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RESEARCH ARTICLE

A Practical Approach for Determination of Human Gender & Age

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Abstract- In this paper, we are presenting a new approach for gender & age determination based on image mining with C means clustering. Image Mining is an area which is used for pattern recognition & other application.

Keywords: Image Mining, Image retrieval system, Clustering, Pattern Recognition, Segmentation

I. INTRODUCTION

Since human faces provide a lot of information, many topics have drawn lots of attentions and thus have been studied intensively. A trained fully connected two-layer network, called SEXNET, to identify gender from facial images. Tamura et al [1] used a multi layered neural network to identify gender from face images of different resolutions. It is an approach that combines neural networks and decision trees.

In Previous papers the ages were classified into four classes, childhood, young, youth and old. This classification is more or less as our classification in the main classification stage. Our proposed system consists of two classes which we call secondary classification stage. The classification in the secondary stage is not partitioned equally, instead the age partitions are based on some changes in the facial features. Also the facial feature changes are almost negligible in the age group from 36 to 45 years[2]. In current scenario, role of image is very crucial in business such as business images, satellite images, medical images and so on. We can analyze these data to reveal useful information to provide to human users. But, unfortunately there are certain difficulties to gather those data in a right way. Due to incomplete data, the information gathered is not processed further for any conclusion. Color image based on segmentation aims at searching image databases for specific image that are similar to a given query image. It is a rapidly expanding research area situated at the intersection of databases, information retrieval, and computer vision. This method focuses on Image 'features' to solve the query and have been the recent focus of studies of image databases. The features further can be classified as low-level and high-level features. Users can query example images based on these features such as texture, color, shape, region and others. By similarity comparison the target image from the image repository is retrieved. Meanwhile, the next important phase today is focused on clustering techniques. Clustering algorithms can offer superior organization of multidimensional data for effective retrieval. It also allows a nearest neighbor

search to be efficiently performed. Hence, the images are rapidly gaining more attention among the researchers in the field of data mining, information retrieval and multimedia databases. Spatial Database is one of the concepts which play a major role in Multimedia System.
Researches can extract semantically meaningful information from image data which are increasingly in demand. The image mining process is as shown in figure 1.

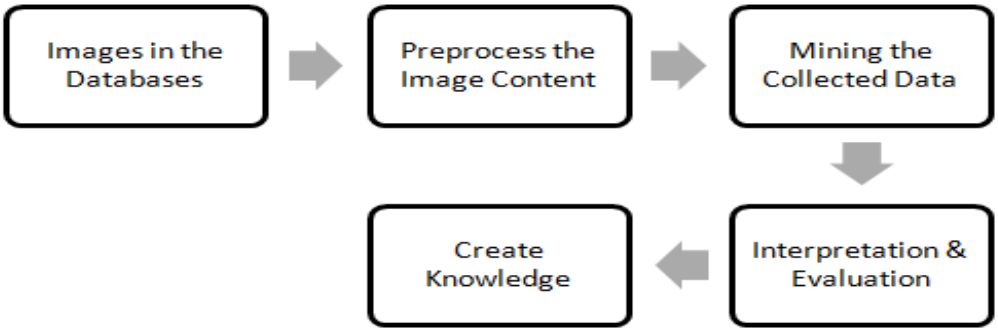

Figure 1. Image Mining Process

II. RELATED WORK

In general the first step in any recognition process is to choose good discriminatory features. A well-known problem in pattern recognition is the "curse of dimensionality"- more features do not necessarily imply a better classification success rate. Feature extraction in pattern recognition involves the derivation of salient features from the raw input data in order to reduce the amount of data used for classification and simultaneously provide enhanced discriminatory power.

