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Emotion Recognition Using Real Time Face Recognition

Vedhas Vinjamuri
U.G. Student,Dept of Computer,
ViMEET, Khalapur, Mumbai, India

Rajeev Sugandhi
U.G. Student,Dept of Computer,
ViMEET, Khalapur, Mumbai, India

Sanika Vilas Kubal
U.G. Student,Dept of Computer,
ViMEET, Khalapur, Mumbai, India

Manasi Badgujar
U.G. Student,Dept of Computer,
ViMEET, Khalapur, Mumbai, India

Prof. Vishal Gotarane
Assistant Professor, Dept of Computer,
ViMEET, Khalapur, Mumbai, India

Abstract—

Facial expressions are the fastest means of communication while conveying any type of information. These are not only exposes the sensitivity or feelings of any person but can also be used to judge his/her mental views. Facial detection in images is the foremost step towards facial recognition and expression recognition along with face localization. High degree of variability in the images that can be obtained of faces due to varying conditions of lighting, exposure, color and expression.

Using Machine learning tools and algorithms such as OpenCV 3.4.0 and the Haar Cascade Classifier. This research paper details our approach towards creating a semi-automated with a slight degree of human program which can be used to simultaneously detect multiple users and provide an effective solution to facial recognition using minimal amount of resources.

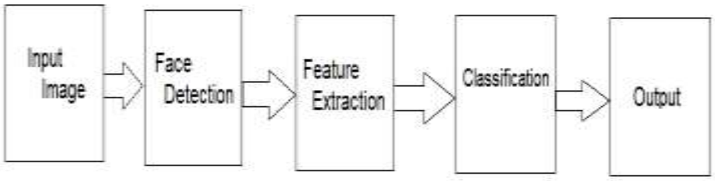
Keywords-Face detection, Machine Learning, Feature Extraction, Image Processing, Neural Networks, OpenCV.

I. Introduction

Face recognition is a relatively new section of biometrics, where a user is detected from an image of his face. Face recognition is achieved by utilizing multiple points similar in a human face, and the user is detected by their unique face features. The Haar Cascade, part of the OpenCV module, contains a collection of reference points for the detection and recognition of a human face in an image.

Face recognition has the potential to be used in various fields, some of its current applications being security, logging of user attendance, and more recently, online transactions.

The project aims to delve into real time facial recognition using a camera feed and training a neural network to recognize and detect users on the feed itself, and further allowing the detection of multiple users simultaneously.



II. Literature Survey

Junguk Cho et al. [1] have presented components architecture pertaining to face recognition-based system on AdaBoost algorithm using Haar attributes. They get described the hardware style techniques which include image scaling, integral impression generation, pipelined processing along with classifier, and parallel processing multiple classifiers for you to accelerate the processing speed on the face recognition system. Also, they have also discussed the optimization on the proposed architecture which is often scalable pertaining to configurable units with variable resources. The proposed system performance may be measured and compared with a similar software rendering. They get showed regarding 35 time's raise of system performance on the equivalent software implementation.

D. Gobinathan et al. [2] have presented a hybrid means for face recognition in shade images. The well-known HAAR feature-based encounter detector developed by Viola as well as Jones (VJ) that was designed for gray-scale pictures was along with a skin-color filtration system, which supplies complementary facts in shade images. The image was passed by way of a HAAR Feature based encounter detector, which ended up being adjusted in a way that it ended up being operating in a point in its ROC curve which has a low quantity of missed people but a top number involving false detections. Their recommended method features eliminated a number of these false detections. They have likewise used a color pay out algorithm in order to reduce the results of illumination. Their experimental results about the Bao shade face databases have showed that this proposed method was better than the unique VJ algorithm. expression analysis. The experimental results do show that the proposed feature extraction technique is fast, accurate and efficient for facial expression recognition.

ShangHung Lin [3] has given a great introductory course just for these new facts processing technological know-how. The paper has showed the viewers the generic framework to the face acceptance system, and the variants which are frequently encountered from the face detector.

Images made up of faces were necessary to intelligent visionbased human being computer discussion, and exploration efforts within face control include encounter recognition, encounter tracking, create estimation, as well as expression acceptance. However, many reported methods include assumed that this faces within the image or a graphic sequence are identified as well as localized. To construct fully programmed systems that analyze the knowledge contained within face pictures, robust as well as efficient encounter detection algorithms ended up required. Given 1 image, with regards to face recognition was to recognize all picture regions that contain a face irrespective of its three-dimensional placement, orientation, as well as lighting conditions. Such a difficulty was complicated because people are non-rigid and also have a high level of variability in space, shape, shade, and structure.

III. METHODOLOGY

We are planning to develop a software with the ability to scan multiple faces, in real time, and recognize them using Machine learning. This is a function-level software, which can be easily attached to real world projects like attendance verification applications, user recognition and authorization-based applications used in banks or near ATM machines.

We will be able to grab images from the camera without no manual efforts required, convert the images into machine readable format (numbers) and push it through a neural network that is trained to detect the faces extract their features and recognize the user and further also his emotions.

IV. PERFORMANCE ANALYSIS

We need various assessment metric values to be calculated in order to analyze our proposed technique for the pose variation detection. The metric values are found based on True Positive (TP), True Negative (TN), False Positive (FP) and False Negative (FN). The usefulness of our proposed work is analyzed by five metrics namely False Positive Rate (FPR), False Negative Rate (FNR), Sensitivity, Specificity and Accuracy. The demonstration of these assessment metrics is specified in equations that given below.

