International Journal of Current Engineering and Technology
E-ISSN 2277 – 4106, P-ISSN 2347 – 5161

Available at http://inpressco.com/category/ijcet

Research Article

Face Recognition System by using Principal Component Analysis and Fully Convolutional Network

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Received 10 Nov 2020, Accepted 10 Dec 2020, Available online 01 Feb 2021, **Special Issue-8 (Feb 2021)**

Abstract

Face recognition has increased a noteworthy situ- ation among most usually utilized uses of picture preparing. With the quick development in media substance, among such substance face acknowledgment has got a lot of consideration particularly in recent years. Face as an item comprises of unmistakable highlights for identification; in this manner, it stays most testing research region for researchers in the field of PC vision and picture handling. Halfway face pictures are created in an unconstrained domain. A face might be blocked by shades, a cap and a scarf, caught in different postures, situated incompletely out of cameras field of view. Human face assumes a significant job in our social cooperation, passing on individuals' character yet it is a powerful item and has a high level of inconstancy in its appearances. The issue of perceiving a self-assertive fix of a face picture remains to a great extent unsolved. This study proposes a new partial face recognition approach, called Dynamic Feature Matching, which combines Fully Convolutional Networks, Principal Component Analysis and Sparse Representation Classification to address partial face recognition problem regardless of various face sizes. DFM does not require prior position information of partial faces against a holistic face.

Keywords: *Dynamic feature matching, Partial face recogni- tion, Principle component Analysis, Fully convolutional network.*

Introduction

In The 21st century is an advanced and logical time wherein a great deal of progress has been accomplished as to facilitate people for achieving their assignments. On the side of above explanation, these days utilization of PC innovation has been a vital piece of life. PCs are being utilized in pyramids of uses, which go from easy to complex critical thinking techniques. Among such commitments face acknowledgment innovation has risen as valuable device to perceive highlights of coun- tenances through their inborn attributes. What‟s more, it has been one of the most explored regions in the field of example acknowledgment and PC vision. Be that as it may, because of its wide use in huge number of utilizations, for example, in bio-measurements, data security, law implementation get to control, observation framework and brilliant cards. Be that as it may, it has numerous difficulties for analyst that should be tended to. Face an item relies upon outward appearances, which comprise significant highlights. For example, present invariance, enlightenments and maturing which are potential zones that require further examination over past work. The aftereffect of past looks into uncovers that outward appear- ances are changing regarding maturing; thusly, they couldn‟t be for all time displayed in face acknowledgment. The face acknowledgment issue can be sorted into two primary stages: 1) face check and 2) face distinguishing proof. For instance, continuously framework, face check distinguishes a similar individual in the scene, and face recognizable proof who is this individual in that scene. In the main stage it finds a face in a picture. Likewise, in the subsequent stage, it extricates highlights from a picture for separation. After that they are coordinated with face database pictures so as to perceive right face picture. Face acknowledgment framework involves three primary modules: preprocessing, include determination, and order. The specialists have proposed various calculations and systems for perceiving a face in a powerful and effective way. For this reason, they have concentrated on identification and acknowledgment of qualities and highlights for people, for example, nose, eyes, mouth, face shape position, size, and adjacent to relationship among attributes and highlights. Besides, continuous research in face acknowledgment attempts to grow such frameworks that could function admirably in a viable and proficient way in large number of true applications.

