



BAHIR DAR UNIVERSITY COMPUTING FACULTY

Industrial project on Simple Language Translation

Submitted to the faculty of computing in partial fulfillment of the requirements for the degree of
Bachelor of Science in **Software Engineering**

Group members:

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Bahir Dar University, Bahir Dar Institute of Technology

Declaration

The Project is our own and has not been presented for a degree in any other university and all the sources of material used for the project have been duly acknowledged.

Daniel Getaneh

Name

Signature

Yezibalem Aemro

Name

Signature

Yeabsira Aychiluhim

Name

Signature

Faculty: Computing

Program: Software Engineering

Project Title: Simple Language Translation

This is to certify that I have read this project and that in my supervision and the students' performance, it is fully adequate, in scope and quality, as a project for the degree of Bachelor of Science.

Mulugeta Muche

Name of Advisor

Signature

NO.	Examining committee members	signature	Date
1			
2			

It is approved that this project has been written in compliance with the formatting rules laid down by the faculty.

Roles and Responsibilities

Table 1: List of Students with their respective Tasks

List of Tasks	List of Members		
	Daniel Getaneh	Yezibalem Aemro	Yeabsira Aychiluhim
Gathering databases	✓	✓	
Train the dataset by AI	✓		
App drawer			✓
Homepage of the app	✓		
Learn Ge'ez page		✓	✓
Setting app page		✓	
About us page	✓		✓

Acknowledgment

First and foremost, we would like to thank the Almighty God, who gave us the opportunity and strength to achieve whatever we have achieved so far. Beside to these we would like to deepest appreciation to those people who helped even in the smallest way in making the completion of this project.

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We are also deeply grateful to Mr. Mengistu and Mr. Minassie Lemma for their generous donations and support. Without their help, this project would not have been possible. Thank you all for your dedication and commitment to this cause.

List of Acronym

- **AI** – Artificial Intelligence
- **OS** – Operating System
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Abstract

Language is a system of communication which consists of a set of sounds and written symbols which are used by the people of particular country for talking or writing. The ability to communicate in multiple languages is becoming more and more important in the increasingly integrated global community.

A language translator is a mobile application that can be utilized for translating from one language to another. It is a very important tool for anyone who is learning a new language. The problem of language difference has hindered effective information communication over the years. In Ethiopia, there are above 85 languages. But, despite the existence of many languages in the country, many are still struggle to write, speak or listen these languages properly. The study develops flutter language converter app in order to deal with this problem and make language translation easy and facilitates stress-free communication, it is advisable to use several languages learning software's. There are different flutter based language translator applications. However, the existing apps were restricted to a set of words that were hard coded into the app at the time of its development. We are developing flutter app which is compatible with **Android, iOS, Linux, Windows, MacOS** and **Web**.

This project aims to create a comprehensive translation of Ge'ez language to Amharic language and vice versa. It will include a variety of resources to help people learn and understand the language and its respective nuances. The project will be organized into different sections that cover the basics of language structure, grammar, vocabulary, and common phrases. Furthermore, it will provide a glossary of words and phrases, as well as useful examples of usage. This flutter framework based application will also include using AI transformer based model for translation of the two language. The project is designed to be comprehensive and user friendly, with the goal of making it a valuable resource for anyone looking to learn and understand the Ge'ez and Amharic language.

With this documentation, we will try to explain about our projects with three chapters, the first chapter wants to describe background, objectives, methodologies that we use during the project lifetime. The second chapter explains the system logic by comparing with the existing applications. Finally, the third chapter explains about the overall system designs of the application. We finished this documentation with the references that used during the development of this project and appendices of some useful words that is known in IT world.

1. Chapter One: Introduction

1.1. Background

Language is a system of communication which consists of a set of sounds and written symbols which are used by the people of particular country for talking or writing. The primary purpose of language is to communicate between individuals, but language can be used in several specific ways to get certain kinds of ideas. Language allows people to: express emotion, share our ideas, thoughts, and feelings with others. The ability to communicate in multiple languages is becoming more and more important in the increasingly integrated global community.

Translator is a very important tool for anyone who is learning a new language. It is such a great app especially for the one who want to learn Ge'ez but can't. In a translator, the user can look up a word from the target language. Translation plays an important role in human life because it has made communication among people with different languages in reality. Both spoken and written translation, translation activities become a tool to create optimal communication. The way in which we communicate with people is important because it can affect the relationship we have the effectiveness of our own and others' work and of the organizations in which we work the translation is important to both language and culture because it enables better communication between two people. Because of translation as well, the equal understanding of the development of innovations in all aspects becomes easy to be understood and followed.

