DAEYANG UNIVERSITY

BACHELOR OF SCIENCE IN INFORMATION AND COMMUNICATION TECHNOLOGY

IT PROJECT

FINAL PROJECT REPORT

PROJECT TITLE:

MTHANDIZI

BY

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SUBMITTED TO

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ACKNOWLEDGEMENTS

First and foremost, praises and thanks to the God, the Almighty, for the blessings of wisdom, knowledge intelligence and hard work throughout my research work and studies to complete my project successfully.

I would like to express my deep and sincere gratitude to my project supervisor Mrs. Susen Chinyama for giving me the opportunity to do the project and providing invaluable guidance and for her ongoing support during the project, from initial advice, motivation and encouragement throughout this Project. I am extending my heartfelt thanks to Mr. Tchili Alindamawo for his enthusiasm, patience, insightful comments, helpful information, practical advice and unceasing ideas that have helped me tremendously at all times in working on the Mthandizi project. His immense knowledge and profound experience have enabled me to complete this Project successfully. Once again Special thanks to my project coordinators Mr. Kondwani Chimatiro and Mrs. Suzen Chinyama who were very considerate, graceful and patient from day one till to the day my project was successfully completed. Not forgetting the entire ICT team of staff members who allowed me to go through with the project.

I am extremely grateful to my parents for their love, prayers, caring and sacrifices for educating and preparing me for my future. Also, I express my thanks to my sisters and the whole of my family for their support and valuable prayers. I am also very much thankful to my girlfriend for her love, understanding, prayers and continuing support till I completed my project.

I also wish to express my sincere thanks to the Daeyang University for accepting me into the graduate program.

Finally, but not least, thanks to all my friends, roommates and classmates who have supported me academically, spiritually and physically during last four years at Daeyang University.

Wow this is a big one, a special thanks to myself for never giving up!

Table of Contents

INTRODUCTION

Purpose

MTHANDIZI is a project which is aiming at providing direct mode of communication between natural language speakers and the deaf in Malawi. The system is there to bridge communication problems to the deaf community for example the system can be used by deaf students to easily communicate with their teachers or lectures during classroom hours, it can be used in different organizations during meetings for an effective communication and also the system can be used by broadcasting stations like MBC to translate news to the deaf. So basically, the system will not only reduce effort and time for a deaf person in communication but would also bridge communication gap. Overall this project is a utility for humanity and particularly for the deaf community.

Scope

Mthandizi is a software that translates hand gestures into text or either speech and also translates text and speech into hand gestures. The system consists of the following components:

i. Training the system with different gestures
ii. Reading a gesture
iii. Making a sentence from hand gestures
iv. Translating speech/text to Sign language
v. Speech to text
vi. Printing of Documents

There will be a simple user interface providing the personnel to select the necessary options.

Goals

i. To increase inclusion of the deaf people in different associations.
ii. Provide better learning methods to deaf students.
iii. To eliminate communication problems to the deaf people during meetings.

iv. To providing an innovative platform to different sectors where our system can be applied.

Objectives

i. To translate speech into sign language at a real time.

ii. To translate sign language into either speech or text at a real time

Definitions

Term	Definition
Student (deaf Person)	User who speaks the sign language
Lecture (Speaker)	User who speaks with voice
Mthandizi	A native real time application

References

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B.H, A. D. (2012). *SYSTEM ANALYSIS AND DESIGN.* John Wiley and sons, Inc.

K, K. (2011). *SYSTEM ANALYSIS AND DESIGN.* PEARSON.

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SOMMERVILLE. (2011). *SOFTWARE ENGINEERING.*

Design Considerations

Assumptions and Dependencies

While designing this project, we needed to make some assumptions related to software, hardware and the environment. The system will run on Microsoft Operating System (8 &10). The hardware computer should be at least Intel(R) Core (TM) i3 above at a clock speed of 2.40 GHZ speed above.

Design Constraints

Time constraint

Both the design and implementation parts of the project should be completed within 4 months. At the end of the semester two of 2020-2012 academic year a prototype needs to be implemented, so in order to achieve this all, the specified schedule should be strictly followed. The detailed schedule can be found in the Gantt chart of the project.

Performance constraint

The system performance strongly depends on the internet connectivity. Where there is a reliable internet connection, hence the system will run smoothly and it also depends on the users to speak proper English with proper pronunciations and also have better knowledge and know how to speak with hand gestures.

Design Goals and Guidelines

1.1.1. Reliability

The main purpose is to make the system run without any problems or bugs. In order to maintain the reliability, the system will implement machine learning so that the system can be trained with different sign gestures and learn. We will use various testing strategies while designing the project in order to improve the performance and decrease the number of errors that will occur.

1.1.2. Usability

Since this project intends to simplify speech-impaired students and others, it should be simple and functional at the same time. The user interface is kept simple so that the pure functionality is gathered without being bothered with lots of menus or buttons.

1.1.3. Portability

The system will be implemented only into the pc environments having Windows 8 and 10 operating systems which makes the system low-portable.

1.1.4. Extensibility

This project is designed to be extensible in terms of the number of gestures to be recognized, for as it will allow to be trained and learn the sign gestures.

1.1.5. Innovation

The system should be innovative in a such a way that it should portray the disciplines of Artificial intelligence and Machine Learning.

Data Design

Data Description

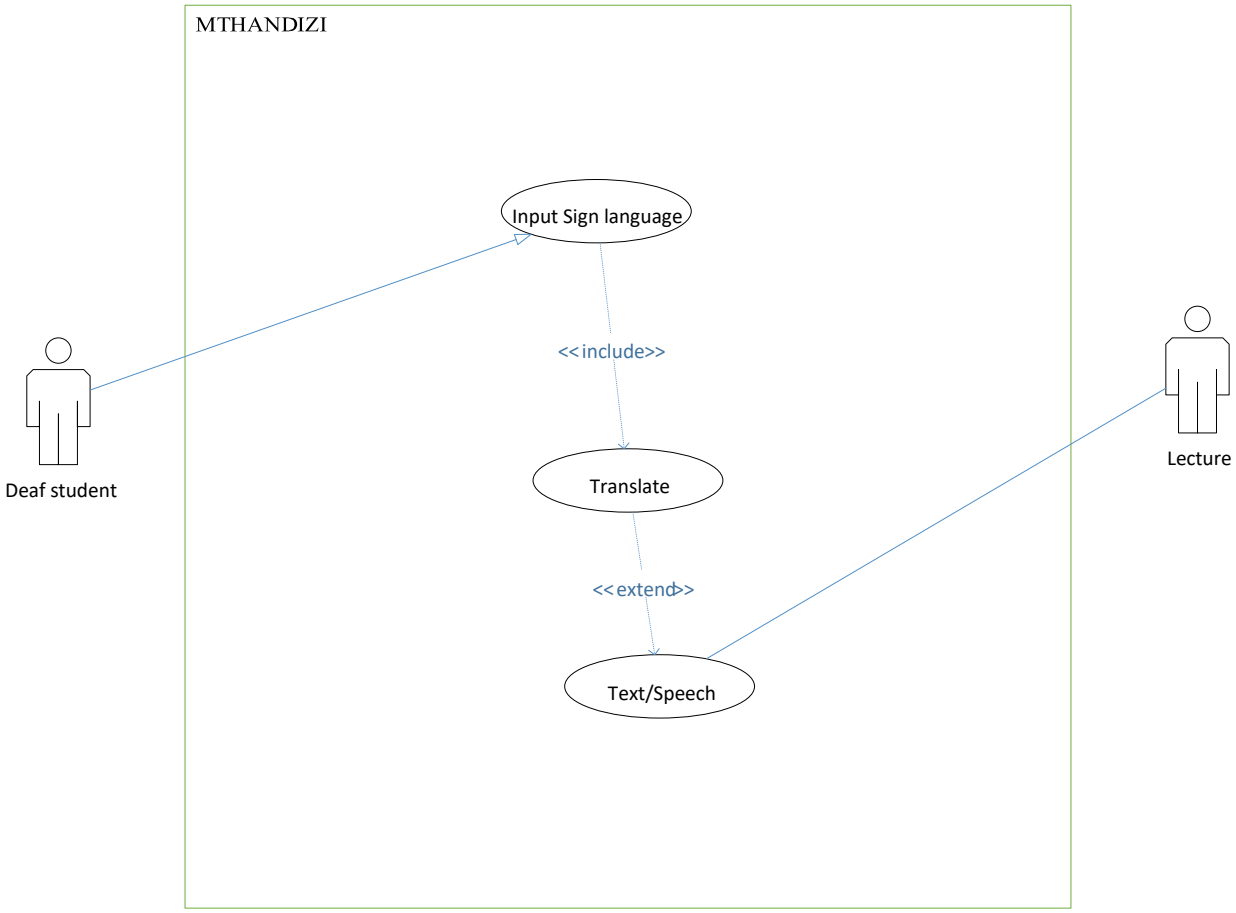
Every major module and subcomponents will be implemented as classes. The arrangement of data will be in an object-oriented programming. The system basically consists of two functions, sign recognition function and speech to sign recognition. The system will not have a database but have pre-defined datasets of different gestures and also it will include some of the google APIs.

For both function there will be seven main classes, interface handler, controller, speech controller/ sign controller, display controller, translation controller and word look up and sign handler. For every

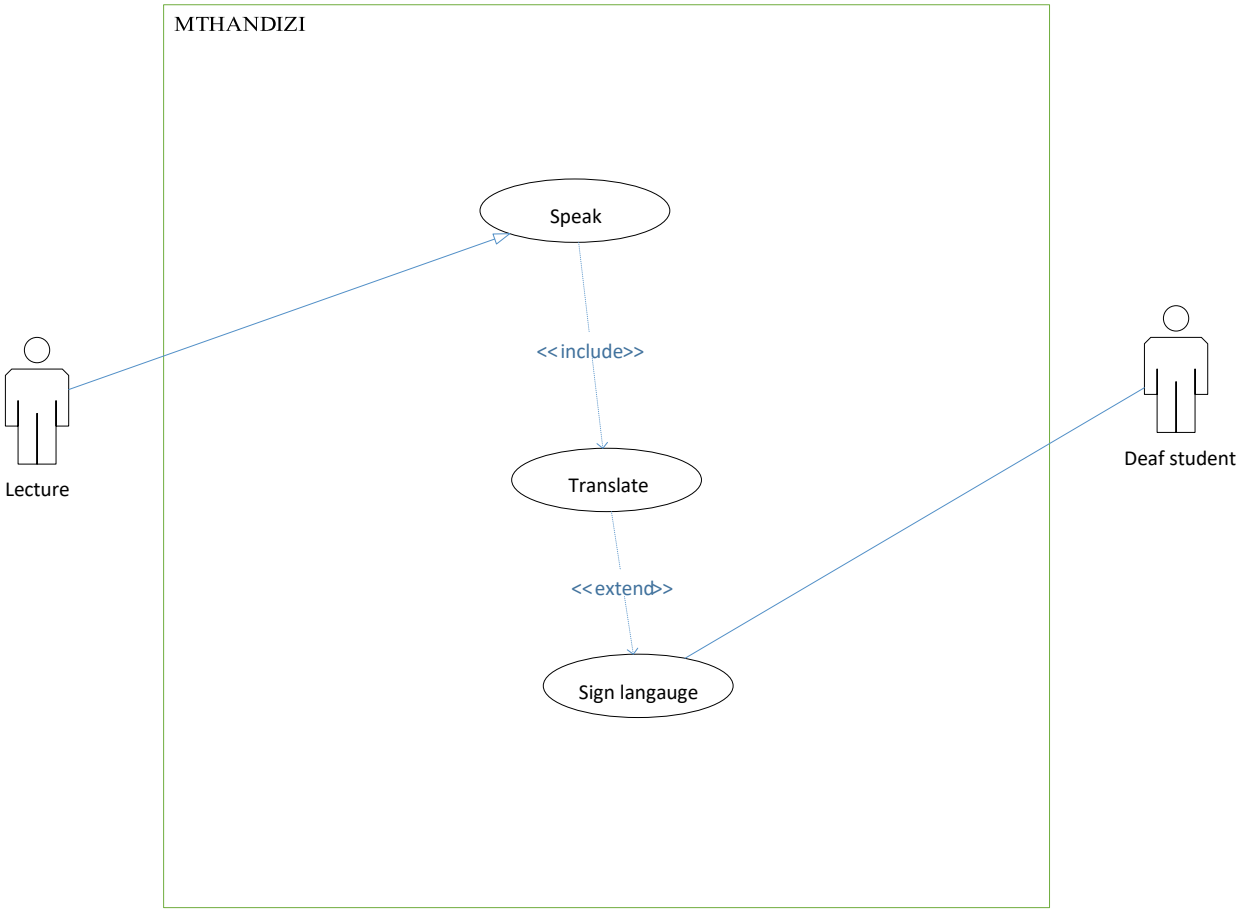
sign gesture introduced to the system will align against the gestures in the dataset of the Wordlookup module. The same applies for the speech to sign language function, the word spoken will also align with a word data set to display a sign language on the display.

Use case

Deaf student/person use case



Lecture/Normal Person Use Case



System Architecture

Architectural Design

The system will consist of five major components. The components will be designed and implemented as functional units and classes. The interfaceHandler is a class that arranges the menu of the program, buttons and displays. The inputHandler is seen as the initial component of the system as it is to handle the user input data for further processing.

