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An Improvised System of Biometric Detection for Iris, Fingerprint and Face Images

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Abstract: ***A biometric system is a computer system, which is used to identify the person on their behavioral and physiological characteristic (for example fingerprint, face, iris, key-stroke, signature, voice, etc). A typical biometric system consists of various modules of sensing, feature extraction, and matching. But now a days biometric system are being troubled or tampered by using fake biometrics. In this project, an attempt has been made to introduce a multi biometric system (proposed system) in which three biometric techniques such as face recognition, fingerprint, and iris recognition are incorporated. And also the attacks/troubles are imposed on the system by using Image Quality Assessment for aliveness detection and the study is continued how the system can be protected from fake biometrics. It may be studied from this project that, the multi-biometric system is more secured than uni-biometric system.***

Keywords: Behavioral and physiological characteristic, fingerprint, face, iris, multi biometric system, Image Quality Assessment.

I. INTRODUCTION

Digital images are usually affected by a wide variety of distortions during acquisition and processing, which results in loss of visual quality. Therefore, image quality assessment (IQA) is appropriate to image accomplishment, watermarking, constraint, transmission, restoration, enhancement, and reproduction. The aim of IQA is to calculate the bulk of quality degradation and is thus used to evaluate/compare the accomplishment of processing systems and/or optimize the choice of parameters in processing. Objective image quality assessment refers to automatically prevent the quality of distorted images as would be perceived by an average human.

If a naturalistic reference image is supplied against which the quality of the distorted image can be compared, the model is called full reference (FR). 2D face biometrics (that is denomination individuals based on their 2D face information) is still a major area of research. Wide range of viewpoints, occlusions, aging of subjects and Baroque outdoor clarification are challenges in face recognition. While there is a significant number of works addressing these issues, the vulnerabilities of face biometric systems to Spoofing attacks are mostly overlooked. Among the different threats analyzed, the direct or spoofing attacks have motivated the biometric community to study the vulnerabilities against this type of currish actions in traits such as the fingerprint the face and multimodal approaches.[1] When spoofed, a biometric recognition system is bypassed by performance a copy of the biometric evidence of a valid user. Spoofing attack is the action of outwitting a biometric sensor by presenting a posture biometric. There are many anti-spoofing techniques such as the use of multibiometrics or challenge-response methods, cancellable biometrics but the liveness detection techniques are the emerging field of research which use different physiological properties to distinguish between real and fake traits. IQA can be used for liveness detection to physical a multi-biometric and multi-attack guidance method.

Authentication is used to determine the identity of a person/user. Authentication is a very important concept in security, because many critical security services are dependent on authenticating users. All in all, strategies for validation fall into three classifications something the client knows (passwords, PINs), something the client has (i.e. Tokens: ID Cards, smartcard) something the client is (i.e. Biometrics). As of late, the expanding enthusiasm for the assessment of biometric frameworks security has prompted the production of various and extremely assorted activities concentrated on this significant field of examination. Since the biometric is one of best security in future. The biometric security is propelled by the direct and spoofing assailants. That biometric framework enhanced by studying the spoofing system for iris, figure print, and 2D face.[2] In these assaults, the interloper uses some sort of artificially delivered antiquity (e.g., sticky finger, printed iris image or face cover), or tries to emulate the conduct of the honest to goodness client (e.g., step, mark), to falsely get to the biometric framework. As this sort of assaults are performed in the simple area and the connection with the gadget is done after the general convention, the standard computerized assurance systems (e.g., encryption, advanced mark or watermarking) are not viable. The previously stated works and other simple studies, have unmistakably demonstrated the need to propose and create particular assurance systems against this risk.

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II. EXISTING SYSTEM

In Existing method it uses the Image Quality Assessment method to extract the feature. In that process, it first converts the image to gray and filter the image using the Gaussian filter. Then compare the filter image and gray to extract the eleven qualities of image. Then use the Quadratic Discriminate Analysis to classify the feature.[3]

Hardware system based biometric authentication process in existing system is proposed in this process. A hard ware authentication is the spoofing process and identify by the sensors. That is, sensors sense the identification by using body temperatures, blood pressures, modification of faces etc.

The demerits of existing system are:

1) The hardware base authentication process of the sensors is needed and it is expensive.
2) The power is necessary for hardware.
3) The hard ware needs regular check and replace in time else it gives wrong results.