Translation means transferring message from source language into Target language with the nearest equivalent. The aim of translation is to find the equivalent meaning of the source language expression in the target language. Furthermore, translating a literary work into another language is creating a new literary work in another language. One can find, understand and learn the meaning of one word in another language among the two. It serves a good opportunity for student's researchers and other individuals who are on the field of language study.

1.2. Objectives

Project objectives are what you plan to achieve by the end of your project. This might include deliverables and assets, or more intangible objectives like increasing productivity or motivation.

1.2.1 General Objectives

The general objectives of this project is to design bi-directional language translation for Ge'ez language to Amharic language and vice-versa.

1.2.2 Specific Objectives

To achieve the general objectives of the project, the following specific objectives are formulated

- ✓ To identify the syntactic relationship between Ge'ez and Amharic languages

- ✓ Implementation and testing the proposed system
- ✓ To design an optimal language and translation AI model.
- ✓ Find a solution to the existing problem.
- ✓ Test the developed system.

1.3. Statement of the Problem

Ge'ez is an ancient language and many manuscripts are already archived by Ethiopian Orthodox Church as well as by the National Archival agency. Ge'ez had been known as being used in Ethiopia since the 4th century and as a spoken language close to a thousand years and had been serving as official written language practically up to the end of 19th century.

Since currently there are a lot of historical, cultural and religious documents available in Ge'ez language, there is a need to translate the manuscripts to Amharic and other Ethiopian Languages to make the decoded knowledge accessible to every especially Amharic users. On the other hand, Ge'ez as a language being researched and taught in different Universities around the world in terms of accessing the decoded knowledge. Indirectly, Ge'ez language speakers are being created therefore; there is also a need to translate Amharic documents to Ge'ez language.

Today Ge'ez remains only as a spoken language and the liturgy language of the Ethiopian Orthodox Tewahedo Church. Whereas, Amharic is among the most spoken language in Ethiopia and the official working language of the Federal Government of Ethiopia, where it has about 30 million native and non-native speakers. The translation of Ge'ez words to Amharic will be of paramount importance in order to enable Amharic user to easily access the invaluable indigenous knowledge decoded in Ge'ez language.

1.4. Beneficiaries of the Project

The Significance of our project is to translate from the source language to other alternatives and also it is well known that a great part of our country's income comes from tourism. The second importance is reaching under resourced languages; by translating the different valuable publications; for example, from Ge'ez to Amharic it is possible to address information need of Amharic language speakers. The third importance is it solves language barriers between individuals to read and understand different publications and also it is absolutely necessary to achieve effective communication between different cultures. In the process of spreading new information, translation is something that can change history of the country.

1.5. Limitations of the Project

- ✓ This Application doesn't support searching words by voice.
- ✓ It may not provide accurate translations for all inputs, as it relies on machine translation algorithm and limited number of (about 3600 bi-directional dataset) datasets.

- ✓ It only translates 2 languages.

1.6. Scope of the Project

This project is for users who are speaking/use Amharic and Ge'ez languages. And it contains the following tasks:-

- ✓ It translates words as well as sentences between the two languages.
- ✓ The system allows the user to view about us information.
- ✓ The system allows the users view about Ge'ez language and learn about the language.
- ✓ The system shows the setting of the application.

1.7. Methodology

The methodology is the analysis of the principles or procedures of inquiry in a particular field of study. When we relate it with our project it is the system on how we will perform information gathering, analyze and design, implement, test and evaluate it using different ways.

1.7.1 Requirement Gathering Methods

We have chosen the following data collection methods

- ✓ **Reading:** In order to obtain the required amount of parallel data, a Holy Bible Geez-Amharic translation and some other religious books (Wedase Mariam and Arganon) are used.
- ✓ **Internet:** It is our major source to gather information for our project. We also have been watching tutorials online about how the flutter based translator works and how to make our application.
- ✓ **Document analysis:** We will go through different documents that are related with our project.

1.7.2 Analysis and Design Methodology

In this project the team will use object-oriented system development methodology (OOSD). This has two phases.

- ✓ **Object Oriented Analysis (OOA)** - during this phase the team used to model the function of the system (use case modeling), find and identify the business objects, organize the objects and identify the relationship between them and finally model the behavior of the objects.

- ✓ **Object Oriented Design (OOD)** - during this phase the team uses enterprise architect software to refine the use case model, and to reflect the implantation environment, model object interactions and behavior that support the use case scenario, and finally update object model to reflect the implementation environment.

