A MOBILE APPLICATION TO IMPROVE ONLINE LEARNABILITY TO VISUALLY IMPAIRED ELEMENTARY SCHOOL CHILDREN

Project Id: TMP-23-310

Project Proposal Report

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BSc (Hons) in Information Technology Specializing in Information Technology

Department of Information Technology

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March 19th

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Declaration of the Candidate and the Supervisor

I declare that this is my own work, and this dissertation 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 my knowledge and belief it does not contain any material previously published or written by another person except where the acknowledgment is made in the text.

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The supervisor/s should certify the proposal report with the following declaration.
The above candidates are carrying out research for the undergraduate Dissertation under my supervision.

02/05/2023

…….. ……

Signature of the supervisor: Date:

Abstract

Many visually impaired students today struggle to access course materials like their peers do in the digital age. Students with disabilities, particularly those who are visually impaired, can benefit greatly from online learning. We'll talk about why it's crucial to make online education accessible to students who are blind and how to do it. We want to make learning in the primary stream easier for primary students who are blind or visually impaired. They can learn new information and broaden their knowledge using this intelligent mobile device application. A tutor recommendation module based on the student's knowledge level, a voice calculator and virtual tutor, a brain-improving game module, and a helpful voice bot are all included in the application. As my part, I will be doing the Simple calculator and schedule a meeting with the virtual tutor. The calculator has two options: voice base calculator and touch base calculator. The system will provide a touch system to identify the numbers and calculations. The screen is divided into two main sections, one relating to numbers and the other with calculations. Calculator can do addition, subtraction, multiplication, and division mathematical calculations. A voice-based calculator can provide an accessible way for people with visual impairments or disabilities to perform calculations. Since they may have difficulty using traditional calculators, a voice-based calculator can serve as an alternative means of access. Further, I will create an accessibility mode and incorporate it into the user interface design.

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1. Introduction

1.1 Background Literature

Calculator is one of the most important devices that people use in their everyday life. But now-a-days, the purpose of hand-held calculators is mostly being served by calculator applications embedded in smart-phones. Moreover, with the advancement of speech-recognition technology, many of these applications are now providing voice-command support along with auditory output. Therefore, people can use their voice for calculation instead of pressing buttons. This voice command supported calculator is helpful to people who are not able to see or use their hands. For resolving this problem in 2018 peoples are implemented Bangla Speech Recognition in Voice Input Speech Output (VISO) Calculator.

In 2019 developed calculator for blind persons called Edu Braille Edu Braille can bring up braille codes letter to a series of words. But this tool cannot make a sound. From these shortcomings, the writer wants to add sound features as a correction and additional display on an Android smartphone to make it easier for braille instructors to monitor learning. Braille keyboard with sound output as a learning tool for blind visualizes. The Braille keyboard that has been made has a Braille code so that blind people can find out the letters on the keyboard. This tool does have a lack of sound output because the software and audio amplifiers have not been done. From these shortcomings, the writer wants to add a sound output feature when the keyboard is pressed to make it easier for blind people to know that the keyboard is pressed according to what they want.

Two-language voice calculator with Braille keypad based on ATMEGA128 microcontroller is a calculator that the keypad already uses braille code and is equipped with sound output. The disadvantage of this tool is that it is not equipped with Self-Correction, a feature that can correct answers automatically. Based on these shortcomings, it can be used as a reference in making tools which is equipped with a self-correction feature so that blind people can learn to count independently without relying on teaching staff.

A simple calculator system based on ATMega328 microcontroller with a 3x2 Braille keypad is suitable for use as a counting aid for the Blind. Simple calculator system based on the braille system as a numerical input by the user.

1.2 Research Gap

As discussed above, a lot of current research and systems have been presented but it is still not possible to present a complete system with all the proposed features. But this proposed system is more effective and comprehensive.

This table shows a summary comparison of the features of the proposed system and the existing system approach.

Research	Simple voice base calculator	Virtual tutor	Accessibility mode in the UI design.	Mobile application
Research 1 [1]	✓	✗	✗	✗
Research 2 [2]	✗	✗	✓	✗
Research 3 [3]	✗	✗	✗	✗
New Research	✓	✓	✓	✓

Table 1

2. Research Problem

One of the requirements of inclusive growth is the progressive inclusion of disabled students, a marginalized group in society, at higher levels of education. It is a crucial step on the road to stability and full participation in life. In the age of technology enhanced learning, e-learning is essential for reducing the learning differences and challenges faced by students with disabilities. Recently, several initiatives have been put into place to improve accessibility for people with disabilities, including the installation of elevators, ramps, wheelchair access, and support personnel. Even though they haven't made the digital divide disappear. For some of these students, disabilities like dyslexia and dyscalculia make higher education challenging. Similarly, those who are blind or have low vision do not currently have access to technologies like screen readers, magnifiers, and so on to access e-content.