In the present work, a novel software-based multi-biometric and multi-attack protection method is proposed which targets to overcome the aforesaid limitations through the use of Image Quality Assessment (IQA).[4]

A. Image Quality Assessment

Image quality assessment is a most important topic in the image processing area. Image quality is a characteristic of any image usually contrasted and a perfect or flawless image. Advanced images are liable to an extensive scope of bends amid capacity, accomplishment, pressure, preparing, transmission and generation, a few of which may bring about a debasement of visual quality. Imaging frameworks presents some measure of contortion or curios which decreases the quality evaluation. All in all quality appraisal is of two sort one is subjective visual quality evaluation and second one is objective visual quality appraisal. Target image quality measurements can be characterized on the premise of accessibility of a unique image, with the twisted image is to be looked at. Open methodologies are known as full-reference, implying that a complete reference image is thought to be known. In numerous down to earth applications, then again, the reference image does not exist, and a no-reference or "visually impaired" quality evaluation methodology is alluring.

It is not just fit for working with a decent execution under distinctive biometric frameworks (multi-biometric) and for assorted mocking situations, yet it additionally gives a decent level of security against certain non-ridiculing assaults (multi-assault). It displays the standard focal points of this sort of methodologies quick, as it just needs one image (i.e., the same specimen procured for biometric acknowledgment) to distinguish whether it is genuine or fake, non-meddling, easy to understand (straightforward to the client), shoddy and simple to implant in officially useful frameworks(as no new piece of hardware is required).

B. Fake biometrics

Fake biometrics means by using the real images (Iris images captured from a printed paper and fingerprint captured from a dummy finger) of human identification characteristics create the fake identities like fingerprint, iris on printed paper.

Fake user first capture the original identities of the genuine user and then they make the fake sample for authentication but biometric system have more method to detect the fake users and that's why the biometric framework is more secure, because every individual have their one of a kind attributes ID. Biometrics framework is more secure than other security systems like watchword, PIN, or card and key. A biometrics framework measures the human attributes so clients don't have to recollect passwords or PINs which can be overlooked or to convey cards or keys which can be stolen. Biometric framework is of diverse sort that are face acknowledgment framework, unique mark acknowledgment framework, iris acknowledgment framework, hand geometry acknowledgment framework (physiological biometric), signature acknowledgment framework, voice acknowledgment framework (behavioral biometric). Demonstrate the kind of distinctive biometric. Multi biometric framework implies a biometric framework is utilized more than one biometric framework for one multi-biometric framework.

A multi biometric framework is utilizing the different wellspring of data for acknowledgment of individual confirmation. Multi biometric framework is more secure than single biometric framework. In this Survey Base workshop report Image quality appraisal for liveness identification method is utilized for figure out the fake biometrics. Image evaluation is power by supposition that it is unsurprising that a fake image and genuine specimen will have diverse quality securing. Unsurprising quality contrasts in the middle of genuine and fake examples may contain shading and luminance levels, general ancient rarities, amount of data, and amount of sharpness, found in both sort of images, auxiliary bends or characteristic appearance. For instance, iris images caught from a printed paper will probably be fluffy or out of center because of precarious face images caught from a cell phone will in all likelihood be over-or under-found and it is not uncommon that unique finger impression images caught from a spurious finger.[5]

In addition in ultimate attack in which an unnaturally produced image is directly injected to the communication channel before the feature extractor, this fake sample will most probably not have some of the properties found in natural images. An added advantage of the proposed technique is its speed and very low complexity, which makes it very well suited to operate on real scenarios (one of the desired characteristics of this type of methods).

As it doesn't send any characteristic particular property (e.g., details focuses, iris position or face identification), the calculation burden required for image preparing reasons for existing is exceptionally decreased, utilizing just broad image quality measures quick to figure, consolidated with extremely straightforward classifiers. It has been tried on freely accessible assault databases of iris, unique mark and 2D face, where it has come to comes about completely practically identical to those acquired on the same databases and taking after the same experimental protocols by more complex trait-specific top-ranked approaches from the state-of-the-art.[6]