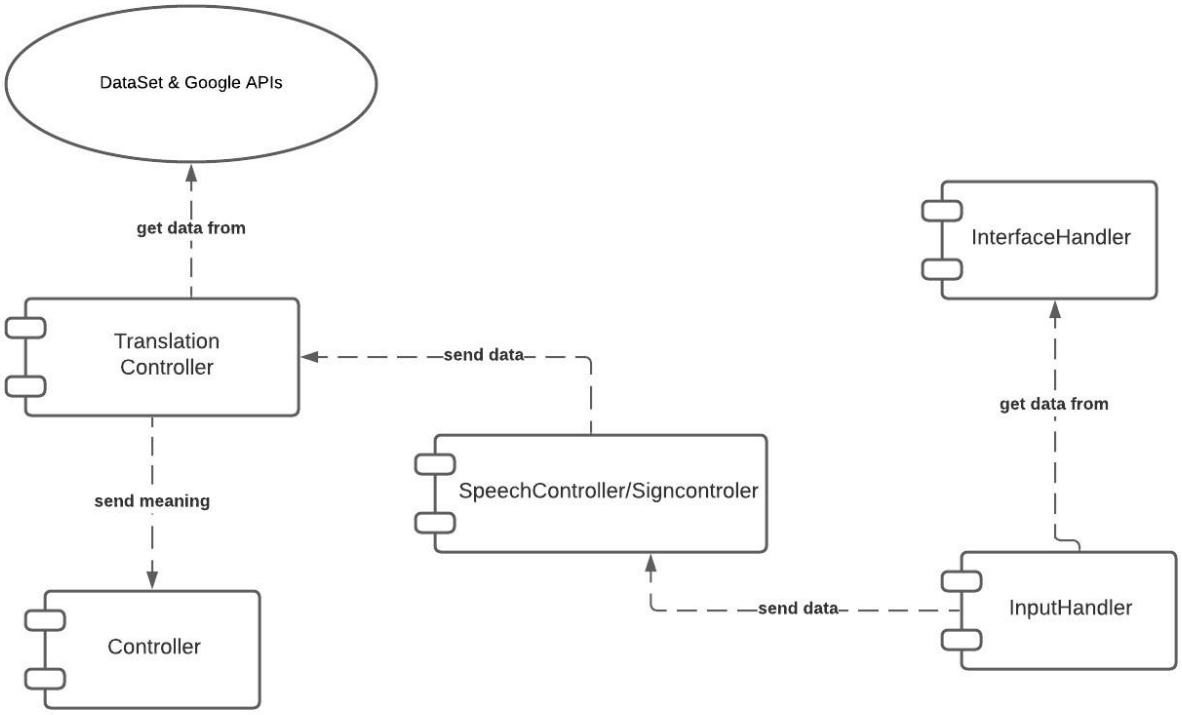


Figure 2 Component Diagram of the system

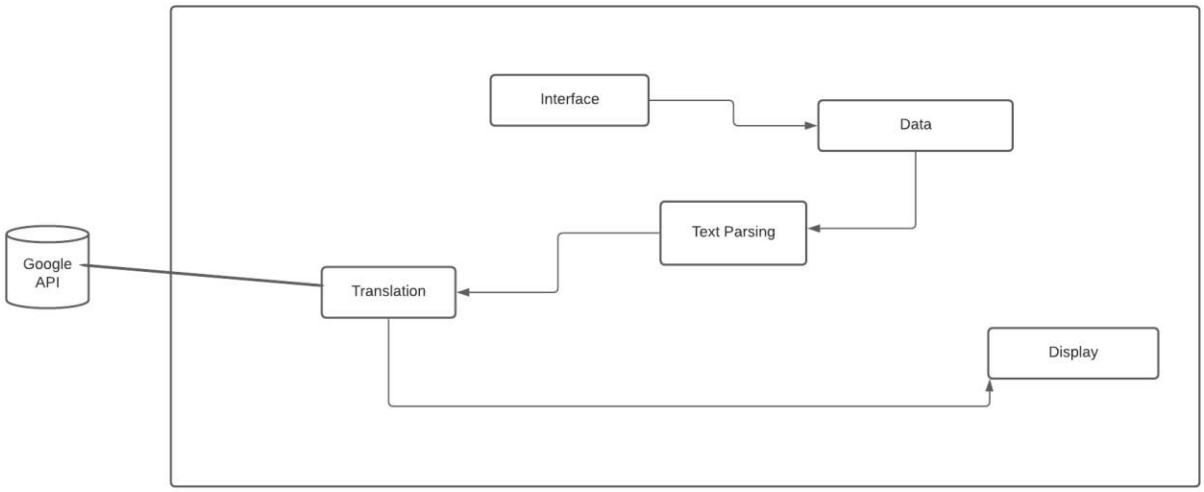


Figure 3 An Architectural overview of Speech recognition

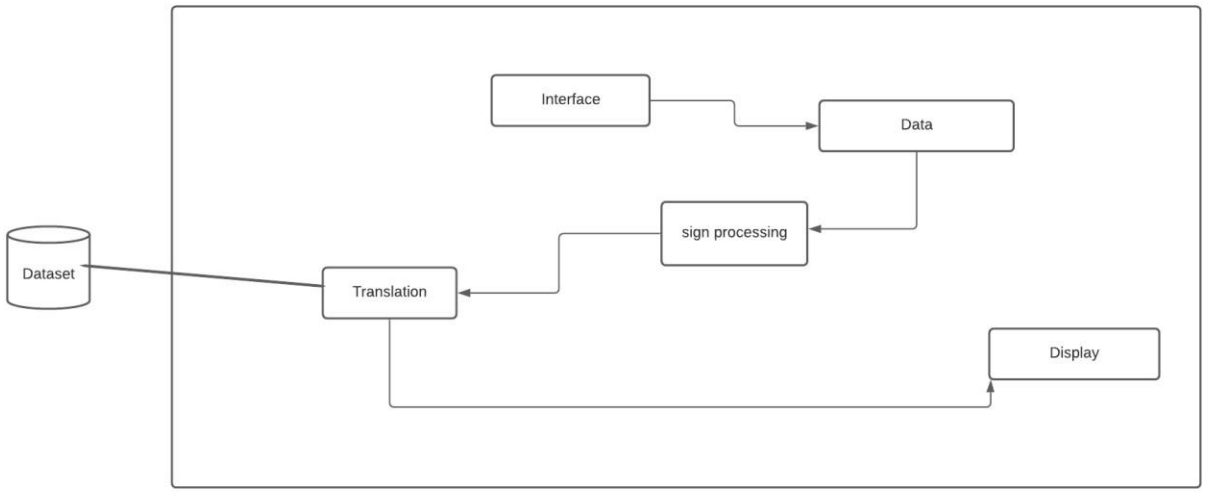


Figure 4 an architectural overview of Sign recognition.

Description of Components

Interface handler

This controls the main GUI as the user opens the application.

Controller

It contains all the functionality modules and handles communication between all modules.

Speech Controller

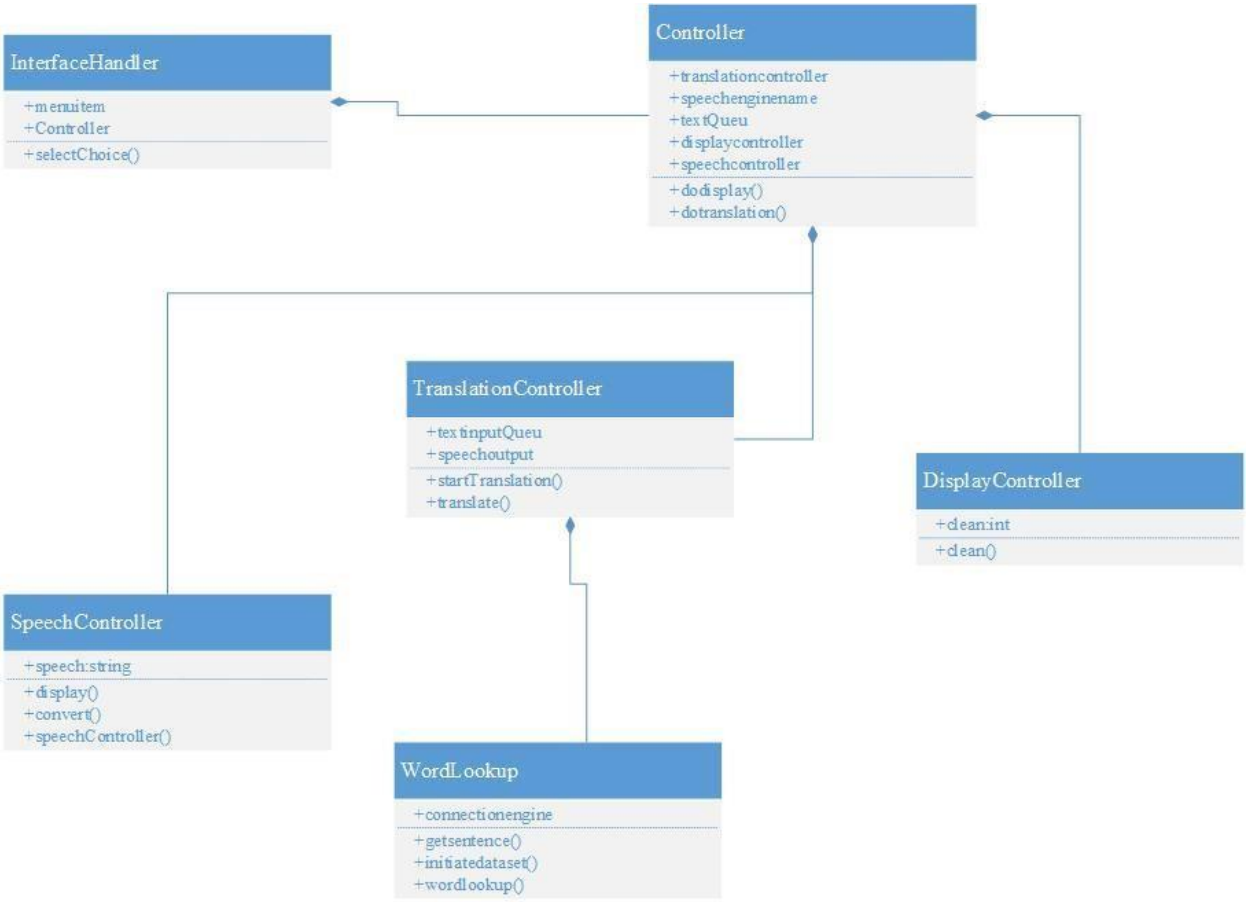
Converts speech input into text either speech for further processing

Translator Controller

Translate text into Sign language.

Architectural Overview of a Class Diagram

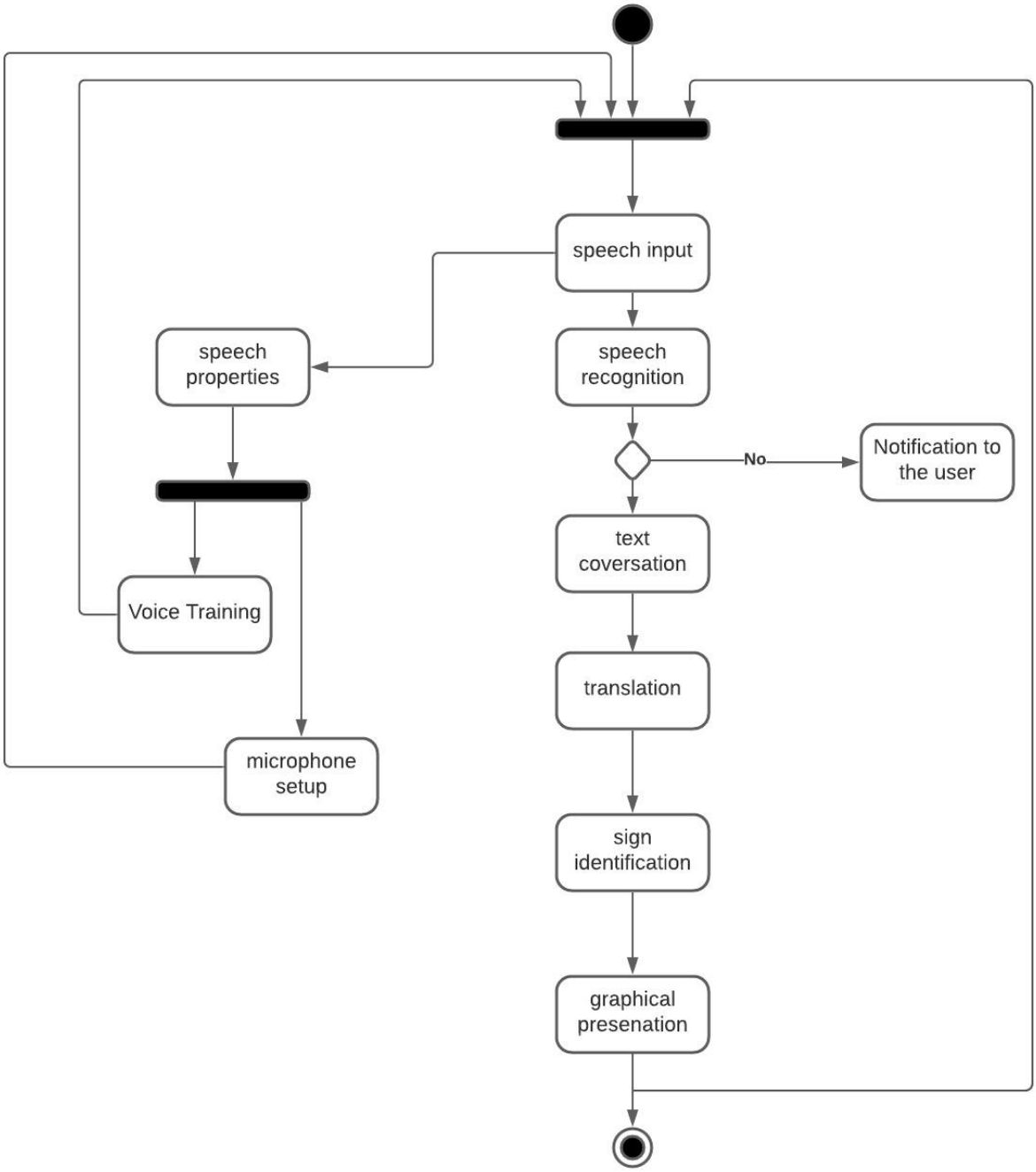
Class diagram helps to model the static view of an application.



