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Gender Recognition from Face Pictures with Native WLD Descriptor and Neural Network Approach

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Abstract-In various biometric applications, gender recognition from facial images plays an important role. In this paper, we investigate Weber's Local Descriptor (WLD) for gender recognition. WLD is a texture descriptor that performs better than other similar descriptors but it is holistic due to its very construction. From WLD we will obtain the significant properties of face images. Here an approach for developing an automatic system to classify gender from a facial image using Neural Network Classifier is presented. The significant features are allowed to feed as input to the neural network. The experiments are performed on given database and the accuracy of the system is computed for the database.

Keywords- Weber's local descriptor, Feature extraction, Gender Recognition, Support vector machine, Local binary Pattern.

I. INTRODUCTION

Gender classification was first perceived as an issue in psychophysical studies, which focuses on the efforts of understanding human visual processing and identifying key features used to categorize between male and female individuals. Research has shown that the disparity between facial masculinity and femininity can be utilized to improve performances of face recognition applications in biometrics, human-computer interaction, surveillance, and computer vision. However, in a real-world environment, the challenge is how to deal with the facial image being affected by the variance in factors such as illumination, pose, facial expression, occlusion, background information and noise. This is then also the challenge to the development of a robust face-based gender classification system that has high classification accuracy and real-time performance.

The conventional approach applied in face recognition, including face-based gender recognition, typically involves the stages of image acquisition and processing, dimensionality reduction, feature extraction, and classification, in that order. Prior knowledge of the application domain is required to determine the best feature extractor to design. In addition, the performance of the recognition system is highly dependent on the type of classifier chosen, which is in turn dependent on the feature extraction method applied. It is difficult to find a classifier that combines best with the chosen feature extractor such that an optimal classification performance is achieved. Any changes to the problem domain require a complete re-design of the system.

The following figure illustrates Pattern Recognition approach.

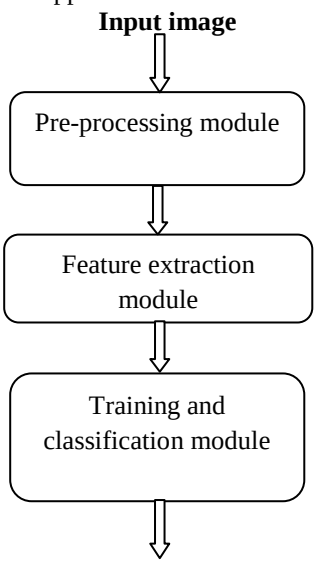

Fig 1.1: Pattern recognition approach

II. PREVIOUS WORK

Although gender classification can play a significant role in many computer vision applications, it has not been as well studied compared to the more popular problem of recognition and identification. Most of the existing solutions for pattern recognition problems apply trainable or non-trainable classifiers preceded by heuristic-based feature extractors. This section discusses briefly on previous works, from the perspective of the classification methods applied.

Support vector machine (SVM) is a popular algorithm for classification. In, a gender classification system using local binary pattern (LBP) and SVM with polynomial kernel was proposed. A disadvantage of the method is that high classification performance can only be achieved if the block size for the LBP operator is correctly selected, which is a rather difficult task. The work applied Viola and Jones face detection, 2D-DCT feature extraction and K-means nearest neighbour (KNN) classifier. 2D-DCT is a compute-intensive algorithm; hence this method is not suitable for real-time applications. Among the first attempts to apply neural networks in gender classification, With a fully-connected multi-layer perceptron (MLP) used in conjunction with a large number of image processing modules, an average error rate is high enough which is rather large compared to state-of-the-art results. A hybrid approach in which they processed the face image with principal component analysis (PCA) for dimensionality reduction. Genetic algorithm (GA) was then used to select a good subset of Eigen-features. In addition to the poor error rate achieved, the main drawback of this method is that, although it is an effective global random search method, GA exhibits high computational complexity. The main disadvantages of the aforementioned methods are that the feature extraction and classification modules are designed and trained separately, and they require prior application-specific knowledge in order to obtain optimal pre-processing and feature extraction designs.

