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Hand Gesture Detection

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***Abstract*: Gesture recognition is an emerging topic in today's technologies. The main focus of this is to recognize the human gestures using mathematical algorithms for human computer interaction. Only a few modes of Human-Computer Interaction exist, they are: through keyboard, mouse, touch screens etc. Each of these devices has their own limitations when it comes to adapting more versatile hardware in computers. Gesture recognition is one of the essential techniques to build user-friendly interfaces. Usually gestures can be originated from any bodily motion or state, but commonly originate from the face or hand. Gesture recognition enables users to interact with the devices without physically touching them. This project describes how hand gestures are trained to perform certain actions like switching pages scrolling or down in a page.**

***Keywords*: Gesture recognition, Human-Computer Interaction.**

1. Introduction

Humans are able to recognize body and sign language easily. This is possible due to the combination of vision and synaptic interactions that were formed along brain development. The requirements for hand detection involve the input image from the webcam. The image should be fetched with a speed of 20 frames per second. Distance should also be maintained between the hand and the camera. Approximate distance that should be between hands the camera is around 30 to 100 cm. The video input is stored frame by frame into a matrix after preprocessing. In order to replicate this skill in computers, some problems need to be solved: how to separate objects of interest in images and which image capture technology and classification technique are more appropriate, among others. In this way, these devices are capable of capturing human gestures, developing a new medium of human-machine interaction. The uses of these devices are present in the most diverse areas, such as robotics, medicine, sign language translation, computer graphics, and augmented reality. Gesture recognition methodologies are usually divided into two categories: static or dynamic. Static gestures are those that only require the processing of a single image at the input of the classifier, the advantage of this approach is the lower computational cost. Dynamic gestures require the processing of image sequences and more complex gesture recognition approaches. In the literature, we can find several recognition methodologies based on supervised and unsupervised learning. The method of neural networks to classify the data extracted from the images which a special type of neural network is used, called learning vector quantization. Convolutional neural networks and stacked delousing auto encoder. In this work, we used two image bases of 24 gestures, some segmentation techniques and the use of convolutional neural networks (CNNs) for classification. Thus, with the proposed methodology, we demonstrated that with simple architectures of convolutional neural networks, it is possible to achieve excellent results for static gesture classification. The final sections of this work show the results we obtained a discussion and comparison with other works and, lastly, our conclusions and perspectives for future work.

2. Literature Survey

A hand gesture recognition system provides a natural, innovative and modern way of non-verbal communication. It has a wide area of application in human computer interaction and sign language. Hand Gesture Recognition for Human Computer Interaction, International Conference on Image Information Processing India [1]. Parkinson's Comparative Study of Hand Gesture Recognition System, AIRCC Digital Library [2]. Hand Gesture Recognition Systems: A Survey, International Journal of Computer Applications [3]. Comparative Study of Hand Gesture Recognition Algorithms, International Journal of Research in Computer and Communication Technology [4] this survey proposes a real time implementation and novel methods for a hand-pose estimation that can be used for vision-based human interfaces. In this paper different methodologies, segmentation, feature extraction, classifiers are discussed and compared. Navigation of PowerPoint Using Hand Gestures, International Journal of Science and Research [5]

3. Proposed System

In the dataset, it will consider sentence, words, vowels, etc., and also it considers numbers; starts from 0 to 10. Here we have used a different type of method to identify the Parkinson disease. Training model is created for the feature extracted data, and then the simulation and the classification are based on the performance of the classifiers used. Classifiers are used to differentiate between disease peoples and non- disease people. Then normal and Parkinson's disease patients are identified.

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4. Figures

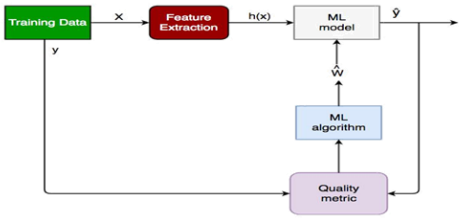

Fig. 1. Generalized classification block diagram

1. X: pre-classified data, in the form of a N*M matrix. N is the no. of observations and M is the number of features
2. Y: An N-d vector corresponding to predicted classes for each of the N observations.
3. y': Labels predicted by the Classifier.
4. ML Algorithm: The algorithm that is used to update weights w', which update the model and "learns" iteratively.

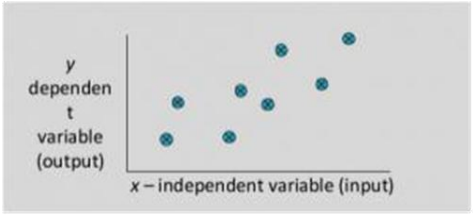

Fig. 2. Linear regression model

A regression problem is when the output variable is a real or continuous value, such as "salary" or "weight". Many different models can be used, the simplest is the linear regression. It tries to fit data with the best hyper-plane which goes through the points.

5. Conclusion

The results also showed that the gesture recognition application was quite robust for static images. However, the video version was enormously affected by the amount of illumination, such that is was necessary to check and adjust the HSV values for skin color when starting the program to get the proper output. Sometimes the adjustment was difficult to do because of the lighting conditions and the amount of objects in the background. The application was very susceptible to noise on the video stream. Slight hand movements could affect gesture recognition. Nevertheless, if the hand is steady enough for long enough; the program outputs the correct command. It was also observed that while the program was executing there were memory leaks. Attempts to remedy the problem were made by using the OpenCV functions to release memory. Despite this, the leaks continued. Perhaps the leaks were due to the implementation of OpenCV functions for the sequences behind the scenes.

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