Subspace Based Face Recognition using Clustering

[1] **Elumalai Gokulakrishnan**, [2] **Seshasayanam Asha**

[1]School Of Computing Science and Engineering, VIT University-Chennai.
Chennai, India

[2]School Of Computing Science and Engineering, VIT University-Chennai.
Chennai, India

Abstract - The main theme of this research proposal is about how the face recognition takes place in real-time. In this paper we are going to focus two things mainly artificial neural network (ANN) and Clustering for face detection and face recognition. Artificial neural network provides an optimal solution for face recognition. Unsupervised learning algorithm and self-organized map (SOM) is used for feature based face recognition. We are going to train such an artificial neural network to extract facial features even for identical twins.to recognize fast in template database we are going to use clustering technique to achieve better performance. In face recognition twins cannot be identified still research is going on. I proposed solution for identifying twins that might give a better result.

Keywords - *ANN,SOM,Neuron,FRR,FAR.*

1. Introduction

The term biometrics is used to identify a unique physiological and behavioural characteristics of an individual user. Nowadays biometrics are used for secure authentication. Biometrics is a passive identification of the user. Biometrics provide a reliable security such as M-Banking E-banking login authentications even ATM also having biometrics features to recognize a person.one factor authentication provides less security features so they moved one step forward multimodal biometric authentication more than one biometrics features combine together for security authentication. Highest degree of security like combining security authentication like passwords, tokens, biometrics.so many research is going on biometrics to provide a better security to world. The researchers are expecting a true biometrics that supports by everyone in the world. Biometrics thoughts like says "you are the password" you don't have remember all the password don't want to write in paper and keep in secret place, no password stolen .more than one factor authentication provides an higher security due to higher cost, maintenance support it doesn't use that technique. The technology moving forward like a fast train the user is expecting like from there place they want to do all in a single place technology speeds like anything. Biometrics is the current and upcoming technology. In the worlds still there is an trustworthy between the people only familiar biometrics they are trusting like fingerprint users are look for different security authentication depending upon which application they needed.

2. FACE Recognition

Face recognition is the process of extracting the facial features in the face for identifying the unique individual of the person.

2.1 Challenges of Face Recognition

A) Image Resolution
Capturing image quality also very important for face recognition which involves pixel size also needed.

B) Illumination of Background Lightning Effects
Some photos were taken sunlight and some taken under physical light that makes an image distortion we need take care about lightning effects the system that supports automatic capture and reduce background lightning effects.

C) Identification of Identical Twins
Twins can be identified easily but the problem still in research is about how to find identical twins still identical twins have an unique features in this research we will discuss those things.

D) Large variability in facial appearances
In human faces have their different facial expression are given by the user while taking photos so design such system capable to recognize person.

E) Failure in Enrollment

While user registering in biometric template database user has to give pose appropriate face for recognition unless it leads to inconvenient for face recognition.

F) Recognition Time

While authenticating user with database it takes more time whether the user is authenticated or not. Use proper technique for face recognition leads to less time for face recognition.

G) Extraction of Exact Features

While extracting the features from an image the system must identify exact feature location from the image unless it leads to failure in extracting the features.
The above discussed challenges are still researchers doing experiments to overcome the problems.

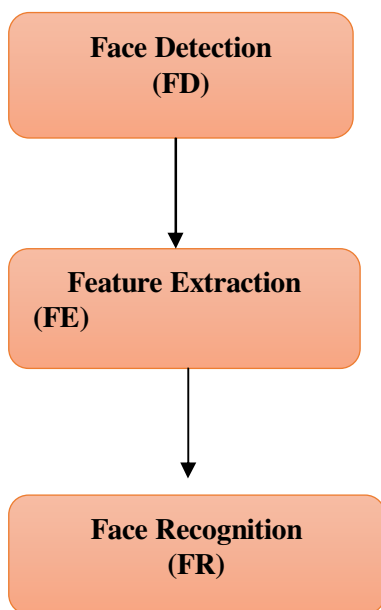## 2.2 Three Basic steps for Face Recognition

Fig 1: Basics steps for face recognition

3. Face Detection

Face Detection is the process of analyzing and identifying the exact feature location in the captured image this technique can be applied using edge detector. Image is full of matrix consist of different values. The edge detector can be applied everywhere to identifies the feature in the image .imagine that in mobile phone while capturing the photos it sense the person and detects the square box face of every person in front of the camera that is called the face detection.