It appears that students with visual impairments face greater disadvantages than students with other disabilities, which disadvantages them. By lowering learning complexities, it promotes the use of assistive technologies to enhance learning. Although these assistive technologies make it possible for people with disabilities to access online learning materials, they are not universally effective. Additionally, they are not always cheap. As a result, some students with disabilities might not be able to afford these. Additionally, the design of the learning system does not account for the unique needs of students with disabilities. We cannot classify them as disability-aware e-learning systems as a result. Because people with disabilities will need personalized information in particular formats, assistive and adaptive technology must be created to offer universal access to knowledge.

3. Research Objectives

3.1 Main Objective

For visually impaired students, the main goal of a voice and touch-based calculator is to give them an easy and quick way to perform mathematical calculations. Visual cues are not necessary for visually impaired students to input data into and receive results from the calculator when using voice commands. Students who are blind or visually impaired can input data into the calculator and hear the results back through touch based inputs and audio feedback. The main objective for virtual tutor is visually impaired students a convenient and accessible way to manage their academic schedules and meetings is the main goal of a virtual tutor for meeting scheduling. The virtual tutor can serve as the visually impaired student's personal assistant by reminding them of upcoming events and appointments, sending them notifications, and assisting them in time management.

3.2 Sub Objective

Virtual tutor and Voice calculator.

- The system will schedule a meeting with the virtual tutor.
- The calculator has two options: voice base calculator and touch base calculator.
- The system will provide a touch system to identify the numbers and calculations.
- The screen is divided into two main sections, one relating to numbers and the other with calculations.
- Simple voice base calculator - calculator can do addition, subtraction, multiplication, and division mathematical calculations.
- Develop a review & rating module.
- Create an accessibility mode and include it in the UI design.