1.7.3 Implementation Methodology

Implementation is coding of all functions specified by requirement analysis and design. We have chosen object-oriented programming as our coding approach, because: -

- ✓ It makes it possible to extend the behavior of objects through both composition and inheritance, allowing objects to take on new life and usefulness in new settings.
- ✓ It is often the most natural programming approach as it models the real world.

To perform this, we will use client AI model and Dataset architecture. The AI model and Dataset provides service to the client/user and the client requests service from the AI model or Dataset. The application doesn't need any internet, and servers like database and web.

2. Chapter Two: System Features

2.1. The Existing System

This part of the document will be devoted to understanding how the existing system performs its task and describe the proposed system in detail. In order to fully understand the existing system, we have started using unstructured interview, document analysis, and reading: In order to obtain the required amount of parallel data, a Holy Bible Ge'ez-Amharic and some other religious books (Wedase Mariam and Arganon) are used and we have started and developed a good working relationship with the stuff of Ge'ez language department.

The existing system functions semi –automated different words with meanings in the paper based dictionary and multi-lingual Translation (Above three languages) like Google translator.

- ✓ Users: student and others search the words meaning from the Dictionary, Google translator
- ✓ Dictionary: book in the paper based dictionary
- ✓ Multi-lingual Translation (Above three languages) like Google translator
- ✓ Free limited API from AI pre-trained models like Google translator, Microsoft and Yandex.

2.2. Proposed System

Flutter framework, which let's to develop android, iOS, Linux, Windows, MacOS and Web compatible, application will be developed using dart by using in combination of static dictionary dataset and AI trained model which mainly focuses on translating words to the target language.

This Bi-lingual translator is mobile world's platforms compatible application, designed to help individuals for word translation to users of the translator. It provides a user-friendly and attractive user interface with its setting up of the application in order to be compatible with users.

2.3. Requirement Analysis

Requirements analysis, also called requirements engineering, is the process of determining user expectations for a new or modified product. In this section we are going to describe the functional and nonfunctional requirements of the proposed system, designing the use case with its description, State chart diagram, designing the sequence diagram and activity diagram for the use case, User Interface prototype, Analysis Class Model then Logic model finally, we are going to design the interface of the system.

2.3.1 Functional Requirement

Functional requirements are product features or functions that developers must implement to enable users to accomplish their tasks. So, it's important to make them clear both for the development team and the stakeholders. Generally, functional requirements describe system

behavior under specific conditions. The following are the functional requirements of the proposed system:

- ✓ The system should have setting of the application.
- ✓ The system should allow the user view about Ge'ez language.
- ✓ The system should allow the user view about us page.
- ✓ The system should allow the users share application.
- ✓ The system should allow the user translate words as well as sentences.

2.3.2 System Use case

A use case is a methodology used in system analysis to identify, clarify and organize system requirements. The use case is made up of a set of possible sequences of interactions between systems and users in a particular environment and related to a particular goal.

(a) Use case Diagram

Use-case diagrams describe the high-level functions and scope of a system. These diagrams also identify the interactions between the system and its actors. The use cases and actors in use-case diagrams describe what the system does and how the actors use it, but not how the system operates internally.

