is to give a blind person the ability to access the written text of a Sinhala book. This allows them to easily listen to the valuable content of Sinhala books. TTS technology allows the written text in a Sinhala book to be read out loud in a natural-sounding voice, which makes it easier for visually impaired people to understand the content. The technology uses computer algorithms to analyze the Sinhala text and generate an appropriate pronunciation, intonation, and rhythm for each word and sentence. Here are the steps for TTS,	• Without the speech of an outside person, Sinhala text converts into clear speech and makes it easy for visually impaired people to hear. Visually Impaired person can read the book in male or female Sinhala voice as per his wish.

		• An audio notification should be sent to visually impaired people after the OCR process is complete. • Here, Texts that have been extracted and identified in Sinhala characters should be transmitted to the TTS system. • Finally, TTS should be used to read aloud and clearly audibly to visually impaired people the Sinhala text recognized in the camera picture. Overall, the main task of using TTS for visually impaired people in a Sinhala book reader is to provide them with a way to access written text and enjoy the content of books, regardless of their visual impairment.	
Godakanda P.G.S.	Sinhala book authentication and voice directions.	• Audible guidance and help user to navigate app through the functions of the app and	• When a user enters a room and aims the camera at a book, the

get a clear idea and guidance whenever user faces a difficulty perform a task.

- When a user enters a room and points out the camera towards the book the system will automatically calculates the distance.

- Then after the blind user touches the book and try to capture the image the system will send a voice message and inform the user about the book frame and how to capture it.

- Using real time Image processing technology identify the dangerous object near by the blind user and distance to the object will notify verbally to the user and identify the probability of occurring an accident to user. Users will navigate in a pristine environment evading dangers and harmful things.

system will compute the distance for them. By avoiding the obstacles that occur while searching for the book, the visually impaired user is notified through voice notification to reach the book. Users will be guided through the app to reach the book's location and guide the person for capture the image of that book.

Semini J.P.D.L.	Optical Character Recognition (OCR) Optical character recognition is the process of classification of optical patterns contained in a digital image. This turns images of typed, handwritten, or printed	• Sinhala Character Identification and word formation through engine and translate to the speech then send it to the TTS. • When the app is not running, users can read the time using a background process. The program should also be able to start	• The focus is on aspects of an OCR engine that are new or unique, such as line searching, and features/classification processes. How the scanned document in the Sinhala language has been transformed

	text into machine-encoded text that might be electronic or mechanical.	the camera when the user launches it using voice commands. • The program should be able to quickly scan the document when the user launches it. • On the paper in front of the camera, the app needs to be able to automatically focus. • Until the document is within the capture frame, the system should alert the user audibly. • The system should be able to automatically capture and obtain the image whenever the document is completely within the capture frame. • The device's storage should be used to store the image that was captured. • Before submitting information to the OCR system, the system must detect and correct skew.	into editable text by a software interface and transformed into an open-source word processing application. Most existing OCR programs are designed for English and industrial use, with few implementations available for languages so this application is mainly for the Sinhala language. In their OCR application which uses multi-font and multi-size, the researchers used skew identification and correction, supported by segmenting the characters. Here, the text of the Sinhala book obtained by using the blind user camera is prepared for text to speech (TTS) by OCR.

Bhagya H.D.M.	Read the book using the recoded voice pitch.	• The method of identifying someone based on their speech features is called speaker recognition (voice biometrics). It focuses attention on the speaker. • In this app blind users have an option to hear the sound from a different voice.	• Identify any person's recorded voice pitch and read the Sinhala book for Visually Impaired Individuals using that recorded pitch. Users can hear any Sinhala book using recoded pitch at that moment. Using image

		- The user can record any other person's voice through a voice recorder. - After that the system will measure the pitch variation of your voice when giving a speech to determine your vocal range. - Texts that have been extracted and identified in Sinhala should be transmitted to the TTS system with the recorded voice. - Other than that user can read the image content using this app and translate it into a Sinhala text. That also can hear using the recorded voice pitch.	recognition and translate the image component into a Sinhala text. Then using TTS get the text into a speech.