3.1 Performance Evaluation of Biometrics

A) False Rejection Rates (FRR)
Sometimes system may fail to recognize the authorized user. So many times user has to register in to the database leads to rejection

$$FRR=NFR/NEIA \qquad (1)$$

where

NFR=Number of false rejection rates [8]
NEIA=Number of enrollee identification attempt [8]

B) False Acceptance Rate(FAR)
Sometimes the problem may occur technically i.e.mistakely the system authorized other user to access the logins. Due to poor background effect the user has registered and after login to the user account system cannot provide permission to access.

$$FAR=NFA/NIIA \qquad (2)$$

where
NFA=Number of false acceptance
NIIA=Number of imposter identification attempts

4. Proposed model

In our proposed model is based on artificial neural network and clustering for face recognition

4.1 Why Artificial Neural Network

Artificial neural network is an adaptive learning ability to learn how to do task dynamically for the given the image it first preprocess and analysis image after identifies a hidden layers of the input image and produce the result. Single input layer and it identifies multiple hidden layer terminal of the image we have train a learning algorithm to extract features all over the image. Self-organized Map is defined as ability to map a features automatically.
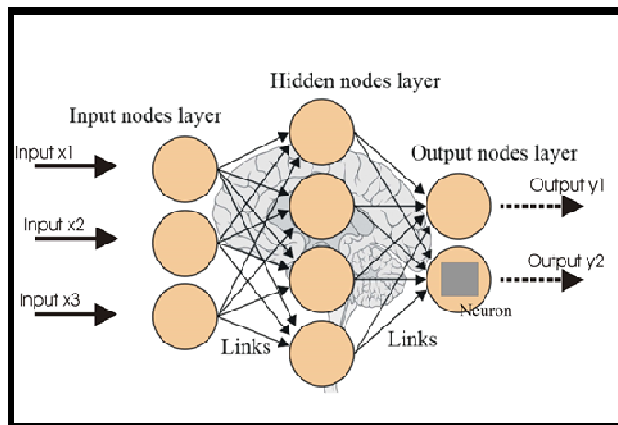

Fig 2: Block Diagram of Artificial Neural Network

In ANN neurons plays important role the system doesn't know who I am? Familiar faces user can easily recognize within a fraction of seconds. How the human brain recognize the person, first it captured face and neurons transfer to brain with some identification brain identifies a person with some biological features it just match face with stored images in brain. Human face have a unique features like mole, rash in face that cannot deleted from the face. Distance measure of an individual features like distance between left eye lid to right lid that will same for all the time it will not grow after some extent of years.

In this research ANN going to use unsupervised learning technique which has no external teaching for the training ANN depends upon whatever the input has given as user depends upon it analyses it gathered local information it extract the features and group together to produce an optimal performance result to the user whether user is authenticated or not and it is called as self-learning organization (SOM).ANN creates set of rules for extracting features from that it falls and satisfy the conditions means it execute the process. First it initially sense the captured image and it identifies biological representation features and then marked up values in table. It identifies possibility unique hidden layer feature from the face to the extend level. Feed forward mechanism technique are used in the artificial neural network. Learning algorithm is the process in which neural network adapts and produce a desired output. Convolution mechanism provides an extreme level of feature extraction from end to end in a local image sample.

4.2 Identical Twins Recognition Problems and Solution

Fig 3: Example for Identical Twins

In above identical twins can you identify who is younger, elder? Physically they are same but mathematically and biologically they are not same.in human naturally face can

have a unique features for example identical twins may have an skin rasterization, skin distortion under eye wrinkle, eye length may varies. Below I have proposed a technique to identify the identical twins.
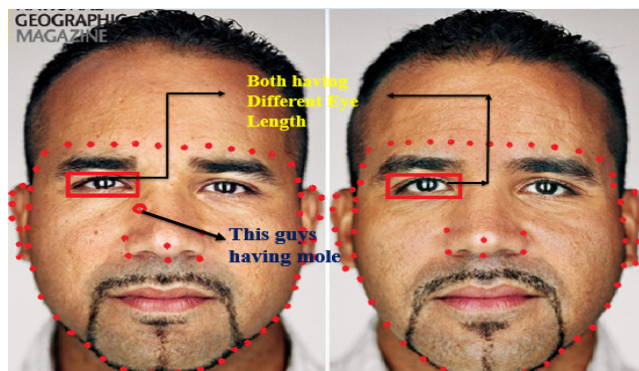

