

ASLNOW

American Sign Language on the go

ASLnow

CREATE Report

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Background

In the workplace and outside of it, for anyone part of the Deaf community or simply for anyone that is deaf, there are many burdens that arise and become an unintended contributor to ableism, specifically audism, a lesser-known negative bias that affects people that are deaf [1]. Living in a hearing world, deaf individuals face regular difficulties when communicating in daily life situations. Whether that be because of a lack of service accessibility, no immediate access to a sign language interpreter, or simply because the other communicating party does not understand or know sign language.

While there are many ways for deaf individuals to communicate, such as with cued speed, lip reading and gestures. The most common and reliable form of communication is through an official sign language like American Sign Language (ASL) [2]. ASL is growing in popularity and its importance has led to the rise in Deaf people joining the labor market as well as how institutions approach how to work with members of the Deaf community. Industries such as Hospitality, Healthcare & Emergency Services, Retail, and Education are growing sectors for the deaf [3]. However, according to data from the National Deaf Center, only 48% of deaf people were employed, versus 72% of hearing people [4].

For individuals who are deaf, getting a meaningful job is an uphill process, the communication barrier makes it even harder to prove them worth. Once hired, deaf individuals still face significant problems because of inability to effectively communicate with coworkers. This leads to feelings of discouragement and isolation from others because many coworkers would be unsure of how to approach deaf



people. Hiring ASL interpreters, while seemingly a good solution, is cost ineffective for many companies. Thus, giving an easily accessible and affordable application with quick access to American Sign Language would be more effective in improving communication between parties. Furthermore, while the workplace is important for the Deaf community, it is also important to note that assistive technology would improve facets of life outside of that, where knowing ASL would be the norm rather than a specialty language. Thus, the application would need to target a wider range of people including children, such that learning ASL starts from an early age.

Existing assistive technologies do not focus on teaching ASL or are instead solely focused on translating from English text to sign language. The “Handtalk” application for example is a translation app that goes from English speech or text to ASL. It uses machine learning for its translation feature, which while effective, does make it error prone and not sufficiently reliable to use as a platform to learn ASL. Furthermore, applications like “THE ASL APP” and “Hands On ASL” only provide flat pictures or hand gestures alone which are also not sufficient because they either provide little depth or because ASL does not only rely on hand movement alone. The 3D environment and model-based animations in our application will allow users to interact, zoom, and move the model around to get a better view of the signs.

Statement of the problem

American Sign Language (ASL) is one of the most important languages in the United States. According to HealthyHearing.com, the United States has an estimated half a million to one million people who primarily communicate only with ASL. It is also the fifth most commonly used language after Spanish, Italian, German, and French. Learning ASL allows for more meaningful conversations and creates a deeper connection between non-verbal and

primarily verbal communicating parties. This is immensely helpful in addressing the disconnect that deaf individual may feel; relieving them of the prejudgment and prejudice they may face and the misunderstandings that occur when trying to communicate with others. Furthermore, HealthyHearing.com mentions that learning ASL has an added benefit to the workplace for professionals such as educators. Many ASL certified educators would be able to teach in classrooms targeted towards children and beginner level practitioners. With assistive technologies, the learning process can be made easier, more enjoyable, and more interactive, and thus incentivize ASL learning [4]. However, it is often the case that such environments lack such technologies simply because they are not readily available or do not exist. As mentioned previously in the background section of this report, other applications that teach ASL exist, however, a large majority of them follow a pay as you go model with monthly subscriptions which turns away potential users who are willing to learn ASL but not willing to continuously pay for an app.

Rational of Solutions

The main focus of our application is to facilitate access to learning American Sign Language (ASL) that is both easy to use and interactive. With our app we hope to help with the communication barrier that exists between English and ASL. We will offer a variety of ASL words and expressions with accompanying 3D animations for the users of our application to practice and learn from. The app will also offer users the ability to use an English/ASL alphabet translator for occasions where it might be useful. The app will have a variety of categories to choose and learn from, from how to sign colors to common expressions such as "I don't understand", and "I don't know." Towards the end of each category, the user will have the option to take a quiz in order to test their knowledge of the ASL signs they have learned. With these

features at our focus, we hope to help in making ASL an easy to learn, enjoyable, and interactive experience.