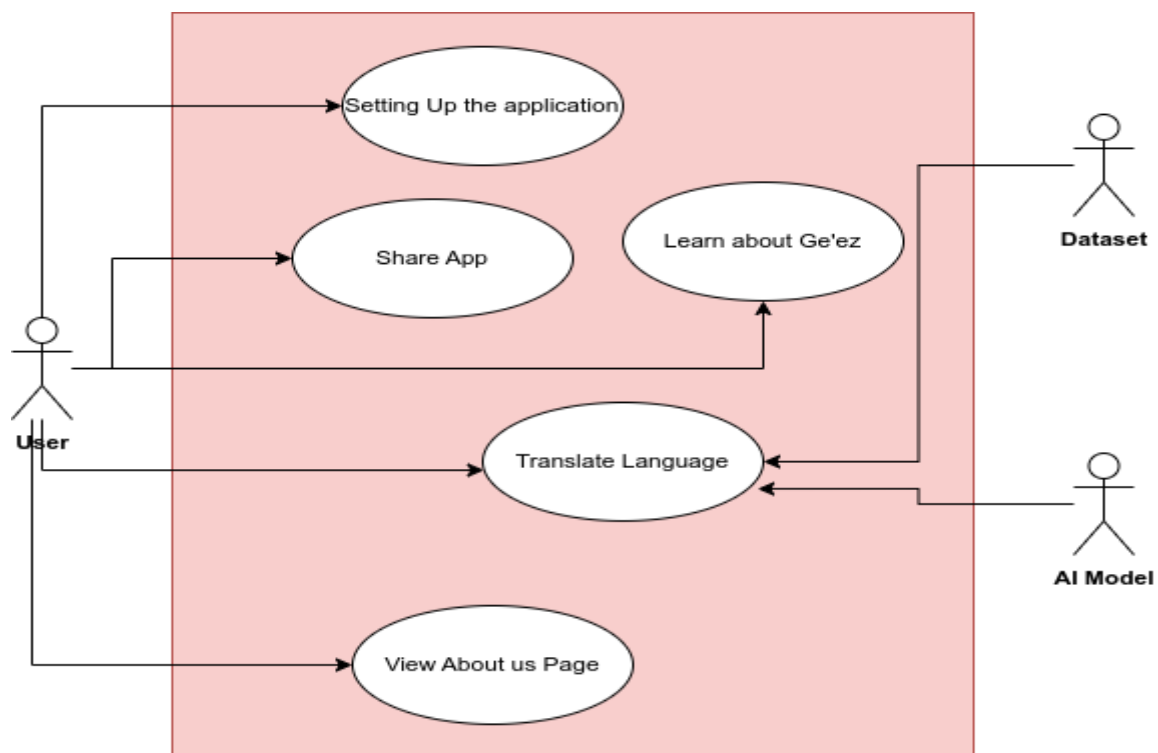


Figure 1: Use case Diagram of the Proposed System

(b) Use case Documentation

This section should include a use case documentation by showing use case number, name, actor, description, pre-condition, post condition, priority, basic course of action and alternate course of actions. In the basic course of action and alternate course of action, you have to indicate the user interface and the business rule if needed.

2.3.3 Business Rule Documentation**2.3.4 User Interface Prototype**

User interface requirements should be gathered with a prototype approach here and aligned with system use case documentation that shows the user interaction with the system. It should be labeled and referenced in the use case documentation.

2.3.5 Activity Diagram

Activity diagram is another important diagram in UML to describe the dynamic aspects of the system. Activity diagram is basically a flowchart to represent the flow from one activity to another activity. The activity can be described as an operation of the system. The control flow is drawn from one operation to another. This flow can be sequential, branched, or concurrent.

The purpose of activity diagrams is like the other four diagrams. It captures the dynamic behavior of the system. Other four diagrams are used to show the message flow from one object to another but the activity diagram is used to show message flow from one activity to another. It does not show any message flow from one activity to another. Activity diagram is sometimes considered as the flowchart. Although the diagrams look like a flowchart, they are not.

2.3.6 Sequence Diagram

Sequence diagrams should be drawn for each use case to show how different objects interact with each other to achieve the functionality of the use case. Show how objects operate with one another and in what order (chronological) to respond to the actors.

2.3.7 Analysis Class Model

Model Classes with their attributes, methods, relationship, multiplicity and Role

2.3.8 Logic Model

It is an informal way of programming description that does not require any strict programming language syntax or underlying technology considerations. It is used for creating an outline or a rough draft of a program. Pseudo code summarizes a program's flow, but excludes underlying details. System designers write pseudo code to ensure that programmers understand a software project's requirements and align code accordingly.

Pseudo code is not an actual programming language. So it cannot be compiled into an executable program. It uses short terms or simple English language syntax to write code for programs before it is actually converted into a specific programming language. This is done to identify top level flow errors, and understand the programming data flows that the final program is going to use.

2.4. Non-Functional Requirement

Non-Functional Requirement (NFR) specifies the quality attribute of a software system. They judge the software system based on Responsiveness, Usability, Security, accuracy and other non-functional standards that are critical to the success of the software system. The non-functional requirements of this system include the following

- ✓ **Reliability:** The system consistently performs its intended function. Example the important functions are validated. So the system is reliable.
- ✓ **Efficiency:** The system is efficient based on the concept of resource Consumption. Example it only needs a computer that has a browser to access the system.
- ✓ **Robustness** (Error handling requirement): The system have error handling mechanisms that is, as errors occur it will not stop functioning rather provide error manages and back to the previous page to give chance to reenter data and process the task by beyond the error.
- ✓ **Resources:** The system is compatible with specified hardware and software environment
- ✓ **Platform:** our system supports any operating system and all browsers.
- ✓ **Performance requirement:** Response time: - depending on the strength of available network the system should be response in short period of time.
- ✓ **Availability:** The system is available 24 hours /7 days to everyone.
- ✓ **Correctness:** The application should never allow unauthorized users to delete or insert evaluation data from the database.
- ✓ **Accuracy:** The level of accuracy in the proposed system will be better due to the reduction of error. The system is implemented in a way that gives correct output for the users when they give correct input.
- ✓ **Usability:** Our system user interface will be designed in a simple and very attractive manner in order to make the usability of the system comfortable.