Fig 4: Solution for Identical Twins

Slight difference for twins that makes a perfect identical twin recognition the above pictures shows exactly how the identical twins are identified initially captured the image and make enhancement of the image ANN applied everywhere of the image and then identifies hidden layer of the each pixels that are captured it creates self-organized map rule and then image has compared with template database to match the score.

Clustering the image is the process of partitioning gender and then grouping the similar features from the image.so that fast recognition takes place into the template database. Initially the image, ANN has capable to recognize the male or female and then partitioning takes place. This novel approach provides fast detection and recognize a person this can be achieved by convolution mechanism.

4.3 How the Feature Extraction Takes Place

Distance measure of the unique features marked up for the input image below it has been tabulated a distance measure of the unique objects.

Table 1: Feature Extraction

Feature Extraction	Distance Measure
Left Eye Lid	2.0
Right Eye Lid	1.97
Left Eye Brow	2.5
Right Eye Brow	2.49

Feature Extraction	Distance Measure
Left Eye Lid	2.0
Right Eye Lid	1.99
Left eyebrow	3
Right eyebrow	2.97

USER IDENTITY	FUSED SCORE
RAM	0.77
Kumar	1.2
Selva	0.88
Murugesh	1.44

Root of nose	0.5
Left nostril	0.75
Right nostril	0.79
Black dots/mole	0
Eye Wrinkles	0

5. Proposed Algorithm

I.   Detect the face and Capture image from user with an exact pose.
II.   Preprocessing the image like thinning, smoothing, cropping the image 102*102
III. Partitioning the image by gender and then detects the features.
IV.   Apply artificial neural network all the pixels and identify the hidden layers from the input image.
V.   Generate automatically self-organized map rule for the input image.
VI.   Apply convolution mechanism in depth to identify hidden layer in the image.
VII. Sum the feature value and normalize those values and store it in template database.

VIII. Score level fusion technique allows fix the threshold values to make a decision quicker.
IX.   Finally generated outcome value falls within the threshold value means genuine otherwise imposter.
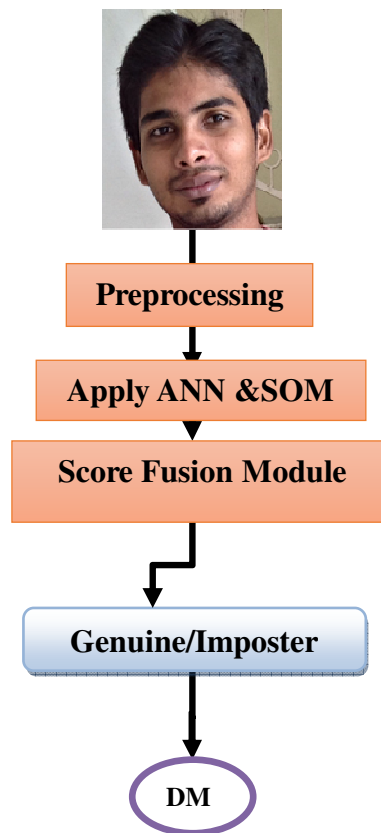
6. Proposed Architecture

Fig 5: Architecture of face recognition

7. Conclusion

Biometrics provides a high level security end-to-end system supports worldwide. Face recognition provides a better security solution. Nowadays artificial neural networks plays a vital role for learning algorithm it provides an optimal performance output.in this research we discussed about how the face recognition works in real time using ANN.I strongly recommend the this technique for future face recognition. The   Generation should be "Identify Everyone, Everywhere all the time" [7]. Still there are some more problem for face recognition in future the face recognition must provide without any faulty to recognize people confidentiality.

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