Design and Development of Systems

Our app is designed to be welcoming and friendly such that users of any range can partake in the experience. The current homepage is designed to be simple and uncluttered with contrasting colors that allows us to introduce our users to the two main functions of our application (ASL learning and ASL translator). On the ASL learning page, the user will be able to choose from a variety of categories to learn from and will be able to take assessment quizzes at the end of each category. In the translation portion, the user can choose to write any sentence in English and then be able to translate it into a direct one to one mapping of the ASL alphabet. An ASL alphabetic keyboard using graphical representations of signs was also developed for translation from ASL to English. Figure 1 below shows the homepage and the main features of our application. By selecting “LearnASL” the user is taken to the center page where various ASL learning categories are available. Similarly, if the user selects “Translator”, they are taken to the page on the far right where the alphabetical translator is located.

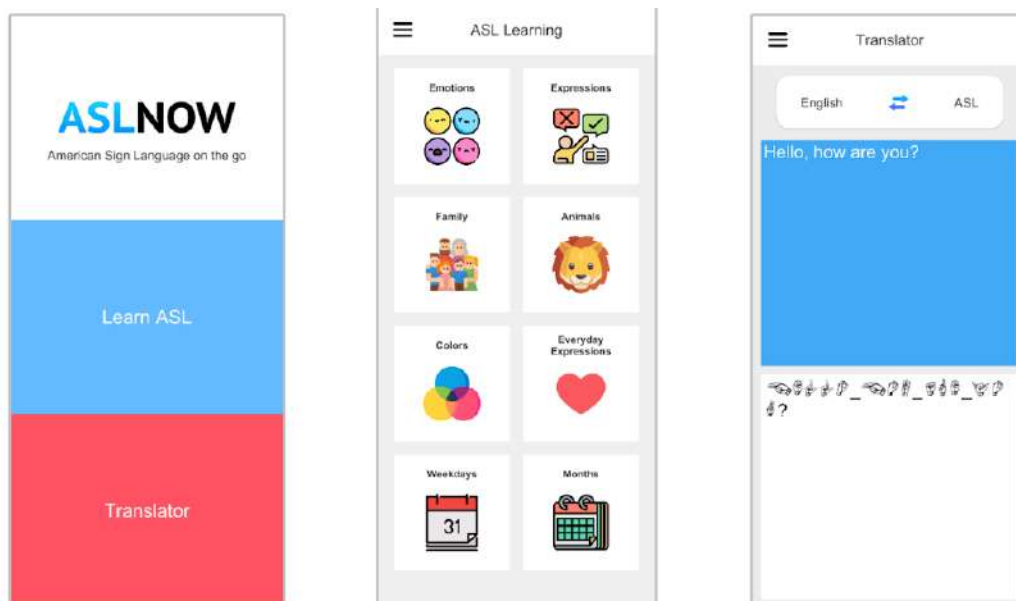


Figure 1. “Homepage and Main Feature Selection”

In the ASL Learning section of our application, users can cycle through a variety of categories to view the ASL animations of their choice. In Figure 2, we can see an example of the ASL animation for “Calm” under the Emotions category of the learning section. The category name is listed at the top of the application along with the name of the animation above the 3D model. At the bottom of the screen in the same figure, we have buttons for previous and next, that will allow users to cycle through all the animations available to them.



Figure 2. “Sample Animation”

Below in Figure 3 is the same animation sample but zoomed in for users who may have difficulty viewing the signs. In Figure 4, we have the quiz feature that demonstrates a user's understanding of the ASL signs learned where red is.