Review of Literature

This paper considers the issue of Face acknowledgment frameworks in certifiable applications need to manage a wide scope of impedances, for example, impediments and camouflages in face pictures. Contrasted and different types of impedances, for example, no uniform light and posture changes, face with impediments has not pulled in enough consideration yet.[1] The significant way to deal with inexact separations is the milestone based methodology which precompute and store various most limited way trees established at tourist spots. While these strategies effectively attain preferable scalability, some of them have critical precision problems for close pairs and the other methods with better precision have three orders of magnitude slower query time. Consequently, focus of the research community is shifting toward under mentioned exact methods, leading to recent large improvement on exact methods.[2] Face recognition (FR) is the problem of verifying or identifying a face from its image. It has received substantial attention over the last three decades due to its value both in understanding how FR process works in humans as well as in addressing many challenging real-world applications, including de-duplication of identity documents.[3] Right now, creator enhances as it proposes a profound learning and set-based way to deal with face acknowledgment subject to maturing. The pictures for each subject taken at different occasions are treated as a solitary set, which is then contrasted with sets of pictures having a place with different subjects. Facial highlights are removed utilizing a convolutional neural system normal for profound learning. This test result show that set-based acknowledgment performs superior to the singleton based methodology for both face distinguishing proof and face verification.[4] Right now, novel and productive facial portrayal is proposed. It depends on isolating a facial picture into little districts and processing a portrayal of every area utilizing nearby double patterns.[5] Right now, utilizes the methodology which is absolutely information driven strategy which gains its portrayal straightforwardly from the pixels of the face. Instead of utilizing built highlights, we utilize a huge dataset of named appearances to achieve the fitting invariances to posture, enlightenment, and other variety conditions.[6] Right now creator proposed structure initially changes the first posture invariant face acknowledgment issue into a fractional frontal face acknowledgment issue. A powerful fix based face portrayal conspire is then evolved to speak to the blended fractional frontal appearances. For each fix, a change lexicon is found out under the proposed perform multiple tasks learning plan. The change word reference changes the highlights of various stances into a discriminative subspace. At long last, face coordinating is performed at fix level as opposed to at the all encompassing level.[7] In this paper, initially they requires three face poses for training purpose. Among them first pose is taken from front, second is from left side and the third face image is taken from right side. All the face images are processed in next phase for bi-parting these images and the entire images are converted into six partial phases. After conversion of these faces into six parts the provision is made to define the image classes.These image classes are used with the LDA feature extraction algorithm.[8] The author proposed a Multi-Scale Region-based CNNs (MRCNN) model and achieves the highest performance for partial face recognition on NIR-Distance database. However, these methods require the presence of certain facial components and pre-alignment. To this end, we propose an alignment-free partial face recognition algorithm DFM that achieves better performance with higher computation efficiency.[9] In this paper the author propose an alignment-free approach called multiple key points descriptor SRC (MKD-SRC), where multiple affine invariant key points were extracted for facial features representation and sparse representation based on classification (SRC) is used for classification.[10]

Problem Statement

Partial face acknowledgment (PFR) in an unconstrained domain is a significant undertaking, particularly in circumstances where halfway face pictures are probably going to be caught because of impediments, out-of-view, and enormous review point, e.g., video observation and cell phones. The issue of perceiving a subjective fix of a face picture remains to a great extent unsolved. To perceive a subjective face picture caught in unconstrained condition.

Proposed System

In the proposed work I have taken the partial images as an input and perform various operations on that image like preprocessing, feature extraction, classification and if found the matching image which is related to given input then displaythe result. When input Image is matched with dataset then show the resultant image as an output. For this processing I am using fully convolutional network (FCNN) algorithm and Principal Component Analysis (PCA) algorithm.

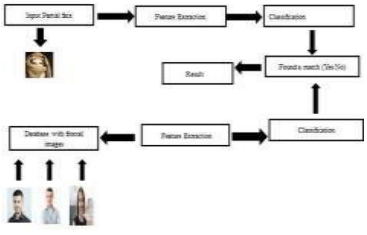


Fig. 1. System Architecture

Algorithm

A. Principal Component Analysis Algorithm:
1) Prepare the Data, The first step is to obtain a set S with M face images. Each image is transformed into a vector of size N and place into the set.
2) Obtain the Mean After obtaining the set, the mean image has to be obtained.
3) Subtract the Mean from Original Image, The difference
between the input image and the mean image has to be calculated and the result is stored.
4) Calculate the Covariance Matrix.
5) Calculate the Eigenvectors and Eigenvalues of the Covariance Matrix and Select the Principal Components,
In this step, the eigenvectors (Eigen faces) and the corresponding eigenvalues should be calculated. From M eigenvectors, only M should be chosen, which have the highest eigenvalues. The higher the eigenvalue, the more characteristic features of a face does the particular
eigenvector describe. Eigen faces with low eigenvalues can be omitted, as they explain only a small part of the characteristic features of the faces
B. Fully Convolutional Network Algorithm:
Image Classication, Object Detection and Semantic segmentation processes are involved in Fully Convolutional
Network.
Steps involved in Fully Convolutional Network.
1. Image Classication to Semantic Segmentation
2. Upsampling Via Deconvolution
3. Fusing the Output
4. Getting the results