Fig 1: Fake iris

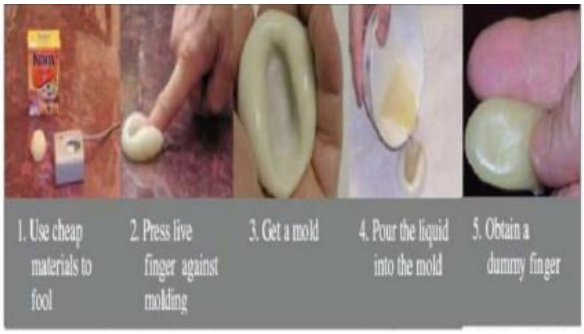

Fig 2: Fake Fingerprint

Here in the above Figure 1, the photo of verification iris image is placed in front of verification device even though it is not an original iris but it accepts that. Iris images caught from a printed paper will probably be fluffy or out of center because of precarious face images caught from a cell phone will in all likelihood be over-or under-found and it is not uncommon that unique finger impression images caught from a spurious finger.

Here in the above Figure 2, by using some cheap materials and make them as a mold. In that mold by pressing the finger and by using liquid, dummy finger can be obtained. [7]

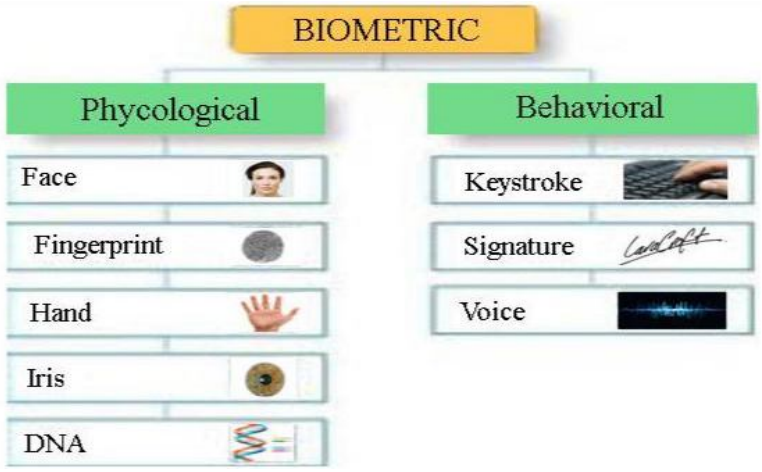

Fig 3: Different Types of Biometric

The above Figure 3 presents different types of biometric both physiological and behavioral types.

Biometric framework is of diverse sort that are face acknowledgment framework, unique mark acknowledgment framework, iris acknowledgment framework, hand geometry acknowledgment framework (physiological biometric), signature acknowledgment framework, voice acknowledgment framework (behavioral biometric) by using this also we can access the security system even through it is fake. (Iris images captured from a printed paper and fingerprint captured from a dummy finger) of human identification characteristics create the fake identities like fingerprint.[8]

III. PROPOSED SYTEM

In proposed system, two algorithms are used to extract the feature of image. It first extracts the Image Quality Assessment of the image, and then extracts Scale-invariant feature transform and combine both the feature and used to classifying the process. [9]

A. *Advantages of proposed system*

1) Its speed and very low complexity.
2) It is very well suited to operate on real scenarios.
3) It does not deploy any trait-specific property.
4) General image quality measures fast to compute, combined with very simple classifiers.

B. *Module*

1) Query image
2) Preprocess
3) Filter
4) Extract the feature
5) Classification.

C. *Query image*

It is the input image used to the process this image is original or fake. The spoofing image is created by photo editing software. That input images are loaded and shown in the guide.

D. *Preprocess*

The preprocess step is important one in the image processing. In this process the noise will be removed and the image will be resized and some process done will be done for output.

E. *Convert to gray*

In preprocess step the first step is gray image. In image process all image in grayscale. In the grayscale image the RGB is removed because some process is done in without RGB image. So first we remove the RGB in given query image.

F. *Resize the image*

It is the second preprocess step and in this step the image size will be changed. Because the query image is in any size it affect the time consuming and output quality. So we change the image size our comfortable range.

G. *Filter*

In filter process, the noise is removed from input image. The noise is the unwanted pixel of the image. The Gaussian filter is used to remove the noise in query image.[10]

IV. SIMULATION RESULTS

The evaluation experimental protocol has been designed with a two-fold objective.