One of the first attempts to develop facial age estimation algorithms was reported by Kwon and Lobo (Kwon 1999), [3]. Kwon and Lobo used two main types of features: Geometrical ratios calculated based on the distance and the size of certain facial characteristics and an estimation of the amount of wrinkles detected by deformable contours (snakes) in facial areas where wrinkles are usually encountered. Based on these features Kwon and Lobo (Kwon 1999) classified faces into babies, adults and seniors based on a computational theory for visual age classification from facial images. First, primary features of the face, namely the eyes, nose, mouth, chin, and virtual top of the head, are found. The research in age-estimation started in 1990s and uptil now, many approaches have been proposed. They typically consist of two main steps: image representation and age prediction. For the image representation, the most common models are aging pattern subspace [1], patch-based model [2], Anthropometric model [4], Active Appearance Model (AAM) [5] and aging manifolds [6]. The final step for age estimation is either the multiclass classification problem or the regression problem. In 1999, Kwon [3] measured the changes of face in shapes, e.g. six geometric ratios of key features, to classify faces into appropriate age groups. Drawing inspiration from this work, Ramanathan [7], Dehshibi [8], later used the geometric ratios of facial features and added information of texture, e.g. wrinkles, in their approaches. Although these approaches achieved low Mean Absolute Errors (MAEs), they can only deal with young ages when the shapes of faces vary largely. Moreover, because of the sensitivity to head pose in the steps of computing geometric ratios in 2D face images, only frontal faces can be used. Adopting the Active Appearance Models (AAMs) [9] approach, Lanitis et al. [11], Khoa Luu et al. [5] used AAM features, which combine both shape and texture information in their age estimation studies. In 2009, using AAM features extracted from image with 161 landmarks, Ricanek et al. [9] developed a multiethnic age-estimation system that can deal with the race problem[14].Recently, based on the arguments that age information is often encoded by local information, such as wrinkles around the eye corners, other approaches are to divide face images into many sub-regions, extract features from these regions, and then combine them together. Yan et al. [2] proposed to use Spatially Flexible Patch (SFP) and Gaussian Mixture Model (GMM). B. Li et al. [15] developed a technique to extend the human aging image dataset by mining the web resource and then used SFP for representing face images. Suo et al. [11] designed a multiresolution hierarchical graphical face model for age estimation. LBP features and Gabor

features are also exploited in the work of Günay [5], and Gao [12]. Guo et al. [8], in 2009, investigated the biologically inspired feature (BIF) derived from a feed forward model of the primate visual object recognition pathway – HMAX model.

Age Estimation Approach fall in two mainstreams. According to the first stream the problem is treated as a standard classification problem, solved using standard classifiers where age estimation is performed by assigning a set of facial features to an age group. Within this context facial features used may be associated with the general appearance of a face or may be associated to age-related features (e.g. wrinkles)[16]. As an alternative age estimation approaches that rely on the modeling of the aging process have been developed. In this section typical approaches described in the literature are briefly presented. The aim of this review is not to present an exhaustive literature review of the topic but rather to highlight the evolution of the topic. A more detailed presentation of the related literature is presented by Ramanathan et al. (Ramanathan 2013) and Fu et al. (Fu 2012).

III. PROBLEM IDENTIFICATION

Most of the time it is not possible for us to know the age and sex of the person. Most of the methods fail to implement this concept. Advances in image acquisition and storage technology have led to tremendous growth in very large and detailed image databases.

The system is mainly using supervised neural networks with back propagation algorithm. The image is entered to the system, features are extracted, the image is classified in one of the four main age classes, then a more specific age range class is specified. We firstly classify age into four main age categories and each age category is classified into two age ranges. We obtained our data to train and test our system from two databases, FG-NET [2] and MORPH [10].The images in FG-NET are ready and their features are already extracted. MORPH database have only images with some other related information, but without extracted features. For this purpose we ought to extract the features from the images obtained from MORPH database using am-markup tool. Finally we train the system with Easy- NN tool based on the two datasets FG-NET and MORPH[9].

In the color based image retrieval the RGB Color model is used. Color images normally are in three dimensional. RGB color components are taken from each and every image. Then, the mean values of Red, Green, and Blue components of target images are calculated and stored in the database. Based on the RGB component mean values, the images are clustered as Red, Green and Blue major component categories. These three mean values for each image are stored and considered as features. Then the top ranked images are re-grouped according to their texture features. In the texture-based approach, the parameters gathered are on the basis of statistical approach. Statistical features of grey levels were one of the efficient methods to classify texture.

The Search efficiency of image retrieval relies on an efficient classification scheme. Rather than searching an image over a huge collection of image database. If the images are classified into a finite number of groups, then the search time is reduced by an amount equal to the total number of groups. This plays a significant role when the present day application falls into real time [22]. These images, if analyzed, can reveal useful information to the human users. Images deals with the extraction of implicit knowledge, image data relationship, or other patterns not explicitly stored in the images. Image mining is more than just an extension of data mining to image domain.

Most current CBIR systems work on a completely different principle. Fixed-length real-valued multicomponent feature vectors typically characterize stored images, each image having a value for every feature in the database. In this case, searching consists of calculating the similarity between feature vectors from query and stored images, a process of numerical computation.