Figure 3. “Sample Animation”
Zoomed in



Figure 4. “Quiz feature in the app”

Development

The app is currently being developed using Unity game engine which is a cross-platform game engine that is particularly used to develop for mobile platforms. Using Unity makes development faster and more efficient as it provides a 3D environment and focuses on working with 3D models. Figure 5 shows an example of our early development environment with some parts of our code base along with the necessary components and assets needed in developing our application. Through Unity and C# we can control our components to implement the features that we have, as well as the interface.

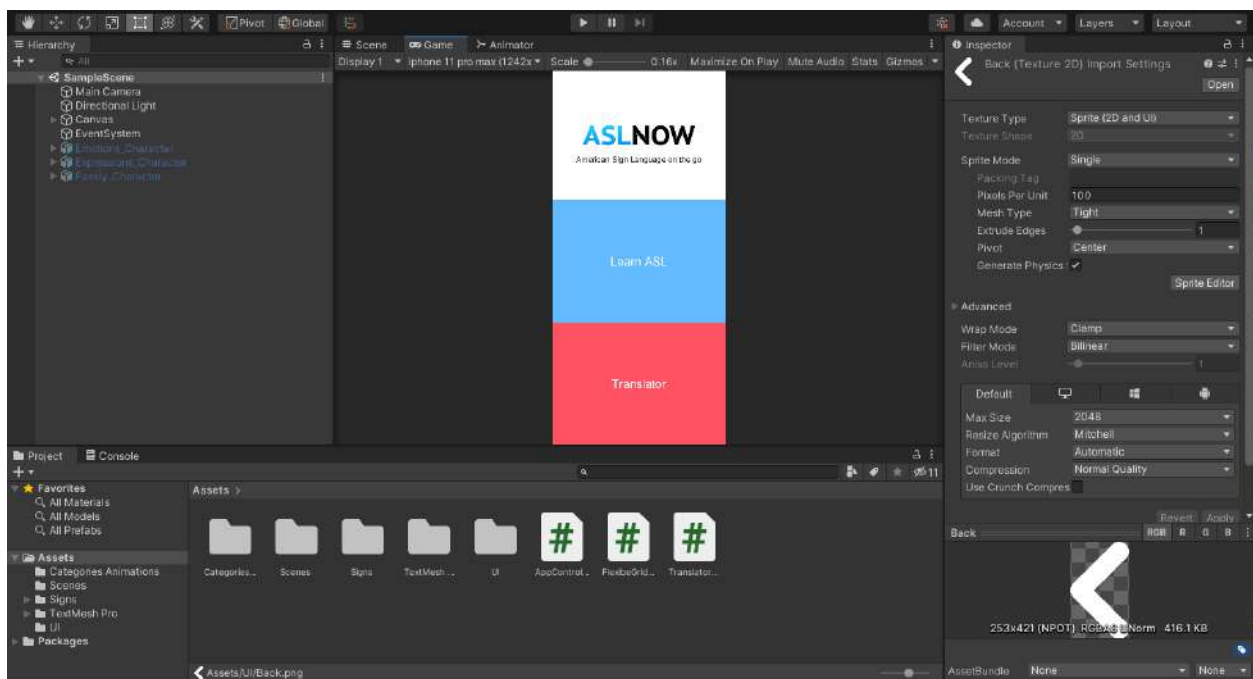


Figure 5. “App development using Unity”

For the development of our 3D models and accompanying animations we are using Blender, a free to use and open-source 3D computer graphics software that has similar capabilities of other 3D software such as Autodesk Maya and 3Dmax. Our development pipeline first requires the models and animations to be completed in blender and then exported to Unity as

.FBX files. The .FBX files hold all the other information necessary such that we can use our models and animations developed in blender. Figure 6 below shows the rendered view of the 3D model used on the left and the pose selection bones that are used to animate the model on right.



Figure 6. “Rendered Model and Armature in Blender”

For the development of our UI and graphics we are using Affinity Designer, a vector graphics editor, to pre-design our ideas. The application will be developed and optimized for IOS and Android.

