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Human Face Recognition System Using Optimization techniques and Multiple Classifiers

A Research

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Chapter One

General Introduction

1.1 Introduction

It is very difficult to structure automated systems that equivalent to the ability of humans of revealing faces, recognized body part, or estimates human body dimensions from an image or a video. The intellectual and conceptual challenges of such a problem is non-rigidness of human faces, as well as their wide variability in color, size, shape, and texture. Track humans in videos or detect human appearance in the image is of high importance in various applications like monitoring traffic-safety, auto-focus cameras, visual surveillance, and human-computer interaction [1]. Face reorganization a pattern that can be centered on the face or body. Face detection can be defined as the steppingstone to all the algorithms of facial interpretation, consisting of face recognition, face authentication/verification, age/gender recognition, facial expression recognition/tracking, face modeling, face adjustment, face relighting, and head pose tracking . Only when computers identify face because the computer calculates the logic, and match the expiration according to the facial arrangement, The main aim of face detection is defined if there is a face in the image, if the image started then it returns image place, and extent all faces [2].

There are two classes for each face detection approach (non face and face). Face tracking/identification is the base for the majority of applications. The face's position in video or image should be determined via this application. Furthermore, recently the field of security has benefited greatly from the development of face detection approaches . Several of the main face

detection applications are the detection of human behavior, Selfie camera, and biometric approaches. Basically, the existence of faces are detected by face detection in 2-D structures. Thus, detecting the faces of humans can be achieved [3]. Certain number of techniques, and methods have been utilized in face detection field.

The data that is fed to computers will have main impact on the computer's outcome. The algorithm's reliability, and precision is utilized for the purpose of estimating the implementation regarding face detection approaches. Certain parameters have been utilized as standards [4] .

- a) Learning time: the needed time for changing and improving the authenticity for the purpose of differentiating between nonfaces and faces
- b) Samples required for training: the precision regarding the obtained results will be increased with the increase in the number of examples, sacrificing detection speed
- c) Ratio between false alarm and the speed of detection
- d) Execution time

The difficulties related to face detection field could be the result of these below aspects:

- Head pose: Head model: Due to the fact that the head of humans is somewhat similar to sphere in 3-D area, thus it is challenging to have the face's image fronting toward viewers and always at the center .
- Facial expression: is one of the most influential, temperament, and instant means for human beings to converse their emotions and meanings.
- Image adjustment: Images can be turned, upside-down, rotated or mirror image that is related to the original one, this might obstruct the face detection process .

- The obstacle in front of the face: The obstacle in the face's foreground: Viola-Jones approach utilizes Haar-features for identifying that the recognized object is nonface or face depending on certain differences in power levels of different face parts .
- Illumination: This factor is considered of high importance in defining the image's features and determining the estimation time for detecting the face [5].

1.2 Related Works

Siddiqi, Muhammad Hameed, et al (2014) [6]: Executed a strong FER system, able to provide high recognition precision even with the existence of the above-mentioned variations. The system utilizes un-supervised approach depending on active contour model for the automatic facial detection and extraction. In such system, collecting between 2 energy functions: Bhattacharyya distance as well as Chan–Vase energy functions have been utilized for minimizing the face variations, and maximizing the distance between the background and the face. After that, noise decrying was implemented through the use of wavelet decomposition, then extracting the features of facial movements via applying optical flow, the achieved precision was %88.17 .

Yang, Shuo, et al (2015) [7]: Suggested a novel Deep Convolution Network (DCN) was suggested via this study, DCN recorded an excellent performance with regard to AFW, PASCAL Face, and FDDB. Such approach check high recall rate (90.99 percent) on challenging FDDB standard, they look identifying the faces from novel perspectives via scoring certain responses of facial parts through their spatial structure and order. The mechanism of scoring is closely via taken into account complex condition where the faces are partly detectible. Such approach allow their

network for detecting faces beneath extreme occlusion and un-constrained pose alteration.

Pal and Foody (2010) [8]: They present an approach which emphasizes on a need for dimensionality reduction as a preprocessing classification stage. The experimental and results of study shows that the accuracy rate recognition of SVM algorithm can be increased when reducing the dimensionality of the data. So, the results show that the dimensionality reduction is the basic preprocessing step for SVM algorithm classification. Though, such relation was valid for a large dimensionality reduction, large training dataset are important. The experimental and results show that dimensionality reduction and the SVM algorithm classification accuracy are important correlated. The result when the feature dimensions considered is 55 and 65, the recognition accuracy rate is 92.24% and 91.76% respectively.