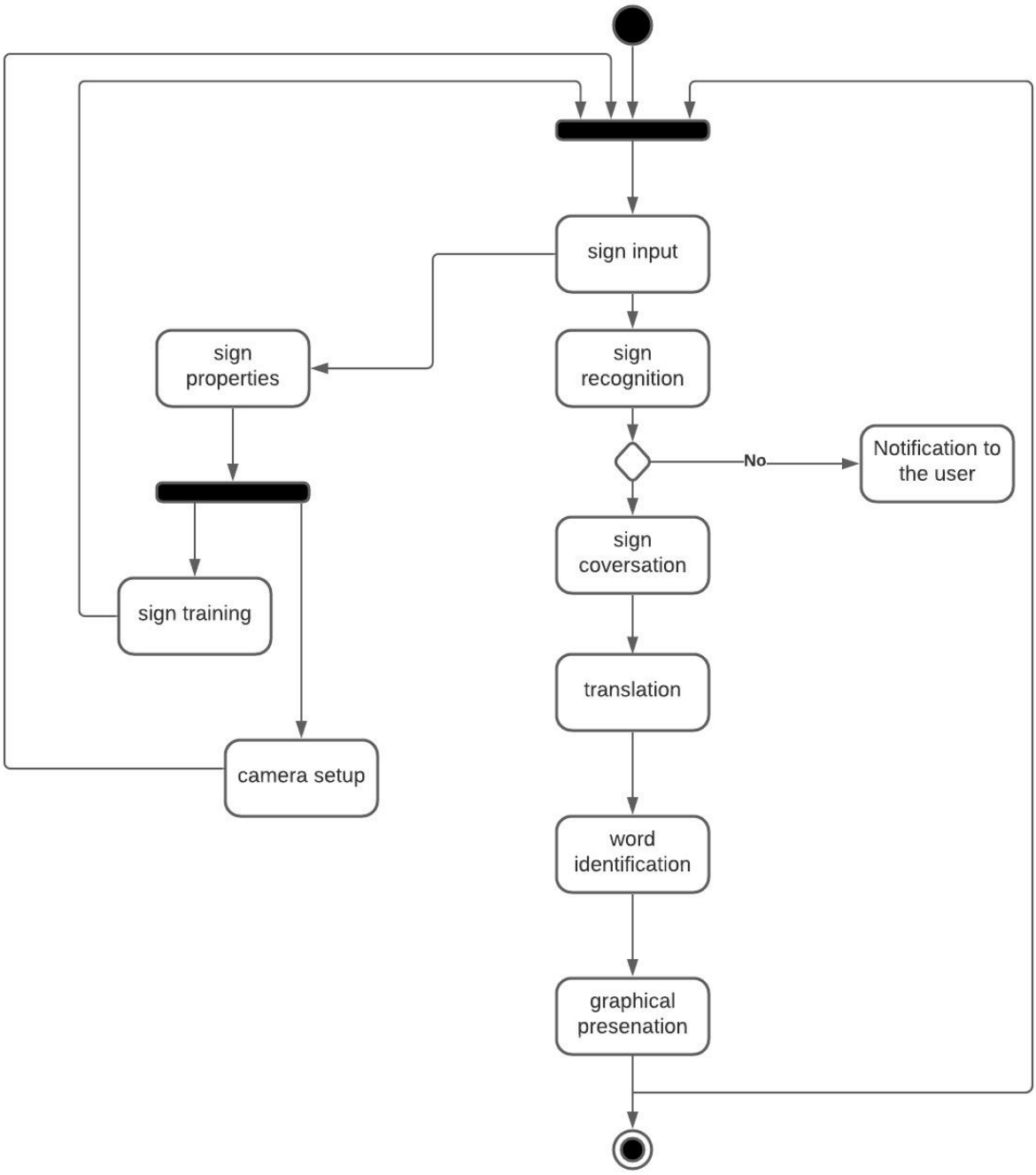
Activity Diagrams

Below are activity diagrams that illustrates the workflow of the system.

