THE TEXTUAL FEATURE AND CLASSIFICATION TECHNIQUES FOR FACE DETECTION FOR ATTENDANCE SYSTEM

Dissertation submitted in fulfilment of the requirements for the Degree of

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By

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ABSTRACT

The face recognition is the system in which machine learning is used. The face recognition system is the system which is used for the attendance system. The test and training set is prepared in which segmentation is done, feature extraction can be applied and dataset is designed. The test set is the image which needs to recognize by associating with the preparation set. The SVM classifier is applied which can classify test image into recognized or non-recognized. The linear SVM classifier has least accuracy because it classifies data into two classes. In this research, SVM can be replaced with KNN which increase accuracy of Classification and increase reliability of attendance system.

DECLARATION STATEMENT

I hereby declare that the research work reported in the dissertation/dissertation proposal entitled "THE TEXTUAL FEATURE AND CLASSIFICATION TECHNIQUE FOR FACE DETECTION FOR ATTENDANCE SYSTEM" in partial fulfilment of the requirement for the award of Degree for Master of Technology in Computer Science and Engineering at Lovely Professional University, Phagwara, Punjab is an authentic work carried out under supervision of my research supervisor Mr. /Mrs. Tejinder Thind. I have not submitted this work elsewhere for any degree or diploma.

I understand that the work presented herewith is in direct compliance with Lovely Professional University's Policy on plagiarism, intellectual property rights, and highest standards of moral and ethical conduct. Therefore, to the best of my knowledge, the content of this dissertation represents authentic and honest research effort conducted, in its entirety, by me. I am fully responsible for the contents of my dissertation work.

Signature of Candidate

ASHISH KUMAR SURYA

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SUPERVISOR'S CERTIFICATE

This is to certify that the work reported in the M.Tech Dissertation/dissertation proposal entitled "**THE TEXTUAL FEATURE AND CLASSIFICATION TECHNIQUE FOR FACE DETECTION FOR ATTENDANCE SYSTEM"**, submitted by **Ashish Kumar Surya** at **Lovely Professional University, Phagwara, India** is a bonafide record of his / her original work carried out under my supervision. This work has not been submitted elsewhere for any other degree.

Signature of Supervisor

(Tejinder Thind)

Date:

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Introduction

1.1 Image processing

It is broad terms that described the operations that can be applied on 2D, 3D or 4D waves form image data. The appropriate analysis tools are provided even in those cases where data have nothing to do with the images. The images which are captured from cameras/sensors placed on satellites, space inquiries and aircrafts or images taken are improved by using the image handling in usual day-today lifetime for many applications [1]. Throughout previous few years number of techniques has been established in Image Processing. The methods which have been settled from them most of the methods are for spreading images obtained from unmanned spacecraft's, space enquiries and military investigation flights. Due to number of advantages given by Image Processing such as relaxed accessibility of powerful personnel processors, large size memory devices, visuals software etc. variety Image Processing system more popular.

Image Processing is used in numerous presentations such as:

- Remote Detecting
- Medical Imaging
- Non-destructive Estimate
- Forensic Revisions
- Textiles
- Material Science
- Military
- Film industry
- File processing
- Realistic arts
- Production Manufacturing

By using one or more medical pictures of a patient the image processing can be used in medical science [2]. Some of them are given below:

- **Visualization:** Before we can create a 3D conception of a three dimensional object such as the crown we often need to remove the object material first from two-dimensional pictures.
- **Computer aided diagnosis:** In direction to notice breast cancer in initial phase regular breast radiographs of females are taken in western countries. The use of automated computer processing is prove to be helpful in case of the above application in which user have to deal with number of images.
- **Image segmentation:** The departure of an image into animated buildings. For example: the partition of a mind image into buildings like white mind matter, grey brain matter, cerebrospinal fluid, bone, fat, skin, etc. From improved visualization to monitoring of tumor growth the segmentation is prove to be helpful.
- **Image registration (also called image matching):** It is used when it is required to combine the number of images to make a new meaningful image to combined the information contain in two or three images of same patient.

The shared phases in image processing are:

- Image perusing
- Storage
- Attractive and clarification.

1.2 Recognition System

1.2.1 Face recognition: In computing capability over past few years, humans are used to recognize one individual using faces that makes face recognition as a most important research field [3]. A simple geometric model has been used in algorithm of face recognition but now it is advanced and uses sophisticated mathematical representation, matching process. The need of surveillance systems and automatic recognition technology results in increase interest of human visual system of face recognition [4]. It can be used for both open-set like verification and closed-set like identification.

