Project Summary

People who are deaf or hearing impaired have limited communication channels when there is no interpreter available. They must rely on either typing or using hand gestures that a hearing individual can understand. This at times may be frustrating and challenging to the hearing impaired individual because they are not using their natural language to communicate. Communicating with such language barrier also takes extra time than if the conversation was seamless. The proposed project tries to bridge the communication barrier by implementing an ASL to voice video chatting interface system. This project plans to use machine learning, computer vision, and video modification software to allow the targeted individuals the opportunity to have a conversation with someone who does not understand ASL, in real time. The equipment required for this project is the Microsoft Kinect sensor, video modification libraries, and ASL video libraries.

Intellectual Merit:

This Small Business Innovation Research Phase I project will lie within the the recognition of gestures and machine learning. The recognition of gestures, specifically finger tracking has become increasingly popular and more researched. Many companies are integrating finger recognition into their products, such as video games and phones. As technology advances, devices will move away from the touch screen and begin to rely more on finger and voice recognition. This project will dive into tracking finger gesture libraries that already exist and will improve them by extend finger gesture technologies to recognize ASL. The translation of ASL hand gestures to text is a current problem without a published and accurate solution. Additionally, this project will involve machine learning, which is a current problem that will always have room for advancement as technology improves. Machine learning will be used as different users will have different sign styles and the software will need to learn when to accept a word and when to reject. The largest anticipated challenge will be distinguishing ASL from common hand gestures. Examples of common hand gestures is scratching a nose or moving a piece of hair from the cheek. Another anticipated problem the project may face will be the processing time and having the translations occur in real time. The more software implemented, the slower the translations. Given that voice detection software is already published, this project will integrate that technology in a way that the transitions are undetected.

Broader Impact:

The broader impact of this project is to improve social norms when it comes to communicating with individuals of the deaf or hearing impaired community. Currently, the targeted audience work harder to be understood by their hearing counterparts. What is proposed has the potential to be used on many platforms besides the Microsoft Kinect. The primary demographic of this project can use this software on their mobile devices and personal computers. The outcome of this project is the first step towards bridging the gap between people with a language barrier. This program can also be expanded to work with other sign language dialects across the world and be translated into many foreign languages.

Elevator Pitch:

Many people have participated in a conversation with someone who speaks a different language than them. Many people also know the feeling of being misunderstood and the frustration of not being able to clarify their thoughts. Deaf and hearing impaired individuals feel this way whenever they are communicating with a hearing person. In today's society and business practices, the most convenient way to virtually interact with others is through videoconferencing. Without the assistance of an interpreter, telecommunication between the deaf/hearing impaired and someone who does not know sign language are limited to text messages and other text chatting systems. What if there was a video chatting interface that could break that language barrier? What if there was a way to allow the people who sign to have a conversation with someone with no signing experience in an effortless manner?

This is the idea behind EC-Chat: The ExClusive Deaf-Inclusive Video Chat Interface. With this proposed interface, the deaf/hearing impaired community will have one more outlet for communicating with individuals who do not understand sign language. This technology will have the ability to translate ASL into text and speech to text in real time. The current technology available for closed captioning is only useful for editing videos after they have been created. No other video chatting interface has the capability to translate a conversation during a live stream. Incorporating these two aspects into EC-Chat will provide a tool that will be useful for business interactions, large conferencing events, and for personal everyday use.

This project will incorporate machine learning and data mining in order to accurately translate the ASL signals. ASL is a complex language and has many classifications: facial expression, palm placement, location, stationary and non-stationary. This project will focus on stationary and basic non-stationary signs due to time constraints.

EC-Chat has three components: the ASL to text translation, the speech to text translation, and the video chatting interface. Transcribing ASL into text will involve using machine learning techniques to classify and interpret the data to convert it to American English. Translating speech to English has already been implemented on various platforms. This software plans to integrate the three components into a usable application that can be accessed online. The outcome for this project is to connect individuals who speak different languages without the complexities of having to translate one's thoughts. EC-Chat aims to handle all of the translations. ASL and American English are the main languages for this project, but this software can be expanded to support other languages in the future.