Cluster-based retrieval of images by unsupervised learning (CLUE) was one such method to tackle the semantic gap problem. The CLUE is built on a hypothesis that images of the same semantics tend to be clustered [4]. It attempts to narrow the semantic gap by retrieving image clusters based on not only the feature similarity of images to the query, but also how images are similar to each other. But this is a general approach and implementations seemed to be complex.

The current CBIR techniques assume certain mutual information between the similarity measure and the semantics of the images. A typical CBIR system ranks target images according to the similarities with respect to the query and neglects the similarities between target images. The performance of a CBIR system is improved by including the similarity information between target images. To achieve this new technique and for improving user interaction with image retrieval systems by fully exploiting the similarity information. Given a query, images in the database are firstly grouped using color features i.e., color based image retrieval. In the color based image retrieval the RGB model is used. Color images are in three dimensional, so RGB color components are taken from each and every image. Then the average value of R, G and B values for both query image and target images are calculated. These three average values for each image are stored as features. By using these stored features the image from the repository is retrieved with respect to the query image.

Then the top ranked images are re-grouped according to their texture features. In the texture-based approach, the parameters gathered are on the basis of statistical approach. Statistical features of grey levels were one of the efficient methods to classify texture. The different texture parameters like entropy, contrast, dissimilarity, homogeneity, standard deviation, mean, and variance of both query image and target images are calculated. From the calculated values the required image from the repository is extracted.

IV. PROPOSED APPROACH

Content Based Image Retrieval (CBIR) is the retrieval of images based on visual features such as color and texture. Reasons for its development are that in many large image databases, traditional methods of image indexing have proven to be insufficient, laborious, and extremely time consuming. These old methods of image indexing, ranging from storing an image in the database and associating it with a keyword or number, associating it with a categorized description, have become obsolete. This is not in CBIR. In CBIR, each image that is stored in the database has its features extracted and compared to the features of the query image. It involves two steps:

Feature Extraction: The first step in the process is extracting image features to a distinguishable extent.

Matching: The second step involves matching these features to yield a result that is visually similar.

The importance of an effective technique in searching and retrieving images from the huge collection cannot be overemphasized. One approach for indexing and retrieving image data is using manual text annotations.

Our proposed method consists of two approaches for images retrieval that is mining by color contents and mining by text. Images are mostly RGB, Gray Scale and Binary types which are easily possible to segments as per their pixels values. RGB images are segmented as per the color content, Gray Scale images are segmented as per their average RGB pixels value and Binary Images as per their ON/OFF pixels status. Image mining by color contents include search for images based on their segmented color contents.

In our project we take the image as an input image which is also called as query image through which we get the resultant image. After selecting the input image we are performing the process of segmentation which is done on the basis of color content. When we perform the procedure of clustering on the input image we get the clustered image. During this procedure the images in the directory are clustered on the basis of color content.

After the completion of segmentation we compare the input image with the directory image. Then calculate the deviation factor between the test image and the directory image. After calculate the deviation factor we get the resultant image.

After displaying the resultant images we come to know the gender and age of the person in the photo Let see Dataflow Diagram for image mining technique based on their color contents as follows in figure 2.