An Activity Diagram of Speech to Sign Language Recognition

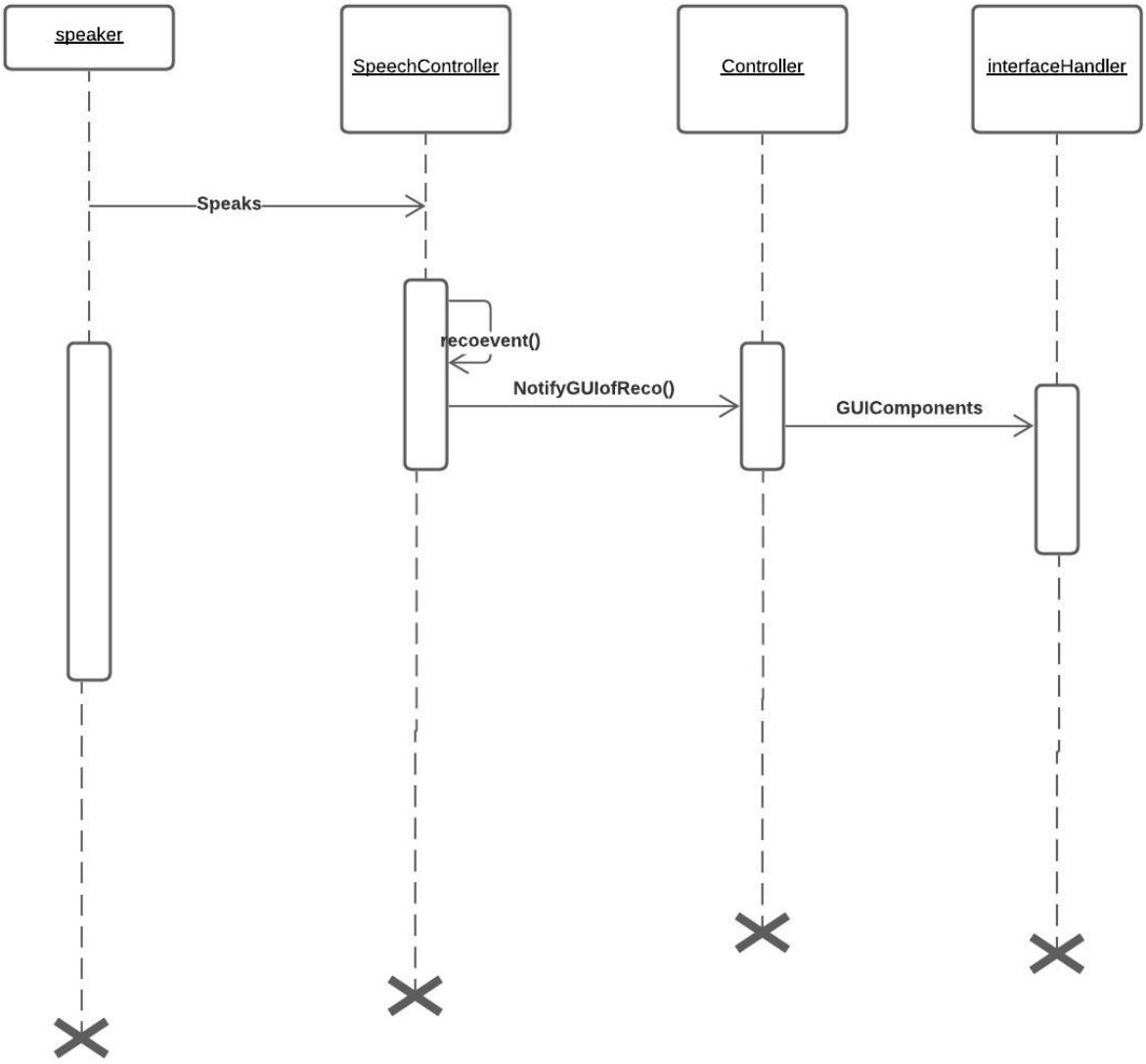


Activity Diagram of sign language to Speech

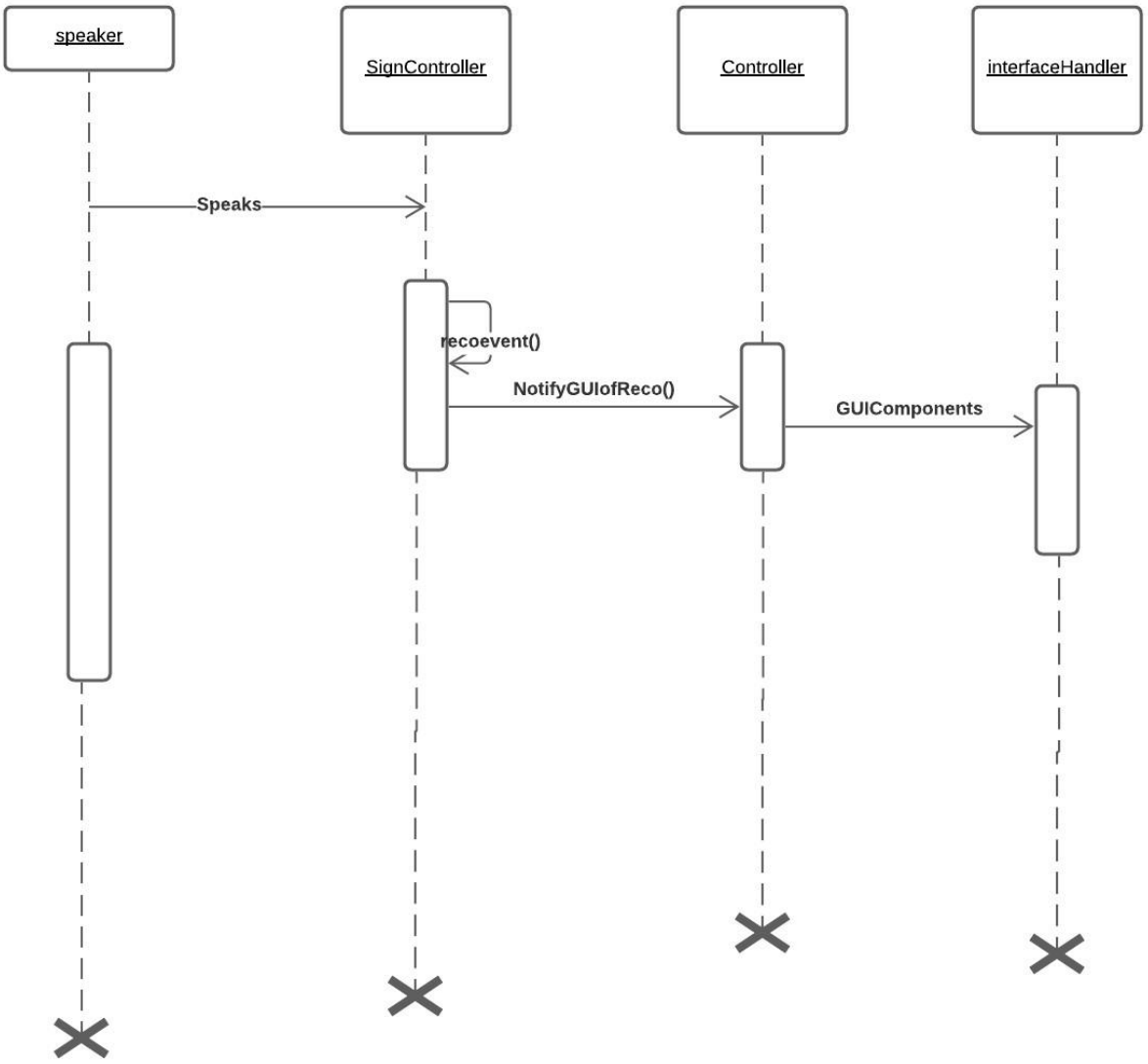


Sequence Diagrams

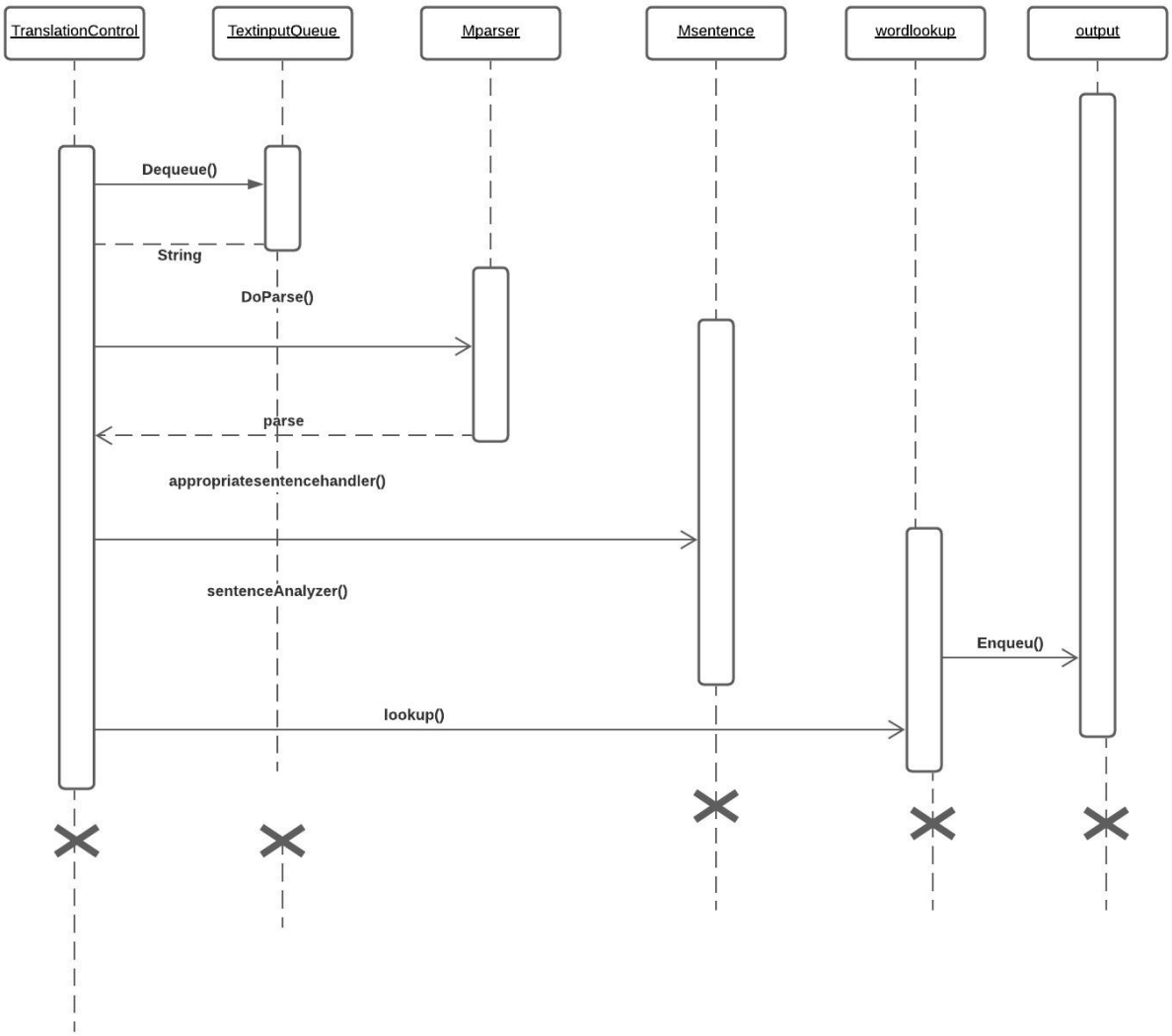
Sequence Diagram of speech recognition



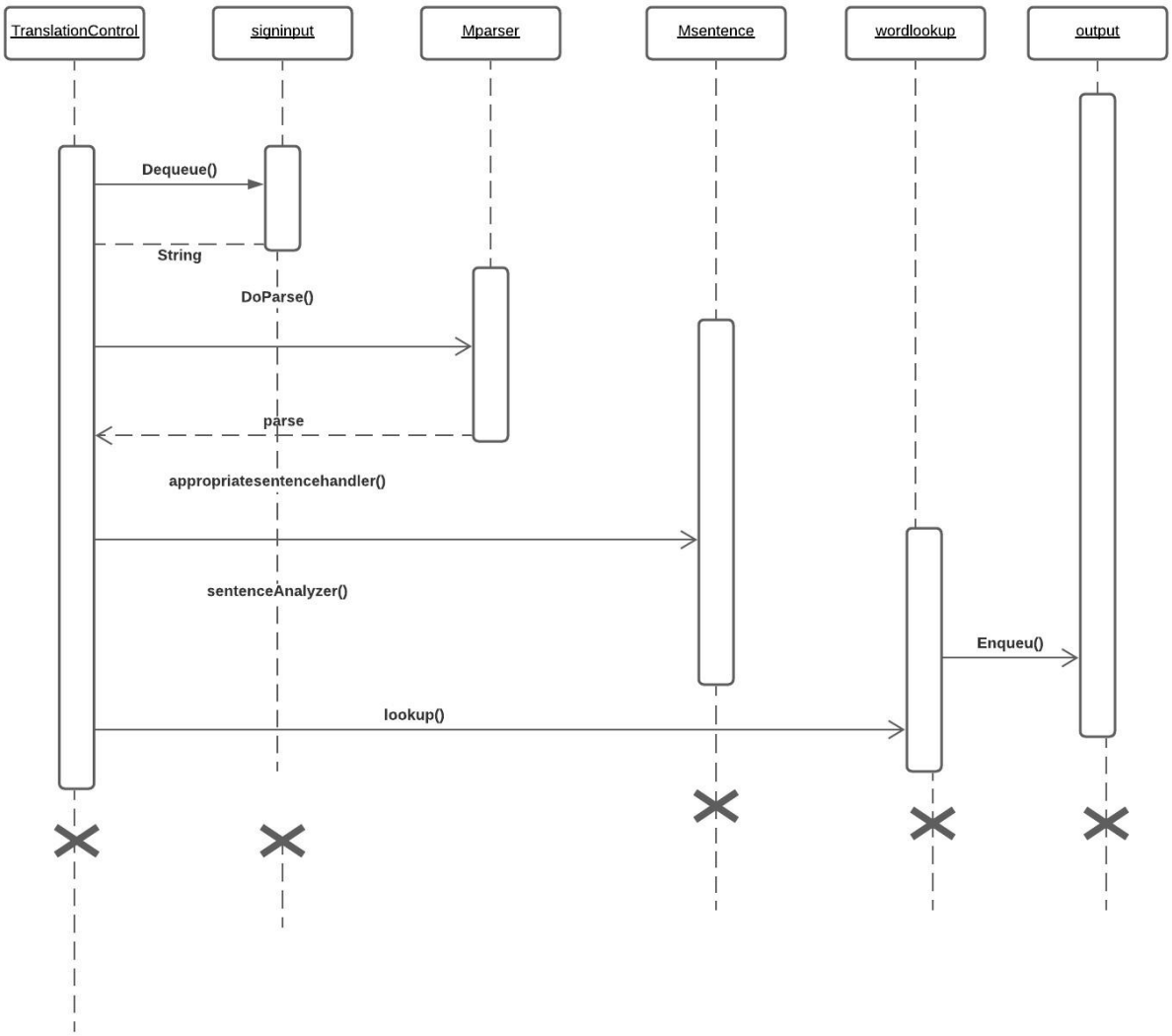
Sequence Diagram of hand gesture recognition



Sequence Diagram of Speech translation



Sequence Diagram of Hand gesture translation

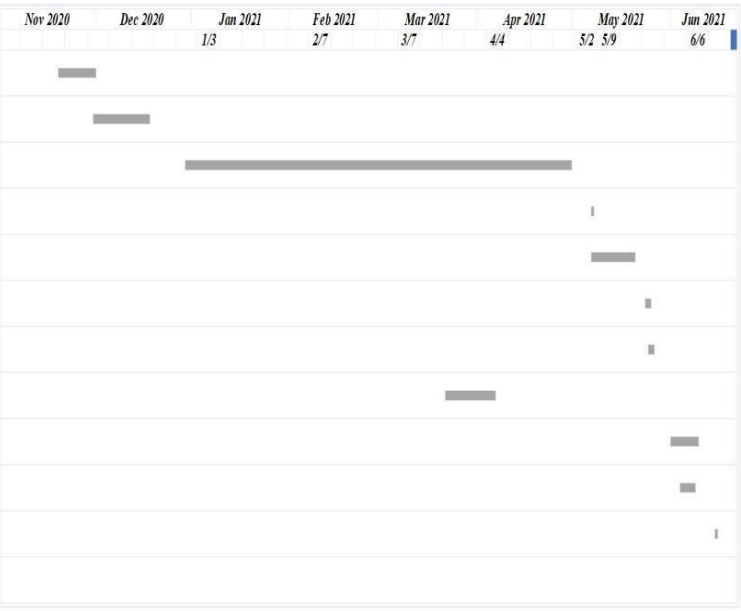


Tools and Libraries

i. The system will run on Microsoft operating system (8 and above). The hardware computer should be at least intel® Core i3 above at a clock speed of 2.40GHz
ii. Python 3.6 is preferred
iii. Anaconda
iv. PyCharm
v. OpenCV
vi. NumPy and TensorFlow

Project Time Frame

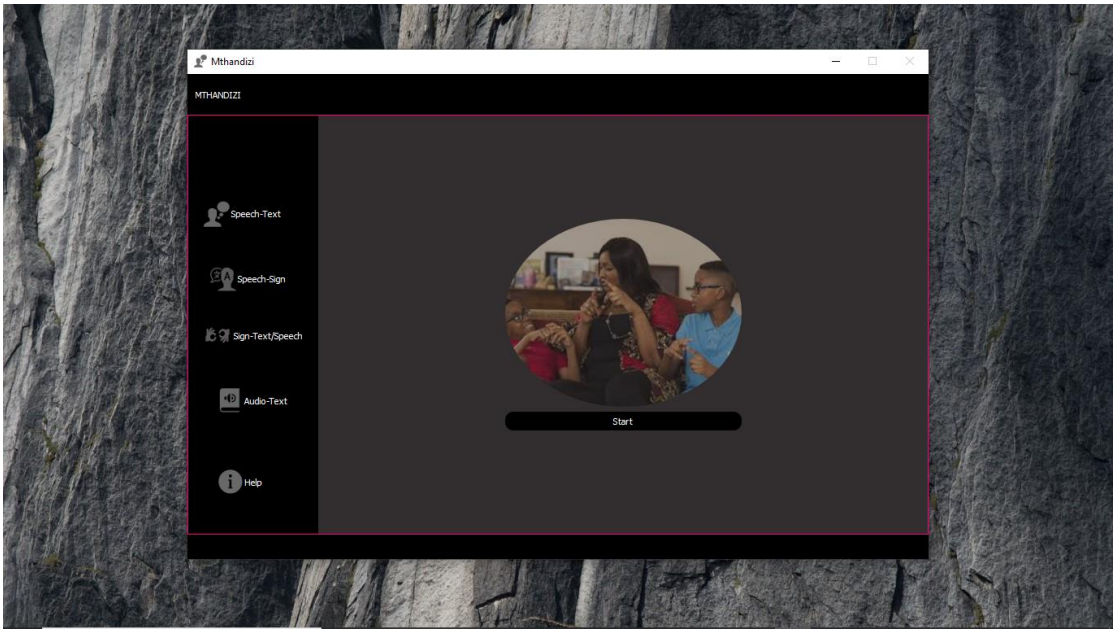
ID	Task Name	Start	Finish	Duration
1	Project SSR	11/20/2020	12/1/2020	8d
2	Project DDD	12/1/2020	12/18/2020	14d
3	Coding	12/30/2020	4/30/2021	88d
4	First Preliminary Project Presentation	5/7/2021	5/7/2021	1d
5	Bug Fixing	5/7/2021	5/20/2021	10d
6	Project presentation (supervisor)	5/24/2021	5/25/2021	2d
7	User Training	5/25/2021	5/26/2021	2d
8	Second Preliminary Project Presentation	3/22/2021	4/6/2021	12d
9	Bug Fixing	6/1/2021	6/9/2021	7d
10	User Traing	6/4/2021	6/8/2021	3d
11	Final Presentation	6/15/2021	6/15/2021	1d
12	Project Report	6/22/2021	7/20/2021	21d



