

# Development of Face and Signature Fusion Technology for Biometrics Authentication

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## Abstract—

**T**he Biometrics system is getting popularity since last decade As per Information Technology industry demand. This technology are satisfy authentication and authorization process needs. But the unimodal biometric system have own limitations. the limitation of unimodal, we can choosing the approach of multimodal biometric system. In this research paper choose the physiological model for face recognition and behavioural model for signature recognition. The recognition of face and signature used match score level fusion. In this fusion technology for secured authentication of person

**Keywords—** Match Score, Face Recognition, Signature Recognition, FAR, FRR.

## I. INTRODUCTION

Biometric Identification System is an authentication system based on the personal identity such as physical or behavioral characteristics of a person. Physical identification includes fingerprint, face, and iris while behavioral identifications are signature, keystroke, gait, etc. Research has shown that unimodal biometric system (single biometric) has difficulties in eliminating spoof attacks by the impostor which results in poor performance[1]. The design of biometric system considers the issues Such as accuracy and speed, the acceptability of a person to use the system and how strong the system is in preventing fraudulent approaches.

Face recognition is a pattern recognition approach for personal identification purposes in addition to other biometric approaches such as fingerprint recognition, signature, retina and so forth. Facial image recognition associated with the object that is never the same, because of the parts that can be changed. These changes can be caused by facial expressions, intensity of light and camera angles, or change accessories on the face. In this regard, the same object with some differences should be recognized as the same object. Broadly speaking, the methods used in the process of face recognition, there are three kinds of holistic methods, methods based on characteristics, and hybrid method. Among holistic methods, methods based on appearance (appearance based method) is a very successful technique for face recognition in recent years. When using a method based appearance, image size  $n \times m$  Pikes described as a vector in the space dimension  $n \times m$  ( $R_{n \times m}$ ) [2]. The Biometrics is science of measuring the unique physical characteristics of a person [3]. These personal features are analyzed and stored as bio-prints in database and used to verify the identity of the person by comparing the existing record with previously stored bio-prints.

## II. CHARACTERISTICS OF BIOMETRICS

- **Universality:** Each person should have the own biometric modifier.
- **Uniqueness:** IF two peoples have same biometric features then it will be much closed to be illogical should not subsist[3].
- **Permanence:** The biometric recognizer should continue like for period of time, it has enabling powers for user recognition after long time registration of the user in the database[4].
- **Collectability:** The biometric should be capable quantitatively.
- **Accuracy:** The accomplishable exactness of the biometric system psychoanalysis Unremarkable explicit in terms of ERR (Equal Error Rate), in this position a low ERR rate is suitable [3].
- **Performance:** The attainable running of analysis and thriftiness assets prerequisite to accomplish chosen quickness of analysis

## III. FUSION TECHNIQUES

A biometric Sample is the signal that has been captured by a biometric sensor. The different biometrics combined to improve the performance. This process is called as fusion. The fusion occurs at different levels.

### I. Sensor Level Fusion

Fusion at sensor level occurs before the matching module is invoked. In this strategy images are fused directly or using some transform technique then features are extracted from fused image.

### II. Feature Level Fusion

Fusion at feature level occurs before the matching module is invoked. Each individual biometric process outputs a collection of features [5]. When features extracted from one biometric trait are Independent of those extracted from the other then it is reasonable to concatenate the two vectors into a single new vector. The new feature vector has higher dimensionality and represents a person's identity in a very efficiently.

### III. Match Score Level Fusion

Match score level fusion occurs after the matcher output its result. Each individual biometric outputs a match score which shows proximity of the feature vector with the template vector. This fusion process fuses these scores can be combined into a single score, which is then compared to the system acceptable threshold. If the classification approach applied to score fusion, then the output may be direct decisions.

