Republic of the Philippines
CAVITE STATE UNIVERSITY
Don Severino de las Alas Campus
Indang, Cavite

KINECT-BASED CONVERSION OF FILIPINO SIGN LANGUAGE TO TEXT: ENHANCING COMMUNICATION ACCESSIBILITY FOR THE DEAF AND MUTE COMMUNITY

Rationale/ Introduction

Potgantwar and Bachchhav (2019) emphasize the significance of Sign language as the primary means of communication for individuals who are deaf and mute. People with disabilities face difficulties in engaging with society, as most individuals struggle to comprehend their sign language. According to F. R. Session, A. Pacific, and S. Africa (2014), the Philippines has a 1.23% prevalence of individuals who are deaf, mute, or hearing impaired within the total population. the lack of communication access can lead to feelings of frustration, isolation, and a sense of being misunderstood among Deaf and Mute individuals. This can adversely affect their mental health and overall welfare, highlighting the crucial need for creative solutions to overcome this communication barrier and foster improved understanding and inclusiveness within the community.

To bridge the communication barrier between individuals with normal hearing and those who are deaf or mute, the system under consideration is designed to recognize sign language gestures of deaf and mute individuals through the use of the Kinect motion sensor device. Furthermore, the translated words are displayed on an output screen. This innovative mechanism serves as a facilitator between individuals with and without disabilities, aiming to promote inclusivity. Through the collection of 3D dynamic motions, the Kinect motion sensor enables feature extraction for the Filipino Sign Language (Hazari, Asaduzzaman, Alam, & Al Goni, 2017).

The proposed system aims to overcome communication barriers encountered by the Filipino deaf and mute community through a focus on Filipino Sign Language (FSL). By leveraging the capabilities of Kinect motion sensor technology, the system is able to identify and convert FSL gestures into text instantly. This facilitates smooth communication between deaf individuals utilizing FSL and the general public. The system can recognize a wide array of fundamental FSL signs and permits the formation of basic sentences by combining these signs, thereby enhancing the expressiveness and efficacy of communication for deaf users. Additionally, the creation of an intuitive and user-friendly

interface ensures accessibility for individuals with varying levels of technological proficiency, making communication tools more widely available. With its dedication to delivering immediate results and functioning in real-time, this system has the potential to significantly enhance communication accessibility and inclusivity for the Filipino deaf and mute community. It plays a role in their social integration and empowerment (Hazari, Asaduzzaman, Alam, & Al Goni, 2017).

The proposed system aims to overcome the communication challenges encountered by the Filipino deaf and mute community, specifically focusing on Filipino Sign Language (FSL). Through the utilization of Kinect motion sensor technology, the system is capable of identifying and translating FSL gestures into text instantly, thereby facilitating smooth communication between deaf individuals who use FSL and the public. Through the use of user-friendly interfaces and real-time functionalities, the system improves accessibility and inclusivity, ultimately empowering the deaf and mute community. This groundbreaking solution not only addresses a crucial societal requirement but also makes a significant contribution to the realm of computer science by demonstrating the practical application of technology in promoting social integration and well-being. In essence, this proposal offers substantial value in advancing the field of computer science and promoting better understanding and inclusivity within the community.

Significance of the Study

The study's importance lies in its ability to eliminate communication obstacles for the deaf and mute community, specifically in the context of Filipino Sign Language (FSL). Through the development of a Kinect-based system for converting FSL to text, this research presents a practical solution to improve communication accessibility. The results could significantly influence how individuals with hearing impairments participate in education, work, and social interactions. Additionally, the technology created in this study may serve as a model for similar systems in different languages and cultures, fostering inclusivity across various fields. Ultimately, the outcomes of this study could drive further advancements in assistive technologies and contribute to a more inclusive society.

One possible way in which the Sustainable Development Goals for Quality Education can make a difference is by improving the accessibility of education for people with hearing loss and those who are mute through the translation of Filipino Sign Language into text. By offering resources that aid in understanding and engaging with educational content, it

promotes the participation of students with hearing impairments and mute individuals in academic environments. Additionally, the SDGS have the potential to reduce inequalities both within and among countries by closing the communication divide between individuals with hearing impairments, mute individuals, and the general population. By ensuring that mute individuals have equal access to communication and information, they can actively engage in social, economic, and cultural activities, ultimately fostering a more inclusive and equal society.