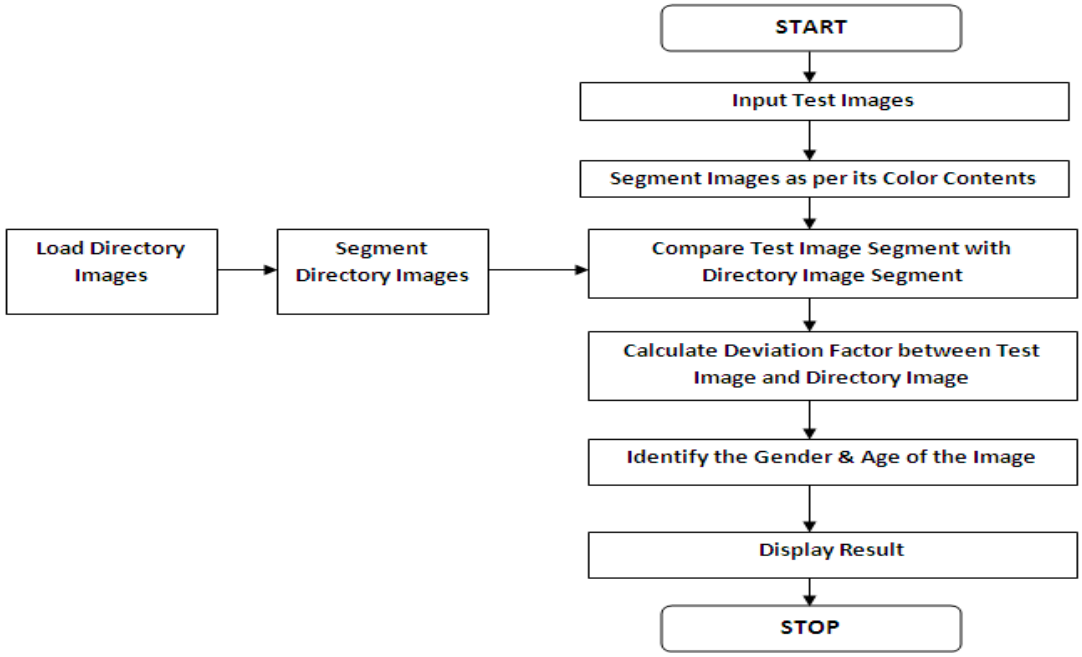

Figure 2: Layout of Proposed System

Segmentation of images based on their color contents is a major area of research. In this method we are using C-means clustering technique to clusterize an image based on their RGB colors as per equation

$$Cn = \int_{1}^{n} \sum_{i=1}^{M} |Pi - Pi + 1| \qquad \ldots\ldots\ldots\ldots\ldots\ldots \qquad 4.1$$

Where

Cn = C means cluster.

n = No of Clusters.

Pi = Backward pixel

$Pi + 1$ = Forward Pixel

M= No of Pixels in an image.

In c-means clustering technique the pixels are scanned as per Raster Scan method from left to right and top to bottom way. Whenever difference occurs with backward and forward pixel we set it as OFF else we proceeds our scanning as per the equation

$$\begin{array}{ll} \text{If } |Pi\text{-}Pi{+}1| = 0 & Pi{+}1 = Pi \\ \text{Else} & \\ |Pi\text{-}Pi{+}1| \neq 0 & Pi = 0 \end{array} \qquad \ldots\ldots\ldots\ldots\ldots\ldots \qquad 4.2$$

Deviation Factor Df is a difference between number of segments of directory image and input test image. Deviation factor is a measure of similarity and difference between two images which can be represented with an equation

$$Df = |Ctr - Cts| \quad \text{..... 4.3}$$

Where ,

Ctr = Directory Image Segments.

Cts = Input Test Image Segments.

An overall searching time for color based image is depended on number of color segments in an image.

$$O(tc) \alpha\ n \quad \text{…..... 4.4}$$

Where $O(tc)$ = searching time for color based image.

We use best fit searching technique to find out an image segment express with

$$O(C)\ \alpha\ O\ (n) \quad \text{……..... 4.5}$$

Where $O(C)$ = no of segments comparisons.

Complexity is a useful point in comparing software systems. This aspect is normally obtained from the source code, but it is completely irrelevant for the user. The mining result is a more important aspect for the user. The factor concerning to the mining result are: the underlying color space used to represent the color features; the quantization approach used; the number of bins on the histogram space (its dimension or digital color resolution); the distance function used to represent the notion of nearness on the color space (histogram representation); the fixed number of images to be retrieved and the threshold used for matching similarity Several color spaces have been used for color representation based on the perceptual concepts.

The first step group original colors into clusters that are as small as possible. The second step computes a quantified color for each cluster. This means that each image is associated with two types of histograms in the mining process.

Mining in visual database is quite different from standard alphanumeric mining. On current approaches, feature vectors per image are computed for evaluation distance function on the feature space. Then this function is used to retrieve images from a given set. Images with distance less than a predefined threshold or within a predefined number are retrieved. These feature vectors facilitate mining by color, texture, geometric properties, shape, volume, spatial constraints, etc.

Pre-processing is the name used for operations on images at the lowest level of abstraction. The aim of the pre-processing is an improvement of the image that suppresses unwilling distortions or enhances some image features, which is important for future processing of the images. This step focuses on image feature processing. The process of image retrieval system is as shown in figure 3. Filtering is a technique for modifying or enhancing an image. The image is filtered to emphasize certain features or remove other features. The noise in the images is filtered using linear and non-linear filtering techniques. Median filtering is used here to reduce the noise [4].