User Manual

User Menu

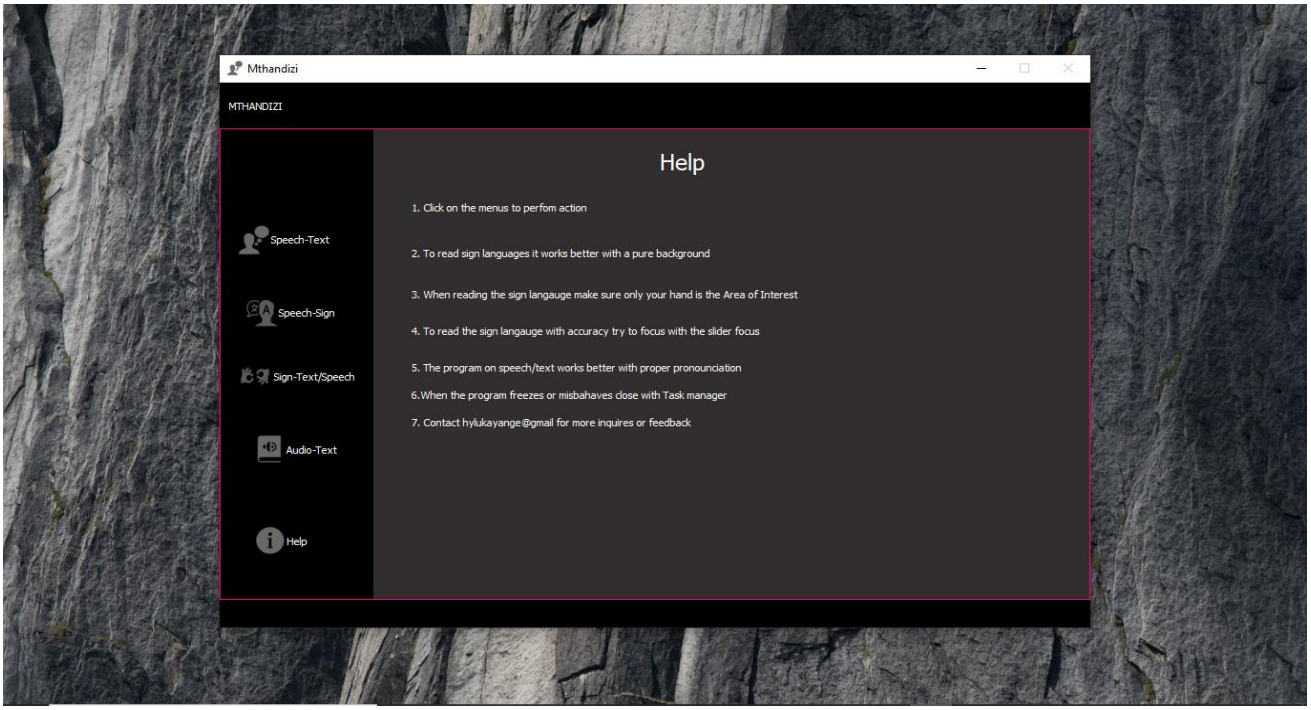
Welcome to user menu



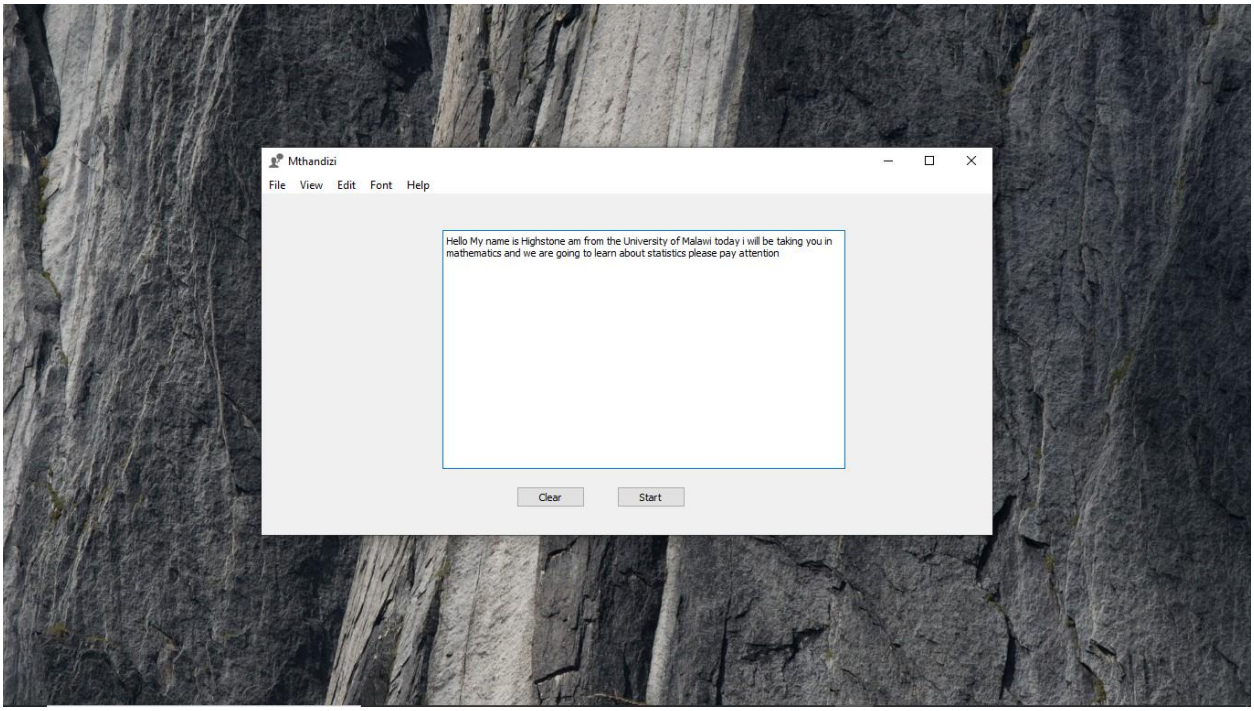
The user menu includes the following options:

i. Speech to text
ii. Speech to Sign
iii. Sign to text/Speech
iv. Help

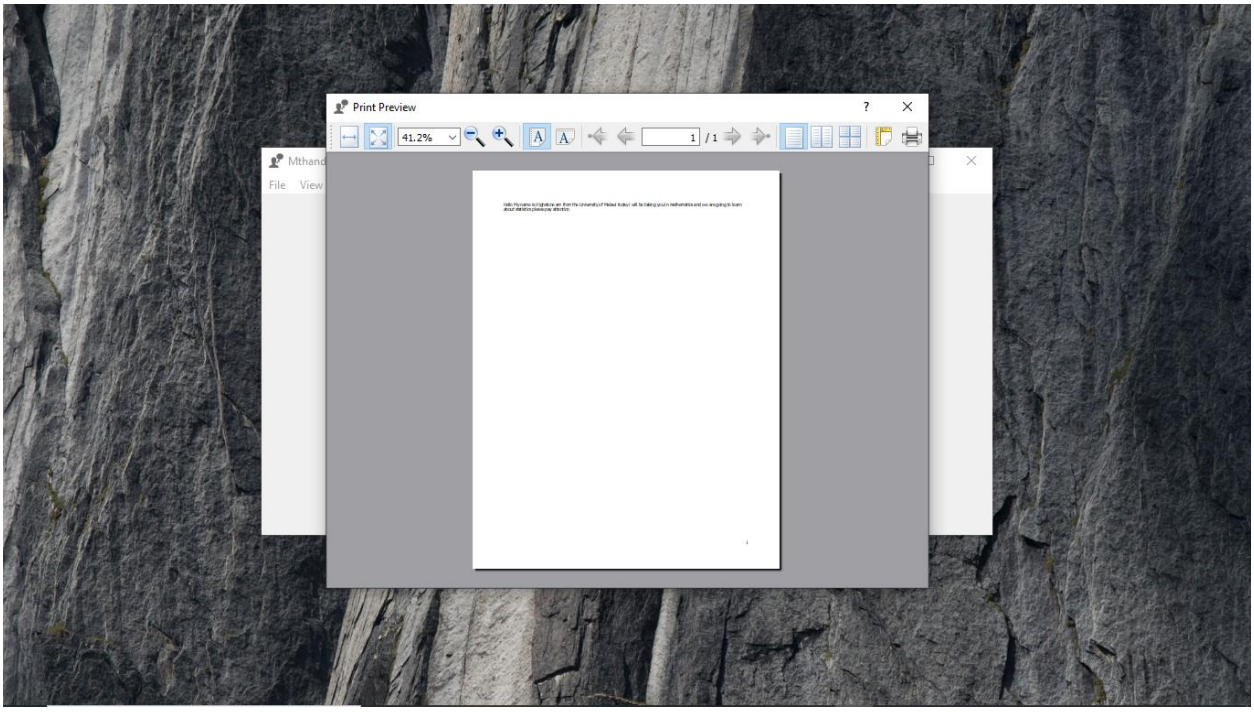
So, when one opens the software the first page it brings is of help.

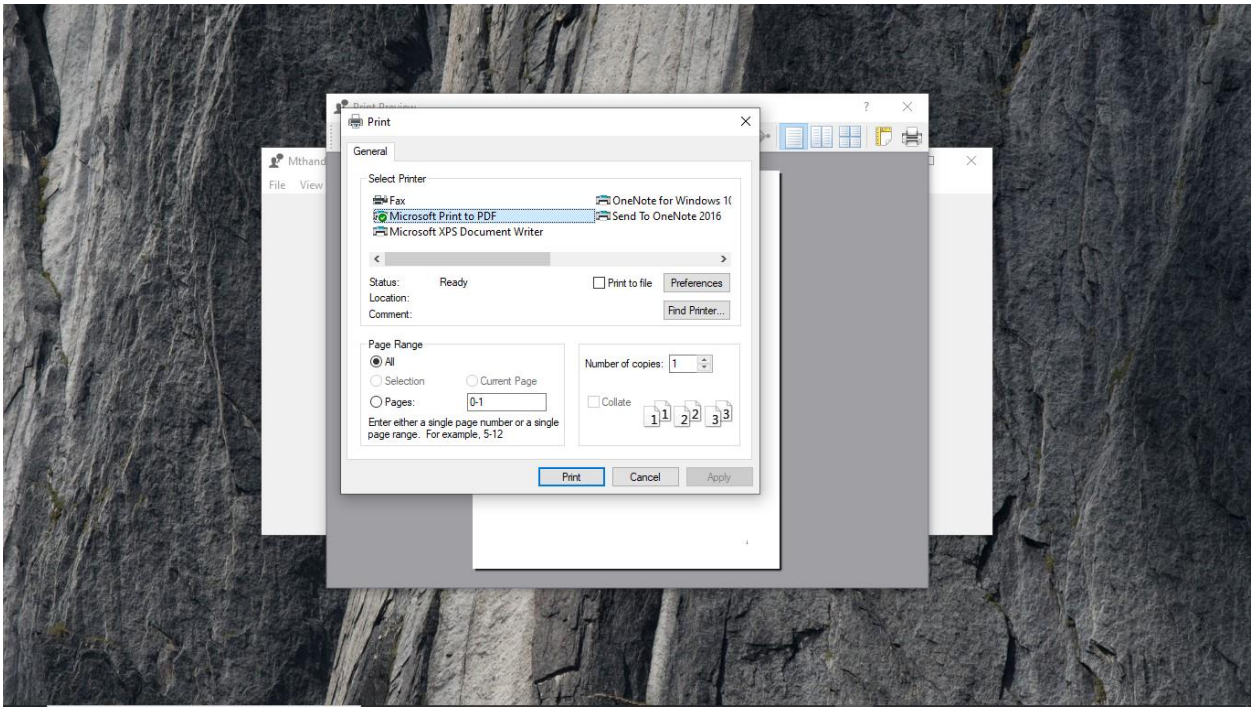


Speech to Text



You click on the start button to starting translating what you speaking into text. After then you can save or print a document to your computer.




