

SIGN LANGUAGE TUTOR

Christopher Anopaishe Meki^a; Chibaya Yolanda^b

Department of Software Engineering, School of Information Sciences and Technology,

Harare Institute of Technology, Harare, Zimbabwe

anopaishemeki@gmail.com^a; yhibaya@hit.ac.zw^b;

ABSTRACT

The sign language tutor application is a software program designed to teach users sign language using an interactive and engaging platform. The app is designed to be accessible to all individuals who are interested in learning sign language, regardless of their proficiency level. The app includes a range of sign language courses, from beginner to advanced levels, that are presented through interactive quizzes and test for the sign alphabet (ASL) and gifs for common words.

The app's user interface is designed to be intuitive and easy to navigate. Users can choose the lesson they want to take and access them through the app's dashboard. Each lesson is broken down into segments that cover different aspects of sign language alphabet. The lessons are designed to be engaging and interactive, with images that show how to perform different signs and quizzes that test the user's knowledge.

The app also includes a range of features that help users track their progress and stay motivated. These include progress tracking and gamification. Progress tracking enables users to see how far they have progressed in their courses, while gamification incentivizes learning by having a scoreboard with scores show how the user is faring against other users.

I. INTRODUCTION

The study focused on sign language e-tutoring using mobile phones specifically on the Android platform. This research examined the Zimbabwe Sign Language. "Communication is key" – unknown, communication takes place everywhere, hourly, daily, be it amongst people or at intrapersonal level. Communication is mostly through natural spoken language, however the disability to convey messages through natural spoken language brings a barrier amongst the deaf, hearing impaired and normal hearing people hence the need for electronic sign language tutors to help in bridging the gap. The study

aimed at developing a web based Zimbabwe Sign Language Tutor.

Design science methodology was employed. After a careful study of literature, we found out that there is no currently active (at the time of writing this paper) sign language e-tutor teaching Zimbabwe Sign Language e-tutor. Sign Language Tutor is a web based application that uses multimedia techniques such as images to teach and give some progress check quizzes. It also supports sign detection (image classification) of image fed from device camera. Image classification is accomplished by using Tensor flow handpose model and fingerpose (Finger gesture classifier for hand landmarks detected by MediaPipe Handpose) artificial intelligence library by Google

This project focused on providing a portable and less expensive learning tool for Zimbabwe Sign Language Tutor.

II. PROBLEM STATEMENT

Lack of portable, on-the-go and cheap methods to facilitate sign language learning hence difficulty in communication amongst the deaf, hearing impaired and normal hearing people. There is need to develop a web based e-tutor to facilitate interactive sign language learning.

III. RELATED WORK

Mobile Sign App

University of Bristol University of Bristol, (2012)launched an innovative application that can help people to communicate in sign language through a searchable database named Mobile Sign. The tool includes the largest free sign language lexicon on the major application stores. Mobile Sign application automatically shows lists of possible words for the user to choose from making it more convenient to the user by the predictive word search, once selected, a video of a person signing the selected word is shown on screen. In addition, it is also available on platforms such as Apple and Android. The application is available to view online or on store on

any platform being used. More so, it is ideal since it allow the user to keep a list of their recently viewed signs for repeat access later. However, it is said to contain information which is not correct which need to use your own judgement or outside sources to check.

Fingerspelling (ASL)

Fingerspelling in American Sign Language(Wager, 2012) is a system consisting of 26 onehanded signs representing the letters of the English alphabet and are formed sequentially to spell out words borrowed from oral languages or letter sequences. This application is a practice tool designed to help improve the ability to read fingerspelling. Users can choose the word length (2-any) and speed (slow to fast) of the fingerspelling, record their answer and keep score. An expert mode is available as ability increases. However, it is said to take more time for reviews, making the user to wait for a long period to get the next review. Also, the reviews are not understandable by the users, making them to go and search on google. In addition, there is no application update done constantly resulting in it taking time to respond

Usign Application (Uganda)

The (Uganda National association of the Deaf, 2017)Uganda National association of the Deaf (UNAD) launched a mobile application to ease communication for people who are deaf or hard of hearing. It is said to address most of the challenges facing those with hearing disabilities because it is user-friendly when fully adopted. The application consists of a vast category giving a wide range to learn which includes Numbers, The Alphabet, and Days of the Week, Months of the Year, Time Signs and Fruits. However, the major issue is that Uganda Sign Language, like any developing language, has a limited vocabulary, which impedes the process of creating a broader lexicon and making it utilizable by both the Deaf community and the population at large. Videos are said to be speedy when playing in the application resulting in more users requesting sign pictures for beginners.

GSL Ghanaian Sign Language (Ghana)

The GSL application(Leiden University, no date) is an initiative of the hands, labels for sign languages and deaf studies in Ghana. The application consists of 300 signs, time, money, fingerspelling alphabets and

also general numbers. In addition, it also translates English words into GSL Ghanaian Sign Language signs, from A-Z. It is also an excellent application as it does, not require internet to use-that is it is completely offline.

IV. SOLUTION

The sign language tutor application is a system designed to facilitate the learning of sign language using an interactive and engaging platform. The system consists of a web application that offers a range of lessons and tests/quizzes in sign language, catering to various proficiency levels, from beginner to advanced.

The system's user interface is intuitive and easy to navigate, enabling users to access lessons and tests/quizzes easily. The courses are presented through sign image recognition tutorials/lessons, interactive quizzes, and gifs for common words, making the learning process engaging and effective. The lessons show how to perform different signs, and the quizzes test the user's knowledge, providing feedback through points scored.

