International Journal of Scientific Research in Engineering and Management (IJSREM)
Volume: 08 Issue: 02 | February - 2024 SJIF Rating: 8.176 ISSN: 2582-3930

SIGN LANGUAGE RECOGNITION USING DEEP LEARNING

Mrs.R.Nivetha, Mrs.P.Vasuki

Department of computer science and engineering, K S R College of Engineering, Tiruchengode, Tamilnadu, India.
Department of computer science and engineering, K S R College of Engineering, Tiruchengode, Tamilnadu, India.

Abstract - In our society, communication with deaf people is lacking. The introduction of Sign Language (SL) was made in order to get around this obstacle. Sign language uses patterns that are visually transmitted to convey meaning to everyday people. People with autism spectrum disorder (ASD) can also benefit from learning sign language. Because they are unfamiliar with the meaning of each sign, normal people are unable to comprehend the deaf use of language. This issue is intended to be resolved by the proposed system. The camera in this system records a variety of hand gestures. The image is then processed using a variety of algorithms. The image's pre-processing begins first. An edge detection algorithm is then used to determine the edges. Finally, the sign is identified and the text is displayed by a template-matching algorithm. A sign's meaning can be easily deduced because the output is text. Additionally, this makes it easier to communicate with the deaf. Python is used to put the system into action. Various libraries are used by the system.

Key Words:optics, photonics, light, lasers, templates, journals

1. INTRODUCTION

1.1 SIGN LANGUAGES

Sign languages, sometimes referred to as signed languages, are languages that use the visual-manual modality to express meaning. Sign languages are articulated by a combination of manual articulations and non-manual features. Sign languages are complete natural languages with their own vocabulary and syntax. Sign languages are not universal and are usually incomprehensible to non-native speakers, despite certain similarities between them. Both spoken and written communication are regarded by linguists as forms of natural language, meaning that they developed over time without deliberate design through an abstract, protracted aging process. Sign language should not be confused with body language, which is a type of nonverbal communication. Wherever there are deaf groups, sign languages are the cornerstone of the local Deaf cultures and have evolved into effective methods of communication. While signing is primarily used by the deaf and hard of hearing, hearing people also use it, including those who are physically unable to speak, those who struggle with speech due to a disability or condition, and those who have deaf family members, such as children of deaf adults.

Figure 1sign language

1.2 HAND GESTURES

Whether used alone or in combination with spoken words, gestures are a type of nonverbal communication in which significant messages are conveyed through outwardly apparent body movements. Gestures can be made with the hands, face, or other body parts. Gestures are a type of nonverbal communication that carry particular meanings; proxemics, shared attention displays, and pure expressive displays are examples of physical nonverbal communication. Motions are implicit in culture and can have completely different meanings depending on the social context. Motion is specific to signing and communicating. While certain gestures, such as the omnipresent act of pointing, are slightly different from place to place, most gestures transmit unique meanings in particular cultures rather than having universal or invariant meanings. A single symbolic gesture might have somewhat different meanings in different cultural contexts—from extremely complimentary to severely insulting.

Figure 2HAND GESTURE

1.3 EDGE DETECTION

Edge location uses a variety of numerical algorithms to identify edges, bends in a digital image where the image's brightness changes sharply, or, more formally, discontinuities. Change detection is the challenge of discovering discontinuities in signals across time, whereas step detection is the problem of finding discontinuities in one-dimensional signals. Edge detection is a vital technique in computer vision, machine vision, and image processing when it comes to feature extraction and detection.

1.4 AMERICAN SIGN LANGUAGE

American Sign Language (ASL) is a natural language used by the Deaf communities in the United States and by most Anglophone Canada. ASL is a comprehensive and structured visual language that is expressed through hand gestures and facial expressions. Apart from North America, many other countries use ASL dialects and ASL-based creoles, such as much of Southeast Asia and West Africa. As a lingua franca, ASL is also widely learned as a second language. The languages that are most closely related are ASL and French Sign Language (LSF). It has been suggested that ASL is an LSF creole language despite showing traits that are not typical of creole languages, such as agglutinative morphology.

