WWW.IJRPR.COM

International Journal of Research Publication and Reviews

Journal homepage: www.ijrpr.com ISSN 2582-7421

Dhvani-A Sign Language Translator for Deaf-Mute

Nikhil Matti[1], Swaraj Khichadi[2], Omkar Patil[3], Ranjita Gouri[4]

[1]Dept. of Computer Science Engineering S. G. Balekundri Institute of Technology. Belagavi, Karnataka, India. nikhilmatti0107@gmail.com
[2]Dept. of Computer Science Engineering S. G. Balekundri Institute of Technology. Belagavi, Karnataka, India. swarajKhichadi@gmail.com
[3]Dept. of Computer Science Engineering S. G. Balekundri Institute of Technology. Belagavi, Karnataka, India. orksorb143@gmail.com
[4]Dept. of Computer Science Engineering S. G. Balekundri Institute of Technology. Belagavi, Karnataka, India. ranjitagouri40@gmail.com

ABSTRACT—

In many parts of the country, such as India, where more than 21 modern languages are spoken, few people here are able to speak only one language. In day-to-day life, everyone should speak to each other by listening or by speaking whenever there is a need to communicate with other people. But when other people in the community with different skills need to communicate with us, it seems to be very difficult, so there will be the problem while understanding their language correctly and even talented people experience some difficulty in communicating with them. The utilization of sign language serves to bridge the communication divide between individuals who possess diverse capabilities and the general population, thereby fostering an inclusive environment. Lately, there has been a surge in the development of numerous innovative strategies within this particular domain. Sign language serves as a prevalent means of communication for individuals who are deaf or hard of hearing. A project has been undertaken to create a sign language system capable of recognizing 26 distinct letters from the English language. This system utilizes the Faster Region-based Convolutional Neural Network (Faster-RCNN) as its foundation. Consequently, the objective is to establish a communication system that bridges the gap between individuals with disabilities and those without.

Keywords: Faster Region-based Convolutional Neural Network (Faster – RCNN), Deep Learning (DL), Sign Language, Open-Source Computer Vision Library (Open CV).

I. Introduction

Sign language is a visual language used by individuals with hearing impairments to communicate with each other and with the wider hearing community. However, due to the limited number of people proficient in sign language and the lack of universal understanding among the general population, deaf individuals often face challenges in everyday communication. To bridge this communication gap and enhance inclusivity, technological advancements have paved the way for the development of innovative solutions such as the Sign Language to Speech Converter. This transformative device leverages the power of artificial intelligence and machine learning to facilitate seamless communication between individuals who use sign language and those who rely on spoken language.

The Sign Language to Speech Converter is designed to recognize and interpret the gestures, movements, and expressions used in sign language and convert them into spoken words or written text. This breakthrough technology aims to provide deaf individuals with a more efficient and accessible means of communication, empowering them to interact more easily in various social and professional settings. The converter typically consists of a camera or a sensor array that captures the movements and gestures of the user's hands, fingers, and facial expressions. These visual inputs are then processed by sophisticated computer algorithms, which employ deep learning techniques to analyze and interpret the sign language components. By recognizing specific signs, handshapes, and facial expressions, the system can generate accurate translations in real-time.

One of the primary advantages of the Sign Language to Speech Converter is its ability to enable effective communication amongst individuals with hearing impairment and individuals who do not understand sign language. Through the automatic translation of sign language into spoken language, the device enables a seamless exchange of information, fostering inclusivity and reducing barriers in various social, educational, and professional contexts. Additionally, the Sign Language to Speech Converter has the potential to revolutionize education for deaf individuals. By providing real-time translation of sign language into spoken words or written text, it can facilitate better access to mainstream educational resources, enhance classroom participation, and promote a more inclusive learning environment.

Moreover, the converter can find applications in healthcare settings, where effective communication between healthcare professionals and deaf patients is crucial. It can assist medical practitioners in understanding and addressing the needs and concerns of deaf individuals, ensuring that they receive the same quality of care as their hearing counterparts.

In conclusion, the Sign Language to Speech Converter represents a groundbreaking technological innovation that aims to bridge the communication gap between deaf individuals and the wider hearing community. By harnessing the power of artificial intelligence and machine learning, this device has the

potential to transform the lives of individuals with hearing impairments, enabling them to communicate more effectively and participate fully in various aspects of life.

