International Journal of Advances in Engineering and Management (IJAEM)
Volume 3, Issue 4 Apr. 2021, pp: 71-75 www.ijaem.net ISSN: 2395-5252

Multiface Deduction Using Image Processing Technique

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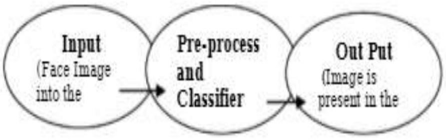
Submitted: 01-04-2021 Revised: 11-04-2021 Accepted: 14-04-2021

ABSTRACT: We present a neural network-based upright multi face detection system. A retinally connected neural network examines small windows of an image, and decides whether each window contains a face. The system arbitrates between multiple networks to improve performance over a single network. We present a straightforward procedure for aligning positive face examples for training. To collect negative examples, we use a bootstrap algorithm, which adds false detections into the training set as training progresses. This eliminates the difficult task of manually selecting non face training examples, which must be chosen to span the entire space of non face images. Simple heuristics, such as using the fact that faces rarely overlap in images, can further improve the accuracy. Comparisons with several other state-of-the-art face detection systems are presented; showing that our system has comparable performance in terms of detection and false-positive rates. In recent years face recognition has received substantial attention from both research communities and the market, but still remained very challenging in real applications. A lot of face recognition algorithms, along with their medications, have been developed during the past decades. A number of typical algorithms are presented. In this paper, we propose to label a Self-Organizing Map (SOM) to measure image similarity. To manage this goal, we feed Facial images associated to the regions of interest into the neural network. At the end of the learning step, each neural unit is tuned to a particular Facial image prototype. Facial recognition is then performed by a probabilistic decision rule. This scheme offers very promising results for face identification dealing with illumination variation and facial poses and expressions. This paper presents a novel Self-Organizing Map (SOM) for face recognition. The SOM method is trained on images from one database. The novelty of this work comes from the integration of A facial recognition system is a computer application for automatically identifying or verifying a person from a digital image or a video frame from a video source. One of the way is to do this is by comparing selected facial features from the image and a facial database. It is typically used in security systems and can be compared to other biometrics such as fingerprint or eye iris recognition systems.

Keywords:-Face recognition, self-organizing map, neural network, artificial intelligence, scope

I. INTRODUCTION

It is often useful to have a machine perform pattern recognition. In particular, machines which can read face images are very cost effective. A machine that reads passenger passports can process many more passports than a human being in the same time [1]. This kind of application saves time and money, and eliminates the requirement that a human perform such a repetitive task. This document demonstrates how face recognition can be done with a back propagation artificial neural network. Recognition System (FRS) can be subdivided into two main parts. The first part is image processing and the second part is recognition techniques. The image processing part consists of Face image acquisition through scanning, Image enhancement, Image clipping, Filtering, Edge detection and Feature extraction. The second part consists of the artificial intelligence which is composed by Genetic Algorithm and There are many approaches for face recognition .faces, In this paper, we present a neural network-based algorithm to detect upright, frontal views of faces in gray-scale images1. The algorithm works by applying one or more neural networks directly to portions of the input image, and arbitrating their results. Each network is trained to output the presence or absence of a face. The algorithms and training methods are designed to be general, with little customization for faces.



Geometric approach to face recognition

The first historical way to recognize people was based on face geometry. There are a lot of geometric features based on the points. We experimentally selected 37 points Geometric features may be generated by segments, perimeters and areas of some figures formed by the points. To compare the recognition results we studied the feature set described in detail in [7]. It includes 15 segments between the points and the mean values of 15 symmetrical segment pairs. We tested different subsets of the features to looking for the most important features. tested 70 images of 12 persons. Images of two persons were added from our image database. They were done with a huge time difference (from 1 to 30 years). We have selected 28 features. In spite of small rotation, orientation and illumination variances, the algorithm works in a fairly robust manner. Each image was tested as a query and compared with others. Just in one case of 70 tests there were no any image of the person in the query through the 5 nearest ones, i.e. the recognition rate was 98.5%. The approach is robust, but it main problem is automatic point location. Some problems arise if image is of bad quality or several points are covered by hair