### IV. Decision Level Fusion

Decision level fusion occurs after the matcher output its result. Each individual biometric process and its feature vectors give its own Boolean result such as accept or reject. The fusion process fuses them together by a combination of different algorithms such as AND, OR, etc

### Face Recognition

Humans often use faces to recognize individuals and advancements in computing capability over the past few decades now enable similar recognitions automatically [6]. Face recognition can be used for both verification and identification. An excellent survey of existing face recognition technologies and challenges is given by Stan Z. Li. Face recognition is an automated method of biometric identification that uses mathematical pattern-recognition techniques on video images of the faces. A facial recognition system is a computer application for automatically identifying or verifying a person from a digital image or a video frame from a video source. One of the ways to do this is by comparing selected facial features from the image and a facial database. It is typically used in security systems and can be compared to other biometrics such as fingerprint or eye iris recognition systems. Face recognition uses camera technology to acquire images of the detailed structures of the face[6]. Digital templates encoded from these patterns, by mathematical algorithms. These algorithms allow the identification of an individual. Databases of existing templates are searched & matched by the matcher engines at speeds measured in the millions of templates per second per CPU. In this fig 1. Show that the face recognition process. Above diagram creation a database using matlab and stored this database in template.

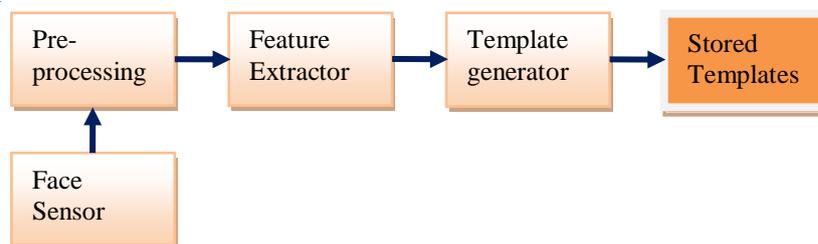


Fig 1. Face Acquisition

### Signature Recognition

Signature recognition is a behavioral biometric. It can be worked in two separate ways:

**Static:** In this mode, clients compose their signature on paper, digitize it through an optical scanner or a cam, and the biometric framework perceives the mark dissecting its shape [7]. This gathering is otherwise called "disconnected from the net".

**Dynamic:** In this mode, clients compose their signature in a digitizing tablet, which gains the signature continuously. An alternate probability is the procurement by method for stylus-worked Pdas. Dynamic distinguishment is otherwise called "on-line". Dynamic data normally comprises of the accompanying data:

- spatial coordinate  $x(t)$
- spatial coordinate  $y(t)$
- pressure  $p(t)$
- azimuth  $az(t)$
- inclination  $in(t)$
- pen up/down

There are two parameters by which we can define the performance of the signature verification:

- **FAR** (False Acceptance Rate): It is defined as the error rate when the signature is forged but the signature defines that it may be original. Actually, it is defined as the ratio of the no. of feature acceptances divided by the no. of identifications attempts.
- **FRR** (False Rejection Rate): It is defined to be forgery while it has been an original signature of a person [10], [9]. Actually it is defined as the ratio of the no. of false rejections identifications attempts. in this fig 2. Show that the signature recognition process. Above diagram creation a database using matlab and stored this database in template.

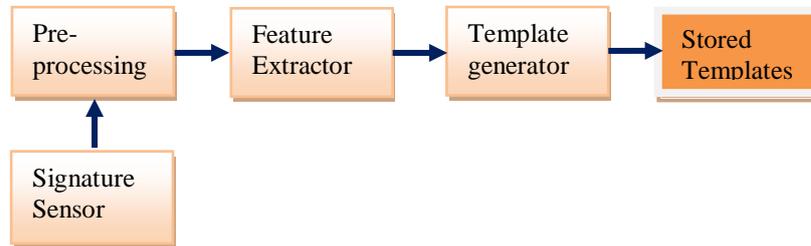


Fig 2. Signature Acquisition.

#### IV. RELATED WORK

**Ali, A.S.O. et al [1]** "A combined face, fingerprint authentication system" This work shows a multimodal biometrics framework that consolidates face and finger impression authentication modules. The proposed face confirmation module fuses Gabor Wavelet surface gimmicks and face edge characteristics. Concerning the unique finger impression module, a basic calculation is utilized for removing fingers' Minutia with a specific end goal to construct characteristic vector for every example unique finger impression. The proposed framework can be utilized viably for individual recognizable proof at worldwide airplane terminals checkpoints.