II. OBJECTIVES

- Enable Communication Accessibility: The primary objective of a sign language to speech converter is to facilitate communication accessibility for individuals who are deaf or hard of hearing. By converting sign language gestures into spoken language, it allows them To enhance interpersonal communication with people who do not understand sign language.
- Real-Time Conversion : The converter aims to provide real-time conversion from sign language to speech. It should be able to analyze and interpret sign language gestures accurately and quickly, ensuring minimal delay in the conversion process. This objective allows for smooth and seamless communication between sign language users and non-sign language users.
- Accuracy and Reliability: Another crucial objective is to achieve a high level of accuracy and reliability in the conversion process. The converter should be able to recognize and interpret different sign language gestures accurately, capturing the intended meaning behind each gesture. It should minimize errors and misinterpretations to ensure effective communication.
- User-Friendly Interface: The converter should have a user-friendly interface that is Simple and accessible, it should offer straightforward guidance for individuals who use sign language on how to position their hands and perform gestures for optimal recognition. Additionally, the interface should be intuitive and accessible to non-sign language users, allowing them to understand the converted speech easily.
- Adaptability to Different Sign Languages: Sign languages vary across different regions and countries. An important objective is to develop a converter that can adapt to and recognize different sign languages. It should be able to interpret a wide range of sign language gestures and dialects, accommodating the diverse needs of sign language users worldwide.
- Portability and Accessibility: The converter should be designed to be portable and accessible across various platforms and devices. It should be compatible with smartphones, tablets, computers, and other communication devices. This objective ensures that individuals can use the converter conveniently in different settings, such as classrooms, workplaces, public spaces, or during personal interactions.
- Continuous Improvement and Updates: As technology advances and new research emerges, the converter should strive for continuous improvement. Regular updates should be provided to enhance the accuracy, reliability, and functionality of the converter. This objective ensures that users can benefit from the latest developments in sign language recognition and conversion technology.
- By addressing these objectives, a sign language to speech converter aims to bridge the communication gap between sign language users and non-sign language users, fostering inclusivity and equal access to communication for all individuals.

III. RELATED WORKS (LITERATURE SURVEY)

The current study builds upon a significant body of research that has investigated the effects of topic of the study on relevant outcome variables. In this literature review, we will summarize and analyze the key findings from previous studies in this area, highlighting the most important and relevant findings to inform the present study.

In this paper 2“Convolutional Neural Network Based sign language translation system”, the author Basel Dabwan discussed about the system that contains Convolutional_Neural_Network (CNN) based on an in-depth learning algorithm for Successful background is a handy American awareness architecture. Sign Language (ASL) This paper builds ASL translation and provides a complete overview of in-depth approaches based on learning to touch desires. The proposed solution was tested on data samples from ASL data sets once obtained a total accuracy of 86.68%. “The proposed plan was appropriate and is faithful to Deaf people. Proposed system it should be designed with the front of the camera and the outlet provided in the form of a text.

In the paper 3“Application Research on Face Detection Technology based on Open CV in Mobile Augmented Reality”, the author Hu Peng discussed that an open-source Computer Database (open CV) is a computer-vision based open-source streaming. “Open CV” provides a very rich visual processing algorithm for C- Programming Language to be written and integrated with its open_source features. A vision-based approach and Data gloves are widely used to interpret the interactions of human computer interactions. The camera is used to capture an image in a vision-based way. A vision-based approach minimizes stress as it does on a glove-based approach.

In this paper 4 “Indian_Sign_Language Recognition Review”, the authors Anuja V. Nair, Bindu, they suggested Real-Time Sign Recognition included an algorithm in which the video was first shot and then divided into multiple frames and a graphic frame was released and continued on that frame with various features. as a Gaussian distinction. The Scaling Machine Feature and other features have been removed although SIFT assists in touch detection. With the development of image processing and creative techniques, many techniques have been developed in this field. Many Indian Sign Language (ISL) symbols are written twice and that is why they are much more complex compared to American Sign Language (ASL) used in one hand. Therefore, most researchers use American Sign Language (ASL) symbols to make most of their website.

Considering these three base papers “Application

Research on Face Detection Technology based on Open CV in Mobile Augmented Reality" and "Indian_Sign_Language Recognition Review", We have come up with an idea, which converts 26 sign gestures into English speach and that will be translated into regional languages like Hindi, Kannada, Marathi, Telegu etc.