1.2.2 Iris recognition: The distinctive epigenetic decoration of Iris left overs even during the life and it is the extremely visible, protected organ [5]. In case

of Iris recognition process a person is recognized by examining the unsystematic pattern of Iris. The unique Iris pattern can be extracted from digested image of the eye through image processing techniques and converted it into a biometric pattern (stored in database). The eye is first photographed in order to identify a subject and then created a pattern for their iris region. In this until matching template is found (subject is identified) or no match create (subject remains anonymous) the input template will be compared with other database stored templates.

1.2.3 Finger print recognition: One of the peak famous and used biometrics is thumbprint credentials. Because of their individuality and stability over time, fingerprints have been recycled for documentation for over a period. Due to development in calculating abilities, fingerprint acknowledgement has become automated. Among the most remarkable strengths of fingerprint recognition, some are mention below:

- Its mellowness offers a high level of credit correctness.
- The rising marketplace of low-cost small-size gaining devices, permitting its use in a wide variety of submissions, e.g., electric commerce, physical access, PC logon, etc.
- The usage of easy-to-use, ergonomic plans not need difficult user-system collaboration.

Continuously the other indicator, a number of faults may influence the efficiency of fingerprint recognition in certain belongings:

- Its suggestion with scientific or illegal presentations

1.2.4 Voice recognition: It is an alternate to typing on the keyboard it's just like whatever you will speak that will be displayed on the screen [7]. The software has been developed to provide a fast method of writing on a computer that helps people to deal with variety of physical disabilities. There are two phases included in each voice recognition system are given below [8]:

- **Training:** In this the presenter's voice pattern is set up from the type's vector and that are kept in a orientation file.

- **Testing phase:** In this features are much unidentified narrator's voice and a pattern similar algorithm computes the similarity score between the unknown speaker's features vector that stored in the reference database.

It is also known as feature extraction is included in both training and testing phases.

1.3 Face Recognition

The face recognition systems have been in use from past few decades. This has found its use in the area of biometrics such as Evidence security, contact control, law enforcement, smart cards and surveillance system. Face recognition research is used in area pattern recognition & computer vision [9]. In Florida, the first large scale application was carried on face recognition.

In current years, biometric built techniques are appeared as a most promising option for recognizing individuals. The physiological and/or behavioural characteristics are individually examined instead of allowing certifying people to access physical and virtual domains. The passwords, PINs, smart cards, plastic cards, tokens and keys are factors that come under physical and virtual domains. The valentines, marks, keys and the like can be misplaced, forgotten, or duplicated. Passwords and PINs are difficult to remember and can be taken or estimated. Magnetic cards can become degraded and unclear and person's biological traits cannot be misplaced, forgotten, taken or forged [10].

There are some factors that are needed to be considering how ever evolving a useful and applicable face recognition system:

- The general speed of the scheme from discovery to gratitude should be satisfactory.
- The correctness should be high
- The scheme should be simply updated and swollen, that is easy to growth the amount of focuses that can be documented.

1.4 Challenges of Face Recognition

1.4.1 The Image Quality: A subset of good quality image (which is collected under expected conditions) is the primary requirement of face recognition. The quality of image is necessary in order to excerpt the structures of image as the approaches robustness will be lost by inaccurate computation of facial features. The reduction in image quality results in delay of even best recognition algorithm.

1.4.2 Illumination Problem: This has been seen that with little change in lighting the images appear differently. This shows that appearance of an object gets drastically changed by illumination that's why irregular lighting should be overcome [11]. The degree of lighting invariance can be achieved using image processing given below:

- Normalizing
- Histogram equalization
- Order-statistic filtering

1.4.3 Pose Variation: Usually, the exercise data used by face recognition schemes are forward view expression pictures of individuals. The profile and other pose angle images contain more detail of information then frontal view images [12]. When frontal view training data need to be use in recognizing a rotated face then the problem will appears. In their face database, multiple views of an individual have been required.

The posture problematic has been distributed in to three classes:

- Modest case with minor revolution angle
- Utmost frequently addressed case, when there is a set of exercise image pairs, forward and swapped images.
- Furthermost difficult situation, when exercise image pairs are not. Behind are the most related methods to posture problem

1.5 General process of Face recognition

In the process of face recognition major stage will be to take an image that can be digital camera image, etc. [13]. To get the detail or identity of the input image user, its procedure is divided into three phases:

- Face recognition

- Article abstraction
- Face gratitude

After performing three above mentioned steps the input image user is identified or verified.

