

Implementation of Facial Recognition on Android Platform

Bhagyashri Ujagare, Poonam Shekokar, Samiksha Sukhadeve
Prof. Diptee Chikhmurge
MIT Academy of Engineering, Alandi, Pune

Abstract - The goal of this project is to implement face recognition and create an application which would use the same for some verification or security purpose on the Android platform based mobile devices. The project should be able to take input as image browsed by the user and should be able to compare this input image with previously stored sample image database. If the input image matches with the sample image in the database then it should give positive result. Mobile image retrieval is one of the most exciting and fastest growing research fields in the area of multimedia technology. There are two main approaches to image retrieval: text based retrieval and content-based retrieval. In this project we follow content-based method which indexes images in a database by identifying similarities between them based on lower level visual features such as color, texture, shape and special information. Content-Based image retrieval is used in this project for color feature extraction. Color feature extraction can be done using Average RGB technique. We also follow the concepts of Local binary pattern, clustering and indexers.

Index Terms— Android platform, Average RGB, Content based image retrieval, Face recognition, Java.

I. INTRODUCTION

THE face recognition area is intensively being explored and developed from the last few years. Face recognition, as one of the most representative application of image analysis and understanding, has received significant attention in both the wide range of security application [1] and research field [2].

Our project mainly focuses on face recognition and hence we need to find or create an algorithm which will execute faster and give results as early as possible. The goal of this project is to implement face recognition and create an application which will run on Android platform for use on mobile devices. The software should be able to take an image as an input and should compare the same with the previously stored database. As this project would be implemented on mobile phones there is a limitation of hardware specification. Because of this reason we need to find out light weight algorithm which could be implemented easily.

This project would also include comparison of query image and database images. The comparison time of query image and database images has to be quick enough to assure operations in real time. The realization of this idea would be

done by selecting good content based image retrieval (CBIR) method. Content based image retrieval method indexes images in a database by identifying similarities between them based on lower level visual features such as colour, texture, shape and special information [3]. Content based image retrieval (CBIR) system typically requires the construction of an image descriptor, which is characterized by two primary functions. One is an extraction process that encodes the image into feature vectors, and another is a similarity measure that compares two images [4].

The overall idea of project can be explained as follows: Firstly a query image is taken as an input then the feature extraction process is conducted in order to extract feature of the query image, similarly the same process is followed for

images in the stored database that is feature extraction is done. After feature extraction process these feature extracted from query image and the database images are compared to get the result.

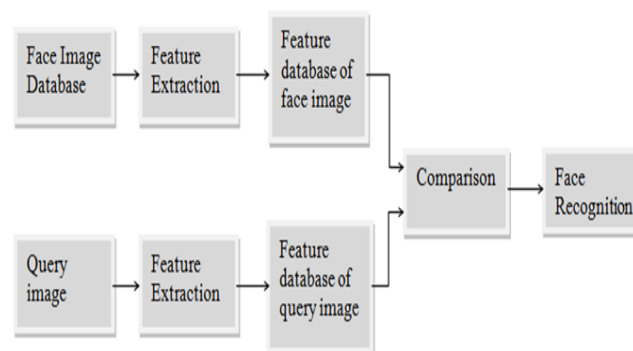


Fig 1. Block Diagram

II. ANDROID PLATFORM

Android is the first open source and free platform for mobile devices and is developed by members of the Open Handset Alliance.[7] The Open Handset Alliance is a group of over 40 companies, including Google, ASUS, Garmin, HTC, These companies have come together to accelerate and improve the development of mobile devices. The fact that it's an open platform has many advantages:

- Consumers can buy more innovative mobile devices at lower prices.
- Mobile operators can easily customize their product lines and they will be able to offer newly developed services at a faster rate.
- Handset manufacturers will benefit from the lower software prices.
- Developers will be able to produce new software more easily, because they have full access to the system source code and extensive API documentation.

III. FACE RECOGNITION

When the topic comes face recognition, the first thing that comes to our mind is Image processing. Image processing can be seen as every possible action that is performed on an image to acquire features of the image. Actions performed on image can be from cropping an image, increasing contrast or scaling, acquiring the RGB format of image to grey scaling it. Ever since digitalization of images came into the computer world, there was demand for image recognition. Image recognition is a classical problem in image processing. While humans can easily extract objects from an image, computers can't. For a computer an image is no more than a matrix of pixels. The artificial intelligence required for recognizing objects in this matrix, has to be created by a programmer. Therefore the most existing methods for this problem apply for specific objects or tasks only.

Examples:

1. Recognizing human faces, often used in digital cameras
2. Pose estimation for estimating the orientation and position of an object to the camera
3. Content-based image retrieval for finding image in a larger set of images.

The diagram given below explains how the face recognition is done and how various algorithms works in the process.

