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FUSION OF FACE, FINGER PRINT & IRIS FEATURES FOR BIOMERTIC AUTHENTICATION SYSTEM

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Abstract
Now these days, biometrics gaining more importance because of recognition system. In this paper, we discuss about eye, face and fingerprint recognition. Images of all three are normalized and features are extracted. Then fusion is done. We classified the distance by database. Then recognition is done and evaluates the parameters.

Introduction
This chapter includes the brief introduction of two emerging fields Biometrics and its extended field Soft Biometrics. These fields are playing a wide role in today's security and surveillance. In these fields physical and behavioral traits are captured for recognition of individual human's.

Biometrics
Biometrics is combination of two Greek words Bios (life) and metrikos (measure). It is recognized that some human body characteristics such as face, gait or voice can be used to distinguish individual from a group of people. In a biometrics system a person is recognized on the basis of physical and behavioral traits. In it pattern recognition is used. In the process of pattern recognition human traits are captured on and then matched with the database. Biometric identifiers are the unique, measurable qualities used to mark and depict individuals. Biometric identifiers are regularly sorted as physiological versus behavioral characteristics. Physiological attributes are identified with the state of the body. Samples incorporate, however are not constrained to unique finger impression, palm veins, face recognition, DNA, palm print, hand geometry, iris distinguishment, retina and smell/fragrance. Behavioral attributes are identified with the example of conduct of an individual, including however not constrained to writing mood, walk, and voice.

Characteristics of biometrics
Any physical and/or behaviour characteristics of a human can be considered as a biometric if it exhibits following characteristics:

- **Universality:** Each person accessing the biometric application should posses a valid biometric trait.
- **Uniqueness:** The given biometric trait should exhibits distinct features across individuals comprising the population.
- **Permanence:** The biometric characteristics should remain sufficient invariant over a period of time.
- **Measurability:** The biometric characteristics can be quantitatively measured i.e. acquiring and processing of biometric trait should not cause inconvenience to the individual.
- **Performance:** The biometric trait should the required accuracy imposed by the application

Types of biometrics
The biometric system can be classified into two different types:

Unimodal biometric system

The unimodal biometric employs single biometric trait (either physical or behavior trait) to identify the user Physiological biometrics identifiers include fingerprints, hand geometry, eye patterns, ear patterns, facial features, etc... Behavioral identifiers include voice, signature, typing patterns etc. While recognizing a person's feature, there are chances for the system to decide a genuine person as an imposter or an imposter as a genuine.

Example: Biometric system based on Face or Palm prints or Voice or Gait etc.

Multimodal biometric system

A multimodal biometric system combines two or more features of a person to be recognized together to determine a person's authentication. Multi modal biometric systems can significantly improve the recognition performance in addition to improving population coverage, deterring spoof attacks, increasing the degrees of freedom, and reducing the failure-to-enrol rate. And also the storage requirements, processing time, and computational demands of a multimodal biometric system can be higher than that

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of the unimodal biometric system. Multimodal biometric frameworks use numerous sensors or biometrics to conquer the constraints of unimodal biometric frameworks.

Components of biometrics systems

A simple biometric system consists of four basic components:

1. **Sensor module** which acquires the biometric data;
2. **Feature extraction module** where the acquired data is processed to extract feature vectors;
3. **Matching module** where feature vectors are compared against those in the template;
4. **Decision-making module** in which the user's identity is established or a claimed identity.

Biometric modalities

Biometric modality refers to a system built to recognize a particular biometric trait. Face, fingerprint, hand geometry, palm print, iris, voice, signature, gait, and keystroke dynamics are examples of commonly used biometric traits. In the context of a given system and application, the presentation of a user's biometric feature involves both biological and behavioral aspects. A brief introduction of these common biometrics modalities is given below

Face

Face recognition is a non-nosy technique, and facial pictures are most likely the most widely recognized biometric trademark utilized by people to make an individual recognition. Static or video images of a face can be used to facilitate recognition. Modern approaches are only indirectly based on the location, shape, and spatial relationships of facial landmarks such as eyes, nose, lips, and chin, and so on. Signal processing techniques based on localized filter responses on the image have largely replaced earlier techniques based on representing the face as a weighted combination of a set of canonical faces. Recognition can be quite good if canonical poses and simple backgrounds are employed, but changes in illumination and angle create challenges. The time that elapses between enrolment in a system and when recognition is attempted can also be a challenge, because facial appearance changes over time.

