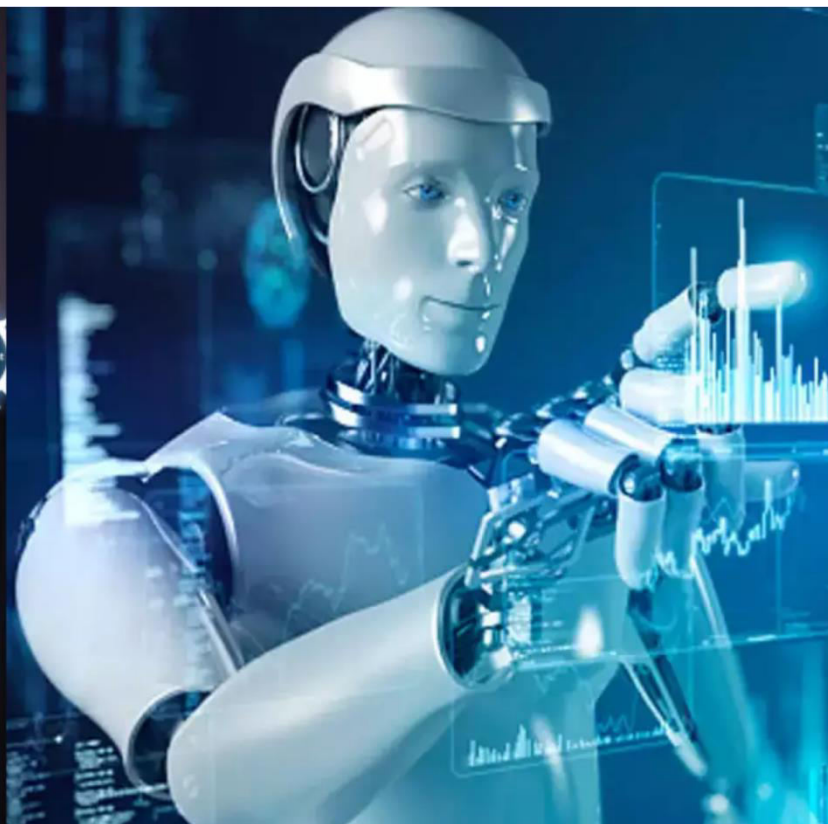




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Review Paper on Sign Language Recognition by CNN

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ABSTRACT: Voice and Language is the main thing for human to communicate with each other. Due to hearing ability we can understand thoughts of each other. Even nowadays we can give commands using voice recognition. But what if one absolutely cannot hear anything and eventually cannot speak. So the Sign Language is the main communicating tool for hearing impaired and mute people, and also to ensure an independent life for them, the automatic interpretation of sign language is an extensive research area. With the use of image processing and artificial intelligence, many techniques and algorithms have been developed in this area. Every sign language recognition system is trained for recognizing the signs and converting them into required pattern. The proposed system aim to provide speech to speechless, in this paper the double handed Indian Sign Language is captured as a series of images and it's processed with the help of Python and then it's converted to speech and text.

KEYWORDS: Machine Vision, Gesture Recognition, Convolutional Neural Networks (CNN), Image Processing and Feature Extraction, Assistive Technology for the Hearing and Speech Impaired

I. INTRODUCTION

Globally, hearing loss has become a widespread issue. By 2050, the World Health Organisation projects that 2.5 billion people (or one in four people) would have some degree of hearing loss, with 700 million people needing hearing rehabilitation. The reliance on sign language, the major language of communication for people with varying degrees of hearing difficulties, grows as a result. Sign languages are complete languages with their own grammar and syntax, but they differ from natural languages in terms of their linguistic features. Each sign language has its own dictionary, which is typically smaller than dictionaries for natural languages. As a result, signers utilise a single sign to represent a variety of spoken synonyms, including the phrases "home," "house," and "apartment." Similar to spoken languages, sign languages are diverse; a number of sign languages, including the American sign language (ASL), the Chinese sign language (CSL), and the Arabic sign language (ArSL), are spoken and used around the world. One of the sign languages used in Arabic-speaking nations is ArSL.

Sign languages are vivid on wide and world level. There are multiple sign languages in world which are regular in use that are ASL (American Sign Language) ISL (Indian Sign Language), BSL (Bangladesh Sign Language), MSL (Malaysian Sign Language). These languages are Built and Developed with lots of work and practical testing with intention of feasibility to the deaf and dumb persons. Any language is created with its word and its meaning. Sign Language is created as "Sign" and "Action of That Sign". Because here we are not able to make them understand meaning of sign by writing word. As they are deaf and can not listen from birth so we cannot teach them words.