Print
General
Select Printer
Fax
OneNote for Windows 10
Microsoft Print to PDF
Send To OneNote 2016
Microsoft XPS Document Writer
Status: Ready
Location:
Comment:
Print to file
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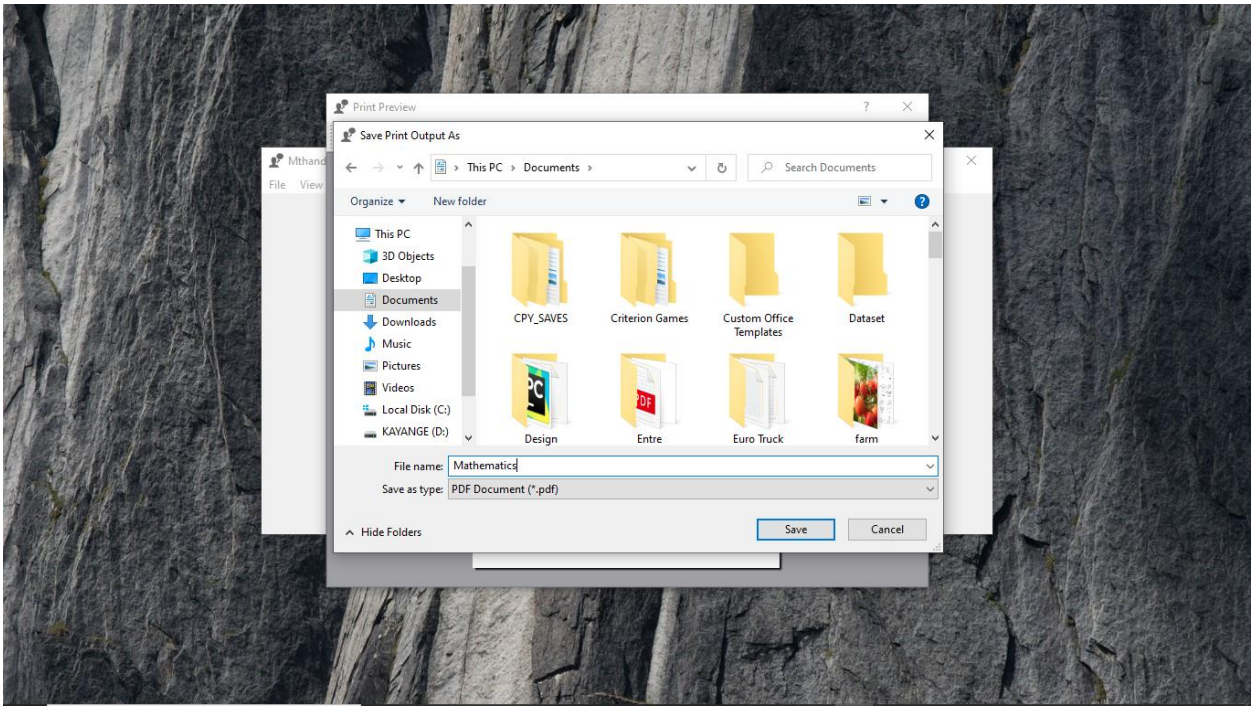
Print Preview
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CPY_SAVES
Criterion Games
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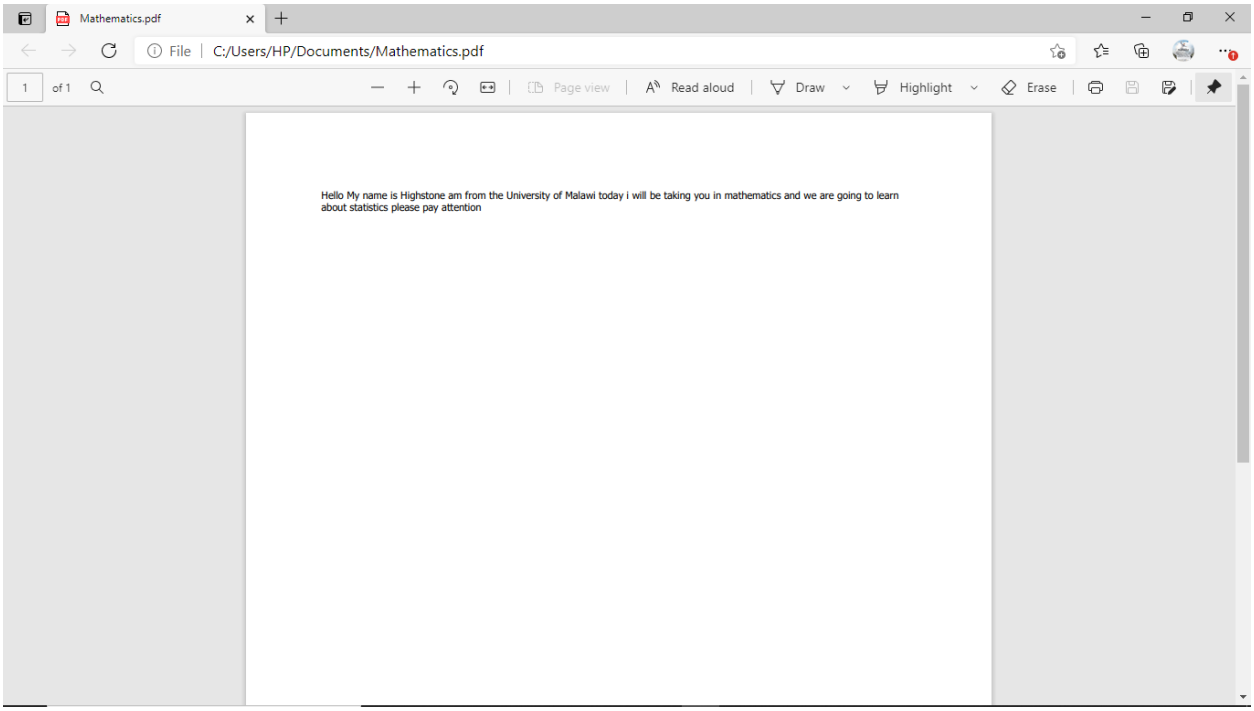
Mathematics.pdf
File | C:/Users/HP/Documents/Mathematics.pdf
1 of 1
Page view
Read aloud
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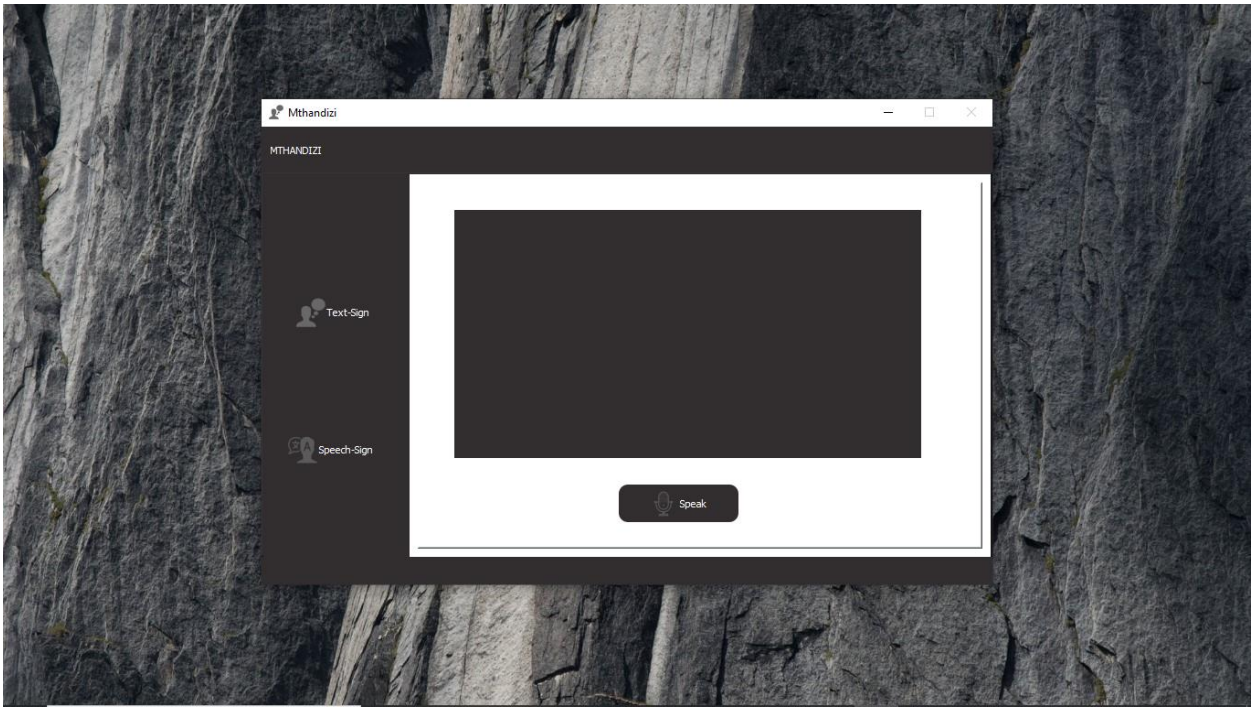
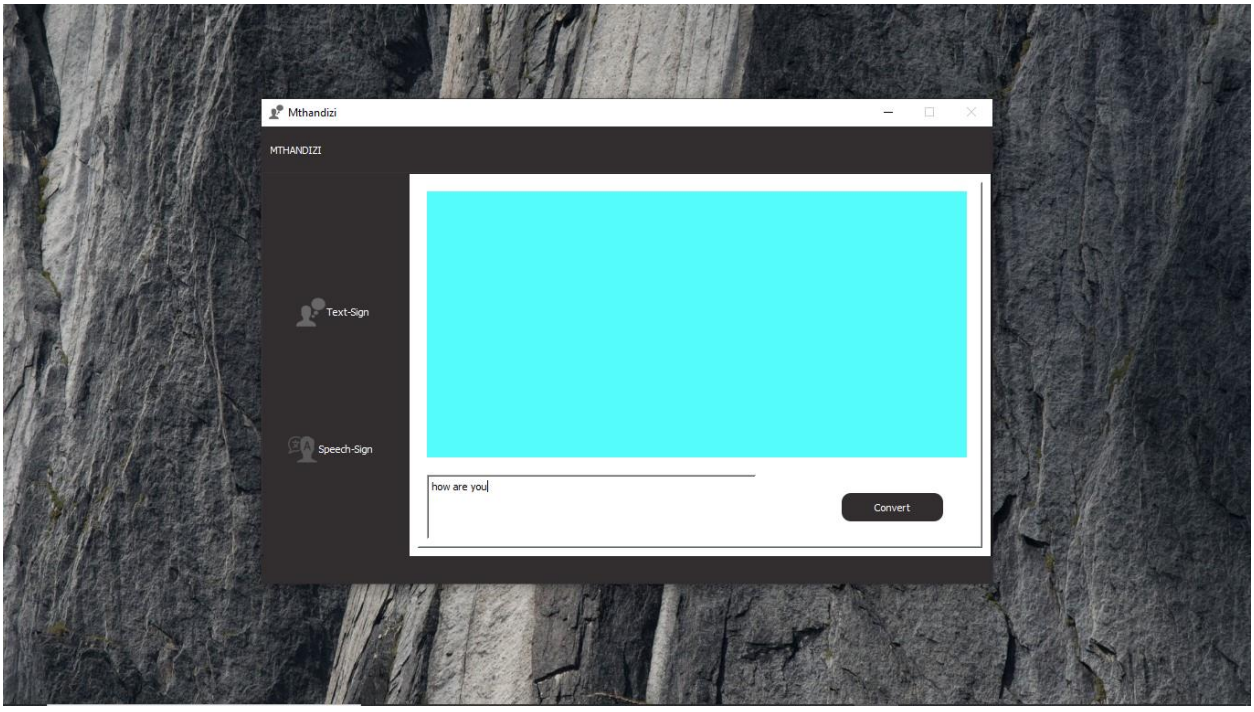
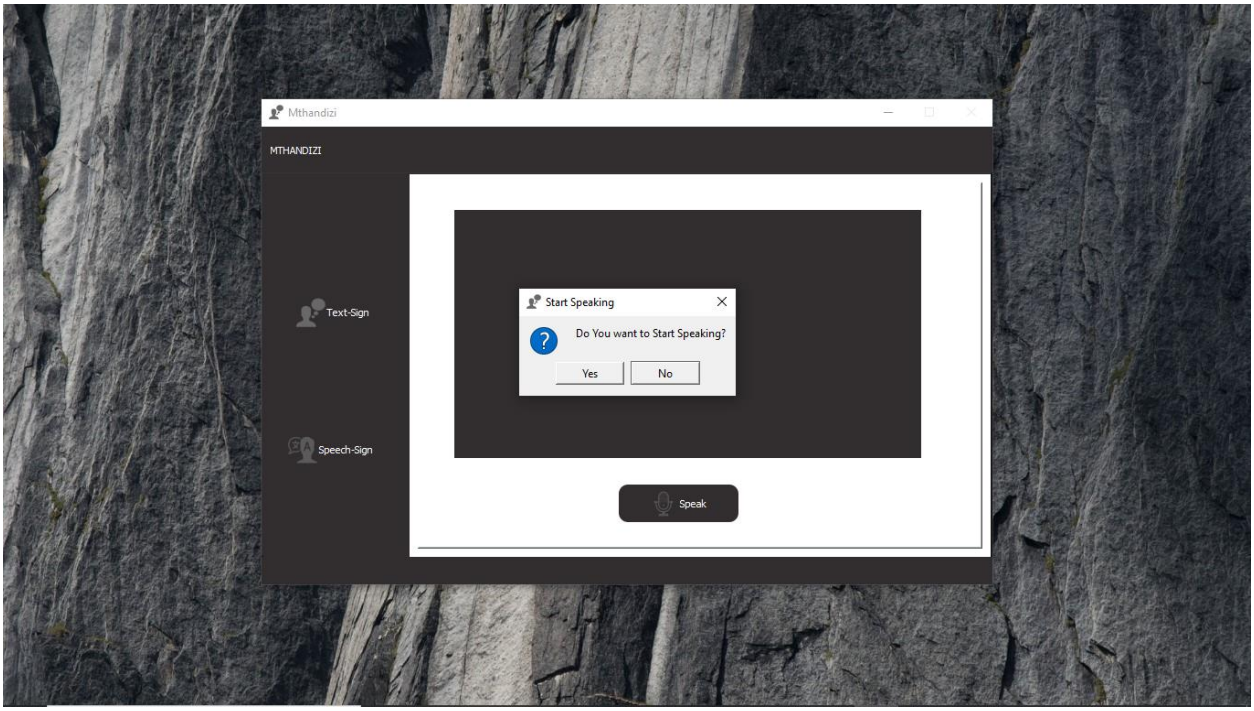
Hello My name is Highstone am from the University of Malawi today i will be taking you in mathematics and we are going to learn about statistics please pay attention

Speech to Sign (hand gesture)

