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SIGN LANGUAGE RECOGNITION USING PYTHON AND OPENCV

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ABSTRACT

This paper focuses on a review of the literature on hand gesture techniques and introduces their merits and limitations under different circumstances. The theories of hand segmentation and the hand detection system, which employ the Haar cascade classifier, may be used to construct hand gesture recognition using Python and OpenCV. The use of hand gestures as a natural interface motivates research in gesture taxonomies, representations, and recognition algorithms, as well as software platforms and frameworks, all of which are briefly covered in this paper. We represent a comprehensive review of vision based sign recognition algorithms published in the previous 16 years, emphasising the importance of taking these things into consideration in addition to the algorithm's recognition accuracy when predicting its successful in real world applications.

Keywords: Hand Gesture, Hand Posture, Computer Vision, Human–Computer Interaction (HCI), Representations, Interaction Products, Recognition Techniques.

I. INTRODUCTION

The increased public acceptance and funding for international projects emphasises the necessity of sign language. The desire for a computer-based solution is significant in these age of technology for the deaf people. However, re- searchers have been attacking the problem for quite sometimes now and the results are showing some promises. Although interesting technologies become available for voice recognition, but there is currently no commercial solution for sign recognition on the market. The goal is to make computers to understand human language and develop a user-friendly human computer interface (HCI). Some steps toward this goal include teaching a computer to recognise speech, facial emotions, and human gestures. Gestures are the non-verbally exchanged information. Gesture recognition is an aspect of human-computer interaction that demonstrates an academic treatise and is a vital to popularising the notion of a human-to-human connection, open dialogue, that must imply the correlation between the user and the machine [1]. Gesture analysis is a scientific field that can recognise gestures such as hand, arm, head, and even structural motions that usually entail a certain posture and/or motion. Using hand gestures, the individual may send out more information in a shorter amount of time. Several approaches were explored to apply computer-vision ideas to the real-time processing of gesture outputs. [2]. The Computer Vision study concentrates on gesture recognition in the open CV framework using the Python language. Language is a huge part in communication. Languages are useless to a person with a disability. Gesture is a vital and meaningful mode of communication for the visually impaired person . So here is the computer-based method for regular people to understand what the differently abled individual is trying to say. For monitoring, there are various similar algorithms and object recognition systems. This allows the identification of gestures, which overcomes the boundaries and limitations of earlier systems.

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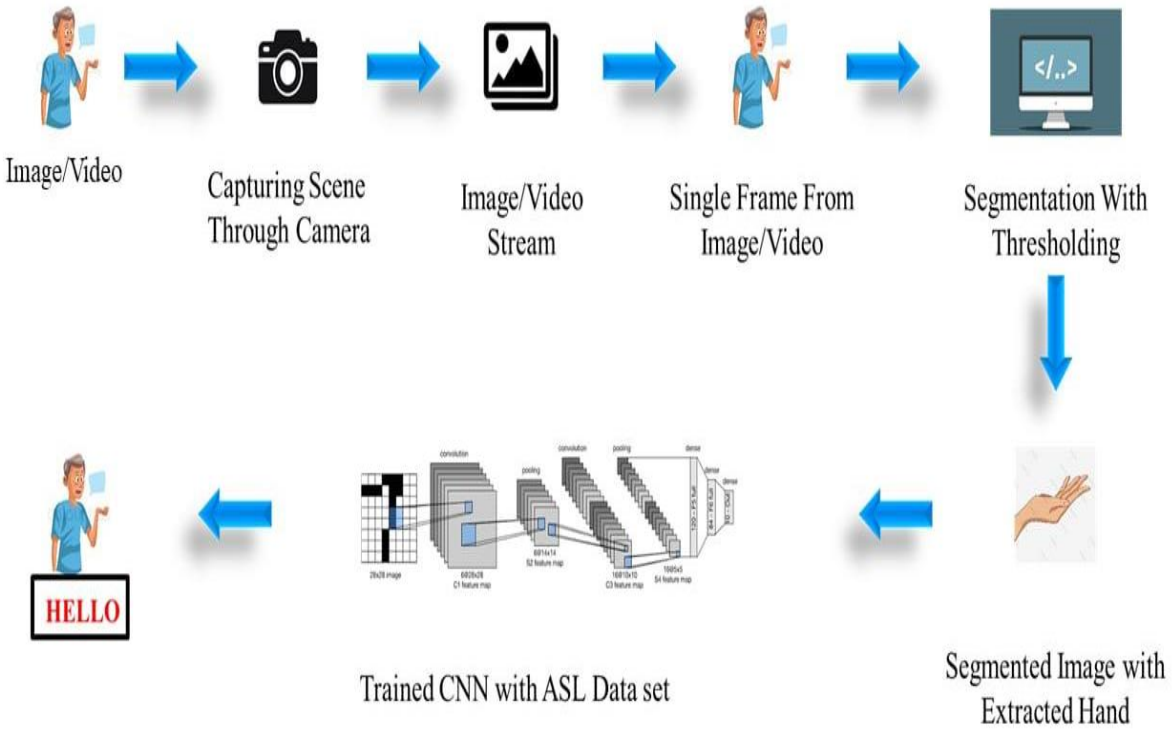