Mathematical Model

Let us consider S as a set of prediction and given to medicine
S = *{ }*
F = *{*f1, f2, f3 .....,fn— F as set of functions to execute commands *}*
I = *{*i1, i2, i3—I sets of inputs to the function set*}*
O = *{*o1, o2, o3.—O Set of outputs from the function sets,
S=I, F, O*}*
S = *{*I, F, O*}*
I = *{*upload partial image as a input. *}*
O = *{*Output i.e. Match the partial face with actual face.*}*
F = *{*PCA and FCN*}*

System Requirements

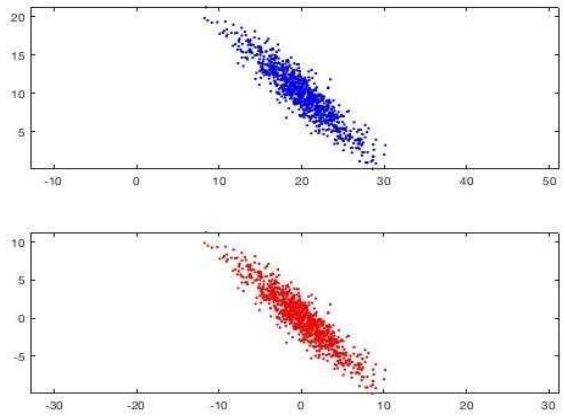
A. Software Requirement
1) Operating System : Windows7 or above
2) Language: Python
3) Database : My sql 5.5 4) Database Connectivity : JDBC.

B. Hardware Requirement
1) Processor : Intel
2) CPU Speed : 1.1 GHz or Higher
3) RAM : 2 GB or Higher
4) Hard Disk : 100 GB or Higher

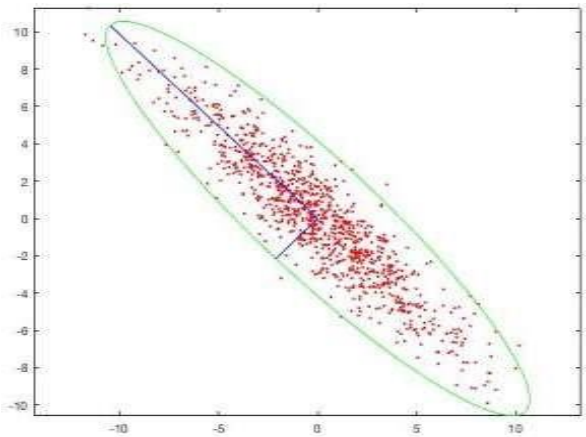
Advantages
• File replication is an effective method to enhance data availability, reduce read latency and power consumption.

Experimental Analysis

These plots show the same data, except the bottom chart zero-centers it. Notice that our data do not have any labels associated with them because this is unsupervised learning. All dimensionality reduction techniques aim to find some hyperplane, a higher-dimensional line, to project the points onto. We can imagine a projection as taking a flashlight perpendicular to the hyperplane were project onto and plotting where the shadows fall on that hyperplane.



We compute the covariance matrix of our data and consider that covariance matrixes largest eigenvectors. Those are our principal axes and the axes that we project our data onto to reduce dimensions. Using this approach, we can take high- dimensional data and reduce it down to a lower dimension by selecting the largest eigenvectors of the covariance matrix and projecting onto those eigenvectors.



Conclusion

Face detection and recognition are challenging problems and there is still a lot of work that needs to be done in this area. The face recognition is a subject of machine learning and Image Processing. That is frequently used for various different applications for authentication secure access control due to their uniqueness. The proposed work is dedicated to design and implement a face recognition model that accept the partial or complete face images in order to identify the face class. In this context the three step process is proposed to work where in first phase the face images are partitioned into multiple face parts this step is termed here as the preprocessing of images. Secondly the images are processed for feature extraction. Finally different techniques are used to perform training on extracted face features and classes and the trained model is used for recognizing the faces. In near future the proposed model is implemented and their performance is provided

Acknowledgment

It is matter of great pleasure for me to submit this Paper on “Face Recognition System by using Principal Component Analysis and Fully Convolutional Network” as a part of curriculum for award of „Master in Computer Engineering“ degree of Savitribai Phule Pune University. Firstly I would like to thank to my guide **Prof. Vilas S. Gaikwad**, for his agile and skillful guidance, continuous inspiration, supervision and discussion while working on this project and writing of this paper. I would also want to thank all the authors of various research papers referred while preparing this paper. My guide and college very much helped and inspired for knowledge gaining to continue my work in future.

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