10. Supervisor checklist (supervisors should fill sections 10 and 11)

a) Is this research problem valid?

| Yes | ✓ | No | |

b) Is the proposed research group, correct?

| Yes | ✓ | No | |

c) Is the proposed research area, correct?

| Yes | ✓ | No | |

d) Do the proposed sub-objectives match the students' specialization?

| Yes | ✓ | No | |

e) Is the required domain expertise, knowledge, and the data available either through the supervisor or external supervisor?
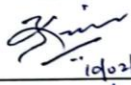
| Yes | ✓ | No | |

f) Is the scope of the solution practical?

| Yes | ✓ | No | |

g) Do all sub-objectives have sufficient novelty?

| Yes | ✓ | No | |

11. Supervisor details

	Title	First Name	Last Name	Signature
Supervisor	Prof	Koliya	Pulasinghe	*(signature) 10/02/23*
Co-Supervisor	Ms	Poorna	Panduwawala	*(signature)*
External Supervisor				
Summary of external supervisor's (if any) experience and expertise				

Summary Sheet

The topic evaluation panel will use the summary sheet to evaluate the suitability of the project

1. Brief description of research problem including references (200 – 300 words max)

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2. Brief description of the nature of the solution (150 words max)

Sinhala book readers for blind users can provide the following solutions.

- Sinhala book authentication and voice directions: The blind people can identify the distance from him to the book and easily access towards the book. Then after the user touches the book and try to capture the image the system will send a voice message and inform the user about the book frame and how to capture it.

- Optical Character Recognition (OCR): Once the app is launched the user can use the app in real-time to scan the book. System auditory guides and helps the user to scan the book to adjust the frame. When the task is successfully completed system translates that to Sinhala and sends it to TTS.

- Text-to-Speech (TTS) Synthesizer: The TTS software can be used to convert digitized text into speech, allowing blind users to listen to the book through their mobile devices.

- Read the book using the recoded voice pitch: The blind user can select any person's voice from the app. The user has to any preferred voice through the recorder and select that voice from the app. The app will read the rest of Sinhala voices using that pitch.

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Semini J.P.D.L.	Optical Character Recognition (OCR) Optical character recognition is the process of classification of optical patterns contained in a digital image. This turns images of typed, handwritten, or printed text into machine-encoded text that might be electronic or mechanical	• Sinhala Character Identification and word formation through engine and translate to the speech then send it to the TTS. • When the app is not running, users can read the time using a background process. The program should also be able to start the camera when the user launches it using voice commands. • The program should be able to quickly scan the document when the user launches it. • On the paper in front of the camera, the app needs to be able to automatically focus.	• The focus is on aspects of an OCR engine that are new or unique, such as line searching, and features/classification processes. The scanned document in the Sinhala language has been transformed into editable text by a software interface and transformed into an open-source word processing application. Most existing OCR programs are designed for English and industrial use, with few implementations available for languages so this application is mainly for the Sinhala language. In their

		- Until the document is within the capture frame, the system should alert the user audibly. - The system should be able to automatically capture and obtain the image whenever the document is completely within the capture frame. - The device's storage should be used to store the image that was captured. - Before submitting information to the OCR system, the system must detect and correct skew.	OCR application which uses multi-font and multi-size, the researchers used skew identification and correction, supported by segmenting the characters. Here, the text of the Sinhala book obtained by using the blind user camera is prepared for text to speech (TTS) by OCR.

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This part to be filled by the Topic Screening Panel members.

Acceptable: Mark/Select as necessary

Topic Assessment Accepted	
Topic Assessment Accepted with minor changes (should be followed up by the supervisor) *	
Topic Assessment to be Resubmitted with major changes*	
Topic Assessment Rejected. Topic must be changed	

* Detailed comments given below

Comments

The Review Panel Details

Member's Name	Signature

Important:

1. According to the comments given by the panel, do the necessary modifications and get the approval by the **Supervisor** or the **Same Panel**.

2. If the project topic is rejected, identify a new topic, and request the RP Team for a new topic assessment.

3. The form approved by the panel must be attached to the **Project Charter Form**.