4. Methodology

4.1 Methodology including the system diagram.

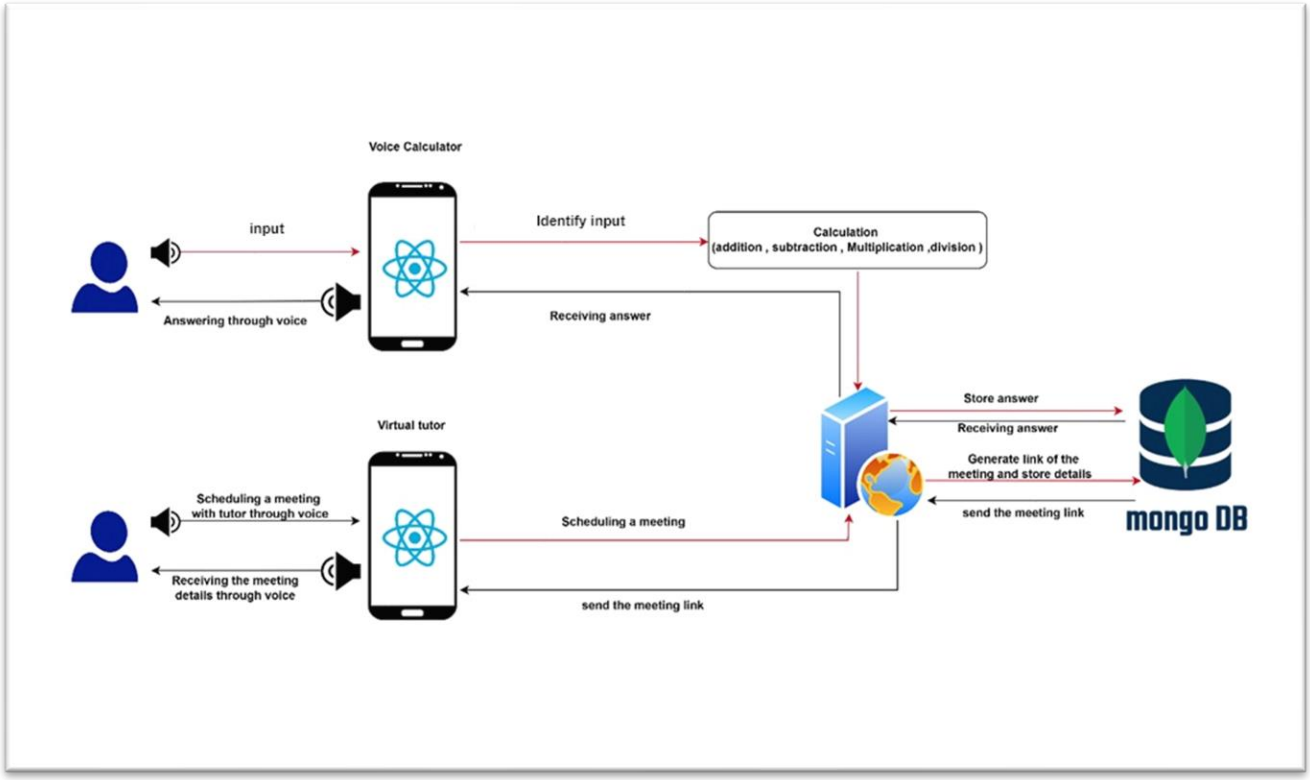

Figure 1

The methodology of the calculator is as follows: first, the user should voice or touch-input numbers and calculations to the system, which will then recognize the input and calculate the numbers in accordance with the user input, store the correct answer in a database, and voice-output the answer to the user.

The virtual tutor's methodology requires the user to voice-enter meeting information (date, time), after which the system will determine the user's needs and generate the meeting link as well as other information for the user, who will then receive the meeting link.

4.2 Commercialization of the Product

E-learning systems for elementary kids are in demand from educational institutions such primary schools, special education institutions, and online learning platforms that cater to students who are blind or visually impaired. The audience that is addressed should primarily consist of teachers, parents, and guardians of visually impaired pupils.

The e-learning platform should be designed with accessibility features, such as audio explanations, high Contrast Mode, text-to-Speech Mode, magnified Mode, and other elements that are particular to the needs of visually impaired students.

The primary kids should not only be the focus of the e-learning system, but also their instructors and parents/guardians, who play a significant role in fostering their academic growth.

The visually impaired society as a whole, including primary schools, visually impaired children, educators, parents, guardians, and organizations that serve the visually impaired society, would be the target market and audience for an e-learning system for visually impaired elementary students.

Commercialization also involves generating revenue from the mobile application. This could involve charging for the application itself, offering premium features for a fee, or monetizing through in-app advertising. Further, use social media to promote.

5. Software Specifications

Figure 2

5.2 Tool and Technology

Tools

Mongo DB

Figure 3

MongoDB is an open-source, document-oriented database system. A NoSQL database program called MongoDB uses documents with schema that mimic JSON. For usage with MongoDB, developer MongoDB Inc. provides the Server-Side Public License.

VS Code

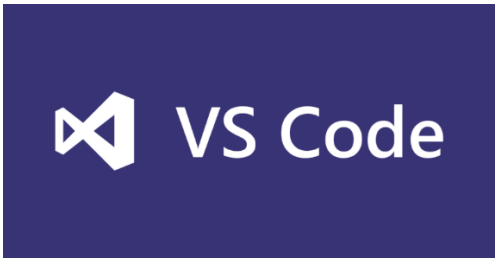

Figure 4

Microsoft created Visual Studio Code, popularly known as VS Code, a source-code editor for Windows, Linux, and macOS that makes use of the Electron Framework. Among the features are debugging assistance, syntax highlighting, intelligent code completion, snippets, code refactoring, and integrated Git.

Technology

React Native

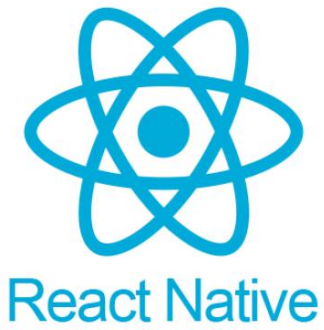

Figure 5

Facebook developed the well-known open source React Native framework for building mobile applications. It enables developers to use a single codebase to create cross-platform mobile applications for iOS, Android, and the web. The ReactJS library, which is used to create web apps, is the foundation around which React Native is constructed.

5.3 Functional Requirements

- The calculator should be able to perform accurate calculations for basic arithmetic operations.
- According to the touch system, the calculator should be able to provide accurate results.
- The calculator should be able to provide clear and audible voice output of the numbers and results of the calculations.
- The calculator should split into sections, each with its own set of braille symbols and sounds.
- The calculator should have easy-to-use navigation and control features, such as buttons or gestures that allow the user to perform calculations efficiently and accurately.
- The calculator should support multiple input methods, such as voice input, keypad input, or a combination of both.
- The mobile application should allow students to view the availability of virtual tutors and schedule appointments at a convenient time and date.
- The ability to personalize virtual meetings based on the student's specific needs and learning style.
- The application should support voice-based commands and prompts to help visually impaired students navigate the scheduling process.