The system also includes features that help users track their progress and stay motivated. These include progress tracking and gamification. Progress tracking enables users to see how far they have progressed in their courses, while gamification incentivizes learning while gamification incentivizes learning by having a scoreboard with scores which show how the user is faring against other users and also new lessons and test are unlocked after passing previous lessons.

The system's comprehensive curriculum covers various aspects of sign language, including finger spelling and common phrases. The courses are designed to be accessible to all learners, regardless of their language proficiency, age, or location.

Overall, the sign language tutor application system is designed to make sign language learning accessible and enjoyable to everyone, empowering learners to take control of their learning journey and promote inclusivity and empathy.

A. Solution Architecture

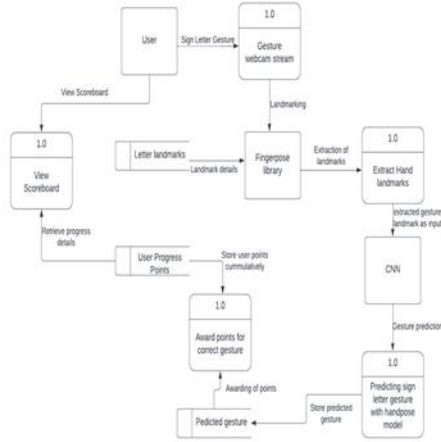


Figure 1: DFD level 1

B. Coding Strategy

The coding strategy is the series of steps taken to accomplish all the objectives in a project. As the size of this project was big, this project was divided into different modules. The structure and relationships between classes was defined first before the classes were created. Some of the features that were developed using trial and error until the desired results were obtained.

C. Experimentation and Testing

Domain	Expected Results	Actual Results
Functional Testing	<ul style="list-style-type: none"> The system modules should function as expected. The system should be easily accessible and user friendly. Error messages should be displayed on the system. 	As expected
Integration Testing	All the integrated modules should work together flawlessly.	As expected
System Testing	All the components of the system should	As expected

	function properly.	
Acceptance Testing	The system should meet user requirements and system objectives.	As expected

V. CONCLUSION

The Sign Language Tutor application project has been successfully implemented, and it has proven to be effective in recognizing and interpreting sign language gestures using the fingerpose library and TensorFlow handpose model. The application provides users with an interactive platform to learn sign language easily and conveniently, with features such as sign gesture recognition, meaning interpretation, and a scoreboard to track progress.

During the testing phase, the application underwent various types of testing, including functional testing, non-functional testing, unit testing, integration testing, and validation testing. These tests helped to identify and fix several bugs and errors, ensuring that the application is of high quality and performs optimally.

The implementation and testing of the Sign Language Tutor application have resulted in a robust and reliable application that can serve as a valuable resource for individuals interested in learning sign language. The application has the potential to make a positive impact on the lives of people with hearing disabilities, as well as those who want to communicate effectively with them.

Overall, the Sign Language Tutor application project has been a success, and it is poised to be an essential tool for promoting inclusivity and improving communication between people with hearing disabilities and the rest of the world.

VI. FUTURE WORK

The Sign Language Tutor application project has opened up many possibilities for future work and improvements. Some of the areas that could be explored include:

1. Adding more sign language gestures: The current version of the application only recognizes a limited

number of sign language gestures. More gestures can be added to increase the scope of the application and make it more useful for users.

2.Improving accuracy: While the application has a good level of accuracy, there is still room for improvement. Fine-tuning the hand pose model and improving the image recognition algorithm can help to increase the accuracy of the system.

3.Adding user profiles: The current version of the application does not have user profiles. Adding user profiles can help to personalize the application and make it more engaging for users.

4.Creating a mobile version: The current version of the application is web-based. Creating a mobile version of the application can make it more accessible and user-friendly.

5.Implementing feedback mechanisms: Users can provide feedback on the application's performance and accuracy. Implementing feedback mechanisms can help to identify areas that need improvement and make the application more effective.

Overall, the Sign Language Tutor application has a lot of potential for future work and improvements. By addressing the areas mentioned above and other potential areas, the application can be made more useful and accessible to users.

VII. BIBLIOGRAPHY



Christopher Anopaishe Meki
is a final year student studying
Software Engineering at HIT

REFERENCES

- [1] L. Ponemon. Cost of a lost laptop. Technical report, Ponemon Institute, April 2009.
- [2] M. Marshall, M. Martindale, R. Leaning, and D. Das. *Data Loss Barometer*. September 2008. Seagate Technology. Can your computer keep a secret? 2007.
- [3] Seagate Technology. Drivetrust technology:a technical overview. 2007.
- [4] P. Kleissner. Stoned bootkit. In *Black Hat USA*, 2009.
- [5] Ellick M. Chan, Jeffrey C. Carlyle, Francis M. David, Reza Farivar, and Roy H. Campbell. Bootjacker: compromising computers using forced restarts. In *CCS '08: Proceedings of the 15th ACM conference on Computer and communications security*, pages 555–564, New York, NY, USA, 2008. ACM.
- [6] Sven Törpe, Andreas Poller, Jan Steffan, Jan-Peter Stotz, and Jan Trukenmüller. Attacking the bitlocker boot process. In *Trust '09: Proceedings of the 2nd International Conference on Trusted Computing*, pages 183–196, Berlin, Heidelberg, 2009. Springer-Verlag.
- [7] L. Ponemon. The human factor in laptop encryption. Technical report, Ponemon Institute,