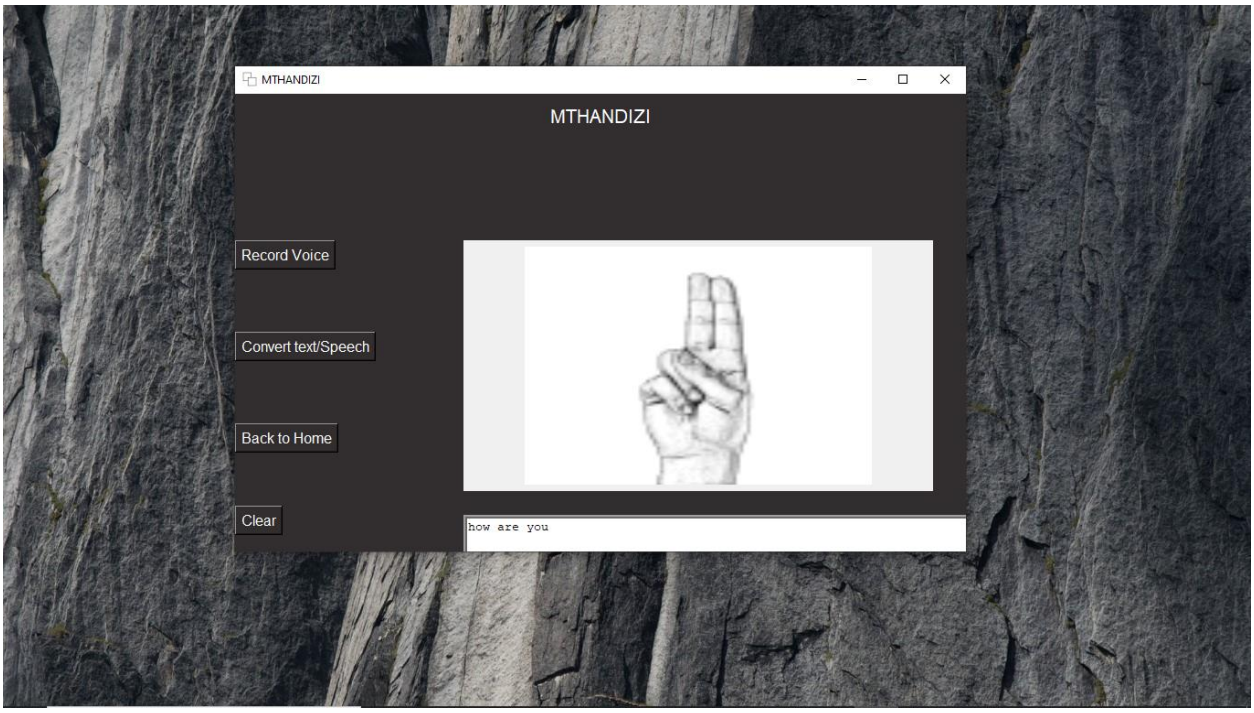


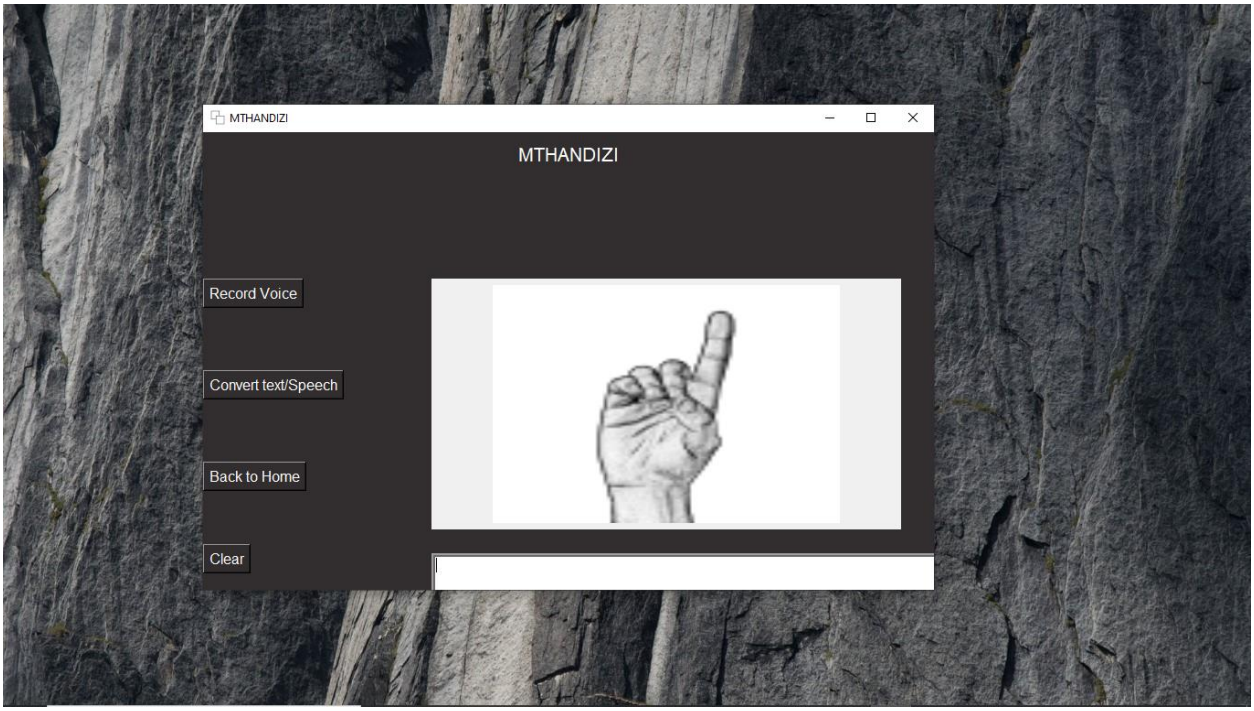


So, when you click on the speech to sign in the menu page this where you navigated to. When you click on speak button the system asks you if you want to start speaking for translation to sign language or not



And as one speaks or types in text the output is shown as below



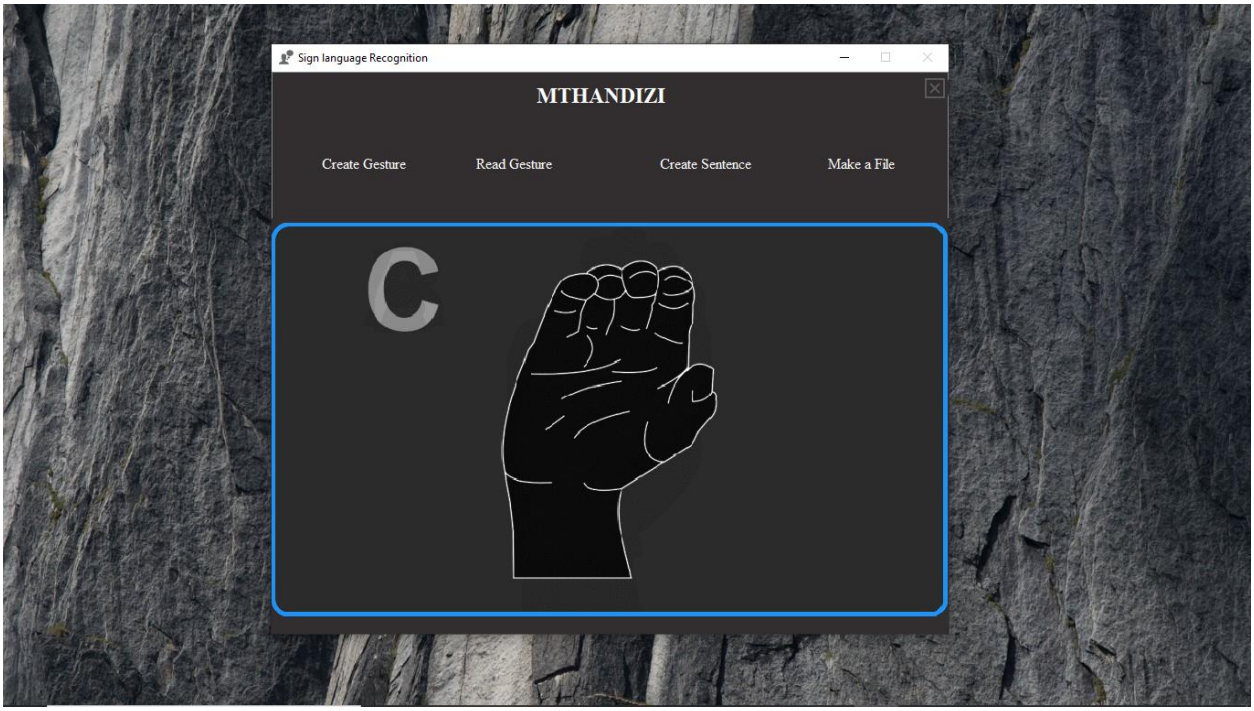


Sign to text

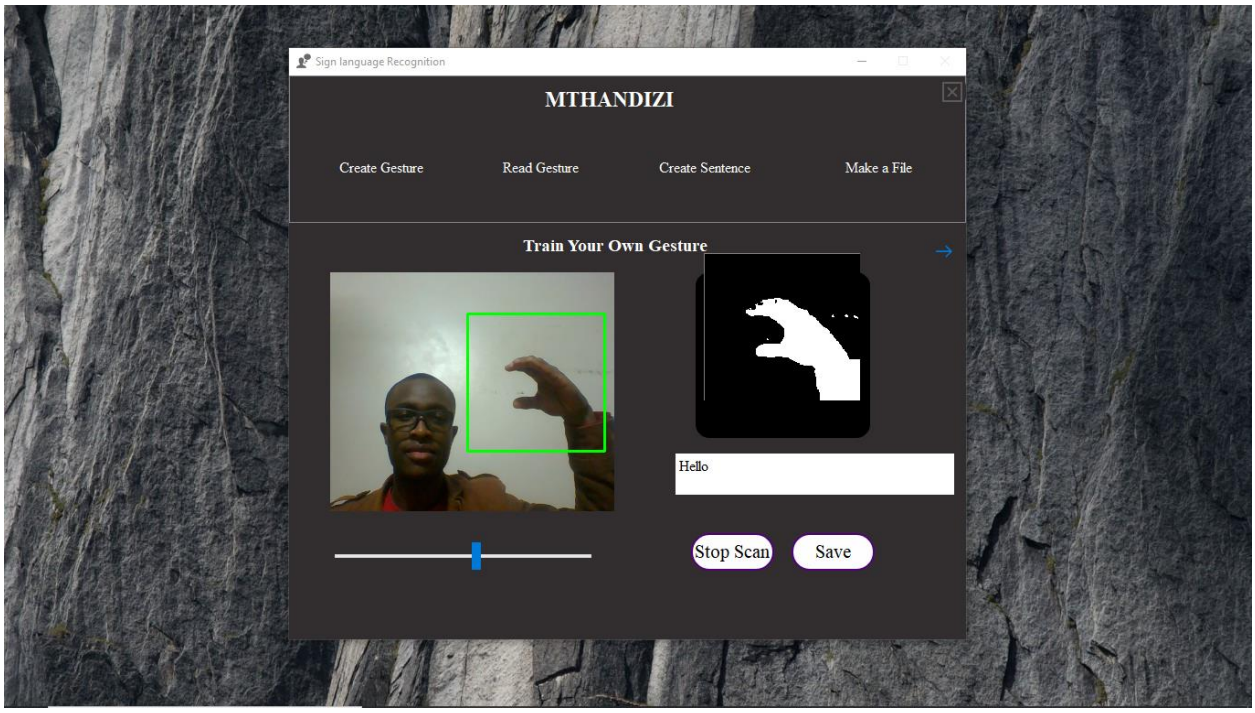
This desktop page translates the hand gestures into text. You can choose the following options

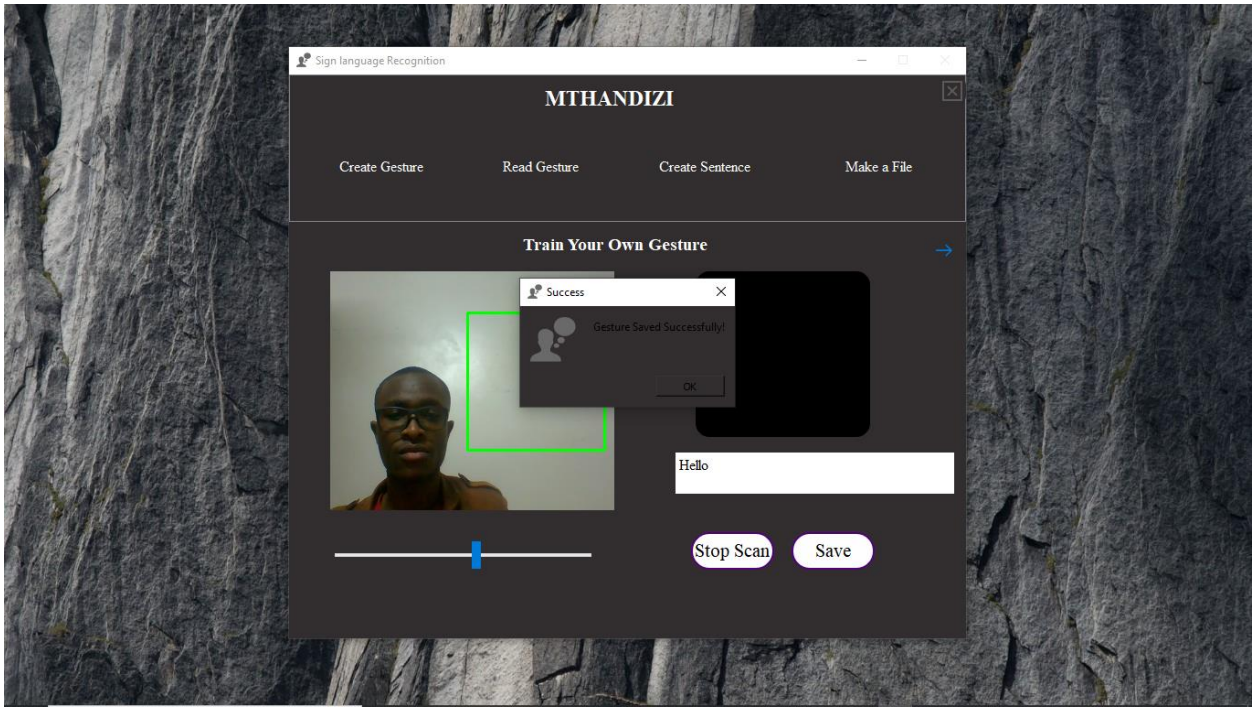
1. Create gesture
2. Read a single gesture
3. Making a sentence.
4. Make a File

