

## Face Recognition with a mixed approach of GA

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**Abstract**— There are a no. of face recognition algorithms including feature extraction , feature selection and feature recognition. This is the area growing more & more implementing 3D pattern recognition and video clips. This algorithm gives a simplified approach for recognizing a face from a repository of faces. A face recognition algorithm includes feature extraction which take out the necessary portions of faces or ROI(Region of Interest ) and applies selection on this set of features .Finally applies any recognition or matching algorithm to match with data set .In this paper, we make use of localization algorithm for making a localized portions of focus from a face clip .From this collected data ,we select the best feature set using mathematical equation of optimization. At last we apply ACO (Ant Colony Optimization ) that is a genetic algorithm of optimization for recognizing the face .The algorithm gives good result with minimized cost & time factor.

*Index Terms*—ACO algo , localization ,mixed and simplified , Time-Cost Reduction

### I. INTRODUCTION

Humans have always had the innate ability to recognize and distinguish between faces, yet computers only recently have shown the same ability. In the mid 1960s, scientists began work on using the

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computer to recognize human faces. Since then, facial recognition software has come a long way. Face recognition, an important means of biometric is a rapidly growing domain in pattern recognition. Usually, face recognition systems accomplish the task through face detection, facial feature extraction and face recognition. Face detection refers to isolating the face blob from the image, i.e. detaching it from the background or the surrounding environment. Facial features which make a face distinct play a vital role in identifying a person. On contrary to this, some other face recognition schemes focus on the geometry of the face. Finally, the recognition algorithm train the system to identify individuals using knowledge gained from the face detection / feature extraction phase. Face detection is a crucial step since subsequent procedures depends solely on its outcome. Many techniques have been employed to successfully localize and extract facial region from images. Most often, face recognition is considered to be a complex task due to enormous changes produced on face by illumination, facial expression, size, resolution, orientation, accessories on face and aging effects. The difficulty level increases when two persons have similar faces.

Face recognition is an important biometric technology which does not require the interaction of the individual but all other biometric recognitions includes human interaction for pattern matching. This characteristic of face recognition makes it different from other biometric techniques like fingerprint, iris, hand geometry and multimodal biometric techniques where the person to be recognized/identified must input his features to the recognition system. Thus face recognition can be used as a biometric in case of tracing criminals law enforcement techniques, multiple enrollments etc.

Previously a no. of approaches using genetic algorithms have been proposed, here we give a mathematical equation based algorithm for face recognition which includes following-

1. **Feature extraction (mixed equation of filter & cropping)**
2. **Feature selection (use of optimization equation)**
3. **Feature Recognition (using ACO algorithm of optimization & Euclidean space)**

**Related work**-feature extraction, selection and recognition has a wide scope of algorithms including simple to genetic and linear to multidimensional space. Those algorithms definitely their time cost, complexity cost, memory and computation cost. This algorithm use simplified equation from the algorithms & hence reduces time & complexity and even for future scope of change. Previously a no. of algorithm for 3 steps are used i.e.

#### **Feature extraction-**

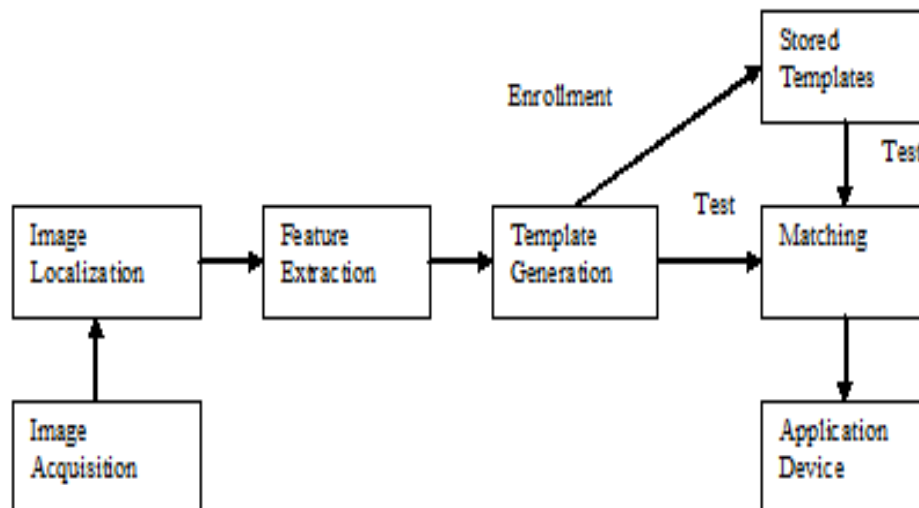
PCA (Principal Component analysis), KPCA (Kernel Principal Component analysis), Partial Least Squares, Edge detection Ridge detection which extracts features from face clip likewise eyes, nose, forehead, chins, lips.

**Feature Selection-**

Simulated Annealing , Genetic algorithms, Meta heuristic methods like filter , wrapper , embedded methods which take small sorts of set for matching features instead of matching the whole set of features with every image of Database .

**Feature recognition-**

Genetic algorithm , Swarm intelligence algorithms or a no. of matching algorithms are used for recognition of required image from a database .

**Proposed work-**

**Figure 1.Procedure of face recognition**

Here , in this work three set of images are stored for different purposes-

- DataBase**-that is having the set of pics for the experiment.
- Feature List**-From the database we extract only the features under interest , no need to compare the complete face clips features.



Figure 2:Feature List extracted

c. **Optimized List**-Only few of the features set is kept for matching & identification not the whole set.i.e. Set  $d$  is subset of Whole Set  $F$  where  $F$  is complete set of all the features.

### We divide our algorithm at three stages of computation-

1. Localization
2. Extraction & Selection
3. Matching or identification

1. **Localization**-In the localization , we introduce a algorithm based on cropping according to the dimensions of the face clip.

