A Review of Implementation of Human Age Prediction Using Facial Images

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Abstract:

In this paper review, a new automatic age prediction framework is proposed. A single image is required to estimate the age of the subject of interest as a input. By using following three main modules we composed a framework. The main modules are:
1) Module of the face detection;
2) Module of enhancement; and
3) The classification module.

In case of classification module we used unsupervised classification technique. K means algorithm is used which classifies the features obtained from the Gabor filters of 6 directions and 4 scales. In the enhancement module of the proposed framework, the key for age estimation are facial regions which are identified by using a more detailed analysis. Finally, by utilizing the FG-net database we can predict the human age. The face detection module comprises the learning for age estimation and main blocks of image representation, a technique named Ad boost which is modification of viola Jones algorithm is used.

KEYWORDS:

Prediction of Age, Ad boost algorithm, Gabor filter, Detection of face, feature extraction, Classification of Feature.

1. Introduction:

Mostly people can be easily recognized by using theirs human traits like state of emotion, where they can tell if the person is sad, angry or happy from the face. As like, it is very easy to determine the gender of the person.

The signs of age progression are normally displayed on faces which cannot be controllable and personalized such as whitening of hair, dropping of muscles and wrinkles. Depending upon the many external factors such as life style and degree of stress, we can easily see the signs of age. An old person, whose age is 30 years, smokes a box of cigarettes each day when we compare his other facial characteristics such as gender, expression and identity then he will look like a 42 years old one. Our main work is revolving around the three modules: detection of face, extraction of featuresand classification of features.

2.Overview of Proposed Age Estimation System

Considering the effects of gender and/or facial expression are an overview of our age estimation system. Our First stepis to detect the eye and face positions from the input image by using an adaptive boosting (Adaboost) method. Byusing an Adaboost method, we will select the face region used for extraction of the features which will mainly excludethe hairs, and then we will use the histogram equalization of facial image for counting the non Illumination of light.Biographical features of image like center of left eye to nose, eye to eye distance, center of right eye to nose and faceangle is calculated along with wrinkles features on images which are global features. These features are global featuresand Global features are obtained by using Gabor filters with specific number of orientations and angles. Amongstalgorithms of classification, algorithms of clustering serves better. So fuzzy-K means approach will be used for it andresults will be obtained in terms of MAE.

Adaboost Method

By implementing an algorithm for detection of faces in an image the basic problem is solved. In 1996, Freund andSchapiro developed the Adaboost algorithm. Adaboost is a machine learning boosting algorithm which is capable of constructing a strong classifier by using a weighted combination of weak classifiers. (In most of the cases a weak classifier classifies correctly in only a little bit.)Each feature is considered to be a potential weak classifier to matchthis terminology to the presented theory. A weak classifier is mathematically described as:

$$h(f,p,x,\theta) = \begin{cases} 1 & \text{if } p\theta < pf(x) \\ 0 & \text{otherwise} \end{cases} \qquad (1)$$

Where x is a 24*24 pixel sub-window, f is the features applied, p is the polarity and θ is the threshold which decideswhether x should be classified as a negative (a non-face) or a positive (a face). Since only a small amount of thepossible 160.000 feature values are expected to be potential weak classifiers. We modified the Adaboost algorithmonly for selecting the best features. The face detector is ready for implementation by using Adaboost algorithm, but Viola-Jones has one more ace up the sleeve.

Gabor filter

The impulse response of a Gabor filter (linear filter) is defined by a Gaussian function multiplied by a harmonic function. In many applications, Gabor filters have been used, like segmentation of texture, detection of target, management of fractal dimension, analysis of document, detection of edge, identification of retina, and coding of image and image representation. Like a sinusoidal plane of particular orientation and frequency, we can viewGabor filter, which is modulated by a Gaussian envelope.

s(x, y): Complex sinusoid
h(x, y) = g(x, y)s(x, y)
g(x, y) : 2-D Gaussian shaped function, known as envelope.

$$g(x,y) = \frac{1}{\sqrt{2\pi\sigma}} e^{-\frac{1}{2}\left(\frac{x^2}{\sigma_x^2} + \frac{y^2}{\sigma_y^2}\right)}$$

$$s(x,y) = e^{-j2\pi(\omega_0 x + v_0 y)}$$

The Gaussian envelope looks as follows:

$$\omega_r(x,y) = K \exp\left(b^2(y-y_0)_r^2\right) + \left(-\pi\left(a^2(x-x_0)_r^2\right)\right)$$