III. PROPOSED APPROACH

In this paper we introduce a novel technique for enhancing the gender classification rate using the textural properties of the faces. The idea of using textural properties of faces is not new, however we employ a new texture descriptor WLD (Weber Local Descriptor) which has never been tested for gender recognition. WLD outperforms in texture recognition than stat-of-the-art best descriptors like LBP, Gabor, and SIFT. The basic WLD descriptor is a histogram where differential excitation values are integrated according their gradient orientations. The differential excitation values are concatenated irrespective of their spatial location and so WLD behaves like a holistic descriptor. The significant features are then fed to the neural network and performing classification process whether the given face related to male person or female. The procedural diagram is shown below.

Procedure

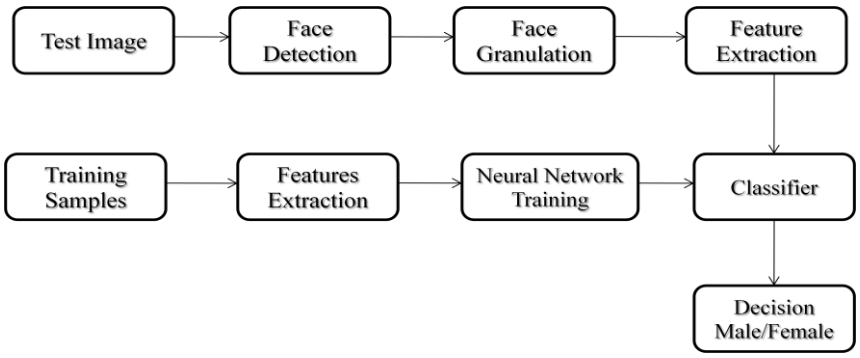

Fig 3.1: Procedural Diagram

Face Detection

It is a process to extract face region from input image which has normalized intensity and uniform size.The features are extracted from detected face part which describes changes of face such as folds in the face skin.We are going to use an executable .dll- dynamic link library file is utilized to extract face region

FACE GRANULATION

It is used to represent the facial information of several parts to extract the features and discriminate presence of variations such as pose, expression and illumination.To detect face granules, 2D gaussian low pass filter is used At each iteration level, the image will be down sampled to make difference of gaussian pyramid.These granules are used to provide facial features such as smoothness, edge details and blurrness

TEXTURE DESCRIPTOR

The face region will be described by extracting its texture by weber's local features extractor.This process involves two stages of features detection such as differential excitation and gradient orientation.This features detector will be useful to extract spatial information for discriminating an illumination changes. It is fast and easy approach and it has better discriminant power than features extraction methods

WEBER'S LAW DESCRIPTOR FOR IMAGE REPRESENTATION

This descriptor represents an image as a histogram of differential excitations and gradient orientations, and has

several interesting properties like robustness to noise and illumination changes, elegant detection of edges and powerful image representation. WLD descriptor is based on Weber's Law. According to this law the ratio of the increment threshold to the background intensity is constant. The computation of WLD descriptor involves three steps i.e. finding differential excitations, gradient orientations and building the histogram.

WEBERS FACE FEATURES

The webers face will be determined using two factors such as differential excitation and gradient orientation. An each granule will be separated into overlapping blocks to evaluate the differential excitation with current coefficient and neighbourhood matrix.

De = sum(change in difference b/w current & surrounding values)/ Current Value

The gradient is defined by **g = atan(De)**

It will be continued for all coefficients of each granules to make webers face pyramid.

FEATURESEXTRACTION

Features such as Contrast, Energy, Entropy, Corelation, Homogeneity, Skewness, Kurtosis are being extracted using GrayCorps Matrix

GENDER RECOGNITION

The block diagram of the recognition system which we used in gender recognition is shown in Figure.2. The two main components of the system are feature extraction and classification. Various existing approaches differ in the choice of feature extraction and classification. For feature extraction we used spatial WLD descriptor described in previous section. It is need to extract most discriminative features for gender recognition.