Figure 1: System Architecture of Sign Language Recognition System

Numerous robust approaches for gesture recognition were developed and reported to function well. [3] The video/image is a demonstration of a hand gesture detection system for operating a robotic arm. Neural networks, Adaptive Boosting, and Support Vector Machine are the algorithms utilised in the reconnaissance. Hand gestures [4] are implemented by using convex hull for better fingertip detection. The accuracy result for the corresponding paper is more than other existing systems. The objective of [5] is to highlight widely effective methods of capturing gestures which have been fundamental in the recent past. The paper of [6] also explains how to identify skin color for shape identification using the convex hull approach and the YCbCr color space transformation. For accurately formed results, ten users provide 330 cases of various hand movements. [7] describes a python-based Linux-based hand motion recognition system. The algorithm utilized isn't depending on the context. It recognizes the number of fingertips and as well as the task carried out per requirement The 2011 Indian census cites roughly 1.3 million people with “hearing impairment”. In contrast to that numbers from India’s National Association of the Deaf estimates that 18 million people roughly 1 percentage of Indian population are deaf. These figures provided the impetus for our endeavour. Hence the need for a system since these speech impaired and deaf persons require an appropriate route to communicate with regular people. Not everyone can comprehend the sign language of the disabled. As a result, our project aims to transform sign language motions into text that can be read by ordinary people.

II. LITERATURE SURVEY

In Literature, We went through additional comparable studies that are performed in the domain of the sign language recognition. The following are summaries of each of the project's works:

A. Methods of Hand-Gesture Recognition in Sign Language Recognition (survey):-

Given paper focused on methods used in the prior Sign Language Recognition systems. Based on our review, HMM-based approaches have been extensively explored in prior research, including its modifications. Deep Learning, such as Convolutional Neural Networks, has been popular in the past five years. Hybrid CNN-HMM and completely deep learning systems have yielded encouraging results and provide avenues for additional research. Clustering and high computational needs, however, continue to stymie their adoption. We believe that the research's future focus should be on developing a simplified network that can reach high performance while requiring little CPU resources, and that embeds the feature learner within the classification in a multi layered neural network approach [8].

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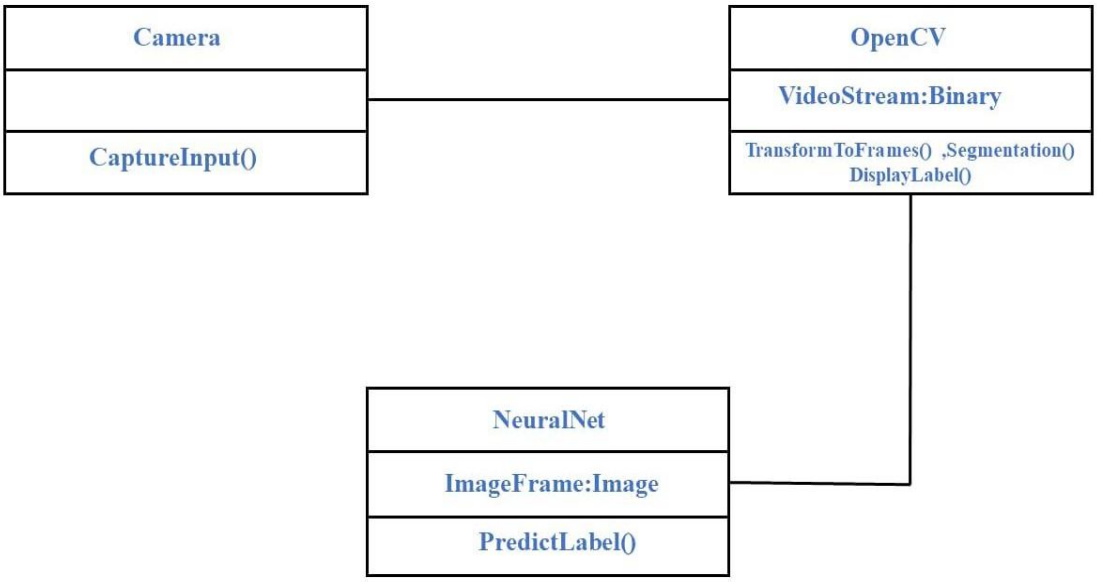

Figure 2: Class Diagram Of Sign Language Recognition System

B. Normal People and Deaf-Dumb People Communication:-

The overall purpose project is facilitate the interaction between deaf and dumb people and normal people to makes the communication between normal people and dumb people easier, by translate the sign language to voice or text with high accuracy [9]. The dumb and deaf communicate via sign language, which is hard to decipher for those who are not familiar with it. As a result, it is necessary to develop a device that can translate gestures into speech and text. This will be a significant step in allowing deaf and dumb people to communicate with the broader population [10].