Face recognition: This step is the first step in image recognition that mainly perform two functions given below:

- Whether humanoid faces act in a particular image
- Wherever there expressions are situated

After performing face detection on input image we get patches for every face in the response image. In order to justify orientations and scales of these patches face alignment are performed that help in making face gratitude system extra robust or stress-free to design. It is the pre-processing step for face recognition [14]. The retargeting, image classification and region of interest detection are also performed using face detection.

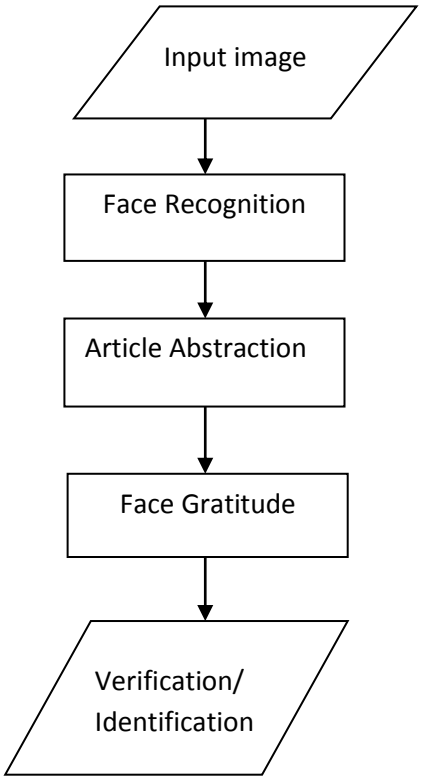

Fig. 1: Flow chart of overall process of face gratitude

Article Abstraction: After completion of first step, human patches are extracted from images that can't be used directly for face recognition. There are some disadvantages of using patches directly for face recognition given below:

- A robust recognition system can't be built from patches that usually contains over 1000 pixels.
- The occlusion and clutter can be occur as face patches are taken from different camera alignments with different face expressions, illuminations [15].

The face extraction has been performed on patches that do information packing, dimension reduction, salience extraction, noise cleaning and remove the drawbacks. The output of this step contains a vector with fixed dimension or a set of fiducially points and their corresponding locations [16].

Face Gratitude: This is the last step in the process of face recognition that recognizes an identity of these faces [17]. There is need to build a face database in order to achieve automatic recognition in which several images are taken of each person and then their features are extracted and stored in the database [18]. Number of researchers has proposed an algorithm to deal with this classification task. There are two main functions that are performed by face recognition step given below:

- **Face Identification:** In this phase a face image is given and the organism has to tell who is he / she or the greatest feasible documentation.
- **Face Verification:** In this step an expression copy and estimate of the documentation is given, the scheme has to express that guess is right or wrong.

1.6 Techniques of Face Recognition

There are mainly three types of methods that are used for performing face gratitude.

- Holistic Similar Methods
- Feature-based (organizational) Methods
- Mixture Methods

1.6.1 Holistic Similar Methods: In this method input data is whole expression area that is converted into face catching system [19]. Eigen values, Main Factor

Investigation, Linear Discriminant Analysis and self-regulating factor investigation etc. are the best example of holistic methods.

1.6.2 Feature-based (organizational) Methods: In this method firstly structures of eyes, nose and mouth are mined along with their location, local statistics. These extracted features are served into an organizational classifier. The feature restoration is considered as a large task in feature extraction [20]. This is the case when due to large variations features are get invisible that system tries to retrieve e.g. head Posture when we are matching' a fore image with a sketch image [21].

1.6.3 Mixture Methods: The complete and article abstraction approaches are combined in mixture face gratitude. Generally in this method 3D images are used i.e., the person face image is trapped in 3D that helps system to reminder the arcs of the eye hollows or face curves [22]. The systems uses an axis and depth of measurement that enable to serve face in profile as enough information is given by it to create a complete face. The 3D system proceeds with:

- Recognition
- Location
- Dimension
- Demonstration
- Equivalent

1.7 How Face Recognition is involved in the attendance system

Maintaining the attendance is essential in every one of the foundations for checking the performance of students. Each organization is using their own techniques and in most of the cases traditional method for taking attendance is physically utilizing participation sheet [23].

This currently used participation stamping technique is very time consuming, repetitive and tedious. The participants recorded physically can be controlled without putting much effort and it is also prove to be very hard to confirm the presence of individual student in a substantial classroom environment with disseminated branches. The manual appearance record scheme is not effective and needs extra time to organize record and to compute the usual appearance of each student.