1.5 SIGN LANGUAGE, INDIAN

Sign Language, Indian, or Plains Sign Talk, is an intertribal language of gestural signs used by Great Plains American Indians. Spanish explorers documented its use on the southern Plains in the sixteenth century, despite its unknown origins. Tribes that spoke a variety of languages regularly interacted through extensive trade networks and political alliances. Vocal communication was difficult, and people probably made the most of their universal propensity to use gestures in these situations. After some time, such motions were conventionalized into a language with an interesting visual jargon and spatial punctuation.

2. LITERATURE SURVEY

Neha Poddar[1] and other others have proposed. In this system, human communication is vital to existence. However, correspondence is a test for those who are silent and have diminished hearing. To understand them, one needs either learn their language—finger language or sign language. The suggested system for this project makes an effort to solve this problem. This article aimed to design an object tracking application for computer interaction as well as a virtual human computer interface device. There were two objectives when designing this system. It functions in two ways: Study and impart knowledge. The project employs a camera to detect hand locations and contours, and then sends Sign Language to a PC depending on the gesture. This will transcribe the gesture that the webcam recorded into audio so that the general public may comprehend what is being said. Therefore, translating Sign Language into text and audio is the aim of our project, Sign Language to Speech Converter. The project's objective is to develop software for a mobile, interactive application that would enable hearing- and speech-impaired individuals to converse with regular people by translating American Sign Language from speech to text and back again.

As recommended by Savant Pramada[2] and others. An important area of research in this system for improving communication with hearing-impaired people is computer recognition of sign language. An effective and quick method for estimating the number of fingers opened in a Binary Sign Language gesture that represents an alphabet is provided in this research. For the system to function, the hand does not have to be exactly in line with the camera. The research makes use of an image processing system to recognize, in particular, the English alphabetic sign language used by deaf individuals for communication. This project's primary objective is to develop an intelligent computer system that will greatly facilitate hand-to-hand communication for the deaf and the blind. The idea was to create an intelligent system that would accept visual inputs such as sign language hand movements and employ machine learning, artificial intelligence, and image processing techniques to create outputs that were easy to identify. Therefore, the aim of this project is to develop a clever framework that can effectively serve as an interpreter between sign language and spoken language, enabling successful and proficient correspondence between people with hearing impairments and regular people.

According to Rasha Amer Kadhim[3] and colleagues, a real-time ASL recognition system based on the ConvNet algorithm was created in this paper using real color images captured by a PC camera. The model, which was tested using new datasets, is the primary ASL acknowledgment model for ordering a sum of 26 letters, including (J and Z), with two new classes for space and erase. It was made to support a broad variety of features, such as different backgrounds, lighting conditions, skin tones, and scenarios. For the preparation and approval, the exploratory results achieved a high precision of approximately 98.53% and 98.84%, respectively. Furthermore, the system exhibited a high degree of accuracy across all datasets when fresh test data that had not been used during training were added.

P.V.V. Kishore[4] and others, has suggested. The various algorithms used to design a sign language recognition system are outlined in this paper. Deaf people communicate with one another and with non-deaf people through the language known as sign language. A real-time sign language recognition system that can recognize sign language gestures in videos with complicated backgrounds was designed by us. Active contour models are used to segment and track the signer's non-rigid hands and head in sign language videos. Using signers' hand and head skin color, texture, boundary, and shape information, active contour energy minimization is

carried out. An artificial neural network employs the error back propagation algorithm to classify signs. Each sign in the video is changed over into a voice and text order. The system has been successfully implemented for 351 Indian Sign Language signs in a variety of possible video environments. The recognition rates for various video environments are calculated. Our research aims to make the system independent of the signer and recognize Indian Sign Language gestures in real time under a variety of lighting and background conditions.

