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Human Gait Based Gender Classification Using Energy Motion Approaches

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Abstract: Gender classification such as classifying human face is only challenging for computer, but even hard for human in some cases. In our work a new novel approach is proposed to recognize gender from the face image. Continuous Wavelet Transforms, Discrete Wavelet Transforms, Radon Transforms are used for features selections for each face images of male and female. These selected features will be used to classify the face images of each Gender using Support Vector Machine. Our work use ORL database contain 100 images include both Male and Female Gender. The experimental result shows that the proposed approach (Continuous wavelet Transform and Support Vector Machine). Proposed work achieves higher performance than some other methods, and is even more accurate than human observers. We also present a numerical analysis of the contributions of different human components, which shows that head, hair and back are more discriminative than other components. All the above prove that gait-based gender classification is feasible in controlled environments. We use both static and dynamic data sets (images & video) for the gender classification process through SVM classifier.

Index Terms: Feature fusion, feature selection, feature extraction, centroid, Radon, gender classification

I. INTRODUCTION

Gender classification using facial images has been in the field of research now days and it is quite interesting. Humans are very good in differentiating the gender from facial images. Human faces provide crucial information regarding gender, age, and ethnicity, in addition to identity. Several important fields for applications of gender classification have been identified, such as biometric authentication, surveillance and security systems, new applications in social networks using face recognition. Gender classification based on facial images is currently one of the most challenging problems in image analysis research.

II. GENDER CLASSIFICATION

A lot of people interested in face recognition also want to know how to perform image classification tasks like:

- Gender Classification (Gender Detection)
- Emotion Classification (Emotion Detection)
- Glasses Classification (Glasses Detection)

Gender classification using facial images has been in the field of research now days and it is quite interesting. Humans are very good in differentiating the gender from facial images. Social Behavior and human interaction is mainly depending upon on the gender of the person with whom he/she they plan to interrelate

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Automatic gender classification is also a useful preprocessing step for face recognition since it is possible to halve, in case of equal amount of both genders, doing the face classification before the face recognition will make the face recognition process almost twice as fast. In addition, separate face recognizers can be trained for the genders and in this way increase the face recognition accuracy. This paper works out on the particular approach using Continues Wavelet Transform (CWT) and Support Vector Machine (SVM) for classifying the gender of the facial images and compared with DWT, RADON along with SVM.

In our work Continuous wavelet transform have been applied to gender classification of images with varying success. Many authors have developed computerized methods to classify gender face images. In our Proposed Method along with Continuous Wavelet Transform, We classify the gender using Support Vector Machine. Our technique performs over well in images containing variations in lighting and facial expression, pose angles, aging effects etc. Moreover it is less time consuming process when we compared with discrete wavelet Transform, Radon Transform along with Support vector Machine.

A.Dataset Description

The paper uses the image dataset called ORL Database. The ORL database totally consists of 400 gray scale images representing male and female gender. This images contains variations in lighting, facial expressions, pose, angles, age effects information. In this work, we collect 400 face images out of which 350 faces are male and rest 50 images are female.

Figure 1. ORL Database of 400 images

In my further work video (.avi) is taken for frame conversion.

B. Proposed Technique

The proposed technique includes Video input on the facial images. The resultant wavelet coefficients are sorted, and take 100 coefficients in file. During the training phase, the SVM is trained with 400 images in the dataset that includes variables pertaining to the corresponding coefficients with label 0 for male and label 1 for female images. Similarly, 200 images is used in testing phase and apply the SVM classification model on the testing coefficients from the CWT of test image set. Finally, SVM prediction rate is calculated in terms of Mean Squared Error (MSE).Thus the classification of

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facial images is achieved in two main steps. In the first step, features are selected from the gender facial images. In the second step, the selected features with higher wavelet coefficients with label 0 or 1 are classified using SVM classifier.

The steps of the proposed technique are as follows:

Step 1: Read input as .avi file(video).
Step 2: Convert the video into several frames.
Step 3: Take one frame for feature extraction.
Step 4: Centroid, Radon features are calculated for single frame.
Step 5: Apply these features to all the frames.
Step 6: Train the dataset using support Vector Machine
Step 7: Test the frames using support vector Machine
Step 8: Calculate the Classification and prediction rate.

C. Feature Extraction Centroid, Radon

1. Centroid Feature

A nonlinear feature extraction method is presented which can reduce the data dimension down to the number of clusters, providing dramatic savings in computational costs. The dimension reducing nonlinear transformation is obtained by implicitly mapping the input data into a feature space using a kernel function, and then finding a linear mapping based on an orthonormal basis of centroids in the feature space that maximally separates the features of gender.

Feature centroid can be calculated in several ways. Depending on how the centroid needs to calculated, there are several possible methods:

1.Calculate the features' central XY coordinates.

2.Use the Feature to Point tool.

3.Use Python to retrieve centroid coordinates. Instructions provided below describe these methods.

2. Radon Feature

Radon Features can be used to enhance (and segment) cell boundaries in EM images.

There are number of methods available for measurement of radon that cover a wide range of cost and complexity. Probably the most widely used method at this time interms of the number of measurements performed is the Activated Carbon Monitor(ACM).