People regularly utilize countenances to perceive people, and headways in registering capacity over the recent decades now empower comparative distinguishment consequently. Early facial distinguishment calculations utilized basic geometric models, yet the distinguishment process has now developed into a study of modern scientific representations and matching methodologies. Significant progressions and activities in the previous 10 to 15 years have impelled facial distinguishment engineering into the spotlight. Facial distinguishment can be utilized for both check and ID.

Fingerprint

Fingerprints—the patterns of ridges and valleys on the "friction ridge" surfaces of fingers—have been used in forensic applications for over a century. Friction ridges are formed in utero during fatal development, and even identical twins do not have the same fingerprints. The recognition performance of currently available fingerprint-based recognition systems using prints from multiple fingers is quite good. One factor in recognition accuracy is whether a single print is used or whether multiple or ten prints (one from each finger) are used. Multiple prints provide additional information that can be valuable in very large scale systems. Challenges include the fact that large-scale fingerprint recognition systems are computationally intensive, particularly when trying to find a match among millions of references. Unique mark recognizable proof is a standout amongst the most remarkable and plugged biometrics. Due to their uniqueness and consistency over the long haul, fingerprints have been utilized for distinguishing proof for more than a century, all the more as of late getting to be computerized (i.e., a biometric) because of progressions in processing capacities. Unique finger impression distinguishing proof is prevalent in light of the natural simplicity in securing, the various sources (10 fingers) accessible for gathering, and their secured utilize and accumulations by law implementation and migration.

Iris

We are living in the age, in which the demand on security is increasing greatly. Consequently, biometric recognition, which is a safe, reliable and convenient technology for personal recognition, appears. Iris recognition is the procedure of perceiving an individual by dissecting the irregular example of the iris. The computerized system for iris recognition is generally youthful, existing in patent since just 1994. The iris is a muscle inside the eye that directs the extent of the student, controlling the measure of light that enters the eye. It is the shaded parcel of the eye, and the coloring is focused around the measure of melatonin colour inside the muscle. Despite the fact that the coloration and structure of the iris are hereditarily connected, the example subtle elements are most certainly not. The iris creates amid pre-birth development through a methodology of tight shaping and collapsing of the tissue film. Before conception, degeneration happens, bringing about the understudy opening and the iris framing arbitrary, one of kind examples.

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Signature

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

1. 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. This gathering is otherwise called "disconnected from the net".
2. 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

Speech

Speech is a combination of both physical and behavioral biometrics traits. The features of an individual's voice are based on the shape and size of the appendages (e.g., vocal tracts, mouth, nasal cavities, and lips) that are used in the synthesis of the sound. Physical characteristics of behavior part of speech change with the age, because of some medical conditions such as cold etc. A text-dependent voice recognition system is based on the utterance of a fixed predetermined phrase i.e. password. A text-independent voice recognition system recognizes the speaker independent of what she speaks. A text-independent system is more difficult to design than a text-dependent system but offers more protection against fraud. Speech recognition is most appropriate for phone-based applications but there are chances of degradation of speech signal due to quality of microphone and communication channel.

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 authenticationmodules. The proposed face confirmation module fuses Gabor Wavelet surface gimmicks and faceedge 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 behavioral 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 fulfill 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.