**Saba Mushtaq et al [2]** "Signature Verification: A Study" Signatures are generally utilized as a method for individual ID and check. Numerous records like bank checks and legitimate exchanges oblige signature check. Mark based check of an extensive number of records is an exceptionally troublesome and time intensive undertaking. Therefore a hazardous development has been seen in biometric individual confirmation and verification frameworks that are joined with quantifiable physical one of a kind attributes (fingerprints, hand geometry, face, ear, iris output, or DNA) or behavioural peculiarities (stride, voice and so forth.). As conventional character confirmation routines, for example, tokens, passwords, pins and so forth experience the ill effects of some lethal imperfections and are unable to fulfil the security necessities, the paper plans to consider a more solid biometric peculiarity, signature check for the considering. We display an overview of mark check frameworks. We order and give a record of the different methodologies that have been proposed for mark confirmation.

**Davit Kocharyan et al [3]** "A Multimodal Biometric System Based on Fingerprint and Signature Recognition" In this paper, author was proposed a multimodal biometric framework, taking into account finger impression and mark distinguishment. Unique finger impression distinguishment is the most prevalent physiological trademark used to recognize a man in biometric frameworks, due to practicality, lastingness, peculiarity, unwavering quality, exactness, and worthiness. Signature distinguishment is the most mainstream behavioral trademark utilized as a part of biometric frameworks. Along these lines, we accept that the mix of these two techniques will have a solid and precise result. We propose a weighted combination plan, which changes the scores into a typical reach, allocated weights and joins them, giving the last combined score.

**L. Mezai and F. Hachouf [4]** proposed a match Score-Level Fusion of Voice and Face Using Belief Functions and Particle Swarm Optimization[8]. The proposed system consists of 4 steps: Step 1, using Denoex and appriou models the match score generates of face and voice is converted into belief assignment. Step 2, Using PSO confidence factor is estimated. In general PSO with populated particles are randomly distributed over search space. Step 3, Using DS theory and PCR 5 combine rules the generated masses are combined to fuse face and voice modalities. Step 4, Decision is about accepting or rejecting the legal user using statistical classification technique.

#### V. FACE AND SIGNATURE FUSION METHOD

In this work, firstly images are taken of face and signature.

Then normalization is done. Then features are extracted of face using LTP, signature HMM method and rigid thinning. After the feature extraction fusion is done. Extracted features are then matched with the database. Then distance is classified and Recognition is done. In the end parameter evaluation is done. Following fig 3. Show that match score level fusion technique for fusion face and signature database. the database will be created using mat Lab.