The selection of methods and instruments for measurement of radon depends on many factors.

a)Operating specification.

b) Performance specification.

c) Accuracy, Prediction.

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D. Support Vector Machine (SVM)

Consider the pattern classifier, which uses a hyper plane to separate two classes of patterns based on given examples {x (i), y (i)} i=1 n .Where (i) is a vector in the input space I=Rk and y (i) denotes the class index taking value 1 or 0.A support vector machine is a machine learning method that classifies binary classes by finding and using a class boundary the hyper plane maximizing the margin in the given training data . SVM is a useful technique for data classification. A classification task usually involves with training and testing data which consists of some data instances. Each instance in the training set contains one "target value" (class labels) and several "attributes" (features).

III. TECHNICAL APPLICATION

The Microsoft Face Detection system provides a solution that can automatically detect faces in still images and real time video feeds. The system can detect an arbitrary number of faces at any scale and location.The system takes photographic images or a video stream as input. The output consists of an array of rectangles which corresponds to the location and scale of faces detected. The following graphic illustrates the Face Detection system:

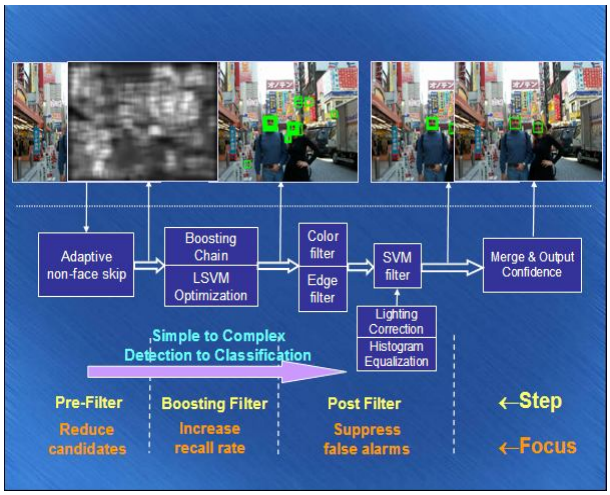

Figure 2. Face Detection System

In the first step the system uses an adaptive pre-filter to eliminate candidate rectangles in the input that it can confidently determine do not contain faces.

In the second step the system feeds the remaining rectangles to an improved implementation of an algorithm called "Boosting Chain." Boosting Chain is a framework for rapid object detection developed by Microsoft Research (please see the 'Documentation' section below for a paper detailing Boosting Chain).

Finally, in the third step the system attempts to eliminate false positives. It applies a color filter and an edge filter to improve the precision of the detection

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IV. RESULTS AND DISCUSSION

The results obtained on the ORL database with our methods are better than those previously published [3]. It should be emphasized that the gender classification results improved significantly, and the number of input features was reduced drastically, which has important implications for real time implementation of the proposed method. The method with the best result was tested with the ORL database, and the results showed that the fused features reached better result than those previously published [3] (see Table I).

As expected, our results show lower classification performance on the ORL database compared to other databases because images in the other databases vary in quality, illumination and partial occlusion.

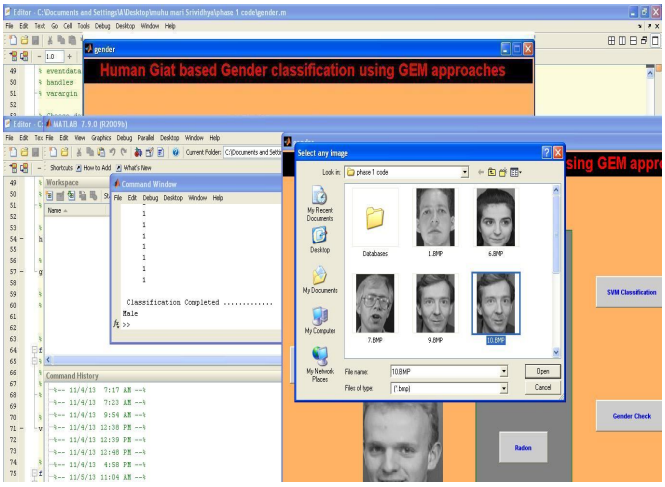

Figure 3.Gender Identification

In this work we used the database Labeled Faces in the Wild which contains labeled face photographs with a wide range of conditions typically encountered in everyday life. The database exhibits "natural" variability in factors such as lighting, race, accessories, occlusions, and background. The described experimental method was designed to make our research consistent and comparable with previously published results. After analyzing the results, it was concluded that feature selection and fusion improved the performance of gender classification significantly in ORL database.

V. CONCLUSION

An original analysis of algorithm to classifying the gender of male and female is distinguish and computed and verified. The images contain variations in lighting and facial expression, pose angles, aging effects etc and finding out the wavelet coefficient using Continuous wavelet transform in gender facial images. CWT is constructed to define the feature of the face gender and best when compared with DWT and Radon. Support Vector Classifier is developed for classification with various Kernels like. Linear, polynomial, RBF and sigmoid. Where we find Linear Kernel is the best choice for our proposed method, which is the original SVM.

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In future, we have to develop the method for applying Centroid, Radon features to all frames to obtain the gender classification of dynamic data (video) using similar SVM classifiers.

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