Roy, D. et al [4] "Speaker distinguishment utilizing multimodal biometric framework" Author was proposed a model to perceive speaker by face and voice signal. In this model we enter voice into model and we get voice and face peculiarities relating to that voice and face by which we attempt to perceive the client. To attain to this we utilized an administered learning model ANN (Artificial neural system). To prepare this model we enter voice gimmick and face emphasizes in synchronous route into model. The ANN model tries to arrange the data concerning a set of clients. The primary issue in planning this model is synchronization between voice gimmick and face characteristic, extraction of face peculiarity, choosing parameter of ANN like cycle worth and

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the last most troublesome is making a model to guide the face alongside voice characteristics. It's extremely hard to handle with the above talked about issue yet we have outlined a model to attain to some degree practical model of speaker distinguishment.

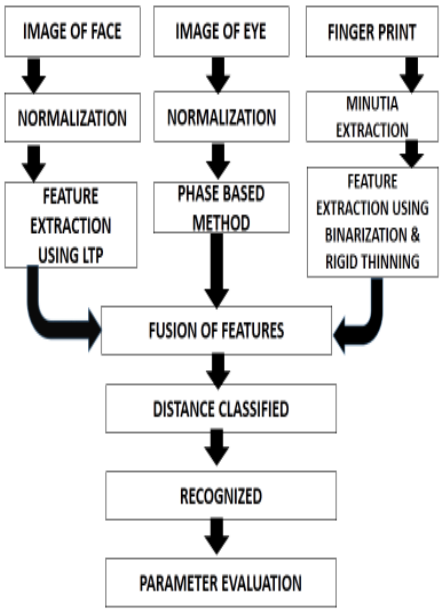
Umit KACAR et al [5] "An Embedded Biometric System" Nowadays, biometric distinguishment frameworks get to be exceptionally well known in security applications. There are numerous biometric peculiarities which can be utilized for this reason, for example, iris, fingerprints, face, and so forth. Ear is additionally a biometric gimmick. Due to its preferences, numerous researchers have a tendency to deal with this, also. So in this paper, an installed ear distinguishment framework is presented. Framework is taking into account an ARM microcontroller which can be modified with MicroC programming dialect. Introduced distinguishment framework can be utilized free from a PC, and put away all the dataset in its own particular memory and trial results demonstrate that, distinguishment rate is extremely well.

Dinakardas, C. et al [6] "A multimodal execution assessment on two separate models in view of face, unique mark and iris formats" In this paper, Author was exhibited a multimodal face distinguishment framework that wires results from both Principal Component Analysis, Fisherface projections, minutia extraction and LBP characteristic extraction on differentbiometric characteristics. The proposed ID framework utilizes the face, finger impression and iris of a man for perceiving a man. We utilize two separate strategies for contrasting the execution. The initially modelused main segment investigation to concentrate the peculiarities of the unique finger impression and iris picture and fisherfaces for the face picture. The second strategy utilized fisherace for face, details extraction forfingerprint and LBP characteristic for iris picture. The created multimodal biometric framework has various remarkable qualities, beginning from using primary segment examination and Fisher's direct discriminate techniques for individual matcher's character verification and uses the novel peculiarity combination technique to solidify the outcomes acquired from distinctive biometric matchers. Two combination techniques are tentatively analyzed. The proposed methodologies are tried on a genuine database comprising of 500 pictures and shows guaranteeing results contrasted with different procedures. The Receiver Operating Characteristics likewise demonstrates that the proposed strategies are better thought about than different methods under study.

Proposed systems

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

Then normalization is done.Then features are extracted of face using LTP,eye by phase based method,fingerprint by binerization 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.



