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Sign Language Recognition System Using Machine Learning

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Abstract: ***Voice and language is the main thing that people understand one with the other. We can understand thoughts through hearing each other. Even nowadays we can give commands using voice recognition. But what if one hears absolutely nothing and eventually can't speak. Sign language is the main communication tool for hearing impaired and mute people and also to ensure their independent lives, automatic sign language interpretation is an extensive area of research. With use of image processing and artificial intelligence, many techniques and algorithms have been developed in this area. Every sign language recognition system is trained to recognize characters and convert them into the desired pattern. The goal of the proposed system to provide speech to infants, in this document ambidextrous Indian Sign Language is captured as a series of images and is processed using Python and then converted to speech and text.***
Technical keywords: Machine Learning, sign language, pre-processing.

I. INTRODUCTION

Sign languages are alive on a wide and global scale. There are more character languages in the world that are commonly used and which are ASL (American Sign Language) ISL (Indian Sign Language), BSL (Bangladeshi Sign Language).MSL (Malay Sign Language). These languages are created and developed with a lot of work and hands-on testing with the intention of feasibility for the deaf and stupid persons. Any language is created with its word and it meaning Sign language is created as "Character" and "Action of this character". Because here we are not able to make them understand the meaning of the sign by writing the word. since they are deaf and cannot hear from birth, we cannot teach them words. We are motivated with aim to use new technologies for better humanity. We found Machine learning like technologies can be used for conquering the backwardness occurred because of this physical disability.

II. LITERATURE REVIEW

The authors of the article [1] A review of smart gloves for character-to-speech conversion Mute the community. The Mute community around the world is facing many problems when communicating. Normal and stupid people can only communicate one way sign language but many times communicating with normal people who experienced problems. Therefore, there is always a communication barrier. This communication barrier is evident due to a speech disorder a person uses a gesture to communicate with an ordinary human being who is not suitable. We are implementing this project to reduce the barrier between stupid and normal person. This device design is based on an embedded system. Flex sensor and Node. MCU are key components. IGN: stem Architecture are the key components.

The authors of the article [2] Gesture-to-Emotional Speech Conversion by Combining Gesture Recognition and Facial Expression Recognition. This paper proposes an integrated method of converting sign language into emotional speech by facial expression to solve communication problems between healthy people and speech disorders. First, sign language features and facial expression features are obtained by a deep neural network (DNN) model. Second, support vector machine (SVM) trained to classify sign language and facial expression to recognize sign language text and emotional facial expression tags. At the same time, a hidden Mandarin-Tibetan bilingual model based on the Markov model an emotional speech synthesizer is trained by adaptive speaker training with a Mandarin emotional speech corpus. Finally, Mandarin or Tibetan emotional speech is synthesized from recognized sign language text and emotional brands. Objective tests show that the recognition rate for static sign language or Subjective evaluation shows that synthesized emotional speech can get a 4.0 average emotional score. The A pleasure-arousal dominance (PAD) emotion tree model is used to evaluate PAD values for both facial expression and synthesized values. emotional speech. The results show that PAD values of facial expression are close to PAD values of synthesized emotional speech. This means that synthesized emotional speech can express facial expression emotions.

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The authors of the article [3] A Hidden Markov Model Based on Sign Language to Speech Conversion system in TAMIL. Fast and eloquent speakers communicate their thoughts, thoughts and experiences through voice interaction with the people around them. The difficulty of achieving the same level of communication is high in the case of the deaf and mute population, how they express their emotions through sign language. Easy communication between ex and the latter is necessary to become an integral part of society. The goal of this work is to develop a sign language recognition system that will help to realize this necessity. In the proposed work it is a hand gesture recognition module based on accelerometer and gyroscope developed to recognize various hand gestures that are translated into Tamil phrase and an HMM-based text-to-speech synthesizer is built for conversion corresponding synthetic speech text.

