

Face Recognition Using CBIR and Genetic Algorithm

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41

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Abstract

Face recognition is used worldwide for security purposes. The data used for facial recognition are frontal face images and retrieval of these images from the database is done using Content Based Image Retrieval or CBIR. Facial image recognition is done by extracting features from images and comparing these features with features of other frontal face images. The proposed system will use FCM and Fast Fourier Transform for feature extraction and Genetic Algorithm for comparison of these features and retrieval of most matching image from the database using CBIR. The proposed system can be used at airports, household security, Museums, etc. for security purposes and will help in identifying people much more accurately.

Keywords— CBIR, Face Recognition, Facial Image, Feature Extraction, Feature Comparison

1 INTRODUCTION

In today's digital world privacy and security has become the centre of concern for many application developers. The range of security threats in the ongoing time varies from unauthorized access to online hacking. To overcome such challenges in security field many new security technologies are on the go in the market, such as: retina scan, fingerprint access, face recognition and many more to access an application which are used to minimize the unauthorized access of the user. Content-based image retrieval is the application of computer vision techniques to the image retrieval problem, that is, the problem of searching digital images in huge databases. The system uses methods of feature extraction and feature comparison to process the query image with image in the database.

2 EXISTING SYSTEM

Face recognition is a challenging aspect in Image analysis. A technique which is able to efficiently perform face recognition is yet to be encountered. The techniques used so far take a number of test images and varies the conditions and variables. Algorithms like PCA and LDA are used to reduce the dimensionality of the features but it does not guarantee satisfactory results when changing viewpoints. PCA uses a statistical approach by reducing the number of variables used for face recognition. Even though these algorithms provide decent results, a system which can provide good results with partially covered faces is not successfully created.

3 RELATED WORK

Gerald et.al.[1] discussed almost all CBIR techniques operate on pixel data although virtually all images are stored in compressed form. Effective CBIR techniques that operate directly in the compressed domain and thus do not require full decompression for feature extraction. D.Edmundson et.al.[7] also explored the idea regarding CBIR features that can be extracted from DCT coefficients, from differentially coded DC data, and from optimized Huffman and quantization tables that are stored in the JPEG headers various features can be extracted based on DCT coefficient data thus avoiding the computationally expensive inverse DCT. G.Schaefer et.al.[6] also suggested an algorithm that is based not directly on DCT coefficients but on differences of these, which are readily available in a JPEG compression stream.

Face Detection is one of the most complex and challenging problem as pointed by M K Dhabhi et.al.[2] in the field of computer vision, due to variations shown by the face of an individual. In this algorithm the concept of haar feature is used to detect face in image. They(haar) are composed of two to three rectangles, and each haar feature has a value which can be calculated by taking the area of each rectangle and then adding to get the final result. Here the concept of integral- image is used for face detection purposes, which is nothing but the summation of the pixel values of the original image.

Genetic Algorithm for face recognition was suggested by Ravi et.al.[3]. Any face recognition system contains 3 phases, face representation, face detection and face recognition. It explains how Genetic algorithm works and how it can be used in face recognition systems. A method has been proposed for face recognition using genetic algorithm. The algorithm is then implemented and tested with 5 different databases: - IFD, Face94, Yale, Face 1999, UMIST. The results were quite satisfactory compared to PCA and LDA. However, the recognition rate for images with different backgrounds was not quite good. D.Yi et.al.[4] used PCA in his approach towards pose robust face recognition and got good results regarding images with different backgrounds. S.Singh et.al.[8] suggested modified PCA algorithm by using some components of LDA algorithm which showed better results than traditional PCA algorithm. But, the algorithm proposed by Ravi et.al.[3] does not require more than 5 images per person for recognition whereas PCA and LDA required around 10 images.

Nidhi et.al.[5] proposed an algorithm for content based image retrieval. The algorithm comprises of designing feature vectors after segmentation which will be used in similarity comparison between query image and database images. The framework is trained for different images in database. In this proposed framework, FCM approach is used. It produces a partition of dataset. And a feature extraction approach is used called “Fast Fourier Transform”, to extract array vector after segmentation of image. The derived array vector is used to form first feature vector along with his component of color image, which will be used as second feature vector

4 PROPOSED SYSTEM

We propose a system that uses genetic algorithm for face recognition of faces with and without obstacle. Genetic algorithm shows much better results than existing algorithms like PCA and LDA. The system has a database which contains facial images. The features will be extracted from the query image and will be compared with the features from the images in the database. If the query

image passes a certain threshold after comparison then the matching image will be shown, if no image passes the threshold then the image is added to the database.

5 SYSTEM ARCHITECTURE

Systems architecture is the conceptual model that defines the structure, behaviour, and more views of a system. The system architecture diagram as shown in figure 1 gives us the brief idea of different modules in proposed system. The system consists of 3 different stages, first stage is the Face Detection stage. In this stage, the face is detected from the query image and Viola Jones algorithm is used to accomplish this. Next is the Feature Extraction stage. Features are extracted from the detected face using FCM and Fast Fourier Transform. And finally, these features are compared to the features of frontal face images in the database using Genetic Algorithm. If a match is found, result is displayed, however, if no match is found then the image is added to the database.