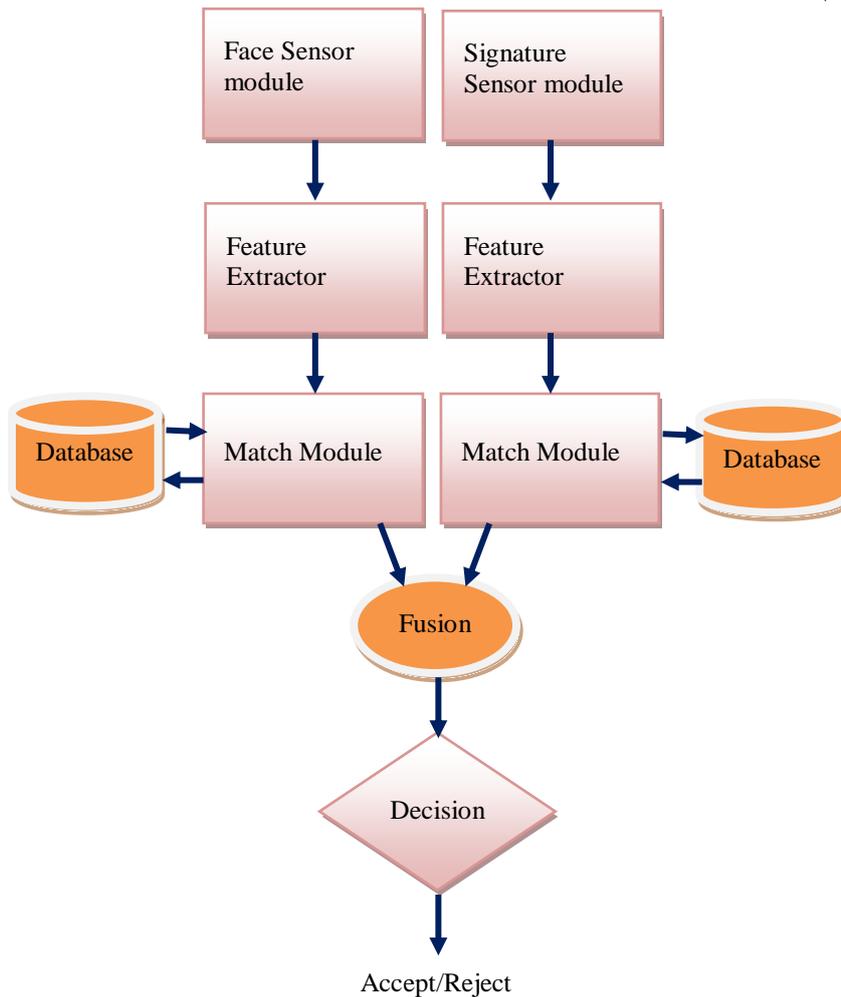


Fig 3. Face and signature Match score level fusion.

## VI. CONCLUSIONS

In this paper presents the brief overview related to multimodal biometric systems. This paper focuses on the approach which mainly combining multiple sources and enhancing the performance of biometric system is achieved. The different multi-biometrics strategies are also well-defined in this paper. The Match Score levels fusion and scenarios of multimodal systems are discussed. From the above study it is clear that different methods are used for the face and signature verification.

## REFERENCES

- [1] Feature Level Fusion of Face and Signature using a Modified Feature Selection Technique(Suryanti Awang, Rubiyah Yusof, Mohamad Fairol Zamzuri, Reza Arfa) 2013 International Conference on Signal-Image Technology & Internet-Based Systems
- [2] Image processing and face detection system with face recognition based face algorithm eigenvectors principal component analysis (pca) (1 Setyawan Widyarto, 2) Dwi Hartanto, Jose Rizal, Dimas Satya Wicaksono) IJCCN International Journal of Computer Commu-nications and Networks, VOLUME 4, ISSUE 1, FEBRU-ARY 2014, ISSN 2289-3369
- [3] S.Nanavati, M. Thieme and R. N a 2002, Biometrics: Identity in a networked world, Ed.John Wiley 20M.
- [4] Biometrics system acknowledgment based on data fusion (Mushtaque Ahmed ) International Journal of Research ISSN- 2350-0530(O) ISSN- 2394-3629(P) March, 2016
- [5] Multimodal Biometrics An Effective Approach of Pers-on Identification : A Review(Swapnali G. Garud, Rav-indra A. Nikam) International Journal of Computer Science & Engineering Technology (IJCSSET)
- [6] Multimodal Biometrics: A Review(Noorjahan Khatoon, Mrinal K Ghose) IRACST - International Journal of Computer Science and Information Technology & Security (IJSITS), ISSN: 2249-9555 Vol. 3, No.3, June 2013

- [7] Fusion of face, finger print & iris features for biometric authentication system( navjeet kaur1, karamjeet singh2) international journal of research science & management august, 2015
- [8] M. Manoj Kumar, N. B. Puhana, Offline Signature Verification using the Trace Transform, 2014 IEEE International Advanced Computing Conference (IACC).
- [9] Zareen, F.J., and Jabin, S., "A Comparative Study of the Recent Trends in Biometric Signature Verification", 2013 IEEE.
- [10] Fusion of Multimodal Biometrics using Feature and Score Level Fusion(S.Mohana Prakash, P.Betty, K.Sivanaruleselvan) International Journal on Applications in Information and Communication Engineering April 2016