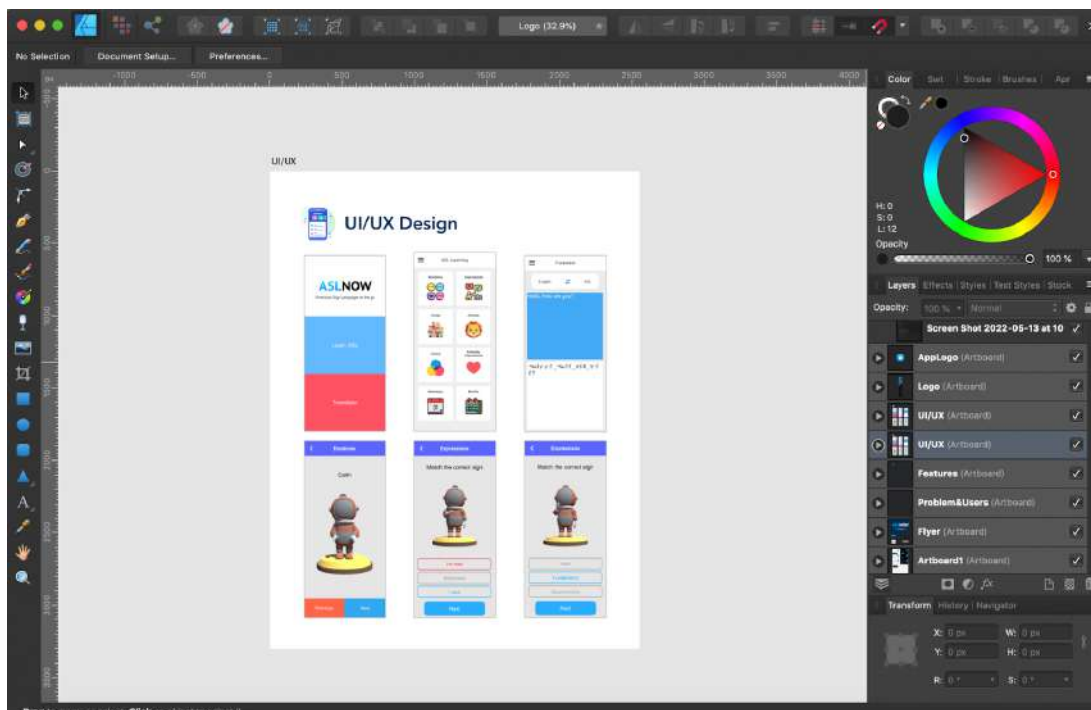


Figure 7. “UI/UX graphics in Affinity Designer”

Evaluation with Users and Partners

Our app has two features where one is learning American Sign Language (ASL) and a translation feature that translates ASL to English and English to ASL. The expected result is that when users click on learning ASL they are expected to see categories where each category has a list of common vocabularies and expressions. Let's say that the user clicked on "common expressions" category, they are expected to see a 3D model animation that shows and teaches words that are listed in the category. They will be able to click next and previous, to view other vocabularies. By the time the user finishes each category, they will take a quick quiz regarding the vocabularies they just learned. The 3D model provided in the teaching part can be zoomed in and out and be rotated for a better view of the animation. Furthermore, the translation feature is using a custom keyboard where users can type signs on the keyboard to translate into English and vice versa as well. Another feature that is currently a work in progress is that the translation will allow the user to view the 3D animations rather than ASL gestures from the keyboard. Based on feedback received, visibility of the 3D model is important and as such we have scaled up the current view of the model and changed the background color to allow for more contrast. It was also noted that it may be preferred to use a model that is more representative of a person with expressive facial animations, and as such we have begun the process of creating a more realistic human-like model in addition to the current one.