The author of the article [4] American Sign Language to Text Translator and speech. The 2001 study by Viola and Jones is a milestone in the development of an algorithm capable of detecting human faces in real time. The original technique was only used for face detection, but many researchers used it to detect many other objects such as eyes, mouths, car license plates and traffic signs. There are also hand signs among them successfully detected. This article proposed a system that can automatically detect static hand signs of alphabets in American Sign Language (ASL). On for this, we adopted two combined concepts of AdaBoost and Haar-like classifiers. In this work, to increase the accuracy of the system, we use a huge database for the training process and generates impressive results. The translator was implemented and trained using a dataset of 28,000 samples hand sign images, 1000 images for each sign positive training images at different scales, lighting, and a dataset of 11,100 Negative samples images. All positive images were taken with a Logitech webcam and the image size was set to the standard VGA resolution of 640x480. Experiments show that our system can recognize all signs with an accuracy of 98.7. Input of this system is live video and the output is text and speech.

The authors of the article [5] Design and implementation of Sign-to Speech/Text technology A system for deaf and dumb people. This paper presents an approach to the design and implementation of a smart glove for deaf and mute people. Several researches have been done to find an easier way for non-voice people to communicate with voice people and express themselves to the hearing world. The development was done in sign language, but mainly in American sign language. This research aims to develop a character to Arabic translator based on a smart glove connected wirelessly to a microcontroller and text/voice presentation devices. An approach to display Arabic text was developed and programmed. The entire system was implemented, programmed, encapsulated and tested with very good results.

The author of the article [6] On the design and implementation of Sign-to Speech/Text technology System. This paper explored two approaches for the design and implementation of a sign language/text translator. They have approaches was developed and implemented to display text and voice in two languages (Arabic and English). In the first part of this article, the system is based on vision developed and demonstrated. In the second part, a glove-based system is designed and implemented. The second system is based on a wireless interface gloves, microcontroller and presentation device for Arabic/English character translation. Two developed systems were tested very good results.

The author of the article [7] Talking Hands - Indian Sign Language for Speech Translation gloves. According to the latest statistics, about 7.5% of the population is hearing impaired and the only means of communication is Indian Sign Language used by them. In this paper, we presented an approach that gives a technique for improving the sign language recognition system. In the proposed method; for detection we will use sensors that are built into the glove gestures and convert them to speech using the Bluetooth module and an Android smartphone. Gloves will help in making artificial one speech that provides an environment similar to everyday communication that is difficult to reach for people with speech impairments.

The authors of the article [8] Sign Language to Speech – Helper System for speech disorders. People with speech and hearing impairments need to socialize others with normally disabled people who can talk about their normal work. Deaf and mute people all over the world use sign language used in their country or local language to communicate with other people. But one who has undergone training is able to understand it. Sign language mainly includes hand and head gestures that express their meaning of letters or words. Non-verbal such as shape, hand orientation, head movements and body movements are used to express the speaker's idea. Use with speech impairment sign language to communicate. This is often either misinterpreted or incorrect identified. This creates a communication gap between the physically disabled and a normal person. There is a communication gap through sign language overcome a is possible for a deaf-mute without acoustic sounds and through signs.

The authors of the article [9] Devanagari Convert printed text to speech using OCR. this article describes a neoteric approach to bridging the communication gap between deaf and normal human beings. In every community there is such a group of disabled people who face serious difficulties in communication due to his speech and hearing impairments.