2.5. System Requirement

We will use different types of software and hardware tools to build this multi-platform compatible application. We have showed all requirement as the below table.

Table 2: System Requirement(Software and Hardware)

No.	Software Requirement	Hardware Requirement
1	Android Studio Code, Visual Code	Computer with 4 – 8 GB installed RAM, 64-bit system type
2	GitHub/Git	Flash Disk
3	PlantUML/Graphiz, Edraw max, App Diagrams	
4	Colab Research for AI Model Training	

3. Chapter Three: System Design

3.1. Architectural Design

3.1.1 Component Modeling

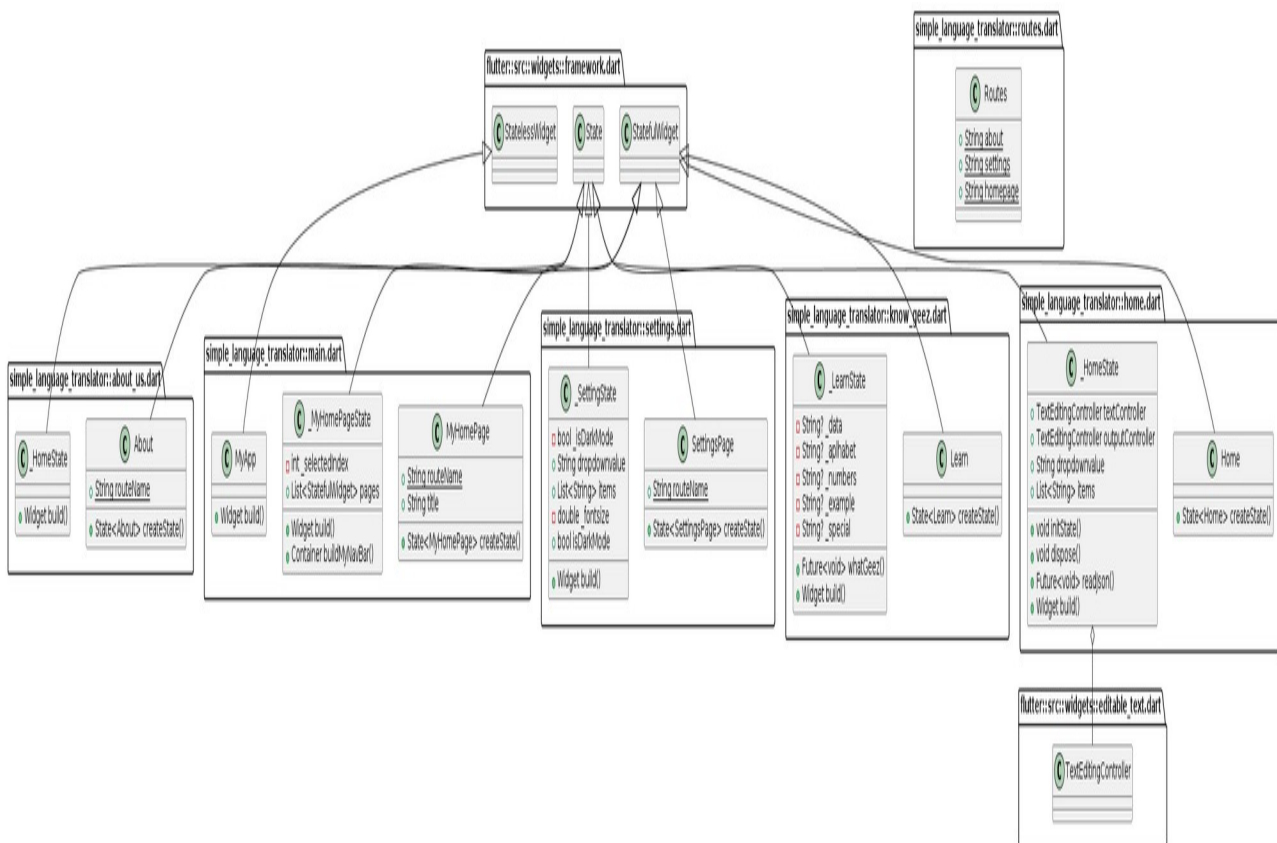


Figure 2: Overall Component Modeling of the System

3.2. Detail Design

3.2.1 Design Class Model

3.2.2 Persistent Model

3.3. User Interface Design

References

- [BiT Project Documentation format of the students](#)
- [Flutter Project Documentation](#)
- [Flutter Package Documentation](#)
- [Dart Programming Documentation](#)

Appendices