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Demographic Estimation of Human Feature from Facial Images

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Abstract: Recognition of most facial variation like shape texture based on different algorithm estimate the automatic estimation of age, gender and race of a person from his face image, which has many applications automatic age estimation can prevent minor from purchasing alcohol or cigarate from vending machine. In Automatic demographic estimation, age estimation remains a complicated problem because of the persons belonging to the same group can be different in their facial appearances due to some of the internal and external factors. In this paper, we demonstrate that a generic framework for automatic demographic estimation of age, gender and race. Given a face image, we first extract demographic informative features via a different boost algorithm, and then employ a hierarchical approach consisting of between-group classification, and within-group regression. Quality assessment is also developed to identify low-quality face images that are difficult to obtain reliable demographic estimates.

Keywords: Demographic estimation, hierarchical approach age estimation.

1. INTRODUCTION

Age estimation and face verification have many applications human face is source of information conveys nonverbal information for communication between human and machines. In the potential application estimation of age, gender, race plays crucial role [2].identification of specific characteristics of human face images have been well explored in face recognition research and the different application [5].

There has been a growing interest in automatic extraction and demographic estimation of facial characteristics and they are used in different application ,these include (i)access control: e.g. in automatic age estimation system prevent minor from purchasing alcohol or cigarette from vending machine.(ii)human computer interaction: e.g. in shopping mall a smart shopping cart can dynamically change advertisement on a bill board on demographics of the customers passing by(iii)law enforcement ,an automatic demographic system helps to identify the suspect more accurately by filtering the database with the estimated age ,gender and race.

2. PROPOSED APPROACH

Among the different literature survey on demographic estimation only very few publications provide a joint estimation of age, gender and race using a generic framework. In this paper we present a automatic estimation from single face images we extract a previously proposed biologically inspired feature from face images [6]. select a demographic feature from boosting algorithm and then we estimate a age, gender and race of human .in this quality assessment method is used to detect a low quality face images which arises from large illumination and expression variation .

1. Prior Work

A few survey paper on the demographic estimation methods are published in different publication in that most of the age estimation method are published .A revive of estimation method by grouping into the different categories. These are

(i) Anthropometric –based approach: [13][14] it utilizes the different distance ratio between individual facial landmark to describe the configurable differences among the face shape . in age estimation it is important to consider the anthropometric feature because of the craniofacial growth ;they are mainly useful to distinguish between the child from the adults. Facial wrinkles analysis to Further Classify Young adults to Senior Adults [16]

(ii)Image based approach: [7] differentiate faces of different group on texture e.g. skin wrinkle, facial marks. PCA, haar, Gabor are widely used to represent the local face region. (iii)Appearance based approach [15].it utilizes both texture and shape to differentiate faces among the individual group. Appearance based model is highly accurate facial landmark than that of the anthropometric based mode.

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2. Face Detection

1. Algorithm used :

A. The Viola-Jones face detector

This algorithm describes the work carried out relating to the execution of the Viola-Jones face detection algorithm. The first part elaborates on the methods and theory behind the algorithm.. Secondly motivating aspects of the actual execution are emphasized and presented together with results and comments on performance. This structure is preferred since many intermediate results have affected implementation decisions and vice versa. Methods The basic principle of the Viola-Jones algorithm is to scan a sub-window capable of detecting faces across a given input image.

3. AGE ESTIMATION

Age estimation and face verification have many applications in different field. Age-separated facial images are usually differ significantly in both shape and texture. There are many algorithms have been proposed in the past few year [8] for face recognition, recognizing aging or estimating the age is still a hard problem [9]. Several papers have been proposed in the past few years for studying facial aging. Ramanathan, et al., [32] proposed a Bayesian age-difference classifier, by using a probabilistic eigen-spaces framework and appearance features. In their work, they assumed that the intraperson image difference samples are Gaussian distributed and the distribution of extra-person image difference samples are represented by a Gaussian mixture model.