The involvement of Cavite State University (CvSU) in thematic areas under Societal Development and Inequality and Public Health and Welfare for "Kinect-Based Conversion of Filipino Sign Language to Text: Enhancing Communication Accessibility for the Deaf and Mute Community" is significant. In terms of Societal Development and Inequality, CvSU's commitment to inclusive education aligns seamlessly with the initiative's objective of improving communication accessibility for the deaf and mute community. By providing tools for translating sign language into text, CvSU plays a pivotal role in dismantling communication barriers and fostering inclusivity within educational environments. Moreover, the initiative champions social inclusion by ensuring that individuals with hearing impairments and mute individuals have equal access to communication and information. This aligns perfectly with CvSU's mission of cultivating a more inclusive society where everyone can participate fully in social, economic, and cultural endeavors. In the realm of Public Health and Welfare, CvSU's focus extends to enhancing healthcare accessibility for marginalized populations, including individuals with disabilities. By enhancing communication accessibility through the Kinect-based conversion of sign language to text, CvSU contributes significantly to improving healthcare access and quality for the deaf and mute community. Additionally, the initiative directly enhances the welfare of this community by empowering them to communicate effectively in various settings. This reflects CvSU's dedication to promoting the well-being and quality of life of all individuals, regardless of communication barriers or disabilities.

Scope and Limitations of the Study

The proposed system aims to enhance communication accessibility for the Filipino deaf and mute community by using Kinect motion sensor technology to translate Filipino Sign Language (FSL) gestures into text. It will focus on recognizing commonly used FSL gestures and displaying their corresponding text output in real time, allowing users to form

basic sentences by combining recognized gestures. The system is designed to function within controlled environments, such as classrooms, workplaces, and public service areas, where clear and structured communication is essential. Additionally, the system will store gesture data in a database, improving accuracy over time and enabling further research on sign language recognition. With a user-friendly interface, it seeks to ensure that individuals with varying levels of technological proficiency can easily operate the system, promoting inclusivity in different social and professional settings.

However, the system has certain limitations. Its accuracy relies on proper positioning and clear visibility of gestures, meaning poor lighting, background movement, or obstructions may lead to recognition errors. The initial version will be limited to a predefined set of FSL gestures, making it less effective for interpreting complex expressions or variations in signing styles. Furthermore, while the system translates sign language into text, it does not generate spoken translations, which may still require users to read the output. The system also does not account for the full grammatical structure of FSL, potentially leading to less precise sentence formations. Additionally, individuals with restricted hand mobility may experience challenges in using the system effectively. As Kinect-based technology evolves, periodic updates will be needed to expand the gesture database and improve recognition accuracy, requiring ongoing development and testing.

Objectives of the Study

The primary objective of this research is to improve communication between people who do not have hearing or speech disabilities and those who do. As of now, there is no way for these two groups to be associated, indeed though a critical portion of the population in nations like the Philippines falls into the last-mentioned group. To address this issue, the study aims to make a framework or innovation that uses the Microsoft Kinect Sensor to precisely interpret Filipino Sign Language motions into content in real-time. The essential objective is to make communication more available for hard of hearing and quiet people by giving them a way to effectively express themselves and associate with others through composed communication. By bridging the gap between sign language and content, this investigates points to engage hard of hearing and quiet people to completely take an interest in social, instructive, and proficient settings, eventually advancing inclusivity, uniformity, and a way better quality of life for this underserved population.

Expected Outputs

The proposed study envisions several significant outcomes. Firstly, the system will provide translated text, allowing individuals with hearing and speech impairments to effectively communicate using written means. Secondly, during the training phase, the system will gather gesture data for Filipino sign language expressions, facilitating accurate recognition and translation of gestures. Moreover, the study aims to create visual representations of gesture movements, assisting in the analysis and understanding of captured gestures. Lastly, the development of a comprehensive database containing Filipino sign language gestures and their corresponding written translations will streamline real-time communication by enabling efficient retrieval of gesture translations. These outcomes collectively contribute to the overall objective of improving communication accessibility for the deaf and mute community, promoting inclusivity and active participation in various social, educational, and professional contexts.

References

Potgantwar, & Bachchhav. (2019, October). Sign Language Interpreter using Kinect Motion Sensor using Machine Learning. Retrieved from https://www.ijitee.org/wp content/uploads/papers/v8i12/L26451081219.pdf

Hazari, S. S., Asaduzzaman, M., Alam, L., & Goni, N. A. (2017). Designing a Sign Language Translation System Using Kinect Motion Sensor Device. https://doi.org/10.1109/ecace.2017.7912929

Tolentino, L. K. S., Juan, R. O. S., Thio-Ac, A. C., Pamahoy, M. a. B., Forteza, J. R. R., & Garcia, X. J. O. (2019). Static sign language recognition using deep learning. International Journal of Machine Learning and Computing, 9(6), 821–827. https://doi.org/10.18178/ijmlc.2019.9.6.879