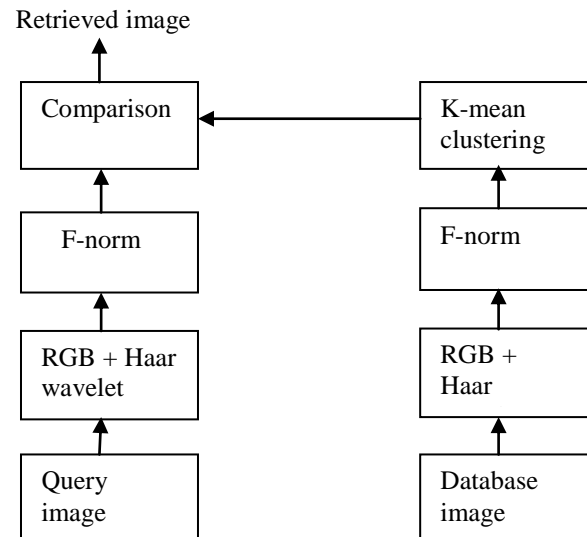


Fig 2.Processing Of Image

The first step in processing of an image is Acquisition where we acquire the query image from the user. Acquisition of the image can be done through browsing or by taking the picture using the camera. The first block reflects the same. The second block explains about the pre-processing of the image. The third block is about feature extraction. The feature extraction of the image can be done using the two methods called content-based image retrieval and local binary pattern.

IV. CONTENT BASED IMAGE RETRIEVAL

Content based image retrieval (CBIR) [10] is a technique for retrieving images on the basis of features such as color, texture and shape. Feature extraction using content based image retrieval can be done taking into consideration various features of the image such as colour, shape and texture wherein we use color feature extraction to get the features of image. Color feature extraction can be done using various methods out of which we use Average RGB (red, green, blue).

A. Color Feature Extraction

Feature extraction is one of the most important components in a content-based retrieval system. Color feature extraction is one of the very useful feature extraction technique as human can easily recognize the image on the basis of color. Color is that property of the image which is used very frequently to describe the image. Color features are used for measuring similarity between images. The method that we use for color feature extraction is RGB.

B. RGB Color Model

Color model also called the color spaces or color system is used for specification of the color in some standard way. Color space is one of the main aspect of color feature

extraction. Color space is a multidimensional space [8] in which different dimensions represent the different components of the color. For example of color space is RGB [11]. The main purpose of the RGB color module is for the sensing, representation and display of images in electronic systems. We use the co-ordinate system to specify the colors where each point shows the different color. The basic colors of the image can be seen as red, blue and green. In RGB color space R gives the intensity of the red, G gives the intensity of the green and B gives the intensity of the blue. The monitors or video cameras use the RGB color model to describe the colors of the image. In the RGB color model by mixing these basic colors in proper quantity different colors can be obtained. By setting the red, blue and green values as one in the co-ordinate system we get white color. Similarly to obtain black color we set all the values as zero.

To extract the color feature of the image we use Average RGB technique in this project. Here, firstly the color image is broken down into red, green and blue values. This image color values are stored in matrix form. Using image matrix all R, G, B components in image are extracted and separated into three different array forms as shown in fig3. Then calculate the total number of red pixels, green pixels and blue pixels in the image and later the average of each is calculated individually

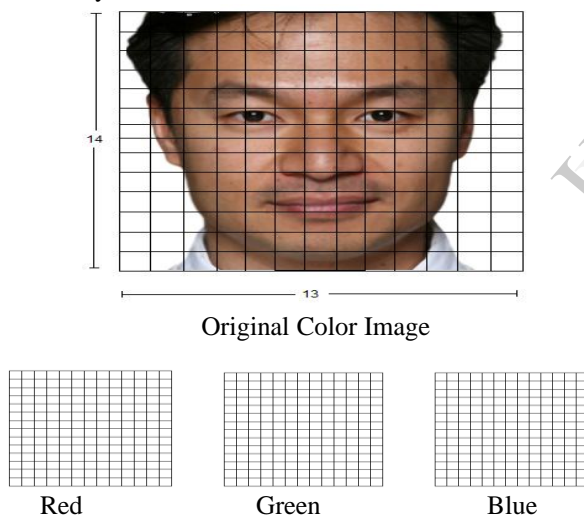


Fig 3. Color image and RGB matrix

V. HAAR WAVELET TRANSFORM

Wavelet transform have become one of the most important and powerful tool signal representation. It has been used in image processing, data compression and signal processing. In this paper we worked with two feature extraction methods, Haar wavelets for texture feature extraction and average RGB for color feature extraction. If we use single feature extraction method for image retrieval the result may be inefficient. By combining these two methods the efficient result will be produce. [8]

The computation of the wavelet transforms of a two dimensional signals involves recursive filtering and sub-sampling. At each level, the signal is decomposed into four frequency sub-bands LL, LH, HL, HH, where L denotes low frequency and H denote high frequency. Wavelet transform provide a multi-resolution approach to texture analysis and classification. If a data set X_0, X_1, \dots, X_{N-1} contains N elements, there will be N/2 averages and N/2 wavelet coefficient values. The averages are stored in the first half of the N element array, and the coefficients are stored in the second half of the N element array. We apply Haar wavelet decomposition of an image in RGB color space and after that extract the features by using F-norm theory.