First, evaluate the multi-biometric‖ dimension of the protection method. That is, its capacity to accomplish a decent execution, contrasted with other characteristic particular methodologies, under distinctive biometric modalities. For this reason three of the most developed image based biometric modalities have been considered in the investigations and these are: iris, fingerprints and 2D face.

Second, assess the "multi-assault" measurement of the security system. That is, its capacity to identify not just caricaturing assaults, (for example, different liveness detection specific approaches) additionally false to get endeavors completed with manufactured or reproduced tests.

In view of these objectives, and so as to accomplish reproducible results, as a part of the exploratory approval openly accessible databases with very much depicted assessment conventions has been utilized. This has permitted to look at, in a goal and reasonable way, the execution of the proposed framework with other existing best in class liveness location arrangements.

The assignment in every case of the situations and examinations portrayed in the following areas is to consequently recognize genuine and fake specimens. For this reason a 25-dimensional basic classifier in view of general Image Quality Measures has been manufactured. Thus, in all cases, results are accounted for regarding the False Genuine Rate (FGR), which represents the quantity of

false specimens that were named genuine and the False Fake Rate (FFR), which gives the probability of an image coming from a genuine sample being considered as fake.

A. Results for Iris

For the iris methodology the insurance strategy is tried under two diverse assault situations, specifically:

1) Satirizing assault and

2) Assault with engineered tests.

For each of the situations a particular pair of genuine fake databases is utilized. Databases are partitioned into absolutely autonomous (as far as clients) train set, used to prepare the classifier and test set, used to assess the execution of the proposed assurance strategy. They are obtained applying two-fold cross validation.

The classifier used for the two scenarios is based on Quadratic Discriminant Analysis (QDA) as it showed a slightly better performance than Linear Discriminant Analysis(LDA), which will be used in the face-related experiments ,while keeping the simplicity of the whole system.

B. Results for iris-spoofing

The database utilized as a part of this caricaturing situation is the ATVS- FIR DB which may be acquired from the Biometric Recognition Group-ATVS.1. The database contains genuine and fake iris images (imprinted on paper) of 50 clients arbitrarily chosen from the BioSec gauge corpus. It takes after the same structure as the first BioSec dataset, in this way, it involves 50 clients × 2 eyes × 4 images × 2 sessions = 800 fake iris images and its relating unique specimens.

The procurement of both genuine and fake specimens was done utilizing the LG Iris Access EOU3000 sensor with infrared brightening which catches bmp dark scale images of size 640 × 480 pixels. Some run of the mill genuine and fake iris images that may be found in the dataset. Is demonstrated. As said above, for the examinations the database is isolated into a train set, involving 400 genuine images and their comparing fake examples of 50 eyes and a test set with the staying 400 genuine and fake specimens originating from the other 50 eyes accessible in the dataset.

The liveness identification results accomplished by the proposed approach under this situation, where it can be seen that the system has the capacity effectively in order more than 97% of the examples. In the last section, it is demonstrate the normal execution time in seconds expected to process (extricate the components and arrange) every specimen of the two considered database.

C. Results for Iris-Synthetic

In this situation assaults are performed with artificially created iris tests which are infused in the correspondence channel between the sensor and the component extraction module. The genuine and fake databases utilized as a part of this case are as below.

1) *Real database:* CASIA-IrisV1. This dataset is freely accessible through the Biometric Ideal Test (BIT) stage of the Chinese Academy of Sciences Institute of Automation (CASIA). It contains 7 dark scales 320×280 images of 108 eyes caught in two separate sessions with a self-developed CASIA close-up camera and are put away in bmp position.

2) *Synthetic database:* WVU-Synthetic Iris DB .Being a database that contains just completely manufactured information, it is not subjected to any lawful requirements and is freely accessible through the CITeR examination center. The engineered irises are produced taking after the technique portrayed in which, it has two stages. In the first stage, a Markov Random Field model prepared on the CASIA-IrisV1 DB is utilized to produce a foundation surface speaking to the worldwide iris appearance.

In the following stage, an assortment of iris components, for example, spiral and concentric wrinkles, collarette and sepulchers, are created and inserted in the surface field. Taking after the CASIA-IrisV1 DB, this manufactured database incorporates 7 dark scale 320 × 280 bmp images of 1,000 unique subjects (eyes).