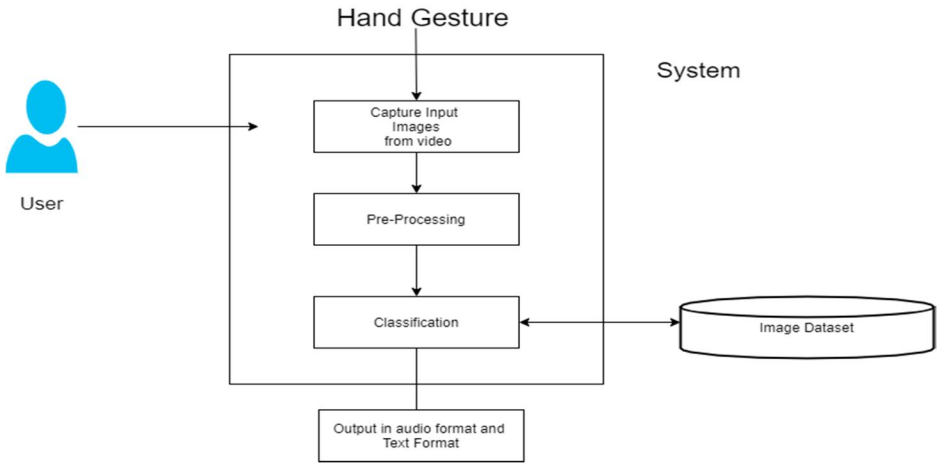
These people use various gestures and symbols to communicate and receive their messages this way of communication is called sign language. Still, communication. the problem doesn't end there because natural language speakers don't understand sign language, which results in a communication gap. It exists for such ends the need to develop a system that can act as a sign language interpreter speaker and translator for a natural language speaker. For this purpose, software solution was developed in this research using the latest technology from Microsoft i.e. Kinect for Windows V2. Proposed the system is called Deaf Talk and works as a sign language interpreter and a translator that provides a dual mode of communication between sign language speakers and native speakers. Dual mode of communication has the following independent modules (1) Character/gesture to speech conversion (2) Speech to sign language conversion. Sign-to-speech module, a person with a speech impediment must place themselves in the Kinect field point of view (FOV) and then perform sign language gestures. System it receives gestures made through the Kinect sensor and then understands them these gestures by comparing them with already stored trained gestures database. Once a gesture is determined, it is mapped to a keyword corresponding to this gesture. The keywords are then sent to text-to-speech a conversion engine that speaks or plays a sentence for natural language spokesman. Unlike sign-to-speech, speech-to-sign language is the conversion module translates spoken language into sign language. In this event that a normal person places themselves in the field of view of the Kinect sensor and speaks in their native language (in this case English). The system will then convert it to text using the speech-to-text API. The keywords are then mapped to theirs corresponding pre-saved animated gestures and then the animations are played on the screen for the spoken sentence. In this way, the disabled person can visualize a spoken sentence translated into 3D animated sign language. Deaf Talk's accuracy is 87 percent for speech-to-sign and 84 percent for sign-to-speech.

The authors of the article [10] Sign-to-speech prototype using an SVM classifier. About 70 million people in this world are mute people. PUSH are children who suffer from non-verbal autism. Communication between speech-impaired people and normal people is very difficult. Normally people with speech impairments use sign language to communicate with others. Not everyone understands sign language. In this paper a prototype is designed that provides speech output for sign language gestures to bridge the communication gap between people with speech impairments and normal people. This prototype consists of a glove that has built-in flex sensors, gyroscopes and accelerometers. These sensors capture user gestures in real time. The Arduino Nano microcontroller is used to collect data from these sensors and sends them to a PC via Bluetooth. The computer processes the data sent by the Arduino and runs a machine learning algorithm to classify the sign language gestures and predict the word. associated with each gesture. Support Vector Machine (SVM) is used for this. classification. This prototype is very compact and can recognize both American Sign Language (ASL) and Indian Sign Language (ISL). This prototype it not only speaks to mute people but also makes them multilingual.

III. ALGORITHM

This system accepts input in the form of a live dataset. We know that we are processing data and training datasets in the system, so we use modules: Pre-processing, Feature Extraction and Classification, all of which use our CNN algorithm. So first insert the Images Live dataset, then pre-process the dataset (the pre-processing step is to clean the Image part and Remove Blur) Then the system will extract the parameters or properties of the file in the extraction part. Then in classification where we use our CNN algorithm to recognize sign language. These are the steps used to train the CNN.

IV. SYSTEM ARCHITECTURE



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V. MATHEMATICAL MODEL

Let's be the Whole system which consists: S= IP, Pro, OP. Where, A. IP is the input of the system. B. Pro is the procedure applied to the system to process the given input. C. OP is the output of the system. A. Input: IP = u, F., where, 1. u be the user. 2. F be set of files used for sending B. Procedure: B. Process 1. In this project capture the image from sign and compare with the dataset. 2. According to image stored in dataset voice alert message give to the user. C. Output: • After sign detection the voice message alert to the user

VI. PROJECT SCOPE

This system can definitely become a step towards the innovation of this world level of problem solving. Our system can be a prototype and a Proof of Concept for solutions on a global level. Deaf and hard of hearing people can use this system and also a normal person can have this system with him and a deaf person can log in from the camera and the sign can be converted to text or speech.

VII. LIMITATIONS

Most people do not understand sign language. A child should not rely on a translator. Fine motor problems lead to garbled signs. I think AAC is faster to learn than signing.