- The ability to provide feedback and evaluation to the virtual tutor, including the quality of the meeting, the tutor's performance, and the effectiveness of the teaching methods.

5.4 Non -Functional Requirement

1.1.1. Usability

- The application should be able to achieve user's required goals efficiently and effectively.
- The application should have a user-friendly interface that is easy to navigate and understand.

1.1.2. Reliability

- The application output accuracy should be error free, and the code should be bug free.so the translation output could be reliable.

1.1.3. Performance

- The application should be able to respond to user requests quickly and efficiently, without lag or delays.

1.1.4. Security and privacy

- The administrative application should be protected from unauthorized access.
- The database should be protected from attacks and unauthorized access.
- The interface should be protected from attacks.
- All passwords should be stored as a secure hash of the administrator password.

1.1.5. Scalability

- The application should be able to handle a large number of users and requests without crashing or experiencing downtime.

1.1.6. Maintainability

- The application should be designed in a way that makes it easy to maintain, update, and fix bugs over time.

1.1.7. Availability

- The system should be available to users 24/7, with minimal downtime for maintenance or other issues.

1.1.8. Portability

- The application should be able to run on multiple platforms and devices, without requiring major modifications or changes.

1. Conclusions

Based on the suggested e-learning system for visually impaired primary students, it can be said that the system offers novel solutions to the issues that visually impaired pupils experience in obtaining a leading education. The system consists of four basic parts that were developed to fulfill the special requirements of pupils who are blind or visually impaired. The system is using React Native as the technology and Mongodb as the database.

My function is to develop a virtual tutor and build a simple voice-based calculator. With the help of the virtual instructor and at their own timetable, the student may engage in a personalized learning experience because of this function. Also, a helpful tool that enables pupils to effortlessly do elementary arithmetic operations is the simple voice-based calculator.

Considering the overall proposed system helps to improve knowledge base skills, ease the day-to-day study life of the visually impaired primary children, and helps to maintain the social equality.

References

[1] Tasnim Ahmed , Implementation of Bangla Speech Recognition in Voice Input Speech Output (VISO) Calculator, Bangladesh, 2018.

[2] A. Sudaryanto, Calculator for Blind with Self Correction Feature, 2018.

[3] G. H. B. A. D. Silva, An investigation of visually impaired learners, Dalugama,srilanka: International Conference on Research and Academic Community Services (ICRACOS), 2021.