Some ordinary genuine and fake iris images that may be found in the CASIA-IrisV1 DB and in the WVU-Synthetic Iris DB have been demonstrated. It might be watch that, as an outcome of the preparation procedure did on the CASIA-IrisV1 DB, the engineered tests are outwardly and fundamentally the same to those of the genuine dataset, which makes them uncommonly suitable for the considered assaulting situation.

The last segment demonstrates, in seconds, the normal execution time to handle every example .In the analyses, with a specific end goal to have adjusted instructional courses (genuine and fake) just 54 engineered eyes (out of the conceivable 1,000) were arbitrarily chosen. Along these lines, the issue of over fitting one class over the other is dodged. The test set includes the remaining 54 genuine eyes and 946 engineered tests.

The outcomes accomplished by the proposed insurance strategy taking into account IQA on this assaulting situation are appeared. Disregarding the closeness of genuine and fake images, the worldwide blunder of the calculation in this situation is 2.1%.

The investigations reported in this Section demonstrate the capacity of the way to deal with adjust to diverse assaulting situations and to keep an abnormal state of security in every one of them. Consequently, the outcomes affirm the "multi-assault" measurement of the proposed strategy.

Finger prints for the unique mark methodology, the execution of the proposed security technique is assessed utilizing the LivDet 2009 DB containing more than 18,000 genuine and fake examples. As in the iris explores, the database is separated into a train set, used to prepare the classifier and test set, used to assess the execution of the assurance system.

Keeping in mind the end goal to create absolutely impartial results, there is no cover between both sets (i.e., tests relating to every client are simply incorporated into the train or the test set). The same QDA classifier officially considered in the iris related tests is utilized here.

D. Results for fingerprints-spoofing livdet

The LivDet2009 DB was caught in the structure of the 2009 Fingerprint Liveness

Detection Competition and it is disseminated through the site of the competition. It contains three datasets of genuine and fake fingerprints caught each of them with an alternate level optical sensor i) Biometrika FX2000 (569 dpi), ii) Cross Match Verifier 300CL (500 dpi), and iii) Identix DFR2100 (686dpi).

The sticky fingers were produced utilizing three unique materials silicone, gelatin and playdoh, continually taking after a consensual strategy (with the collaboration of the client). All in all, the database contains more than 18,000 examples originating from more than 100distinct finger prints are found in the public LivDet09 database used in the fingerprint anti-spoofing experiments.

E. Results for 2D face

The performance of the IQA-based protection method has also been assessed on a face spoofing database the REPLAY-ATTACK DB which is publicly available from the IDIAP Research Institute. The database contains short videos (around 10 seconds inmov format) of both real-access and spoofing attack attempts of 50 different subjects, acquired with a 320 × 240 resolution webcam of a 13-inch MacBook Laptop. The recordings were carried out under two different conditions controlled with a uniform background and artificial lighting and adverse with natural illumination and non-uniform background.

Three different types of attacks were considered to print illegal access attempts and are carried out with hard copies of high-resolution digital photographs of the genuine users, mobile attacks are performed utilizing photographs and recordings brought with the iPhone utilizing the iPhone screen and highdef like the portable subset however for this situation the photographs and recordings are shown utilizing an iPad screen with determination 1024 × 768.

Get to endeavors in the three assault subsets (print, versatile and highdef) were recorded in two distinct modes relying upon the technique took after to hold the assault replay gadget (paper, cell telephone or tablet) hand-based and settled backing. Such an assortment of genuine and fake securing situations and conditions makes the REPLAY-ATTACK DB an interesting benchmark for testing hostile to satirizing procedures for face-based frameworks.

As an outcome, the print subset was chosen as the assessment dataset on Counter Measures to 2D Facial Spoofing Attacks against caricaturing examinations. Images were extricated from recordings gained in the two considered situations controlled and unfavorable.

The Sequential Forward Floating Selection (SFFS) calculation has been utilized to figure out whether certain individual elements, or certain subsets of components, present a higher separation ability than others under the biometric security trial system considered in the work.

The SFFS technique is a deterministic, single-arrangement highlight determination calculation initially proposed in which has demonstrated wonderful execution over other imperfect choice plans. In the current test investigation, the determination foundation to be advanced by the SFFS calculation is the HTER accomplished by the framework in the test set after the exploratory conventions depicted in Sects. IV-A, IV-B and IV-C (the classifiers are the same ones utilized as a part of the past test areas of the work). Specifically, the SFFS calculation has been utilized to scan for the best performing highlight subsets of measurements 5, 10, 15 and the best general subset paying little respect to its size.