Yuan L., et al.,(2013) [9]: They introduced more versatile techniques in face recognition during preprocessing stage of the image by adopting eight eyes segmentation, geometry normalization and energy normalization. Then to attract the global features of the complete expression image as well as the local texture feature of mouth, by using Local Binary Pattern (LBP) and PCA. After the two kinds of feature ultimate recognition and expression classification, the SVM algorithm is used. For the experiment, from total samples of training images, half of the images are poor condition of illumination while half are clear condition. Seven recognition expressions are involved in experiment out of six expressions (happy, surprise, sadness, anger, fear, and disgust) and the result of the average recognition rate is 94%.

Isra'a Abdul-Jabbar (2014) [10]: This study aims to present the improvement of the face recognition rate by image enhancement process. The peculiarity of this work concentrates on improving of the face recognition in the light of face image enhancement, the image file format, the combine of Principle Component Analysis (PCA), Linear Discernment Analysis (LDA), Kernel Principle Component Analysis (KPCA) and Kernel Feature Analysis (KFA) feature extraction and feature reduction dimension. In the initial step,

faces images are adjusted with the image the adjustment, after that point, the images are presented with histogram equalization, then the face image is converted over from PGM to BMP and JPG to get two face databases with great quality, each of them 400 face images database. To decrease the dimension of face images, the PCA algorithm is used with measurement of two distance; Mahcos distance and Euclidean distance, while the Mahcos distance utilizes the remaining three techniques KPCA ,LDA and KFA. The output gained by the use of this approach show clearer metrics, sharp edges as well as provides more points of interest that prompted the predominant execution than the original PGM AT&T ORL database. The highest recognition rate reached by this research is 97%.

Nishu R. and Rajan S. (2016) [11]: In this work, the Scale-Invariant feature transform (SIFT) is used to get the features extracted, the optimized Features are gathered from the extracted features by the use of Cuckoo Search Algorithm. This work exhibits a method for the user authentication system in depending on the combine acquisition of face and fingerprint. Feature level fusion is used as it is used to enhance and provide the optimal results of identification. The accuracy rate of the proposed system is 0.97% .

Shaikh, Sadaf AH, and Dipti Jadhav (2018) [12]: Authors suggested Zernike moments based feature extraction approach with using SVMs for identifying 8 expressions (such as contempt and disgust) on JAFFE, and Radboud faces data-base with distinguishing multi manifold analysis approach with Single Sample Per person (SSPP), and finally put Zernike results to comparison with the results of Hu moments, and the precision was 96.7% .

Verma, Vivek Kumar (2019)[13]: Proposed the extraction of geometrical, and appearing features of face automatically from the frontal view. For extracting the feature, the cumulative benchmark approach is used. There are two basic classes as supervised as well as the unsupervised method applied for gender grouping.

They used a supervised machine learning method with three various classifiers, for this method as SVM, adobos and neural network. Authors have trained all the classifiers by means of conformable training datasets and identical feature. In the end, authors have done a comparative survey of the performance of these classifiers and who classifier is best for their essential dataset over facial images, accuracy was 98.70%.

1.3 Problem Statements :

The problem of above system preceding has been arrived at after displaying the literature on face detection and recognition, and determining face image situations in which such the systems might be of used. A system, to detect and recognize of face images with simplest expression different condition such as (black face, white face , face with glass , smile , little rotate), needs to be in front of the face image detection and recognition systems. Then, they used the feature of face is used extracted face by using (LDA) algorithm after used the all feature as input feature selection by using

Bat and Chicken algorithm. Finally, the features of classification are carried out by using support vector machine (J48,SMO,REP) algorithm.

1.4 Aim of Thesis:

This thesis aimed to design and implement of a system that can accept human face image as an input ,The system is able to recognize human face with high accuracy , no matter what is the illumination or rotation or even The size of The face image , presents the hybrid technique for face image recognition system to obtain high rate of accuracy for face image.

1.5 Thesis Layout:

This thesis is organized as follow:

Chapter two: this chapter includes theoretical background of the general algorithms , and techniques used in this thesis.

Chapter three: this chapter contains the proposed designed system, and its related

Algorithms ,and detail explanation .

Chapter four: this chapter presents the results obtained after applying the processed system on data set and the discussion of these results.

Chapter five: includes the conclusions and recommendations for future work.