SIGN LANGUAGE TRANSLATION SYSTEM

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ABSTRACT

Normal individuals can readily engage and communicate with one another, but those with hearing and speech impairments have difficulty conversing with other hearing people without the assistance of a translator. For deaf and dumb individuals, the Indian sign language is a communication obstacle. People with hearing and speech impairments rely heavily on nonverbal communication, which includes hand gestures. This is why implementing a system that recognizes Indian sign language would have a tremendous positive influence on the deaf and dumb. In this, a method for automatically recognizing finger printing in Indian Indian sign language is proposed. In this case, the system is provided the sign in the form of gestures. On the input sign picture, multiple stages are conducted. To determine the shape of the sign, the first segmentation step is done based on skin color. After that, the discovered region is converted to a binary image. The binary image is then transformed using the Euclidean distance transformation. On the distance modified picture, row and column projection is used. Central moments, as well as HU's moments, are done to extract features. SVM and GREYSCALE are used for classification.

Keywords: Indian sign language Recognition, Convolution Neural Network, Image Processing, Edge Detection, Hand Gesture Recognition

1. INTRODUCTION

Individuals using a Sign Language System (SLS) communicate by visually transferring signals that express their thoughts and feelings. It serves as an alternative for those who are hard of hearing or deaf. As a consequence, it has drawn a significant number of scientists working on this topic for quite some time. A few research on Indian Sign Language have proceeded, despite the fact that many academics have studied on numerous sign languages, including American Sign Language, British Sign, and Taiwanese Sign. Normal individuals seldom try to learn ISL or converse with those who are deaf, hence hearing-impaired people are marginalized in society. This turns out to be a misfortune for them, and as a consequence, they are left in the dark and alone. Thus, a breakthrough in sign language recognition was made, which has far-reaching social implications in addition to its technological ones. As a part of our study, we propose a low-cost Sign Language Recognition system that enables users to understand the meaning of a sign without the aid of a professional translator. Capturing, analyzing and recognizing signals is made easier by computers used throughout the communication channel. Sign language recognition has been approached in a number of methods by various academics throughout time. Research using static hand motions is rare; instead, real-time data and videos are frequently used

1.1 Image Pre-Processing:

Image processing is a method for executing operations on an image in order to enhance it or extract important information from it. It's a form of signal processing in which the input is an image and the output is either that picture or its characteristics/features. Image processing is one of the most swiftly changing technologies nowadays. It is also a crucial research subject in engineering and computer science. The three steps that make up picture processing are as follows:

Using picture capture tools to import the image(s)

Examining, altering the image(s)

Output that may include an altered image or a report based on image analysis.

1.2 Digital image processing:

Digital image processing is the process of manipulating images on computers that have been digitalized. It has been more popular during the last several decades. It may be used in a variety of fields, including medicine, entertainment, geology, and remote sensing. It's no surprise that multimedia systems are heavily reliant on digital image processing.

Processing of digital images is all about manipulating numbers of such low precision. Digitized image processing may take several forms, the most common of which are picture enhancement and restoration as well as image analysis and compression. It is possible to enhance a picture by using heuristic methods to make it more helpful to a human viewer.

1.3 Recognition of Pattern:

Pattern recognition technology must be used to extract objects from pictures on the basis of image processing. Then statistical decision theory must be used to identify and categorize these items using the technologies supplied by statistical decision theory. There are three steps to the pattern recognition process when a picture contains several items, like in fig.
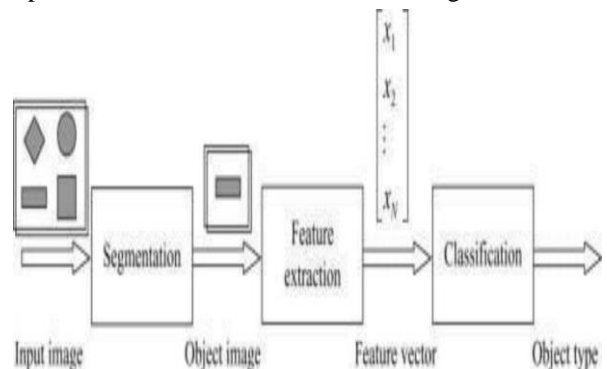
1.4 Sign Language with Gesture Recognition

The process of turning the user's hand gestures and motions into text is known as "sign language recognition." It helps persons who are unable to communicate with the general public to do so. Raw photos and videos are transformed into text that can be read and comprehended using image processing algorithms and neural networks trained on training data.