Flow of Work

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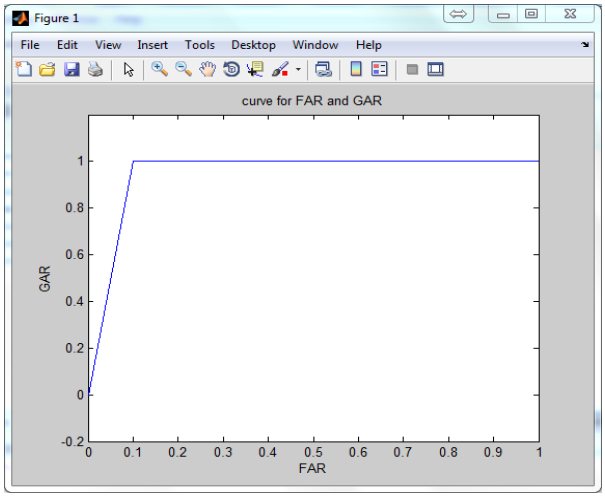
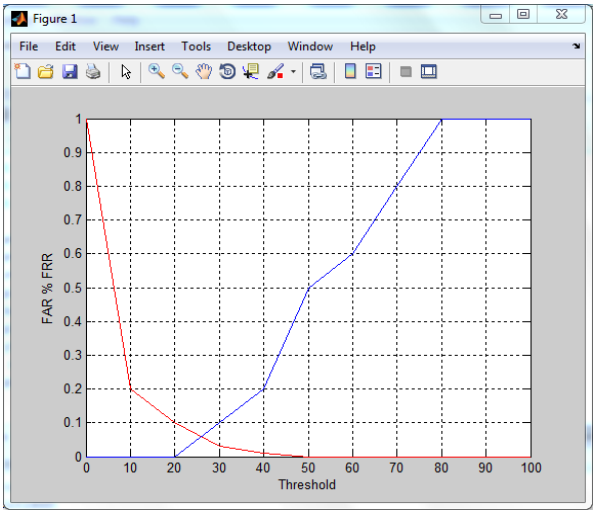
Results

Modalities	FAR (%)	FRR (%)	GAR (%)
FACE	1.1	3.80	96.20
Face, fingerprint and iris fusion	0.15	0.60	99.40



Graph 4.1: Genuine Acceptance Rate

This graph is use to represent the percentage of acceptance or we can say that is use to measure the accuracy.



Graph 4.2: FAR & FRR Percentage

This graph is use to represent the reliability of a system. Reliability is defined as the amount of time in which our system works properly.

Conclusion

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Various approaches have been used for the extraction of features from various types of biometric traits. In the proposed work the biometric traits utilize are face, fingerprint and iris. Single Biometric trait system is fail to provide accuracy for the authenitication of different identies because due to single bimetric trait the chances of mis-matching increases. So to overcome these disadvantages of single trait biometric system, multimodel biometric system come into existance. Multimodel biometric system use face, finger and iris images for the development of proposed system. feature from each biometric credential has been extracted and fused on the basis of score level fusion to reduce feature dimension. Computatiom speed increasses due to reduction in feature dimension of fused features. This propsed system provides accuracy of 99.4%. This provides bettere security than other biometric system because illegal availability of all the traits of single person is not available to match and perform any illegal operation. So one can conclude that multimodel biometric system provides better result as compare to single biometric trait system.

References

1. Ali, A.S.O., Sagayan, V.,Malik, A.S., Rasheed, W. “A combined face, fingerprint authentication system” The 18th IEEE International Symposium onConsumer Electronics, 2014, pp. 1 – 2.
2. Saba Mushtaq ,A.H.Mir “Signature Verification: A Study” 4th International Conference on Computer and Communication Technology,2013,pp. 258-263.
3. Davit Kocharyan, VaheKhachaturyan, HakobSarukhanyan “A Multimodal Biometric System Based on Fingerprint and Signature Recognition” Computer Science and Information Technologies, 2013,pp. 1 – 7.
4. Roy, D., Shukla, A. “Speaker recognition using multimodal biometric system” International Conference on Oriental COCOSDA held jointly on Asian Spoken Language Research, 2013,pp. 1 – 7.
5. Umit KACAR,Murat KUS “An Embedded Biometric System” 16th International Conference on Information Fusion Istanbul, Turkey, 2013, pp. 736-742.
6. Dinakardas, C.,Sankar, S.P., George, N. “A multimodal performance evaluation on two different models based on face, fingerprint and iris templates”International Conference onEmerging Trends in VLSI, Embedded System, Nano Electronics and Telecommunication System,2013, pp. 1-6.