Later there is a necessity of a scheme that will resolve the problematic of scholar record preparation and student average presence calculation. One substitute to brand student presence scheme programmed is providing by facial gratitude. This desertion is proposed to work on the issues of manual attendance system.

Chapter-2

Literature Survey

Marko Arsenovic, et.al, (2017), have projected a new deep learning based face gratitude attendance scheme. This system is proposed to accomplish the recent development of deep convolutional neural networks (CNNs). They have described a detail process of developing a face recognition model. This model consist several essential steps like CNN cascade for face detection and CNN for generating face embedding that are developed using today's most advanced techniques. In this paper [24], author's main role was the practical employment of these state-of-the-art deep learning methods for face gratitude responsibilities. The main task is to deploy CNNs that achieve the best results for larger datasets have to apply on smaller datasets in production environment. They have proposed a new method for face gratitude image augmentation task. The simulation outcomes display that overall efficiency of planned system is 95.02% on a small datasets of the original face images of employees in the real-time environment. The proposed face recognition model could be integrated in another system with or without some minor alternations as a supporting or a main component for monitoring purposes.

Geetha Baskaran, et.al, (2016), have analysed that there are concerns of students attendance in Malaysia every higher education. Currently the attendance process is done manually that is very time consuming and also inaccurate. The students overall academic performance get affected by inconsistent attendance in class that results in need of consistent attendance system. In proposed paper [25], authors have planned a new attendance scheme that uses mobile to recognize face and contain GPS locator. The Local Binary Pattern Histogram (LBPH) was adopted for recognizing face and GPS services are used to locate the position of students. The proposed system is a real time system that shows a high potential to replace the current attendance system. In order to reduce the rate of errors in managing students' attendance records and improve the efficiency of the student attendance-taking process they have designed a student attendance system. The Java-enforced object-oriented programming language developed by Sun Microsystems was chosen for implementing this mobile program. Theatrical results displayed that the recognition discovery share of our recommended procedure reached from75% to 95%.

Samuel Lukas, et.al, (2016), have recommended that verification is one of the main matters in terms of material systems. There are number of techniques that can be used for user authentication out of which one is human face gratitude (HFG). HFG is a significant division of biometric corroboration and are extensively used in different video observing/investigation system, human-computer communication, and gate access control system and network security like presentations. In proposed paper [26], authors have proposed a method for student audience in classroom using face appreciation technique. The face recognition task has been performed using mixture of Discrete Wavelet Transforms (DWT) and Discrete Cosine Transform (DCT) to abstract the structures of student's face which is shadowed by relating Radial Basis Function (RBF) for classifying the facial matters. It can be decided that automatic student attendance scheme in classroom using human face gratitude method everything quite well. Surely, it can be enhanced for compliant a well result chiefly by giving attention in article abstraction or gratitude process. The authors have taken 16 students that are present in the classroom and results shows that out of 148, 121 faces are recognized by using proposed system. This development may help the gratitude procedure develop more strong. The achievement degree of the planned system in knowing facial pictures of the students who are placed in classroom is about 82%.

NazareKanchanJayant, et.al, (2016), have concluded that in judging the performance of students in an academic organization, important role is played by attendance recording. In this paper, authors have proposed an automatic Attendance Management System (AMS) created on face discovery and face gratitude methods as physical attendance system show to be time intense. To perform face detection task they have used adapted Viola-Jones procedure and for performing task of face recognition they have used arrangement- free incomplete face gratitude procedure. The attendance is automatically updated in the excel sheet after successfully recognizing a student [27]. The planned system progresses the presentation of current attendance management systems in terms of involuntary following of the annals of the students, minimizing the physical labor and compression on the presenters for precise marking of the presence. This also helps in reducing the period compulsory for design presence and exploits the interval mandatory for actual teachings process along with increases the efficacy of the total scheme safety.

Priyanka Wagh, et.al, (2015), have analyzed that the attendance system can be prove to be difficult process to maintain when it handle manually. The biometrics can be used to manage the attendance that proves to be smart and automated attendance system the face recognition is one of them. The users are able to solve the issues of fake attendance and proxies. The intensity of light problem and head pose problem are few disadvantages in existing attendance system based on face recognition. So, there is need to implement a reliable and efficient attendance system for classroom attendance which can work for multiple face recognition at one time [28]. There is no need of any specialized hardware in order to implement this system. The smart attendance system can be constructed using camera device and a standalone PC, database servers. The main aim of this system is to detect the faces and perform recognition task on them. After these, the comparison of detected faces can be done by crosschecking with the database of student's faces. The simulation results show that this smart system will be an effective way to maintain the attendance and records of students.