C. A System for Recognition of Indian Sign Language for Deaf People using Otsu's Algorithm :-

In proposed paper, some methods for making sign recognition easier for people while communicating and the result of those symbol signs will be converted into the text. In this project, we are capturing hand gestures through a webcam and converting this image into a grayscale image. The segmentation of the grayscale image of a hand gesture is performed using the Otsu thresholding algorithm. . The whole picture level is split into two categories: hand and backdrop. The best threshold value is calculated by computing the proportion between total class variance and class variance. The Canny edge detection technique is used to locate the border of a hand gesture in a picture. We employed edge-based segmentation and threshold-based segmentation in Canny edge detection. Then Otsu's algorithm is used because of its simplified calculations and stability. This algorithm fails when the global distribution of the target and background varies widely.

D. Image Processing for Intelligent Sign Language Recognition:-

HMMs are suited for full sign recognition of ASL, because to their inherent time-varying nature. Because a series of several of the 36 basic hand shapes may be used to gesture most ASL signs. The continuous indications can be split, with the fundamental hand shapes retrieved as the input to the HMM processor. The fundamental hand shapes may then be identified and chained as ASL words' output. With the approaches presented in this work, the system may be expanded to a full-sign recognition system. [11].

E. Sign Language Interpreter using Machine Learning and Image Processing:-

Pham Microsoft Kinect is used by the Hai to interpret Vietnamese Sign Language. The user must align himself with Kinect's field of view and then conduct sign language movements in the suggested system. Using multi-class Support Vector Machine, it can distinguish both dynamic and static gestures. The gesture features are retrieved, filtered out and normalize on Euclidean distance during recognition [12].

F. Hand-Gesture recognition by using Digital Image Processing using MATLAB :-

The introduction of modern techniques significantly expands the possibilities of traditional microscopic procedures in the forensic field, allowing for the acquisition of necessary quantitative data in forensic analysis

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of pedological phases, mineral phase discrimination, or the option of organic phase analysis straight forwadly in the SEM chamber.

III. CONCLUSION

Today's applications require a variety of picture types as sources of data for explanation and analysis. Several characteristics must be retrieved in order to conduct various tasks. Degradation happens when a picture is converted from one form to another, such as when sharing, scanning, digitalizing, storing, and so on. Thus, the output picture has to endure a procedure termed image enhancement, that includes of a range of approaches that strive to develop the visual presence of an image. Image enhancement improves the interpretability or awareness of information in images for human listeners while also giving superior input for other autonomous image processing systems. The image is then subjected to extracting features using a variety of approaches in order to create the image. more readable by the computer. An effective tool for preparing expert knowledge, detecting edges, and combining erroneous data from several sources. The goal of a CNN is to obtain the correct categorization.

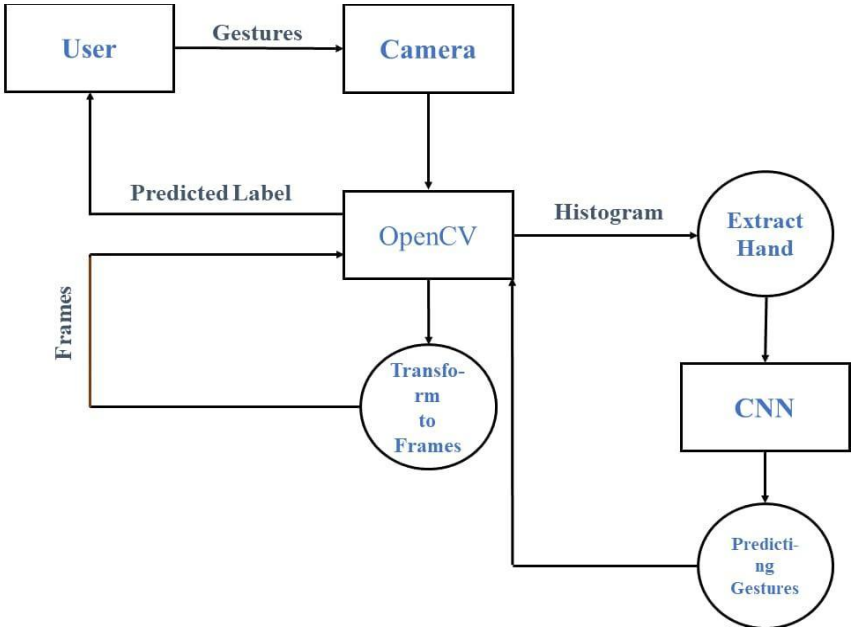

Figure 3: Data Flow Diagram For Sign Language Recognition

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