A model for age progression in young face images was proposed using a growth model based on a cardioid strain transformation. The cardioid strain transformation we can extract the different features. Proposed an age transformation algorithm that minimizes the variations between facial features caused by aging. They adopted a Gabor feature-based face recognition algorithm on the transformed images. Proposed a 3-D shape and texture prediction model to account for variations in face images due to age separation. After the appearance is predicted, they used commercial face recognition software to evaluate the recognition performance and observed that aging prediction model improves the performance of face recognition algorithms. Several regression-based methods have been proposed for age estimation There are different types of variations in facial images .facial images can be either gray scale or colour images also there are large pose variation in facial images. The face image of a person is captured by a digital camera.

Algorithm used:

Gabor Filter

The gabor filter is used for the gender classification there is formula for the gender classification, in that 6 is standard deviation of the Gaussian kernel depend upon the spatial frequency to measured i.e $\sigma = 0.65\theta$

$$g(x, y, \theta, \emptyset) = \exp(-\frac{x^2+y^2}{\sigma^2})$$

$$\exp(2\pi\theta i(x\cos\emptyset + y\sin\emptyset)$$

By using the above equation we can calculate the feature for the gender estimation.

4. GENDER ESTIMATION

Principle Component Analysis (PCA), as proposed by Karl Pearson, is one of the more commonly used statistical approaches to dimensional reduction and data classification. This method computes the transformation of a set of correlated variables into a set of linearly uncorrelated vectors called principal components. The relevance of this transformation lies in the fact that the number of required components to represent data is less than the full dimension of its original one.

This method, also known as the discrete Karhunen-Leove transform, represents a stochastic process as an infinite linear combination of orthogonal basis vectors. In the Karhunen-Leove method [1], a signal (X) is assumed to be made of random vector with an auto-correlation defined as R = E[XXH]. Employing the Cholesky factorization method, we can write the matrix R where the columns of U correspond to the normalized eigen-vectors of R. Then, our data can be transformed to the zero-mean random vector Y with uncorrelated components:

5. RACE ESTIMATION

Modeling color distribution can be very useful in characterizing an image region. For this purpose, different types of color descriptors are used to describe image regions and embed color information into an object recognition framework. In this section, two popular techniques to fulfill this purpose - the color histogram and Color CENTRIST - are analyzed and employed in the practice of race recognition. Color moments are measures that can be used differentiate images based on their features of color. Once calculated, these moments provide a measurement for color similarity between images.

These values of similarity can then be compared to the values of images indexed in a database for tasks like image retrieval. The basis of color moments lays in the assumption that the distribution of color in an image can be interpreted as a probability distribution. Probability distributions are characterized by a number of unique moments (e.g. Normal distributions are differentiated by their mean and variance). It therefore follows that if the color in an image follows a certain probability distribution, the moments of that distribution can then be used as features to identify that image based on color. Stricker and Orengo [1] use three central moments of a image's color distribution. They are Mean, Standard deviation and Skewness.

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6. RESULTS

In this paper, a Demographic estimation of age, gender and race are performed. In This Paper a method for age group estimation is thoroughly described. The proposed technique provides a robust method that verifies the age group of individuals from a set of different aged face images. Crucial features such as distances between various parts of face, shape, analysis of wrinkle geography and calculation of face angle are examined. And for the gender estimation we use gabor filter by using the gabor filter formula we can calculate gabor feature and estimate the gender. for the race estimation we use color moment .from that color moment we can calculate mean and standard deviation .from these fetcher we can calculate race All these ways are compared at last to find the best way to calculate age ,race and gender of the face images in the database.

Fig.results

No. of group	Group No.	Age Range In years	No. of faces actually in this group	No. of faces falling in this group	Correct percentage
2	1	1-40	34	32	96%
	2	41-80	16	16	
3	1	1-30	29	27	84%
	2	31-45	10	5	
	3	46-80	11	10	
4	1	1-18	14	9	62%
	2	19-40	15	9	
	3	41-80	13	13	
	4	Mixed	8	Mixed	

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