The most momentous finding is that, the entire gathering of 25 quality measures is reliably chosen as the best performing list of capabilities for all the considered situations and attributes, demonstrating the high complementarity of the proposed measurements for the biometric security assignment examined in the work. The first perception infers that other quality-related elements could at present be added to the proposed set keeping in mind the end goal to further enhance its general execution (until, in the long run, including new components by decreasing its detection rates).

For all cases, the best performing 5-feature and even10-feature subsets present around a 50% HTER, which reinforces the idea that the competitive performance of the system does not rely on the high discriminative power of certain specific features but on the diversity and complementarity of the whole set.

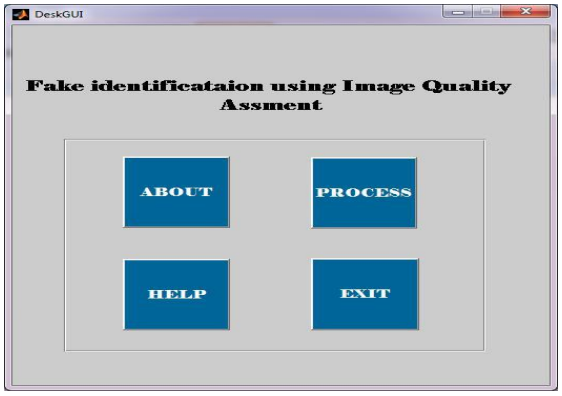

Fig 4 Fake Identification Using Image Quality Assessment

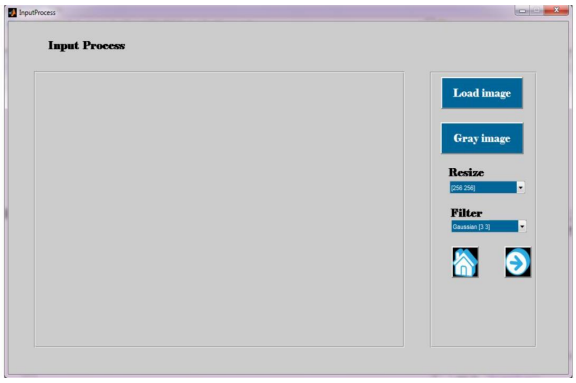

Fig 5 Input Process

The Figure 4 represents the homepage of the software. It consists of four blocks namely, ABOUT, PROCESS, HELP and EXIT. The ABOUT block has information about project and about MATLAB, the block PROCESS has the process, in the HELP it has the process how to do in the PROCESS block. Finally in the EXIT block when pressed that it can exit from the software. The Figure 5 represents blocks in input process. Those are Load image, Gray image, Resize and Filter. These blocks are explained are as follows.

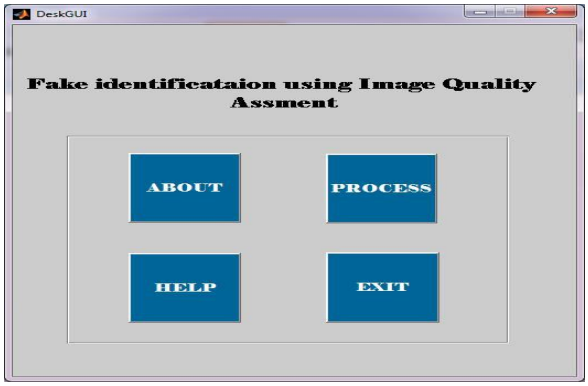

Fig 6 Loading Image

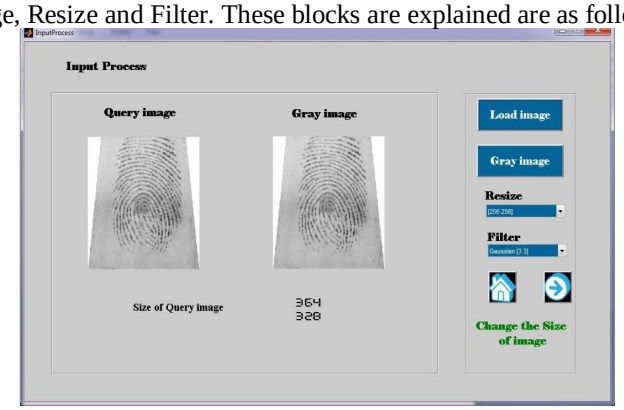

Fig 7 Gray Image

As shown in the Figure 6, when Load image button is clicked on then Query images folder is open and one of the image from them will be selected. Then that image can be loaded in the Input Process. The loaded image may be fingerprint type or face type image. As shown in the Figure 7, when Gray image block is clicked, the corresponding gray image of Query image which is loaded previously will be generated here .Here the size of the Query image is also generate.