6. APPENDICES

6.1 Work Breakdown Structure

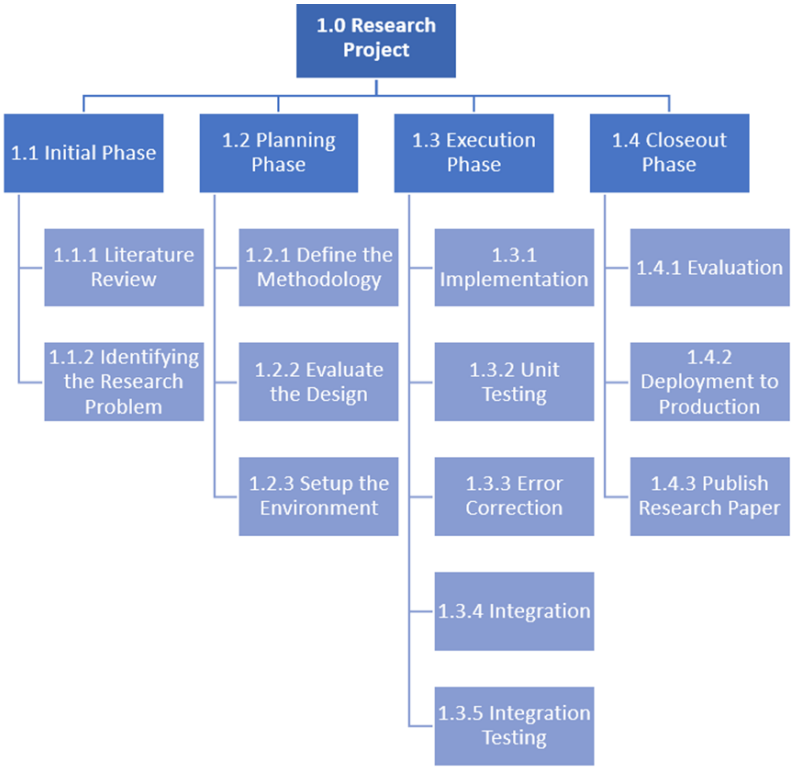

Figure 6

6.2 Gantt Chart

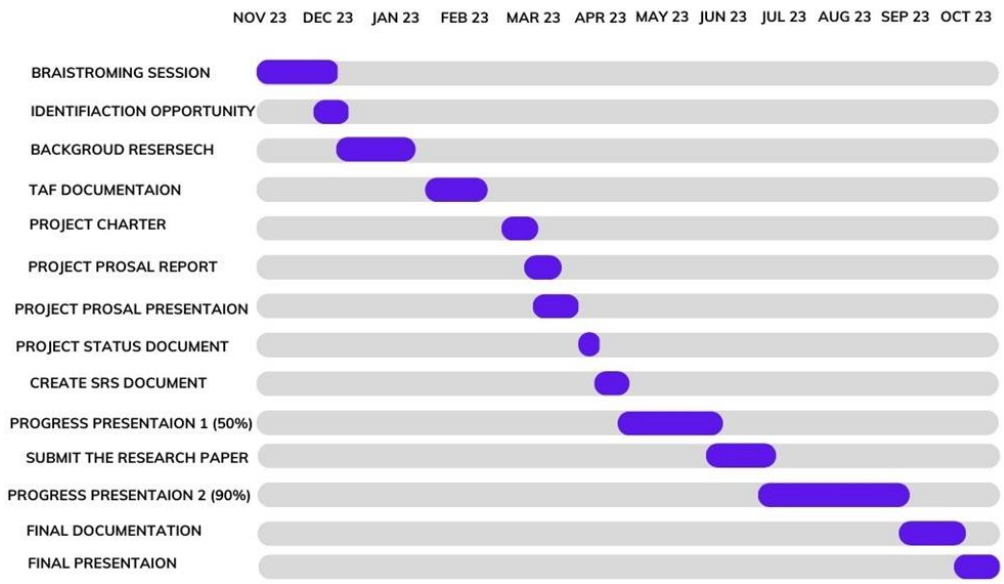

Figure 7

6.3 System Overview

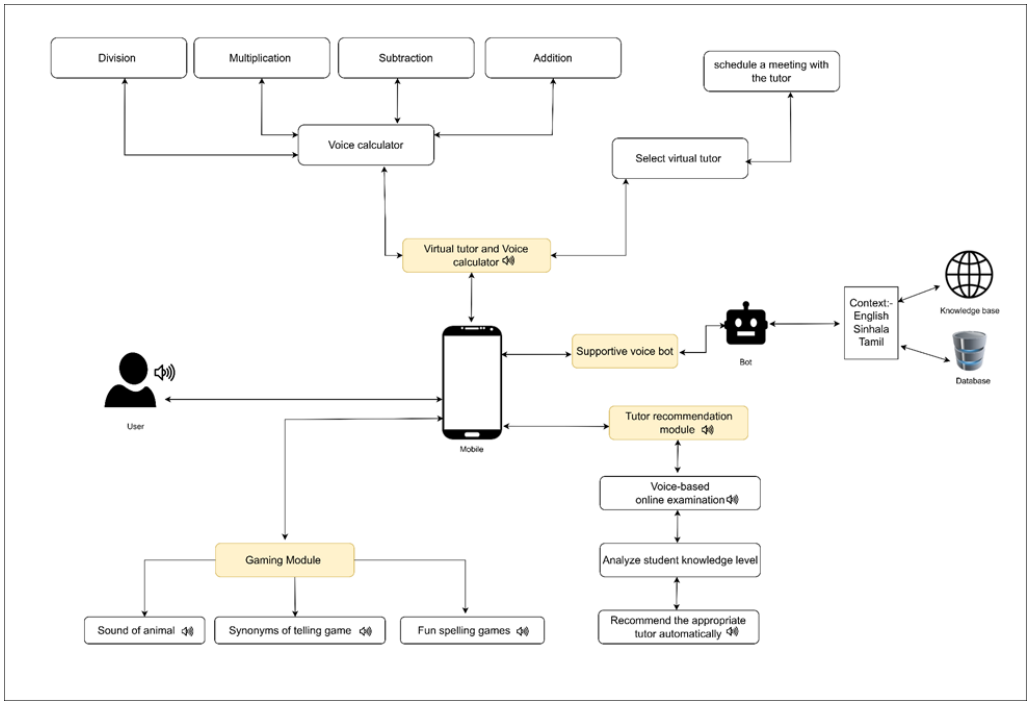

Figure 8

6.4 Blind school images

We visited a Ratmalana blind school to speak with teachers and students about their experiences, problems, and expectations for mobile applications, among other things.

Figure 9


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THE SCHOOL FOR THE BLIND
RATMALANA
விழிப்புலனற்றோர் பாடசாலை

Figure 10