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RETRIEVAL OF FACES BASED ON SIMILARITIES

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ABSTRACT

In this paper, we describe image-based retrieval of similar faces from the database by analyzing each and every face image in the database and storing them with a unique signature based on analysis data. The image-based facial analysis can be done by training the network with millions of faces dataset with perfect labels. Data set will train the system to detect and analyze the face based on training data. A learning network will analyze the face with face features such as beard, mustache, nose and its position and shape, eyes and their shape, forehead and its size, and position of ears. We are going to retrieve only the best match of seven faces as there are only seven identical faces in the world.

Every person has unique set of facial features which differentiate them from others, as identification of a person is hard without eyebrows. We are going to analyze each and every facial feature by our learning network. Signatures are stored into database of our choice with detailed facial information.

KeyWords

Retrieval of Faces Based on Similarities, Face Similarities, Face Recognition, Doppler, Retrieve faces using similarities, face analysis, face detection, face search index

1. INTRODUCTION

The title of the research paper is "Retrieval of Faces Based on Similarities". Purpose of this paper is to define the efficient way of retrieving similar faces from the database by decreasing the time complexity $O(n^3)$ we can achieve this by analyzing the faces in the input images and storing them with a signature based on classification of facial features such as beard, mustache, nose shape, ears shape, eye shape, etc. Facial features can be extracted from an image by usual methods of extraction such as training the network with millions of faces which can classify the input easily (K-NN Training Methods).

Similarly facial analysis is a reverse process of face modeling using the eigenvectors of the face (as shown in Fig. 1) and high level set of parameters that state the shape of the face such as face's gaze, mouth, nose and pose.

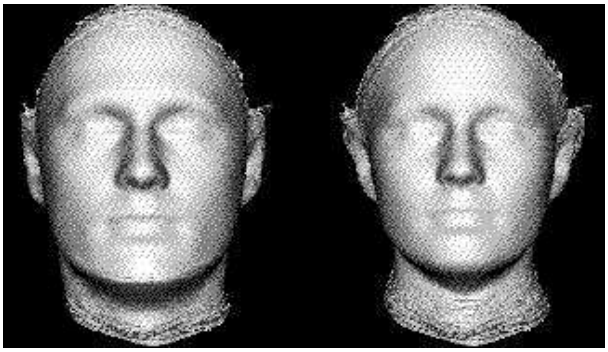

Fig. 1: Eigenvector of a face model

In general, classification of image extracts the information of:

- Detect faces and differentiate portrait photographs from the group ones as well as to categorize analyzed pictures as landscape or exterior architectural photographs if no faces were prior detected.
- Recognize and classify different kinds of architectural objects, like well-known buildings (eg: Burj Al Arab), constructions (eg: Taj Mahal), sculptures (eg: Shivaji Status), etc.
- Estimate similarity between groups of images or frames and evaluate selected image and video quality metrics, including noise, blur, slicing, etc.
- Detect local image (frame) features and calculate their descriptors.

2. SERVICES

2.1 A FACE RECOGNITION SERVICE

Face recognition service is used to detect the face or faces in an input image and recognize them by running face scanner in a trained network of faces. The whole process is described as step by step process in the UML as represented in Fig. 2

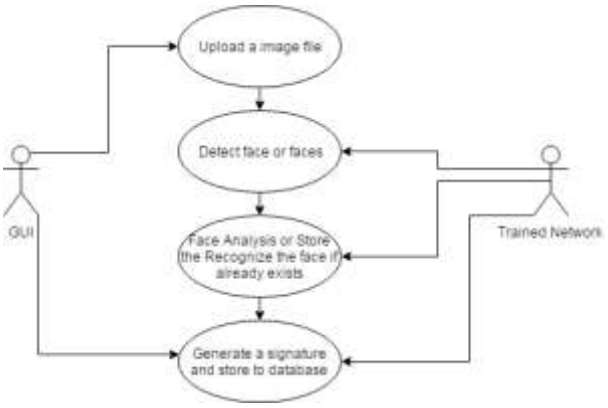

Fig. 2: A use case diagram for face recognition service

In this general case, face detection and analysis is done to generate a unique signature for facial features.

2.2 A FACE ANALYSIS SERVICE

Face Analysis service is used to analyze the face to extract the facial information which will extract information such as gender, beard, mustache, nose pitch up or down, mouth open and emotions of the face. Analysis confidence level increases as database of faces increases, it's a process done by training network of K-NN image classification. For an instance it is shown as Fig. 3.