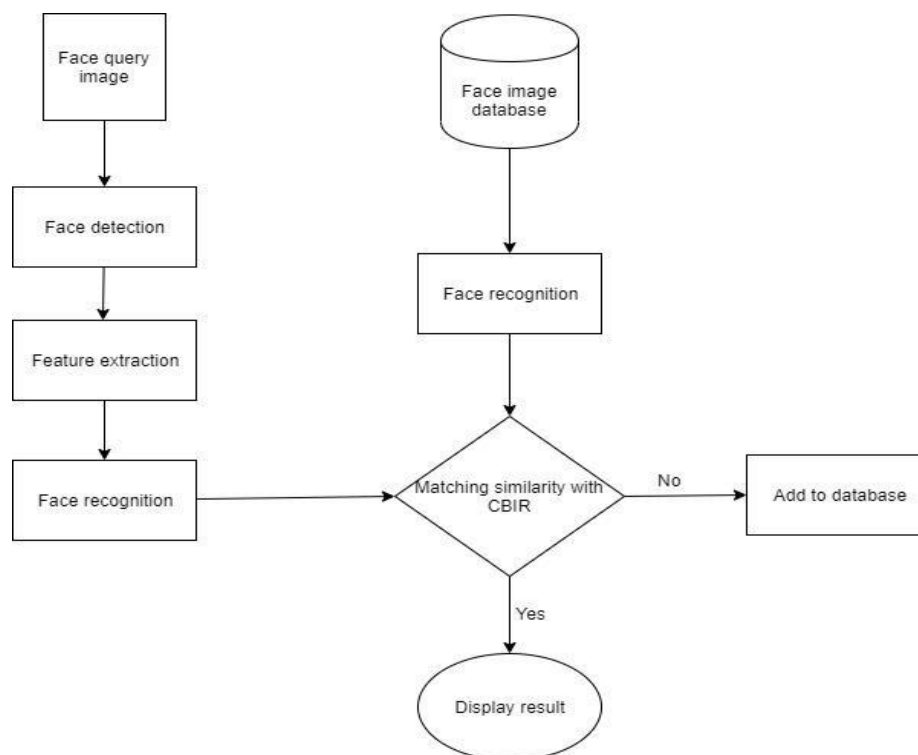


Fig-1: Working of the system

6 ALGORITHM

FCM & Fast Fourier Transform :-

This algorithm is based on content based image retrieval, comprises of designing feature vectors after segmentation which will be used in similarity comparison between query image and database images. The framework is trained for different images in database. In this proposed framework, FCM approach is used. It produces a partition of dataset. And a feature extraction approach is used called “Fast Fourier Transform”, to extract array vector after segmentation of image. The derived

array vector is used to form first feature vector along with his component of color image, which will be used as second feature vector.

Genetic algorithm: -

In this algorithm, features or information regarding image is treated as genomes or chromosomes. Firstly, suppose we have a population of N size, with chromosomes generated randomly. Apply fitness to each chromosome or genomes of population; Make new chromosomes or genomes through crossings of selected chromosomes of this population. Apply recombination and mutation in these chromosomes. Eliminate old population members, so that there is enough space to insert new chromosomes, keeping the population with the same N chromosomes. Eventually, we end up with a population with most suitable or fittest members.

Pseudo-code for evolutionary algorithm:

t:=0;

Initialize & evaluate $p(t)$;

While not stop_condition **do**

$p'(t) := \text{variation}[p(t)]$;

 evaluate $[p'(t)]$;

$p(t+1) := \text{select}[p'(t)]$;

 t:=t+1;

end while

7 FUNCTIONAL REQUIREMENT

Face Detection:-

The face is detected in the image captured. The detection is done using image processing. The input to this feature is an image captured using a camera or uploading previously captured images. This input is further processed and output is obtained as the detected face in the image. This feature gives output as an image with detected face which is further used for feature extraction.

Feature Extraction:-

The features are extracted from the image which will be used as criteria for comparison with other images in the database. The input to this feature is the detected face. When feature extraction is done on this image, it creates feature vectors. This feature gives the feature vectors as an output to the next step. These vectors describe each image uniquely and serve as criteria for comparison.

Face Recognition:-

The feature vectors are compared with the feature vectors of the images in database using genetic algorithm and images which pass the threshold for matching are displayed. The input to this feature is the feature vector. The feature comparison is done here to recognize the face in the query image. This feature results into the recognition of the face in the query image.

8 CONCLUSION

In this paper, we have successfully discovered various uses and threats of the security and the need of the security checks that are needed to counter the previous. we have done extensive literature survey of different papers for CBIR based image retrieval and studied about the different platforms on which the idea could be implemented.

REFERENCES

- [1] Gerald Schaefer, “Fast Compressed Domain JPEG Image Retrieval”, International Conference on Vision, Image and Signal Processing, 2017.
- [2] Nidhi Singh, Kanchan Singh, Ashok K. Sinha, “A Novel Approach for Content Based Image Retrieval”, Third International Conference on Computational Intelligence and Information Technology, 2012.
- [3] M K Dhahi, B K Pancholi, “Face Recognition system based on viola-jones algorithm”, International Journal of Science and Research (IJSR), 2016.
- [4] Ravi Subban, Dattatreya Mankame, Sadique Nayeem, P. Pasupathi, “Genetic Algorithm based Human Face Recognition”, International Conference in Communication Network and Computing, 2014.
- [5] D. Yi, Z. Lei, and S. Z. Li, “Towards pose robust face recognition”, IEEE Conference on Computer Vision and Pattern Recognition, 2013.
- [6] G. Schaefer, D. Edmundson, "DC stream based JPEG compressed domain image retrieval", International Conference on Active Media Technology, 2012.
- [7] D. Edmundson, G. Schaefer, "Fast JPEG image retrieval using optimised Huffman tables", Proceedings of 21st International Conference on Pattern Recognition, 2012.
- [8] S. Singh, M. Sharma, and D. N. S. Rao, “Accurate face recognition using pca and lda”, International Conference on Emerging Trends in Computer and Image Processing, 2011.