Neel Kamal Bhagat[5] and coworkers, has suggested. In this system, speech-impaired individuals communicate with hand gestures. Sadly, the majority of people are unaware of the meanings behind these gestures. In an endeavor to connect something very similar, we propose a continuous hand motion acknowledgment framework in view of the information caught by the Microsoft Kinect RGBD camera. We used computer vision techniques like 3D construction and affine transformation because there is no one-to-one mapping between the depth and RGB camera pixels. The hand gestures were separated from the background noise following one-to-one mapping. For the purpose of training 36 static gestures related to the alphabets and numbers of Indian Sign Language (ISL), Convolutional Neural Networks (CNNs) were utilized. Using 45,000 RGB and 45,000 depth images, the model trained with an accuracy of 98.81 percent. Ten ISL dynamic word gestures were trained with additional Convolutional LSTMs, and training 1080 videos yielded an accuracy of 99.08%.

3. EXISTING SYSTEM

People communicate their ideas, thoughts, and experiences to those around them through interactions with one another. However, deaf-mute individuals do not experience this. Deaf-mute people can now communicate thanks to sign language. Without the use of acoustic sounds, a deaf-mute person can communicate through sign language. This work aims to create a system for recognizing sign language that bridges the communication gap between people with speech impairment and normal people by facilitating communication. Hand gestures are more important than other gestures (arm, face, head, and body), as they convey the user's thoughts more quickly. A Text-to-Speech synthesizer based on HMM is built to convert the corresponding text, and a flex sensor-based gesture recognition module is developed to recognize English alphabets and a few words in the current work.

4. PROPOSED SYSTEM

The proposed system is based on the CNN algorithm. Useful are the pixels with the highest gradient values. Characterize the qualities for high limit and low edge. a pixel's gradient value with previously established threshold values. One of the most effective machine learning algorithms is the CNN algorithm. The CNN algorithm can be used to predict both continuous (as a Regressor) and categorical (as a Classifier) target variables.

4.1 GESTURE IMAGE

The input image is made up of gesture images. The values that are produced by various systems vary. We can normalize the RGB values to get rid of distortions brought on by light and shadow. The further CNN models are used in the normalization process.

4.2 IMAGE PREPROCESSING

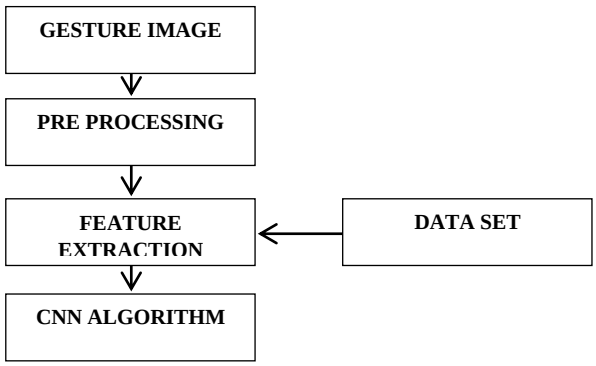
The steps taken to format images prior to their use by model training and inference are referred to as image preprocessing. Color corrections, reorientation, and resizing are all examples of this. As a result, in some circumstances, a transformation that could be considered an augmentation may be most effective as a preprocessing step. Here, the image noise removal, pixelization, and other techniques for preprocessing may be involved. The goal of the one-dimensional image transformation is to make the process easier. The gray scale image is presented in a one-dimensional format. The average method is the most fundamental and straightforward one for converting images to grayscale.

4.3 FEATURE EXTRACTION

The identification of the edges is crucial in image analysis. Edge discovery is valuable to remove limits, corners, lines and bends. It gets rid of the useless data. The canny edge detection algorithm, according to, performs better than numerous other edge detection algorithms.

4.4 IMAGE SMOOTHING

There will always be some noise in an image. Image noise is reduced by smoothing filters. By employing a Gaussian kernel, smoothing Gaussian filters reduce this noise. Provide the height, width, and standard deviation values in both directions as an input.



4.5 CNN MAGNITUDE

Determine the magnitude of the CNN. The edges' intensity values are calculated. Utilizing a large convolution mask, apply a sober filter to detect changes in intensity and gradient values in both the horizontal and vertical directions (x, y). The first-order derivatives for both directions are returned. From this, greatness and incline of the inclination are accumulated.