LBP&MLBP:

Nguyen, D.,T. et. al [2014], by using support vector regression (SVR) method investigated the effects of gender andfacial expression on age prediction. This research is process in the following four ways. First, the age estimationaccuracies by using a LBP (single-level local binary pattern) and MLBP (Multilevel LBP) are compared, and betterperformance as an extractor of texture features globally is shown by MLBP. Then second, we compare the accuraciesof age estimation, using local features extracted by Gabor filtering, global features extracted by MLBP and thecombination of the two methods. The third approach is the most accurate which is shown by results. Third, age estimation accuracy with and without pre classification of expression of face are compared and then it isanalyzed. Fourth, we compared with and without pre classification of gender and analyzed. In the gender preclassification of age estimation experiment showed the results which are more effective.

3. Literature Review:

[1] Lazarus, M.Z. et. al [2013]proposed in this article the given input image is capable of segregating into threeclusters namely: Senior; Adult; Baby. The database which is used in this FG-NET database is available online andwhose results shown the 100 percent accuracy.

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[2] Dib. Y. El et. Alex ended BIF by incorporating fine detailsof facialfeatures by using active shape models,automatic initialization and by including the forehead details analyzing a more complete facial area. **[3]** Jana, R. et. al. [2012] concerned To estimate age groups using face features with providing a methodology. Thispaper proves that we estimate face angle and human age classify according to features of face which are extractedfrom human facial images. Age ranges are classified into five categories. Those are up to 17 years (child), 18to 25years (young), 26 to 35 years (adult), 36 to 45 years (middle aged) and more than 45 years (old). The obtained resultswere significant. This paper can be used for expressions from facial images, classifying gender, and predicting futurefaces.

[4] Otto, C. et.al [2012] propose a component based method for age invariant face recognition. **[5]**Ubaid, S. et.al [2013] discussed By using the facial image of a person we are finding the human age. It has manyreal world applications like interaction of human computer, security of internet, multimedia communication, vendingmachines etc. During growth, two main forms of aging is affected, one is the shape and size variation and the other isthe variation in texture. In this paper, they used the variation in textural of the face during the growth, which appearmore in the adulthood in the form of wrinkles.**[6]**Iraji, M.S. et.al [2014] to estimate the age of face image presented an intelligent mode. They used shape and feature of texture extraction from FG-NET landmark image data set using AAM (Active Appearance Model), CLM(Constrained Local Model), tree Mixture algorithms.

Experimental results showed that in proposed system, fuzzySVM has less errors and system worked more accurate and appropriative than prior methods. Our system is able toidentify age of face image from different directions. **[7]**Chang, K.U. et.al [2010] proposed a ranking-based framework consisting of a set of binary queries. **[8]** Jana, R. et. al. [2013] estimated age group using face features. This process involves three stages: Pre-processing, Extraction of Feature and Classification. Based on the texture and shape information age classification is done usingK-Means clustering algorithm. Age ranges are classified dynamically depending on number of groups using K-Meansclustering algorithm. The obtained results were significant.

4. PROBLEM FORMULATION & OBJECTIVE

By using facial features we can classify the age by using two categories which have been constructed for features: Global features, local features. Among global features, many researchers used Active appearance models (AAM). But it causes many drawbacks that they don't provide any information about features of skin andwrinkles. Many researchers also used a method based on the classification of wrinkle features .But it suffers setback in caseof scar on face. Due to presence of scar area a large (highest) number of edge points will come and that can lead tomisconception. To eliminate this problem local and global both features are used for the prediction of the age. But there is onemore hindrance due to which the correct estimation is measurably affected and this is less tackled by researchers forface non- uniform illumination. When we do not use it, then results are doubted. After extraction of features, weused the classification techniques for features classified in different age groups. SVM is good in classifications asshown by researchers.Keeping above points into consideration which we will follow these key objectives in our work:

➤ For selecting the face region we will useAdaboost method, this method is used for extraction the features in which we will mainly exclude hairs, and then we will apply the histogram equalization to facial image to counter light non illumination.

➤ Geographical features of image like center of left eye to nose, eye to eye distance, center of right eye to nose and face angle are calculated along with wrinkles features on images which are global features. By using Gabor filters with specific number of angles and

- orientations we will obtain the features which are global features.
- ➢ Amongst algorithms of classification, algorithms of clustering serves better. So we will use fuzzy-K means approach for it and we will obtaine the results in terms of MAEvaluable suggestion and advice while evaluating our work time to time.

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