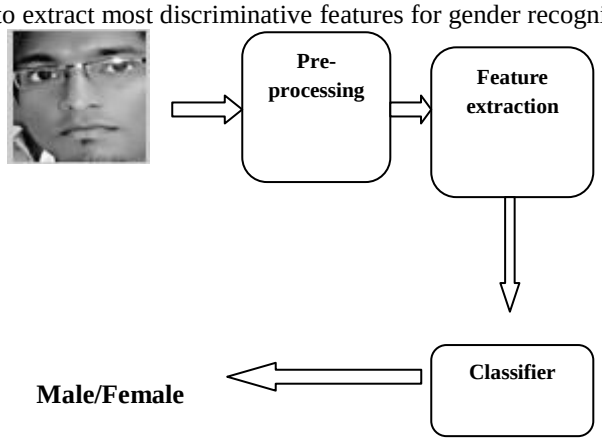

Figure 3.2: Gender recognition

In pre-processing step, we will enhance our input image and focusing on face part in order to achieve accurate results. In our case an RGB images is the source of information, used for acquiring the face image. The image from RGB domain is transformed to greyscale and continues to next block. Because the image contains a large amount of redundant information, system must include a block for the selection of relevant information that best describes the pattern. Features extraction is therefore a very important block of the pattern recognition system. For the classifier is important to choose the most important characteristics of each group. This is particularly true for gender recognition in which only two groups exist: male and female.

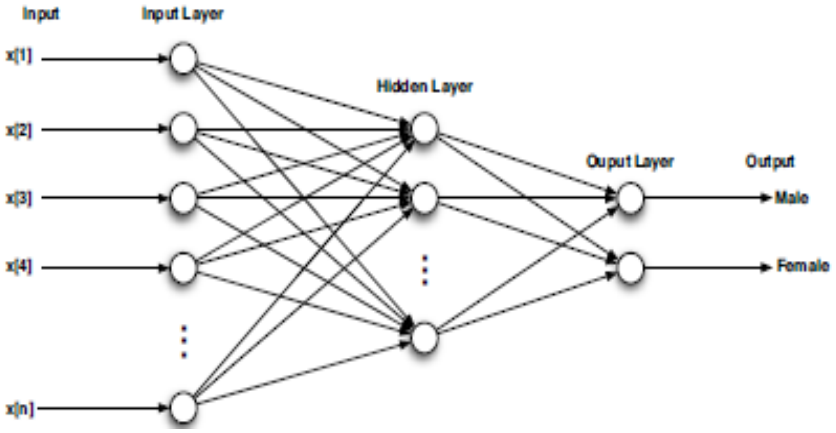

Figure 3.3: A schema of the used neural network.

IV. RESULTS

This paper uses the NN architecture feed forward propagation learning algorithm to create, train and test the neural network for gender recognition using MATLAB software as neural network toolbox.

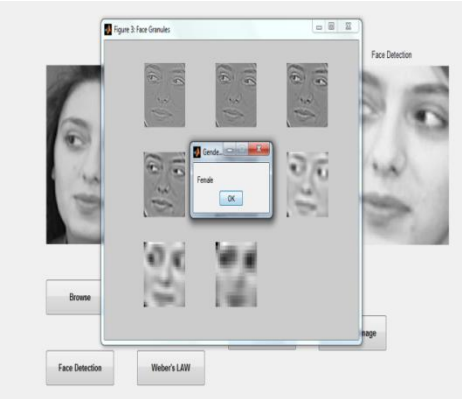

Figure 4.1: Recognition process- Female

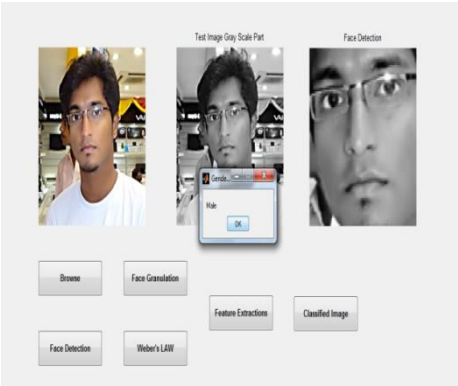

Figure 4.2: recognition- male person.

V. CONCLUSION

In this paper, we proposed a gender recognition system based on Weber's law descriptors and Neural Networks. WLD as a local descriptor results in much improvement in recognition accuracy for gender recognition problem. Despite its simplicity, the proposed system can produce as good results as complicated systems.

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