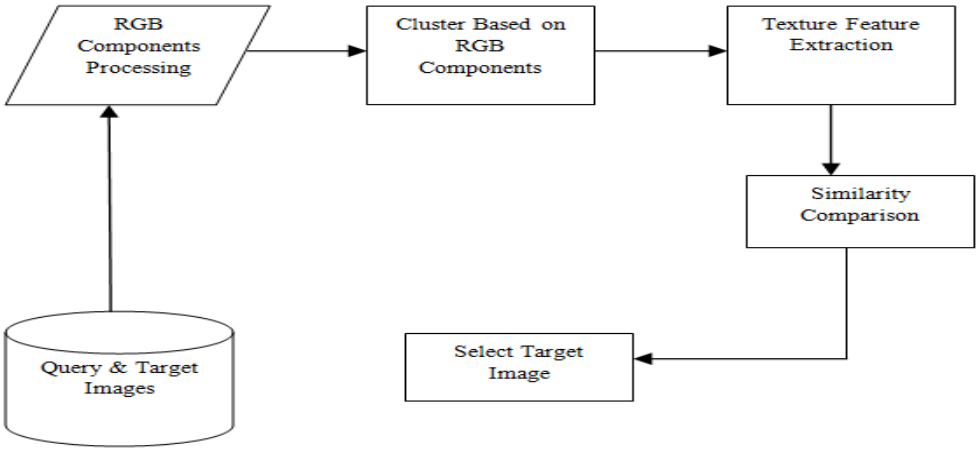

Figure 3: Image Retrieval System

V. RESULT ANALYSIS

Image basically made up of number of pixels. Any work that is related with the image can be done on the basis of number of pixels in an image, Size of the image, color intensity of the image and the shape of image. In this section we are focusing on the various parameters i.e. size of image ,cropping the image , rotate the image and change the color intensity of the image that are associated with the image. After performing various operation of the image we get different results that we have to focus.

The table 1 indicates the comparative study of image parameters. From the given table it is observed that when we change the size of the image the Clustering time, mining turnaround time, and Overall image retrieval time also get decreases. It also indicates that if the deviation factor get increases then the mining precision get decreases.

Test	1	2	3	4
Image Type	jpg	Jpg	Jpg	Jpg
Image Format	24 Bits RGB	32 Bits RGB	32 Bits RGB	32 Bits RGB
Clustering Time	00:00:38:26	00:00:02:56	00:00:0:93	00:00:00:07
Clustering Precision	98.00%	99.62%	98.25%	96.23%
Mining Turn Around time	00:00:14:65	00:00:04:01	00:00:03:02	00:00:03:07
Overall Image Retrieval Time	00:00:53:68	00:00:06:58	00:00:03:95	00:00:03:14
Deviation Factor	0	9.26	11.49	48.52
Overall Mining Precision	100%	90.73%	88.50%	51.47%

Table 1: Result Analysis with respect to Deviation Factor

VI. CONCLUSION

We have developed a system which combines the Clustering and neural network approach to identify humans' genders and their predicted age after analyzing the images. Our approach can be integrated with the face detection since they can share the same integral image. An effective and efficient gender identifier can thus be realized.

We proposed an approach for age estimation using facial features based on neural networks. We classified the ages firstly into four categories, and then each age range category is also classified into two more specific age ranges. This had not been done before elsewhere. We used five neural networks to achieve our task. The facial features rely on 68 landmark points taken from face images. The development process includes age classification, data collection, feature extraction by markup tool and finally training and testing the system by Easy NN.

The main objective of the images is to find sex and age of the person in our system. The images are preprocessed with various techniques and the texture calculation is highly focused. Here, images are clustered based on RGB Components, Texture values and Fuzzy C mean algorithm. Entropy is used to compare the images with some threshold constraints. This application can be used in future to classify the medical images in order to diagnose the right disease verified earlier.

The dramatic rise in the sizes of images databases has stirred the development of effective and efficient retrieval systems. The development of these systems started with retrieving images using textual annotations but later introduced image retrieval based on color content. This came to be known as Cluster Oriented Image Retrieval. Systems, using this we can retrieve images based on visual features such as color, texture and shape, as opposed to depending on image descriptions or textual indexing. In this project we create an image retrieval system that evaluates the similarity of each image in its data store to a query image in terms of color and textural characteristics, and returns the images within a desired range of similarity. From among the existing approaches to color and texture analysis within the domain of image processing, we have adopted the histogram to extract texture and color features from both the query images and the images of the data store.

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