Many times, those who are mentally impaired are unable to interact with the rest of society on a daily basis. It is difficult for them to interact with the general public using their gestures since just a few of them are recognized by the majority, according to observations. Individuals who have hearing loss or deafness are unable to communicate with others in the same manner that hearing people can, thus they must depend on visual means almost exclusively. Deaf and hard of hearing people rely on American Sign Language (ASL) as their primary means of communication.

2. OBJECTIVES

The Sign Language Recognition Prototype is a real-time vision-based system whose purpose is to recognize the American Sign Language given in the alphabet of Fig. 1. The purpose of the prototype was to test the validity of a vision-based system for sign language recognition and at the same time, test and select hand features that could be used with machine learning algorithms allowing their application in any real-time sign language recognition systems.

The implemented solution uses only one camera, and is based on a set of assumptions, hereby defined:

1. The user must be within a defined perimeter area, in front of the camera.
2. The user must be within a defined distance range, due to camera limitations.
3. Hand pose is defined with a bare hand and not occluded by other objects.
4. The system must be used indoor, since the selected camera does not work well under sun light conditions.
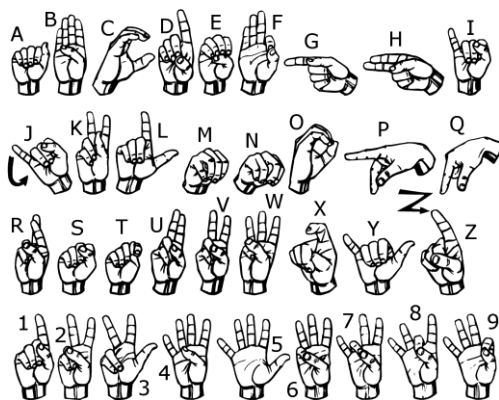
The proposed system architecture, which consists of two modules, namely: data acquisition, pre-processing and feature extraction and sign language gesture classification.

2.1 TensorFlow

TensorFlow, a free software framework for extensive work and non-linear programming, may be used in a variety of ways. It is possible to get TensorFlow from GitHub. Additionally, it is a symbolic mathematics library that may be used in neural networks and other machine learning applications Google use this technology for both internal research and external product development.

2.2 Open cv

Visualization programming framework OpenCV (Open Source Computer Vision Library) is focused on real-time computer vision programming. It's open source and free. Willow Garage and Itseez have been responsible for its upkeep since Intel initially constructed it (which was ultimately purchased by Intel). The BSD open-source Licence means that the library may be used on any platform and is fully free to use.

Applications for Open CV include:

- 3D and 2D software development platforms.
- Estimation of gloom;
- System of the face
- Gesture recognition
- Human computer interaction (HCI)

2.3 Keras

Keras is a Python-based neural network library that is free and open source. In addition to TensorFlow and Microsoft Cognitive Toolkit, R and Theano may also be utilized as a basis. With the goal of supporting quick experimentation with deep neural networks in mind, this user-friendly, modular, and expandable framework was designed. Oneiros was created by Google developer Francois Chollet, who is also the principal designer and maintainer of the Open-ended Neuro-Electronic Intelligent Robot Operating System (ONEIROS).

2.4 Neural Networks

For the purposes of computer science, a neural network refers to a group of algorithms that use an approach similar to that used by the human brain to search for hidden connections in a vast body of data. Neuronal networks, in this context, refer to networks of neurons that may be both biological and artificial. It's feasible to get the best possible outcome without having to re-design the output criteria since neural networks are capable of responding to changing input. An artificial intelligence-based

idea known as neural networks is quickly gaining popularity in the creation of trading systems.

Computer networks called "neural networks" are models of the actual neural networks found in the human brain. As the mathematical functions that gather and classify input in the setting of a neural network, neurons serve this particular job. Similar to the network in terms of functionality, curve fitting and regression analysis are statistical procedures.

2.4.1 Convolution neural network:

Yann LeCun developed convolutional neural networks (CNNs) as a particular design of artificial neural networks in 1988, which became known as the LeCun algorithm. CNN

makes advantage of some of the visual cortex's features. Image classification is one of the most prevalent applications for this architecture, and it is also one of the most complex. Facebook, for example, relies on CNN for its automatic tagging algorithms, Amazon for product recommendations, and Google for picture search amongst its members.