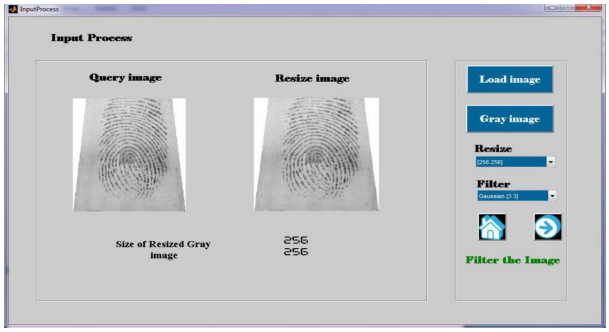

Fig 8 Resize the Image

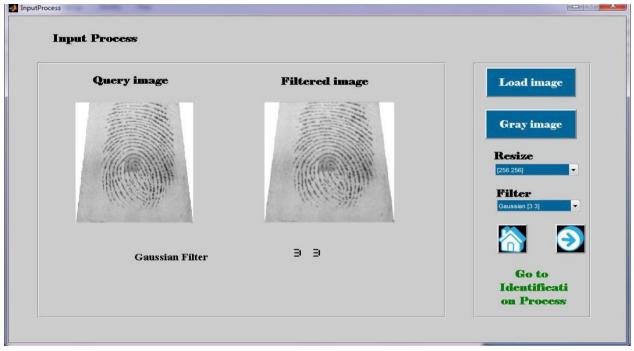

Fig 9 Filtering the Image

If resize button is clicked as shown in the figure 8, then the size of the gray image is resized to [256 256] or [300 300] size.
It can be seen from the Figure 9, when the Filter button is clicked on it shows the size of the filter. One has to select the Gaussian filter of size [3 3] or [4 4] or [5 5]. Then finally here Filtered image can be obtained. After that the forward arrow button is to be clicked on as shown in Figure 9 .Then one has to move to identification process that is output.

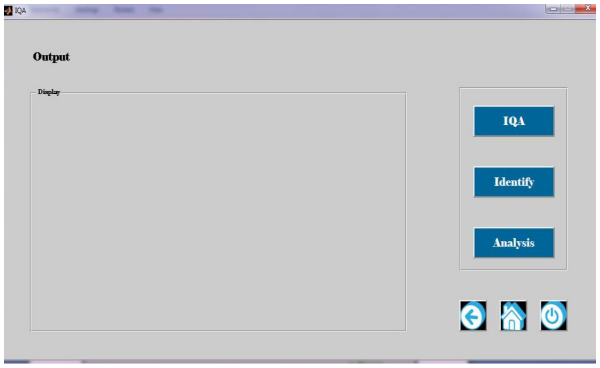

Fig 10 Output

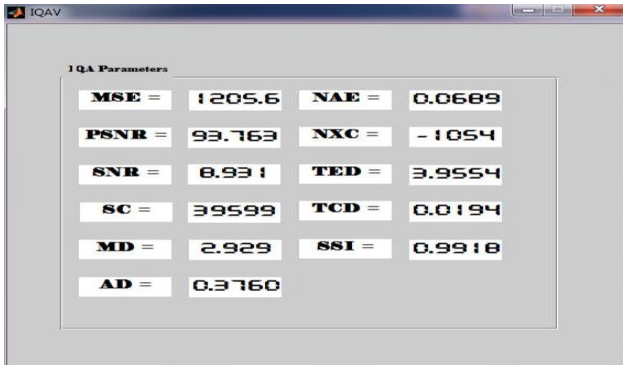

Fig 11 Image Quality Assessment

The Figure 10 represents the output process. This output process consists of IQA, Identify and Analysis blocks. These blocks are explained in the following paragraphs. The Figure 11 shows that, when one clicks on IQA button it will calculate the IQA parameters values MSE, PSNR, SNR, SC, MD, AD, NAE, NXC, TED, TCD and SSI.