VIII. CONCLUSION

Sign language is a tool to reduce the communication gap between the deaf and mute people and the normal person. This system, which is proposed above, provides a methodology that aims to do the same thing as two-way communication possible. This method proposed here facilitates the conversion to character into speech. This overcomes the requirement for translators from real time conversion is used. The system acts as the voice of a deaf and mute person. This project is a step towards helping specially disabled people. This can be further improved by making it more user-friendly, efficient, portable, compatible for multiple brands as well as dynamic brands. This can be further improvised to be compatible with the mobile phones they use built-in camera in the phone. We can increase the distance it can go can be used with a longer trans-receiver module or via Wi-Fi.

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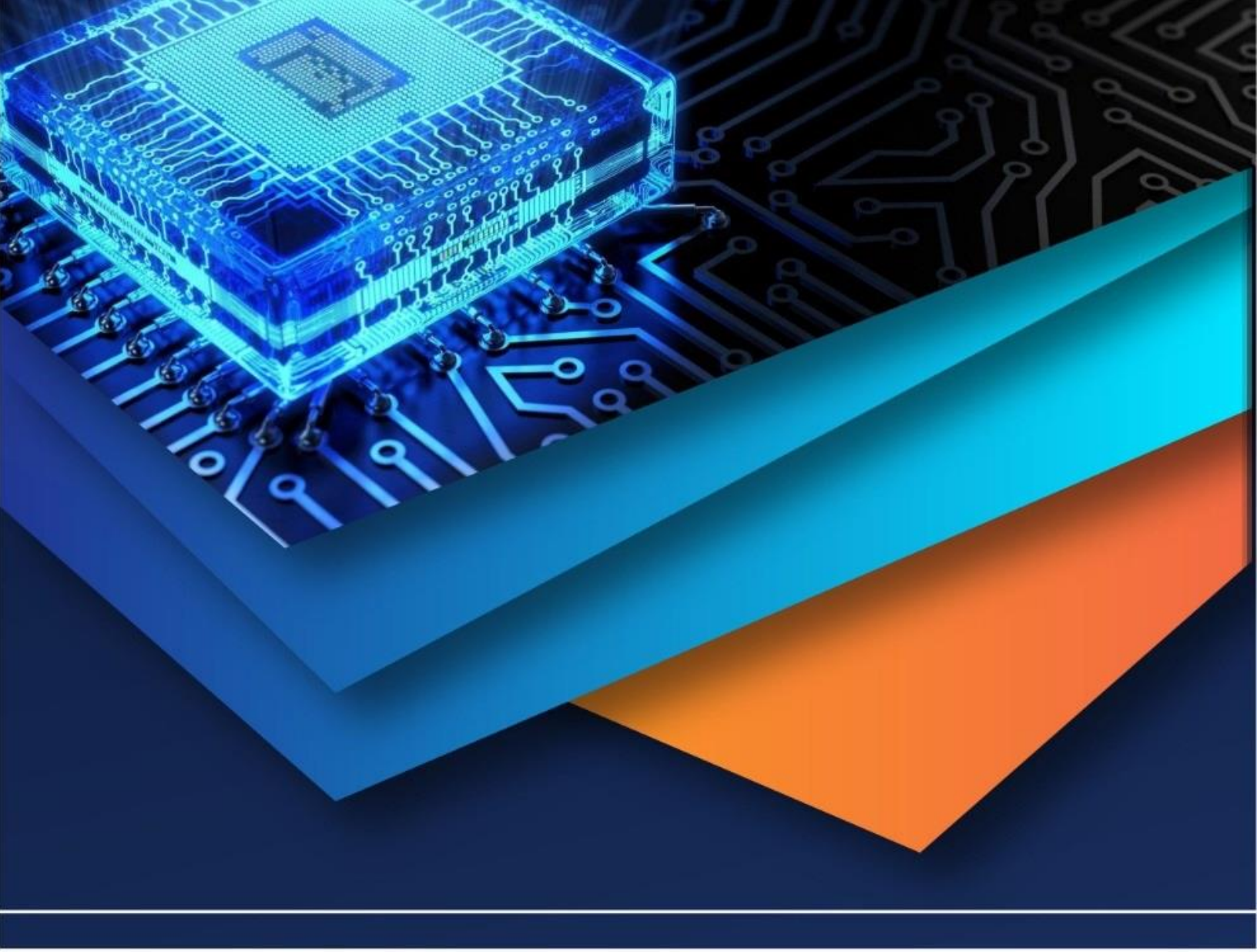

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