Motivation

Communication is a fundamental part of human life, allowing people to share ideas, emotions, and thoughts. However, individuals who are deaf or mute face major challenges in expressing themselves to others. This inspired the idea of developing a system that can bridge the communication gap between normal and hearing-impaired people. With advancements in Artificial Intelligence and Image Processing, it has become possible to recognize hand gestures and translate them into meaningful text or speech. The motivation behind this project is to use these technologies to give a voice to speechless individuals, help them gain confidence, and enable them to communicate independently in society. This project aims to create a positive impact by empowering differently-abled people and making communication inclusive, simple, and effective for everyone.

II. LITERATURE SURVEY

The literature survey explores various approaches developed to bridge the communication gap between speech-impaired and normal individuals through sign language recognition and speech conversion technologies. Khan Sohelrana et al. proposed a smart glove-based system using flex sensors and NodeMCU to convert hand gestures into speech, aiming to reduce communication barriers for the mute community. Similarly, Dalal Abdulla et al. developed a sign-to-speech/text system for Arabic language translation using a wireless smart glove interfaced with a microcontroller, achieving accurate and reliable real-time output. Aiswarya V. et al. introduced a Hidden Markov Model (HMM)-based Tamil sign language to speech conversion system utilizing accelerometer and gyroscope sensors for gesture recognition, demonstrating smooth and efficient translation from signs to Tamil speech. Vi N.T. Truong et al. presented a vision-based translator for American Sign Language (ASL) that integrates the Viola-Jones algorithm with AdaBoost and Haar-like classifiers, achieving an impressive 98.7% accuracy in recognizing static hand signs and converting them into text and speech in real time. Nan Song and Hongwu Yang proposed a gesture-to-emotional speech conversion system combining deep neural networks (DNN) and support vector machines (SVM) for recognizing gestures and facial expressions, followed by a bilingual HMM-based speech synthesizer that produced emotion-rich speech outputs technique.

III. METHODOLOGY

The sequential pipeline that makes up the system architecture of a Sign Language Recognition (SLR) model starts with data collection, in which cameras or sensors record hand motions or signals in the form of images or videos. The region of interest is then isolated by passing this input through a preprocessing module that uses hand tracking, noise reduction, and background subtraction. Only the gesture-relevant parts of the frame are processed thanks to the segmentation stage, which increases the precision of the analysis that follows.

The modules for feature extraction and categorization are then activated. Spatial and temporal data are extracted from static or dynamic gestures using methods such as Convolutional Neural Networks (CNN), Artificial Neural Networks (ANN), and Hidden Markov Models (HMM). Following that, these characteristics are categorized into the appropriate sign classes that correspond to letters, words, or phrases. In order to make the identified sign understandable to non-sign language users, it is finally converted into written or audio output. Real-time interaction and conversation between the general public and hearing-impaired people are made possible by the architecture.

IV. SYSTEM ARCHITECTURE

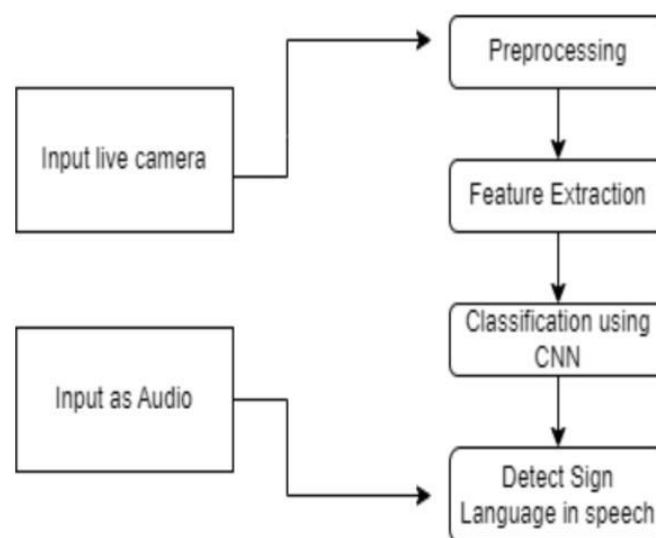


Figure 1. System Architecture

The Sign Language Recognition System aims to bridge the communication gap between hearing and speech-impaired individuals and others. Using Python, image processing, and AI techniques, the system captures hand gestures through a camera and converts them into text and speech. It is cost-effective, user-friendly, and can be used on multiple devices. The project promotes inclusive communication, enhances confidence and independence among differently-abled people, and demonstrates how technology can be used for social good.

V. CONCLUSION

Sign Language is a tool to reduce the communication gap between deaf-mute people and normal person. This system which is proposed above gives the methodology which aims to do the same as the two-way communication is possible. This method proposed here facilitates the conversion on the sign into speech. This overcomes the requirement of a translator since real time conversion is used. The system acts a voice of the person who is deaf-mute. This project is a step towards helping a specially challenged people. This can be further enhanced by making it more user friendly, efficient, portable, compatible for more signs and as well as dynamic sign.

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