Challenges in Face Recognition: - Pose, Illumination,

Facial expression, Image condition, Face size. Classification of Face Recognition Face recognition scenarios can be classified into two types

1) **Face verification**: It is a one-to-one match that compares a query face image against a template face image whose
identity is being claimed. To evaluate the verification performance, the verification rate (the rate, at which legitimate users are granted access) vs. false accepts rate (the rate at which imposters are granted access) is plotted, called ROC curve. A good verification system should balance these two rates based on operational needs.

2**) Face identification**: It is a one-to-many matching process that compares a query face image against all the template images in a face database to determine the identity of the query face. The identification of the test image is done by locating the image in the database that has the highest similarity with the test image [4]. The identification process is a "closed" test, which means the sensor takes an observation of an individual that is known to be in the database. The test subject"s (normalized) features
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PROBLEM DEFINITION:

The problem of face recognition can be stated as follows : Face Recognition human facial features like the mouth, nose and eyes in a full frontal face image. We will be adapting a multi-step process in order to achieve the goal. To detect the face region we will be using a skin-color segmentation method. Morphological techniques will be adapted to ll the holes that would be created after the segmentation process. From the skeletonization process, a skeleton of the face will be obtained from which face contour points could be extracted. Facial features can be located in the interior of the face contour. We will use several di erent facial-images to test our method. There is a database of N portrait images and a query image. Find k images most similar to the given face image. The number k may be a constant (for example, 20 for a large database), it may be limited by a similarity threshold, or it may be equal to the number of all pictures of the same person in the database.

Input image normalization

Image normalization is the first stage for all face recognition systems. Firstly face area is detected in the image. We used template matching to localize a face. Then the eye (iris) centers should be detected because the distance between them is used as a normalization factor. We located the eyes in facial images of different size using the luminance.

Input Data Limitation

For robust work of the system, images must satisfy the following conditions:
- They are gray-scale or color digital photos.
- The head size in the input image must be bigger than 60x80 pixels; otherwise the fiducially points may be
detected with low accuracy.
- Intensity and contrast of the input image allow detecting manually the main anthropometrical points

International Journal of Advances in Engineering and Management (IJAEM)
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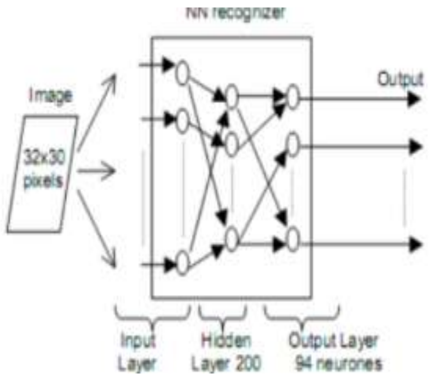
like eye corners, nostrils, lipping contour points, etc.
- The head must be rotated not more than at 15-20 degrees (with respect to a frontal face position).
Ideally, the input image is a digitized photo for a document
(Passport, driving license, etc.).

Neural network

The network will receive the 960 real values as a 960-pixel input image (Image size ~ 32 x 30). It will then be required to identify the face by responding with a 94-element output vector [5]. The 94 elements of the output vector each represent a face. To operate correctly the network should respond with a 1 in the position of the face being presented to the network All other values in the output vector should be 0 [5]. In addition, the network should be able to handle noise. In practice the network will not receive a perfect image of face which represented by vector as input. Specifically, the network should make as few mistakes as possible when classifying images with noise of mean 0 and standard deviation of 0.2 or less.