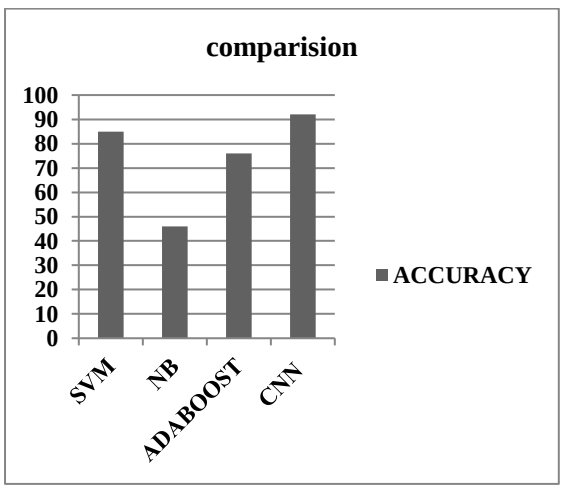
4.6 NON-MAXIMUM SUPPRESSION

The image's thickness and blurring are both reduced by this method. This procedure will result in sharp edges. Think about the pixels next to you during this process. A comparison is made with its horizontal pixel if=0. Reduce the value to zero if the pixel value is lower than that of its horizontal neighbors. Non-maximum Suppression This technique reduces the blurring effect and image thickness. This procedure will result in sharp edges.

5. CONCLUSION AND SCOPE

This paper aims to make it easier for people who are deaf in our society to communicate with others. Here, image-processing methods are used to put the system into action. People who are unable to use gloves, sensors, or other highly sophisticated equipment should use this system. First, use an animated set to get an image. Then, for further processing, convert it to a grayscale image. Edge discovery calculation was utilized to recognize the sign in the picture. There, the cycle incorporates evacuation of commotion and other less significant information and applying smoothing calculation to picture, finding slope extent followed by following the edges by hysteresis. The display of the sign alphabet is the final step. In the future, we might be able to create a two-way system that allows for sign-to-text and sign-to-text conversion. constructing a system in which dynamic gestures are used for interpretation. Mobile phones may also be implemented.

6. EXPERIMENTAL SETUP



ALGORITHM	ACCURACY
SVM	85
NB	46
ADABOOST	76
CNN	92

The SVM algorithm has an accuracy rate of 85%, the NAVE BAYES algorithm has an accuracy rate of 46%, the ADA BOOST algorithm has an accuracy rate of 76%, CNN algorithm has an accuracy rate of 92%, and the overall average algorithm has the highest accuracy rate in the f1 score, precision recall. All of these parameters were taken into consideration when determining the overall classification accuracy.

REFERENCES

[1] "Study of Sign Language Translation Using Gesture Recognition" by Neha Poddar, Shrushti Rao, Shruti Sawant, and Vrushali Somavanshi, and Prof. Sumita Chandak, International Journal of Advanced Research in Computer and Communication Engineering, Vol. 4, Issue 2, 2019.

[2] Deshpande Saylee, Nale Pranita, Sawant Pramada, Nerkar Samiksha, and Mrs. "Intelligent Sign Language Recognition Using Image Processing," by Archana S. and Vaidya, IOSR Journal of Engineering, Vol. 3, Issue 2, 2020.

[3] "Real Time Sign Language Recognition using Python," by Prof. Supriya Pawar, Sainath Muluk, and Sourabh Koli, International Journal of Innovative Research in Computer and Communication Engineering, Vol. 6, Issue 3, 2019.

[4] "Segment, Track, Extract, Recognize and Convert Sign Language Videos to Voice/Text," by P.V.V. Kishore, International Journal of Advanced Computer Science and Applications, Vol. 3, Issue 6, 2020.

[5] "Sign Language Recognition Using Image Processing," by Dr. Lini Mathew and Kamal Preet Kour, International Journals of Advanced Research in Computer Science and Software Engineering, Vol. 7, Issue 8, 2019.