Fig. 3: A sample picture of classification of faces using K-NN classification method.

Each and every facial feature is extracted and generates a unique signature for that face and that unique signature is stored into database including the face.

3. SEARCH INDEX

Search indexing is a method of storing images in index which is easily accessible to retrieve the data from the database by keeping the high confidence images at first and lowest confidence images to last. This is a usual method used in large databases to fetch the information efficiently. Here in search index, we are going to store the faces and their signatures with facial features into database with a clean indexing.

We can also build an index by automatically store the input images which are analyzed with image labels into database, but operation requires lots of computational resources to do.

By building search index, we can achieve results efficiently as shown in the Fig. 4.

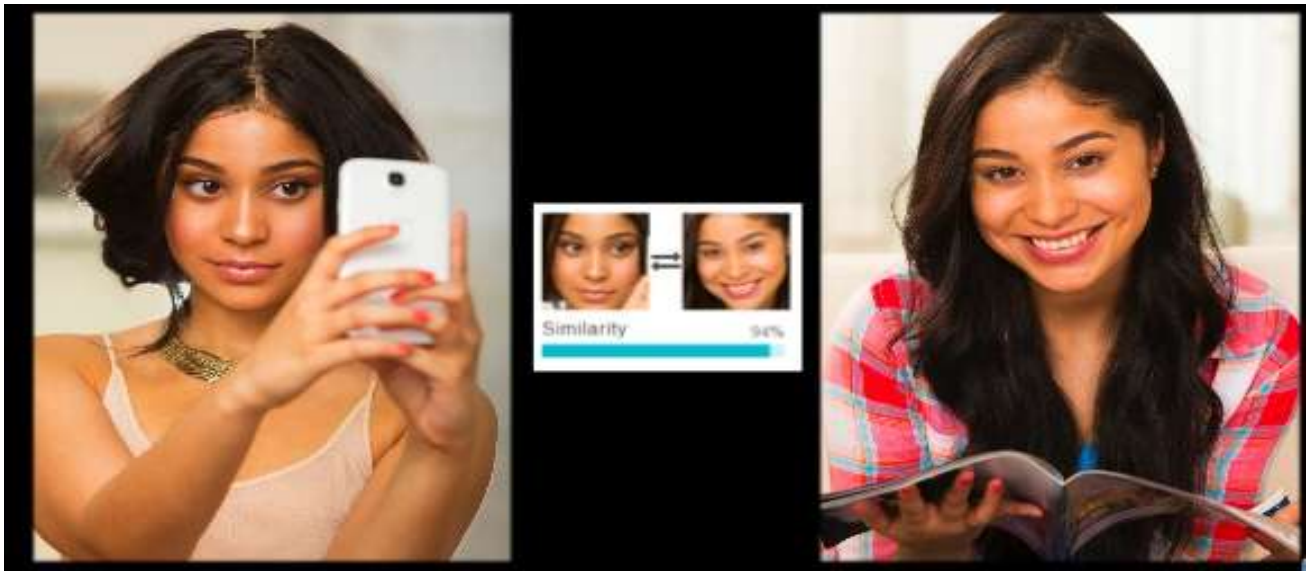

Fig. 4: Face comparison search done using search index.

4. RETRIEVAL OF FACES

Retrieval of faces can be done in two ways, based on similarity percentage and search index respectively.

4.1 SIMILARITY PERCENTAGE

Every face is stored into database with a unique signature which is a form of search index storage method. Using the method of storing unique signature we are going to store all the facial information to a collection of faces. Each and every collection have a similar faces which is done at the backend to reduce the time complexity of the accessing the files for user and the each collection have a similar faces and based on unique signature and identifiers we are using in the signatures we can know the face collection ID to search for. Every input image is analyzed and finds the similarity and it fetches the similar faces from the database based on the similarity ratio, as represented in the Fig. 5.

Fig. 5: Face Similarity Search Result.

We can put a threshold value to retrieve the images based on similarities like 50% similarity percentage, etc. Based on the similarity percentage we are going to fetch the faces from the face collection.

Conclusion

Conclusion of this research paper can be given in simple terms. Traditional method of face similarities is to store the images as file based in a folder and run face analysis on each and every image stored in the system to compare with the given input image, which is time complex and creates a bottleneck to the machine. To reduce this effort and retrieve faces based on similarties can be simply done by generating a unique signature for each and every face in the system which is already analyzed through our training network. By storing the face analysis data with a unique signature will help us to retrieve faces effectively with lesser computational resources.

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