Below is the user Menu for Sign to text panel



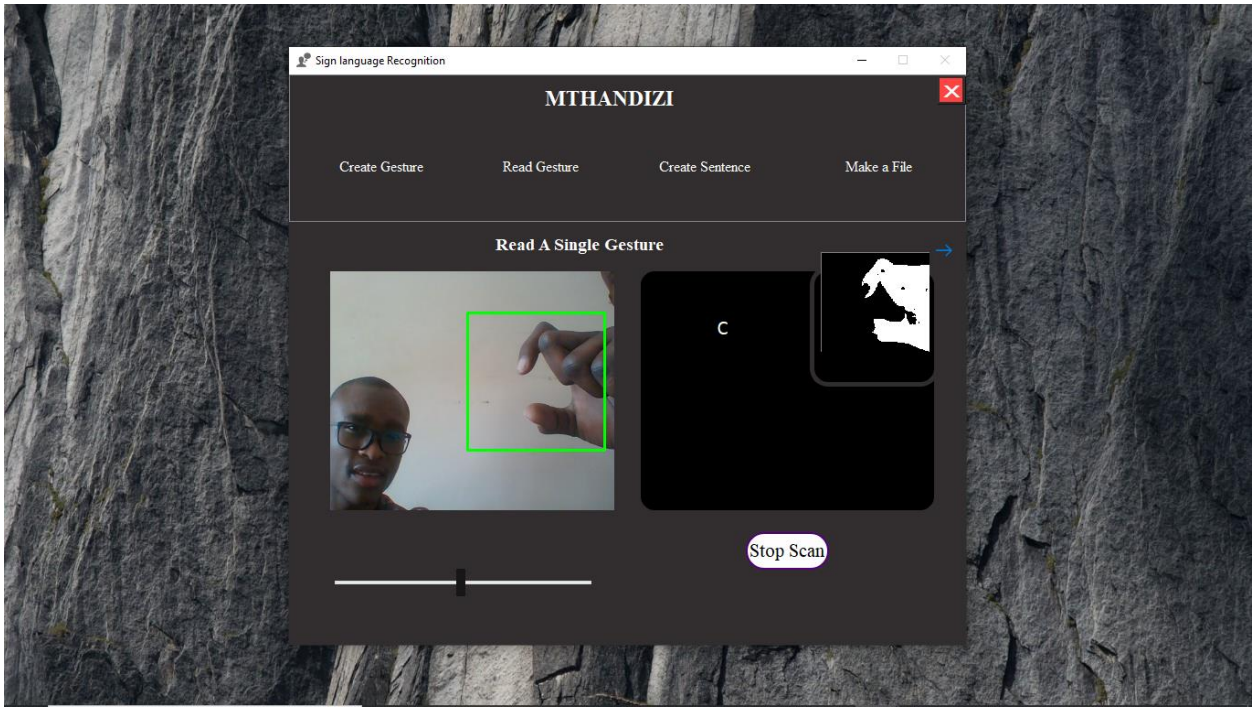
1. Creating Gesture demonstration

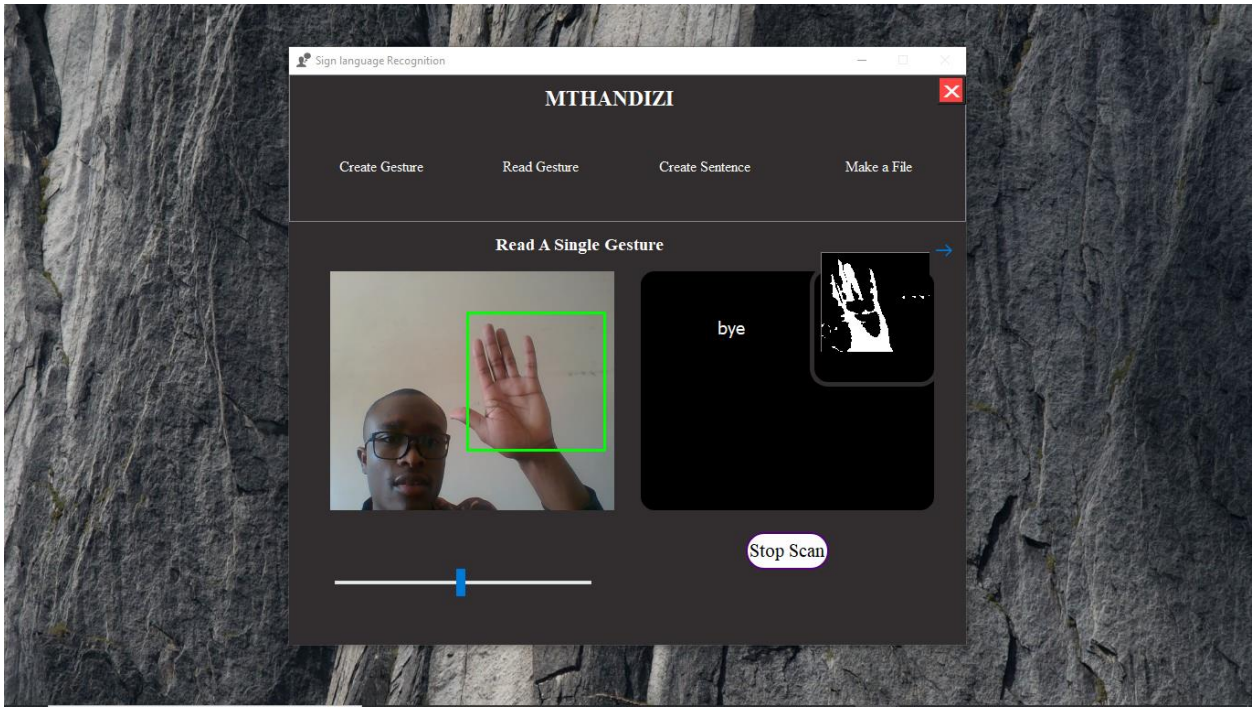


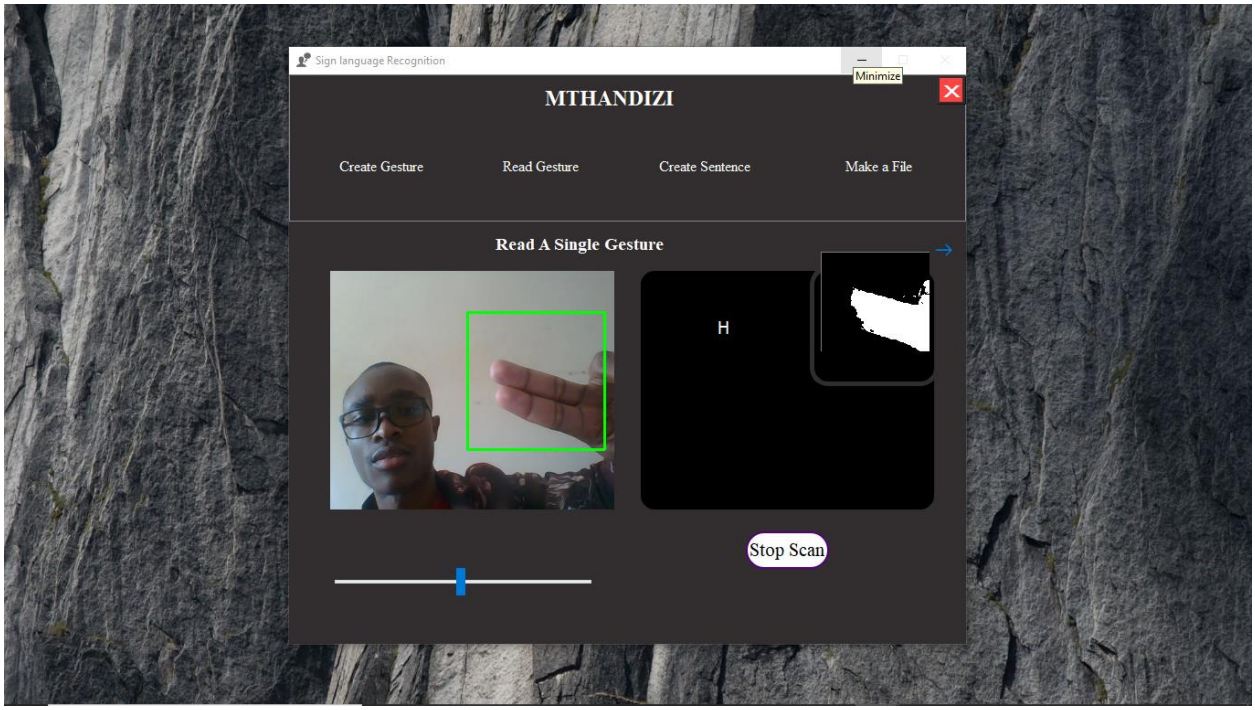


Save the Gesture.

2. Reading a single Gesture demonstration

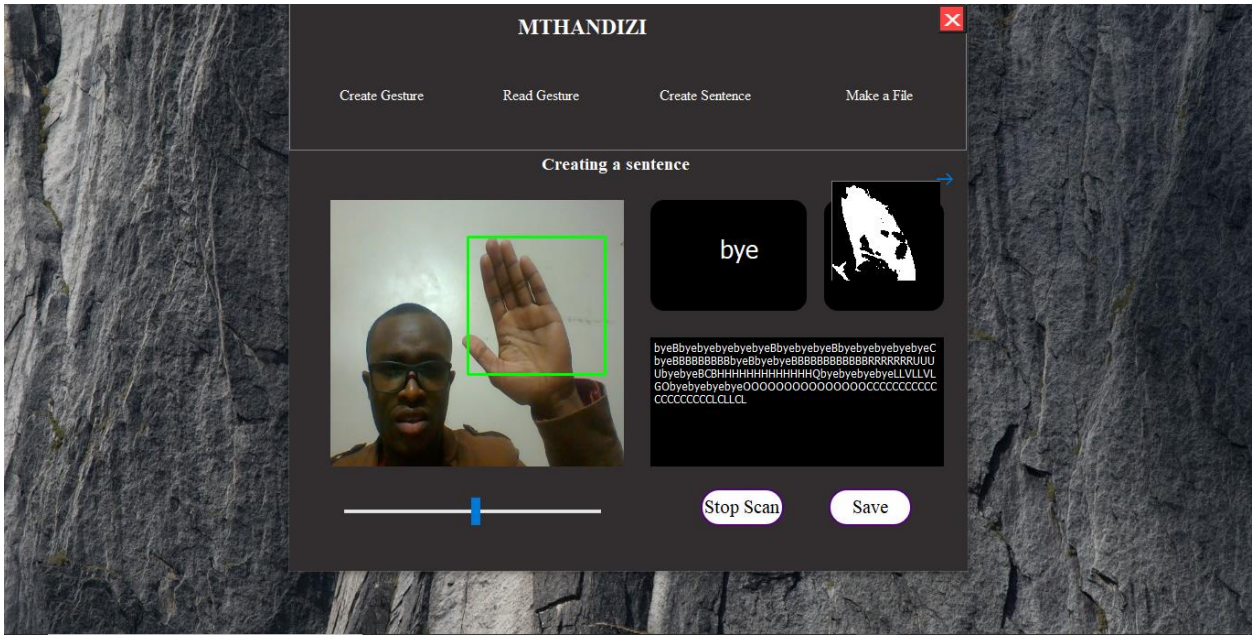


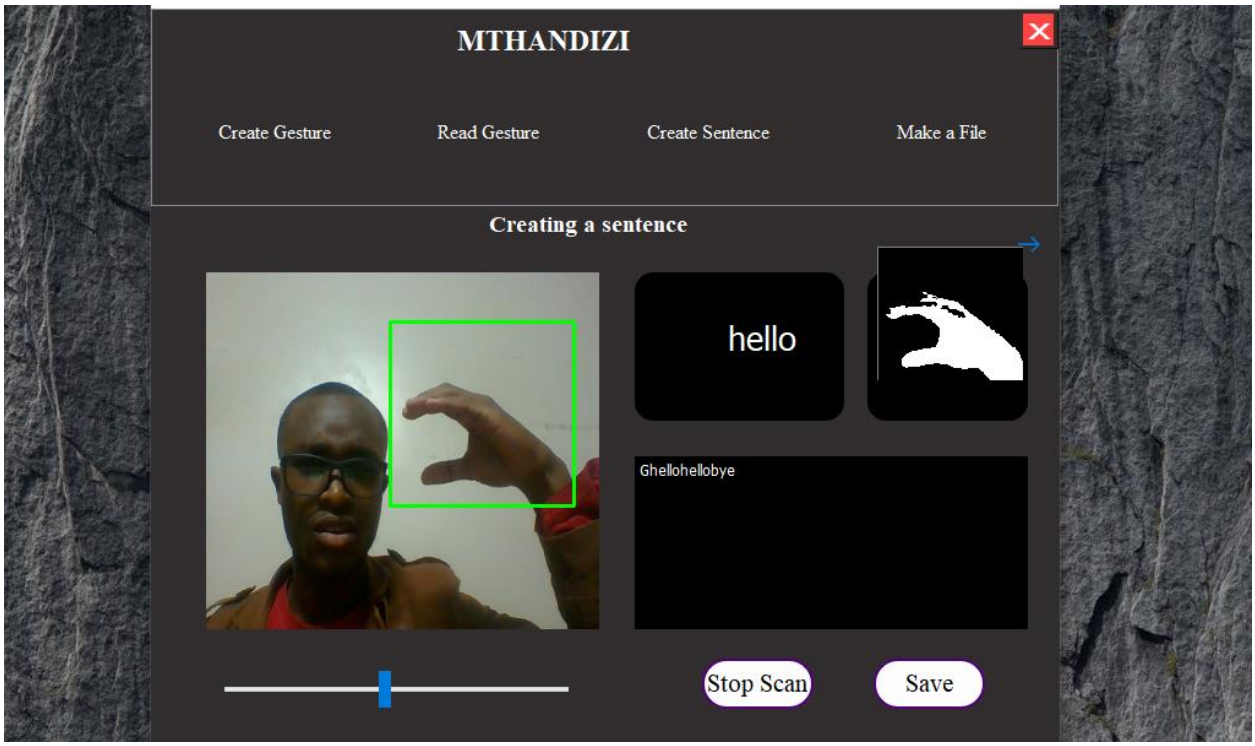




3. Creating a sentence demonstration

Now I will create a sentence using the hello and bye gesture I created plus other letters too.





Installation

i. Extract the installation folder with WinRAR
ii. Look for an executable file (exe) application of the software in the extracted folder.
iii. Click on it to run the software
iv. To some computers it brings an error "Ordinal could not be located in the dynamic link library to fix this install Microsoft Visual C++ redistributed 2008 SP1.
v. If you experience any installation errors contact +265881229304 0r hylukayange@gmail.com

Future Scope

i. Achieve higher accuracy in cases of complex backgrounds
ii. Full motion interpretation
iii. Connect every student with the System.

Conclusion

The system tries to provide direct mode of communication between natural language speakers and deaf. Mthandizi bridges the communication gap between these two peopele. Overall this project is a utility for humanity and particularly for deaf community.