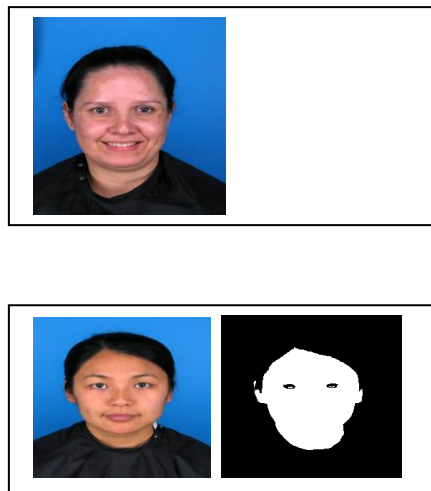


Figure 3:ROIs of test clip

A mathematical equation that gives the locality of the various features of the face under interest i.e. left eye , right eye,chin,lips.These four features are kept under interest and made to know using the equations .Region of Interest is computed sothat it further helps in the extraction of features of face clips in both the areas-

- Database
- Testing Clip

**2. Extraction** – In spite of comparing the whole face clip of database with the test clip, we compare only features taken from face clip. These clips are saved in a separate data structure i.e. array or list. This list is of further two types-

One, list with features of Test Clip

Other, list with features of Database Clips

These features are extracted using the mathematical equation i.e. Mixed Filter equation having content of filter method.

As shown in figure 2, Left Eye, Right Eye, Chin, Lips.

**Selection**-It consists of only a set of optimized features. These features have the quality that these are sufficient for the comparison & matching process. Comparing this subset of features gives the resulted & identified Clip that is recognized by this algorithm.

This selection process makes use of an optimization algorithm having content of ABC genetic algorithm & Best first algorithm. It is a mixed & reduced equation derived from both the algorithms for the purpose of reducing the time, cost, memory & other resources. Hence increases the efficiency & speed directly that gives the scope of further improvement of addition of any other concept in future.

**3. Recognition**-Here we make use of ACO genetic algorithm that is used on the optimized set and full database set to identify the test clip. It is done with the use of ACO (Ant Colony Optimization) algorithm. It gives the result of matched image from the database.

### **Process of ACO:**

#### **Step 1:**

This is the initialization step in which we will determine what is the population of ants which would be equal to the number of features. We will set the intensity of pheromone trail associated with any of the path among the features. That means that we will read the distance among features in the given image and determine the threshold value. In this we will also define the maximum number of iterations are allowed i.e. number of nodes and paths can be traversed.

#### **Step 2:**

This step contains generation of ant. In this we will place one ant on each selected feature. We can assign any ant to feature. This ant should visit all features and build the solution completely.

#### **Step 3:**

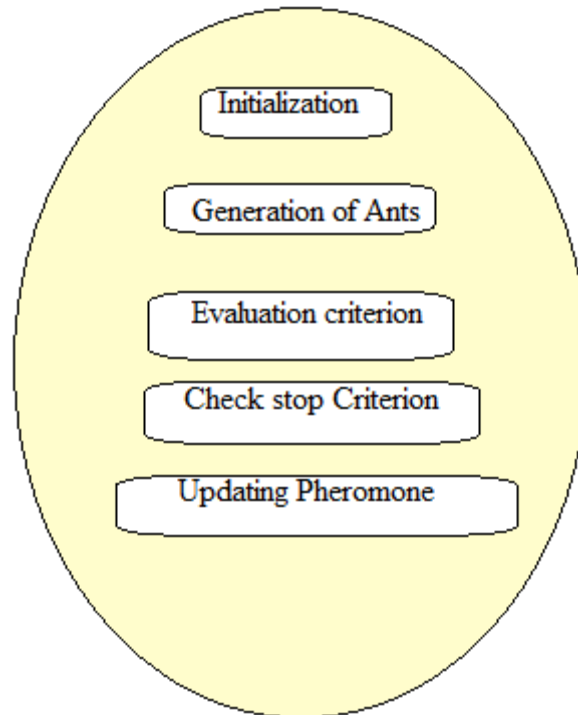
In this step we will talk about the evaluation criteria. In this step we will make use of the Euclidean Distance among the features. Then we will compare the distance obtained with the stored image distance. In this we can assume that if the distance among the features meet the requirement with more than 40% deviation for all paths then we will exit.

#### **Step 4:**

In this step we will check the stopping criteria i.e. if ants have visited all features. Nodes/paths i.e. it reaches the maximum number of iteration allowed then we would exit otherwise we will continue.

**Step 5:**

In this step we do the process of pheromone updating i.e. pheromone intensity for the features, which are selected in step3, is updated. By doing this we will mark the path as verified and node as visited.



**Figure 4: ACO genetic algorithm**

This genetic algorithm with the Euclidean equation gives the correct results after implementation.

Implementation is done in Matlab and gives very accurate & fast results .

## **Conclusion-**

Our work of recognition gives a good & accurate result with the database that is image set of static clips. This is simple & efficient algorithm does not centered around any pure algorithm rather a mixed equation set used for different stages. Use of 3 stages make it easier to divide the equations that make use of 3 set of list & data structure – database , feature set , optimized set. Database set is used in the starting & trained to make another set i.e. feature set. Finally Feature set is trained to make third set i.e. optimized set.

## Future Scope-

In this new era of technology , moving picture scanning is a quite common now a days i.e video surveillance ,CCTV camera .These cameras & devices captures the clips & saved for the any abnormal person identification or Identification of any suspicious person .Hence this security systems is quite usually implemented in major enterprise area .Our algorithm gives a big scope of any enhancement implementing moving clips identification , simultaneous addition of images in database instantly, changing light variations on images ,night time identification etc.

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