Architecture of Neural Network

The neural Network Needs 960 inputes and 94 neurons in output layer to identify the faces. The network is a two-layer logsigmoid/log-sigmoid network [6], [7], [8]. The log-sigmoid transfer function was picked because its output range (0 to 1) is perfect for learning to output Boolean values (see figure3) [5]. The hidden layer has 200 neurons [5]. This number was picked by guesswork and experience [5]. If the network has trouble learning, then neurons can be added to this layer [5], [9]. The network is trained to output a 1 in the correct position of the output vector and to fill the The neural Network Needs 960 inputes and 94 neurons in output layer to identify the faces. The network is a two-layer log-sigmoid/log-sigmoid network [6], [7], [8]. The log-sigmoid transfer function was picked because its output range (0 to 1) is perfect for learning to output Boolean values [5]. The hidden layer has 200 neurons [5]. This number was picked by guesswork and experience [5]. If the network has trouble learning, then neurons can be added to this layer [5], [9]. The network is trained to output a 1 in the correct position of the output vector and to fill the rest of the output vector with 0‟s. However, noisy input images may result in the network been trained the output will be passed through the competitive transfer function. This function makes sure that the output corresponding to the face most like the noisy input image takes on a value of 1 and all others have a value of 0. The result of this post processing is the output that is actually used [9].



System performance

The reliability of the neural network pattern recognition system is measured by testing the network with hundreds of input images with varying quantities of noise. We test the network at various noise levels and then graph the percentage of network errors versus noise. Noise with mean of 0 and standard deviation from 0 to 0.5 are added to input images. At each noise level 100 presentations of different noisy versions of each face are made and the network‟s output is calculated. The output is then passed through the competitive transfer function so that only one of the 94 outputs, representing the faces of the database, has a value of 1. The number of erroneous classifications is then added and percentages are obtained

The solid line (black line) on the graph shows the reliability for the network trained with and without noise. The reliability of the same network when it had only been trained without noise is shown with a dashed line. Thus, training the network on noisy input images of face greatly reduced its errors when it had to classify or to recognize noisy images. The network did not make any errors for faces with noise of mean 0.00 or 0.05. When noise of mean 0.10 was added to the images both networks began to make errors. If a higher accuracy is needed the network could be trained for a longer time or retrained with more neurons in its hidden layer. Also, the resolution of the input images of face could be increased to say, a 640 by 480 matrix. Finally, the network could be trained on input images with greater amounts of noise if greater reliability were needed for higher levels of noise.

II. CONCLUSION AND FUTURE WORK

Face recognition is a both challenging and important recognition technique. Among all the biometric techniques, face recognition approach possesses one great advantage, which is its user-friendliness (or non-intrusiveness). In this paper, we have given an introductory survey for the face recognition technology. We have covered issues such as the generic framework for face recognition, factors that may affect the performance of the recognizer, and several state-of-the-art face recognition algorithms. We hope this paper can provide the readers a better understanding about face recognition, and we encourage the readers who are interested in this topic to go to the references for more detailed study. Face recognition technologies have been associated generally with very costly top secure applications. Today the core technologies have evolved and the cost of equipments is going down dramatically due to the integration and the increasing processing power. Certain applications of face recognition technology are now cost effective, reliable and highly accurate. As a result there are no technological or financial barriers for stepping from the pilot project to widespread deployment. Though there are some weaknesses of facial recognition system, there is a tremendous scope in India. This system can be effectively used in ATM identifying duplicate voters, passport and visa verification, driving license verification, in defense, competitive and other exams, in governments and private sectors. Government and NGOs should concentrate and promote applications of facial recognition system in India in various fields by giving economical support and appreciation. There are a number of directions for future work. The main limitation of the current system is that it only detects upright faces looking at the camera. Separate versions of the system could be trained for each head orientation, and the results could be combined using arbitration methods similar to those presented here. Preliminary work in this area indicates that detecting frontal views, because they have fewer stable features
pro files views of faces is more difficult than detecting frontal views, because they have fewer stable features
and because the input window will contain more background pixels.
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International Journal of Advances in Engineering and Management
ISSN: 2395-5252

IJAEM

Volume: 03 Issue: 04 DOI: 10.35629/5252

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