A. Evaluation Results for face detection based on pose variation False Positive Rate (FPR)

The percentage of cases where an image was segmented to the shape, but in fact it did not.

$$FPR = \frac{FP}{TN+FP}$$

False Negative Rate (FNR)

The percentage of cases where an image was segmented to the shape, but in fact it did.

$$FNR = \frac{FN}{TP+FN}$$

Sensitivity

The measure of the sensitivity is the proportion of actual positives which are properly detected. It relates to the capacity of test to recognize positive results.

Specificity

The measure of the specificity is the proportion of negatives which are properly detected. It relates to the capacity of test to recognize negative results.

Accuracy

The weighted percentage of pose variation images is correctly classified by the measurement accuracy. It is represented as,

$$Accuracy = \frac{TN+TP}{TP+TN+FN+FP} X100$$

For examining the segmentation usefulness our proposed technique is assessed with these above explained assessment metrics False Positive Rate, False Negative Rate, Sensitivity, Specificity and Accuracy.

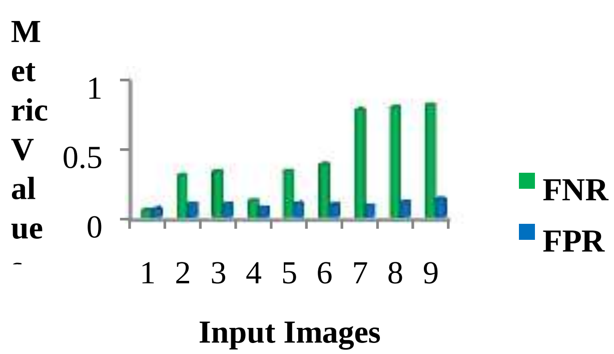


Fig 4: Graph for the comparison of FNR and FPR values for different poses of images

Fig. 4 shows the FNR and FPR values for different poses of images. From the FNR and FPR values it is clear that the values of the straight image are lower than the inclined pose images. Hence it can be shown that the straight pose image attained high accuracy than the inclined images.

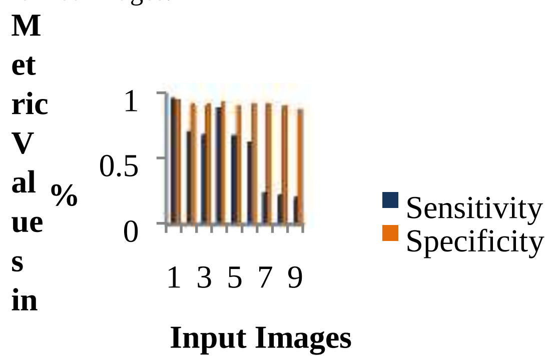
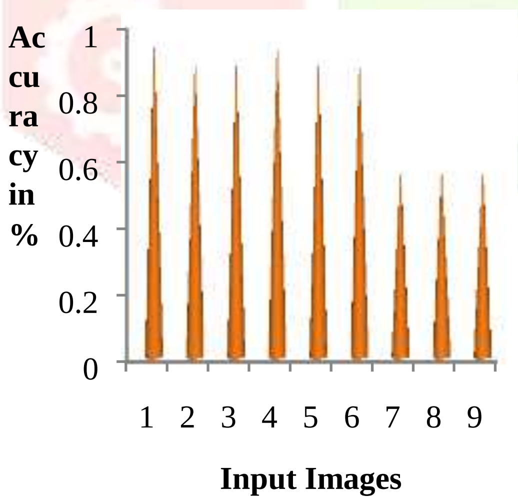


Fig 5: comparison of sensitivity and specificity values

Fig. 5 shows the sensitivity and specificity values for different poses of images. From the sensitivity and specificity values it is clear that the values of the straight image are higher than the inclined pose images. Hence it can be shown that the straight pose image attained high accuracy than the inclined images.



A. ***Fig 6:*** *Graph for Accuracy Values of the images*

Fig. 6 shows the comparison for the Accuracy Values of the images with different poses. Straight face image has higher accuracy when compared to the inclined images. The Accuracy Values obtained have showed that the straight face image is highly detected than the inclined images.

V. CONCLUSION

Face detection is a challenging problem in the field of image analysis and computer vision that has received a great deal of attention over the last few years because of its many applications in various domains. Research has been conducted vigorously in this area for the past four decades or so, and though huge progress has been made, encouraging results have been obtained and current face detection systems have reached a certain degree of maturity when operating under constrained conditions; however, they are far from achieving the ideal of being able to perform adequately in all the various situations that are commonly encountered by applications utilizing these techniques in practical life. The ultimate goal of researchers in this area is to enable computers to emulate the human vision system and, as has been aptly pointed out, "Strong and coordinated effort between the computer vision, signal processing, and psychophysics and neurosciences communities is needed" to attain this objective.

VI. LIMITATIONS AND SCOPE FOR FUTURE WORK

Face Recognition, when applied in a practical situation, should be able to give 100% accuracy. Since an automated system is never guaranteed 100% proficiency, the next stage of development is aimed towards improving accuracy of recognition to numbers acceptable in real world applications.

Since real-time face recognition depends upon images, the quality of the image matters significantly, which, in turn, is dependent upon the device used to take images. Better imaging hardware i.e. higher resolution cameras with the ability to take sharper images will help improve detection.

The software currently being developed is being done with the aim to detect and recognize faces. Current plans for future work include adding the ability to detect and recognize emotions on the detected faces, hence expanding the range of applications for the software.

In its current state, the software can be further developed in a specialized manner for specific applications, such as attendance management systems. The ability to recognize multiple faces simultaneously allows for systems to record attending users in a shorter interval of time than existing systems, which require users to individually place themselves in front of a camera. This software could be trained to recognize users while they are gathered in their workplace, allowing for unobtrusive attendance recording.

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