IV. SYSTEM REQUIREMENTS

4.1 Hardware requirements

- System: The system with the standard minimum configuration.

4.2 Software requirement:

- Operating system: windows 7 and above
- Coding Language: Python
- Coding Platform: IDLE, Jupyter notebook, PyCharm

V. METHODOLOGY

This segment comprises comprehensive information regarding the various components, modules and sub-components involved in the project.

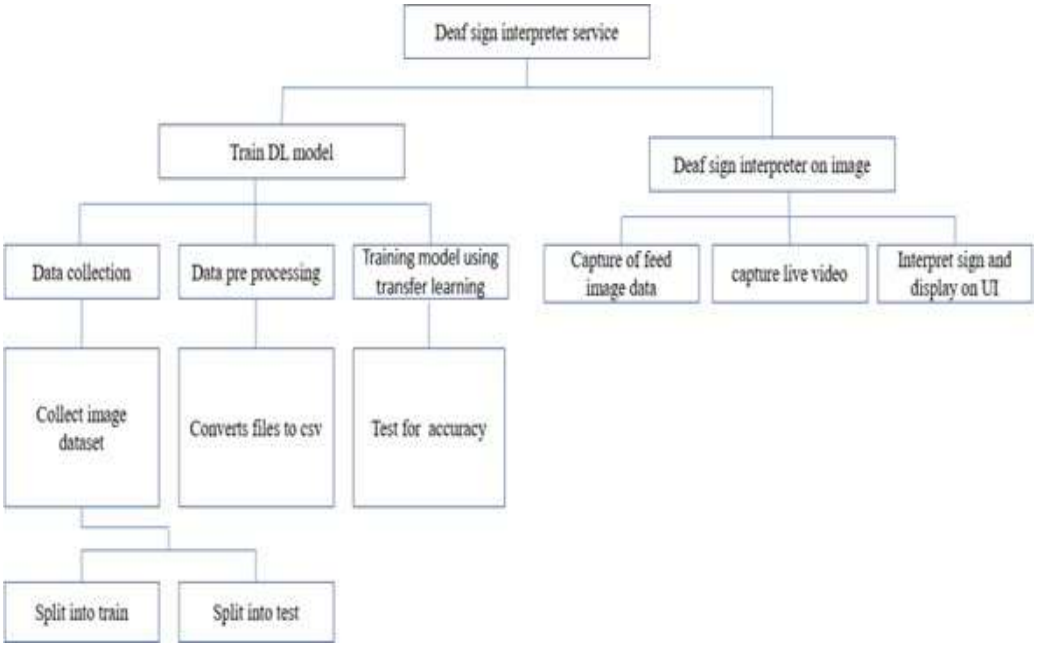

Fig1. components, modules and sub- components.

5.1 Train Model

The initial and most essential step in learning sign language involves the process of "Deep Learning" (DL) model training. This entails training a pre-existing model, and upon successful completion of the training, the model can be utilized in conjunction with an A comprehensive learning framework is employed to demonstrate the outcomes, ensuring originality and integrity. The process comprises several essential stages, including Data Collection, Pre-Data Processing, and Model Training utilizing transfer learning techniques.

Data Collection: To utilize the transfer learning technique during the training process a pre-existing model, data acquisition becomes essential. The process of data collection encompasses obtaining image data that consists of a variety of sign language instances relevant to educational modeling. For each sign language event, we diligently gather data samples, which are later employed for training the model. Following the data collection phase, the dataset is partitioned into separate training and testing subsets, ensuring that the training data is appropriately prepared

Data Preprocessing: Prior to data processing, the image data is resized and labeled according to a chosen deep learning network specialized in transportation reading. Both the test and train images undergo resizing, and appropriate marking is applied using Label Software. The labeled files are then converted into CSV format, which will be utilized to generate training and testing log files for the deep learning (DL) model.

Model Training with Transfer Learning: Once the requisite training data is prepared, the training process involves employing a transfer learning method. The selected architecture for this purpose is RCNN, which is trained anew using the provided deaf signal data to identify the deaf signal. Following the completion of model training, the accuracy of the results is evaluated. If the accuracy falls short, the training parameters are adjusted, and the model training procedure is iterated until desired outcomes are achieved without or the loss function stabilizes.