VI. CLUSTERING

Clustering is the process of grouping samples so that samples are similar within each group. The groups are called cluster. Clustering is an essential and very frequently performed task in pattern recognition algorithm. A cluster is a collection of a objects which are similar between them and are dissimilar to the objects belonging to the other class. The goal of clustering is to determine the intrinsic grouping in a set of unlabeled data. Following are the applications of clustering.

1. Libraries
2. Biology
3. Marketing

A. K-Means Clustering

K-means algorithm is the simplest algorithm that solves the well-known clustering algorithm. K-means is an algorithm to classify or to group our objects based on features or attributes into a K number of groups. K-means clustering algorithm is used in our project to generate a cluster of similar images. This would be helpful in our project to find out the images as early as possible with the help of cluster. By using a cluster the image to be recognized need not be compared with the whole database. Instead it has to be compared with the images that are present in the clusters which have similar values to that query image.

K-Means Algorithm:

Input:

K: number of clusters

D: a data set containing n element

Output:

A set of K cluster

Method:

1. Choose the number of clusters, k.
2. Randomly generate k clusters and determine the cluster centers, or directly generate k random points as cluster centers.
3. Select the database image from database as the initial centroid point.
4. Calculate centroid of image using Eculidian distance.

$$ED = \sqrt{(X - X_c)^2 + (Y - Y_c)^2}$$

5. Re-compute the centroid of each cluster.
6. until the centroids don't change.

VII. CONCLUSION

By studying various papers we came to the conclusion that by using the color feature extraction it becomes easier to describe the image. Color feature extraction is one of the most important feature extraction techniques out of color, shape and texture. We have also used clustering algorithm to generate cluster of the similar images which would be useful for searching the similar image to that of query image very fast. By combining various algorithms such as feature extraction (Average RGB), for grouping similar images (clustering) and then finally using indexing can make the output of the project more accurate. The output of the project so obtained is not 100% accurate.

REFERENCES

- [1] P.J. Phillips, P. Grother, R.J. Micheals, D.M. Blackburn, E. Tabassi, and J.M. Bone. Face recognition vendor test 2002 results. Technical report, 2003.
- [2] W.Y. Zhao, R. Chellappa, P.J. Phillips, and A. Rosenfeld. Face recognition: A literature survey. *ACM Computing Survey*, pages 399-458, 2003.
- [3] Smeulders, A.W., Worring, M., Santini, S., Gupta, A., Jain, R.: Content-based image retrieval at the end of the early years. *IEEE Transactions on Pattern Analysis and Machine Intelligence* 22(12), 1349-1380 (2000).
- [4] Torres, R.S., Falcao, A.Z.: Content-based image retrieval: Theory and applications. In: *Brazilian Symposium on Computer Graphics and Image Processing*. pp. 161- 185. SIBGRAPO (2006).
- [5] Manjunath, B., Ma, W.: Texture features for browsing and retrieval of large image data. *IEEE Transactions on Pattern Analysis and Machine Intelligence (Special Issue on Digital Libraries)* 18(8), 837-842 (1996).
- [6] Zhang, D., Wong, A., Indrawan, M., Lu, G.: Content-based image retrieval using gabor texture features. *IEEE Transactions PAMI* pp. 13-15 (2000).
- [7] OpenHandsetAlliance[2009].URL:<http://www.openhandsetalliance.com> (Last consulted: 04/05/2009).
- [8] Content-based Image Retrieval Using Haar Wavelet Transform and color Moment „Md. Iqbal Hasan Sarker 1 and Md. Shahed Iqbal 2
- [9] Y.M. Latha, B.C. Jinaga and V.S.K Reddy, 2008, A Precise Content-Based Image Retrieval: Lifting Scheme ICGST-GVIP journal, vol. 8, issue 1, June 2008.
- [10] Smeulders, A.W., Worring, M., Santini, S., Gupta, A., Jain, R.: Content-based image retrieval at the end of the early years. *IEEE Transactions on Pattern Analysis and Machine Intelligence* 22(12), 1349-1380 (2000)
- [11] Skin Segmentation Using RGB Color Model and Implementation of Switching Conditions Harpreet Kaur Saini*, Onkar Chand (Department of Electronics Engineering, Institute of Engineering and Technology, Bhattal- Punjab Technical University).
- [12] F- Norm based Color Image Retrieval with Selective Relevance Feedback Jayashree Khanapuri, Department of Electronics & Telecommunication K J Somaiya IE & IT, Mumbai India.