Based on the feedback we received, ASL doesn't only depend on the hand gesture, but it also depends on facial expressions, therefore, we made a new human-like model [6]. As we can observe in figure 8, we can see that each work



Figure 8. "Human-like new 3D model"

or expression has a completely different facial expression in addition to the hand gestures.

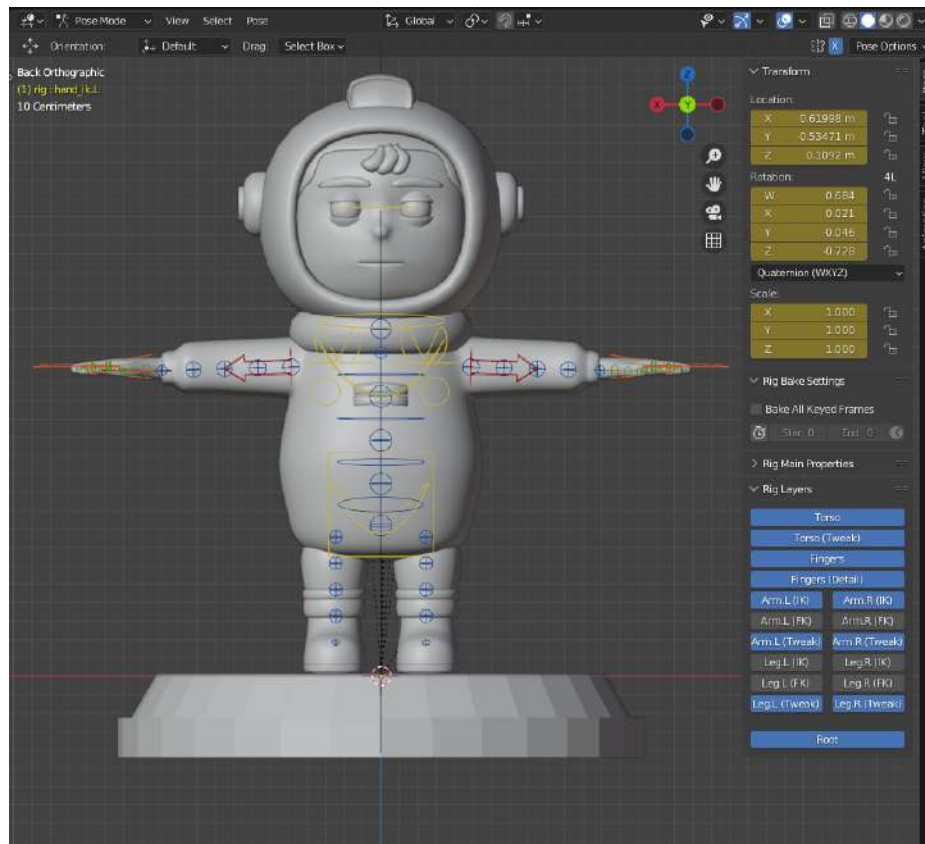


Figure 9. "New Blender model in Pose Mode"

Discussion of Potential Markets and Future Work

ASLNow main target customers who are really interested in learning ASL, including friends, family members and people who want to communicate with others speaking ASL. One of our main goals of creating this app is targeting schools and organizations to offer them our app for discounts. The reason we are targeting specifically schools is because we want kids to learn ASL in an interesting way using our 3D model which kids will mostly be attracted to. These kids might have a friend, family friend, or family member who's speaking ASL, so they can communicate with them easily. In addition, we would offer it to families who have deaf kids and neither the parents nor the child knows ASL, that would be the perfect time for our application to be used because parents can learn then teach their child through the app. On the

other hand, we also will offer our app to the deaf communities to help them teach kids and others ASL easily. Our app will be advertised through social media platform ads, as well as ads on subway entrances and public places so people can also be exposed to our app. We will also advertise our app through ads in other apps.