5.2 Deaf Sign interpretation

Once the trained model is prepared, a Python application will be developed to comprehend signals from individuals who are deaf. This Python application will allow the loading of a video image and facilitate the identification of deafness, as well as provide editing effects for both images and video feeds.

Capture Image or feed image: To obtain the image for interpretation, the module will offer the functionality to capture an image or select an existing image from a feed.

Capture Live video: The deaf sign interpretation service enables the direct processing of video, whether it is prerecorded or streamed in real-time. This service interprets the sign language displayed in the video and presents it on a user interface (UI). A trained model is utilized to analyze input images or framed videos. When the model detects a symbol, it provides information about the symbol, the corresponding event, the confidence level, and a dictionary containing potential related links.

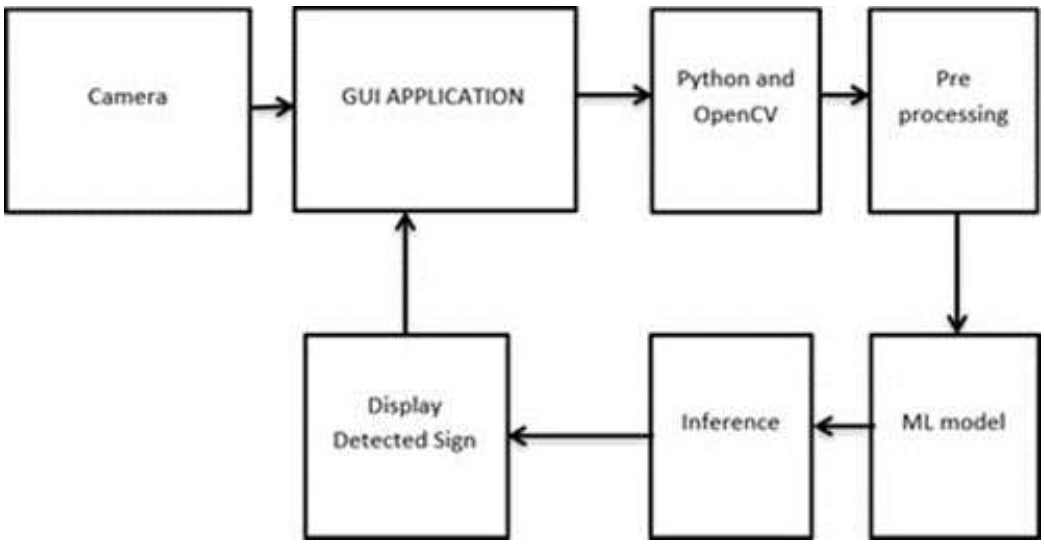

Fig2. Block diagram of the working principle of the

VI. EXPECTED OUTCOME OF THE PROJECT

Conversion of sign language to natural languages like English and Expecting to get sentence as an output Which is generated by processing live sign language.

VII. CONCLUSION

In conclusion, the advent of sign language translators has revolutionized communication for the deaf and hard of hearing community. These innovative tools have successfully bridged the gap between sign language and spoken language, enabling effective and inclusive interactions.

By utilizing advanced technologies such as computer vision and machine learning, sign language translators have significantly improved accessibility in various domains, including education, healthcare, and public services. They have empowered deaf individuals to access information, express their thoughts, and participate fully in society on an equal footing with their hearing peers.

The development of sign language translators also highlights the power of human ingenuity and technological advancements working together to address societal challenges. This transformative solution has opened doors to employment opportunities for sign language interpreters, while fostering a more inclusive environment for the deaf community.

Moreover, sign language translators have the potential to break down communication barriers on a global scale. By leveraging the internet and mobile devices, these tools can transcend geographical boundaries and facilitate cross-cultural communication, fostering understanding and unity among diverse communities.

However, it is crucial to acknowledge that sign language translators are not a substitute for the human connection and expertise of skilled sign language interpreters. They should be viewed as complementary tools that enhance communication rather than replace the irreplaceable human element.

As we continue to advance in technology, it is essential to prioritize ongoing research and development in sign language translation. This includes refining accuracy, expanding language support, and addressing unique regional dialects and variations within sign languages.

In conclusion, sign language translators have revolutionized the way we communicate with the deaf and hard of hearing, empowering individuals and fostering inclusivity. With further advancements, these tools will continue to reshape our world, ensuring equal opportunities and accessibility for all.

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