Adrian RhesaSeptianSiswanto, et.al, (2014), have analyzed that process of face gratitude initiates with removing the width of mouth, width of eyes, pupil like features coordinates. The extracted features are compared with the capacities kept in the database and reoccurrence the adjoining record (facial metrics). In today world, facial recognition has been a hot research topic for researchers the task of face recognition can be done by different methods such as facial article abstraction, facial procedure developments, and facial credit employments. In this paper [29], authors main motive is to provide a greatest face mask gratitude algorithm (Eigen face and Fisher face) provided by the Open CV 2.4.8. Then they have compared it with the ROC (Receiver Operating Characteristics) arc and instrument it in the presence system. The experimental and simulation results show that the ROC curve demonstrates that using the present training set, Eigen face attains healthier result than Fisher face. The Eigen face is applied secret the Attendance System and results show that it is prove be 70% to 90% efficient in terms of similarity for genuine face images.

Chapter-3

Present Work

3.1. Problem Formulation

The face recognition is used to authenticate the users which are using any type of services. The expression recognition consists of various steps which consists of segmentation, feature extraction and classification. To classify the data into recognized and non-recognized the training set need to prepare. When the face is recognized then the attendance of the student gets marked. To prepare the tanning set, the segmentation of the image done, in the second textual features of the image get analyzed. The training set is the dataset which stores the information about the features of the faces. The examination set is the expression image which needs to match with the training set. In the examination set the appearance get segmented, the textual features of the image get analyzed and in the fast step, the classification will be done using SVM classifier. The SVM classifier will classify the data into two classes due to which it has least accuracy which need to get improved. In this research work, the SVM classifier can be replaced with some other classifier to increase accuracy of classification

3.2. Objectives

Following are the various objectives of this research work:-

1. To study and analyse various face recognition techniques of digital image processing

2. To propose improvement in SVM classifier based face recognition system for digital image processing

3. The proposed improvement will be based on the KNN classifier for the face recognition

4. Implement proposed algorithm and compare with existing in terms of various parameters.

3.3. Research Methodology

The SVM classification technique is been used in the previous systems for the expression discovery. In the existing system for the face spoof detection textual features of the test image is analyzed using the DWT algorithm. The textural features will be act like the training set for the classification. The result of the SVM classification will classify the test image into spoofed or non-spoofed face. The textual features of the spoofed image is approximate equal to the original image due to which SVM classification accuracy is reduced in some cases of detection. In this work, KNN classifier is used for the face spoof classification. In KNN classifier The exercise models are shown by n dimensional numeric characteristics. Every instance characterizes a point in an n-dimensional world. Along these lines, the greater part of the exercise examples is stored in an n-dimensional decoration space. At the point when given an unidentified model, a k-nearest neighbour classifier appearances the configuration space for the k exercise samples that are neighbouring to the unidentified sample. "Nearness" is well-defined in positions of Euclidean distance. Not at all like decision have tree orientation and back propagation, nearest neighbour classifiers allocated interruption even with heaviness to every characteristic. This may convey about mistake when there are frequent immaterial characteristics in the data. Nearest neighbour classifiers can similarly be utilized for forecast, that is, to give back an honest valued prediction for a given unidentified sample. For this state, the classifier gives back the average value of the genuine valued related with the k nearest neighbours of the unidentified sample. The k-nearest neighbours' algorithm is amongst the artless of all machine learning algorithms. The structures of the test image will be analyzed with the DWT algorithm and on the discovered structures KNN classifier will be practical which will classify the face into noticed or non-detected

Expected Outcomes

Following are the various expected outcomes of this research :-

1. The proposed algorithm can classify the test set into more than two classes which increase the accuracy of classification

2. The proposed algorithm can also increase the reliability of the attendance system for the classification

Chapter-4

Conclusion

4.1 Conclusion

In this research, it has been concluded that face recognition is the application of the machine learning. In the machine learning system, the new values will be derived from the previous experiences. The training set is prepared in which process of segmentation, feature analyses and classification is implemented. The test set is the image which needs to recognize for the attendance system. In this research work, the SVM classifier is used to classify the faces and which can be replaced with the KNN classifier which increase accuracy of classification.

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