Regarding our future work, we will continue developing the app where we will have different 3D models and many other categories. We will also add the 3D model in the translation feature so that when users type in English to translate into ASL, the 3D animation can appear or be shown as whatever was typed to be translated. In addition, we will have a camera sensor for those who want to translate ASL to English, instead of just typing the alphabets of ASL they can just open the camera and talk in ASL to the camera where it will detect then translate it to English text. Regarding the quizzes, we will also add other different types of quizzes than multiple choices as well as we will definitely add other features to the app once we develop the current ones.

Branding

Throughout the course of this capstone class, our group has faced many obstacles and challenges along the way to get to the point we currently are. We learned that branding our application was a much more important matter that we needed to address, especially because our project is an assistive application aimed at improving the lives of people that primarily communicate through ASL or need to learn ASL. The focus of our topic, the logos, the implementation, and even the name of the app evolved over time.

During our first semester, the group decided to create an assistive technology that would specifically help the Deaf community or people that had significant hearing loss. The application would have text to speech and speech to text, while also attempting to dynamically translate from

ASL to English and vice versa. We learned however that we had not done significant research into the topic and that the task did not have realistic expectations. After some elaboration near the beginning of the second semester and through feedback received from surveys, our focus shifted to creating an application that would help improve communication for the Deaf community by actually raising awareness of the issue and by teaching American Sign Language through animations. Our business name had originally been called “everhear”, but after some feedback from evaluators, we realized that the name could be considered offensive towards the Deaf community because of the word “hear.” We changed the name to “ASLNOW” which was a better fit with our new focus. This change was also reflected in our business logo. The business slogan also changed from “Communication For All” to “American Sign Language on the go.” The app logos were also changed for similar reasons but only after careful consideration and research into American Sign Language. The current app logos now show the sign for “I love you” which happens to be a very powerful sign that is both friendly and inviting.

Original Business and App logos:

Final Business and App logos:



Figure 10. “Original Business Logo”



Figure 12. “Final Business Logo”



Figure 11. “Original App Logo”

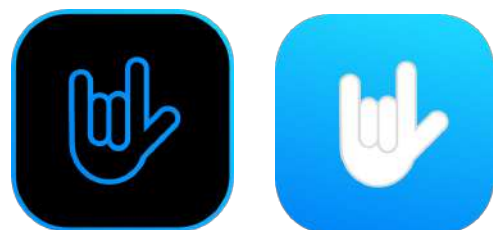


Figure 13. “Final App Logo”

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Acknowledgments

Throughout the semester, we had done a lot of presentation and receiving feedbacks from the professor, evaluators, classmates, members of ASL community. It helped us to improve our implementations and focus on details that we otherwise might not have realized. As we continue to make progress making our app, we are thankful for all the help we received thus far.

Specifically, we would like to thank the organizers, Professor Zhu for making the process of developing this application easy for us and helping us find a specific issue to tackle.



“The project is our own work. All outside sources have been properly cited. The project is supported by NYSID CREATE program.”

Contributions

Aliaa Abdelrahman:

- Team leader responsible for submitting document works.
- Responsible for organizing the work for the group.
- Responsible for supplies bought for CREATE presentation.
- Preparing presentation slides and reports,
- Responsible for updating Wiki-page and uploading all work needed there.
- Helped with the translation feature algorithm for the app.
- Report: Statement of the problem, Evaluation with Users and Partners, Discussion of Potential Markets and Future Work, and Acknowledgment.

Randy Castillo:

- App development in Unity
 - Animations integration
 - UI/UX Implementation
- Algorithms/Coding
 - Used C# to implement all algorithms
- Used Unity and VS Code for the app development
- Designed the UI of the app and the logos using Affinity Designer software.
- Report: Rationale, Development, Design.

Luigi Otoyá:

- Worked on the 3D aspects of the application.
- Designing and creating/updating the character model in blender.
- Creating the skeleton armature needed for the ASL animations.
- Creating the animations for each category.
- Preparing and exporting to Unity.
- Worked on zoom in / rotation feature.
- Report: Background, Branding, Development and Design and Figures (Blender Section), revision, grammar, typos, formatting.