Instead of seeing an image, the computer sees a series of pixels on a screen. For example, if the picture has a resolution of 300 by 300 pixels In this example, the array will have a dimension of 300x300x3. When the width and height of a picture are 300 pixels, the color of the picture is 3. Each integer in this array is given a value between 0 and 255 by the computer. The pixel's brightness is represented numerically by this value.
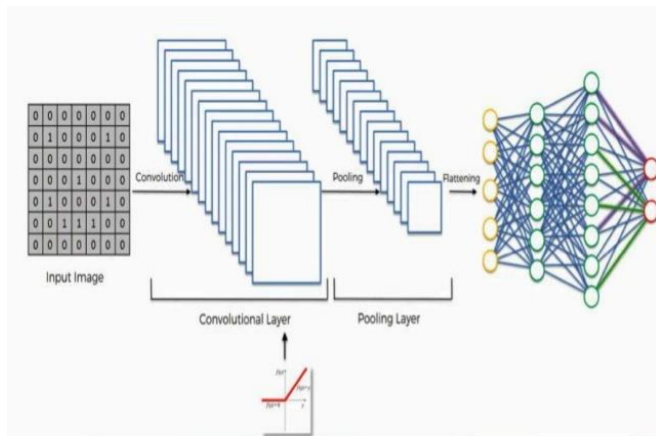
2.5 Existing System

There have been similar initiatives in the area of sign language recognition that we looked at in our literature review All of the project's activities are briefly summarized in the following sections. Recognition of Sign Language Using Hand Gestures: A Survey For many years, scientists have been working on a system called Sign Language Recognition (SLR) to help decipher sign languages. Different sensors, gesture segmentation, feature extraction and classification approaches are being used. As a result of this investigation and evaluation, it is concluded that additional study is necessary. Hybrid approaches and Deep Learning are two examples of contemporary research in classification techniques that have contributed to the field. This research addresses the classification strategy utilize ed in previous Sign Language Recognition systems. Our assessment is that HMM-based techniques, as well as their expansions, have been well investigated in the past.

2.5.1 Otsu's Algorithm:

There are a number of ways in which we may make it simpler for individuals to understand one other's signals when conversing. Those symbol signals will be used to generate the text. Use a camera to record actions of the hands and translate them into grayscale photos. Segmenting a hand motion from a grayscale image is possible using the holding approach. Hand and backdrop make up the bulk of the picture level. The optimal threshold value is found by dividing the class variance by the total class variance Canny edge detection.

2.6 Proposed System:

Our proposed system, which records video and then transforms it into frames, is a sign language recognition system that makes use of convolution neural networks to recognize signs. Images are captured

from each of these hand pixels, and the results are compared . obtained from the training model This has resulted in a significant improvement in the accuracy of the text labels produced by our system.
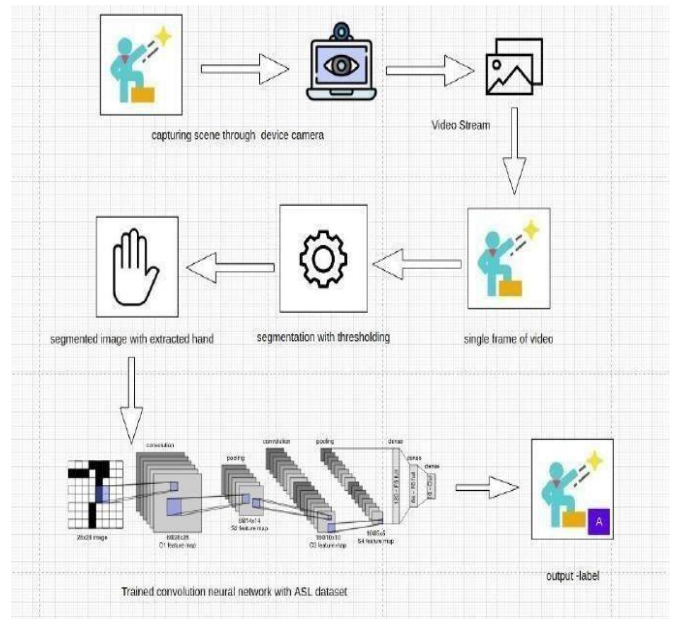
3. CONCLUSION

In this report, a functional real time vision based American sign language recognition for Deaf and Dumb people have been developed for asl alphabets. We achieved final accuracy of 92.0% on our dataset. We are able to improve our prediction after implementing two layers of algorithms in which we verify and predict symbols which are more similar to each other. This way we are able to detect almost all the symbols provided that they are shown properly, there is no noise in the background and lighting is adequate.

We will also train the model on some short videos of some regularly used words such as I'm coming, How are you, I'm Hardik (name of the person).This is my house, and so on in the future. We will strive to improve the number of photos as well as the accuracy at different angles because this dataset is custom produced, and the number of images is not adequate to achieve greater accuracy. Pre-train the model with a large dataset: For better optimization, the system may be trained with a more complete dataset containing thousands of examples for each letter of the alphabet, covering various ambient circumstances, illumination, hand postures, and skin tones.

Various educational studies have been undertaken, not only to make content more accessible to students who use sign language, but also to help those who desire to acquire a sign language

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