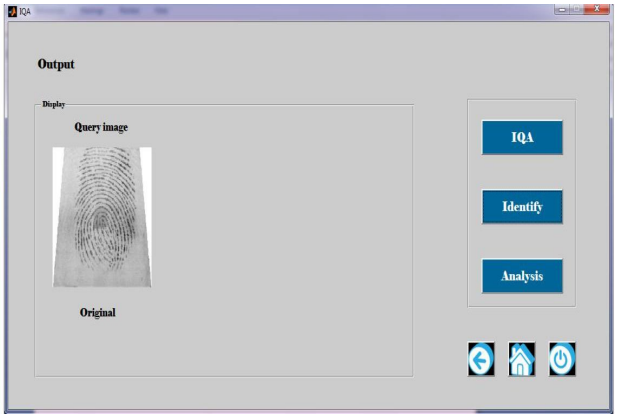

Fig 12 Identification

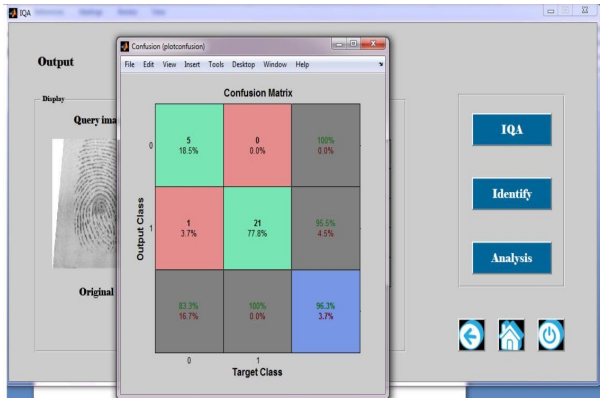

Fig 13 Confusion Matrix

In the above Figure 12 when one clicks on Identify button it gives the output as fake or real according to IQA parameters. This work is done by the biometric equipment. In the above Figure 13 when Analysis button is clicked on it will generate the confusion matrix which will help to tell about system performance.

Fig 14 Performance Chart

In the above Figure 14 when Analysis button is clicked on after generating confusion matrix, that matrix will be minimized and then the performance chart is obtained. After considering parameters like error rate, sensitivity, the classifier accuracy may be obtained.

TABLE 1
Comparison Between Existing And Proposed System

Sno	Existing system	Proposed system
01	It is uni-biometric system.	It is multi-biometric system.
02	It is hardware based system	It is software based system
03	The results may change when weather changes.	The results not change when weather changes.
04	Error rate is more	Error rate is less
05	In this system used parameters are: Body Temperature, Blood Pressure	In this system used 11 parameters are: MSE, PSNR, SNR, SC, MD, AD, NAE, NXC, TED, TCD, SSI
06	It is more expensive	It is less expensive.
07	It is less secure because it is Uni-biometric system.	It is more secure than existing system because it is Multi-biometric system.
08	In this system hardware based technique is used.	In this system software based technique Image Quality Assessment is used.
09	Speed of the system is slow. This system can check one person at a time.	Speed of the system is fast. This system can check 50 persons at a time.

V. CONCLUSIONS

The study of the biometric systems against different types of attacks has been a very active field in future. This is enhanced the field of security technologies for biometric-based applications. On the other hand, notwithstanding this discernible change, the advancement of effective security routines against known dangers has turned out to be a testing assignment. Basic visual examination of an image of a genuine biometric attribute and a fake example of the same quality demonstrates that the two images can be fundamentally the same and even the human eye may think that it's hard to make a qualification between them after a short review. Yet, a few inconsistencies between the genuine and fake images may get to be obvious once the images are deciphered into an appropriate element space. In this setting, it is sensible to accept that the image quality properties of genuine gets to and deceitful assaults will be distinctive. Taking after this "quality-contrast" theory, in the present exploration work the capability of general image quality evaluation as an insurance device has been investigated against diverse biometric assaults (with extraordinary regard for spoofing). For this purpose a feature space of 11 complementary image quality measures has been considered which is also combined with simple classifiers to detect real and fake access attempts. The novel protection method has been evaluated on three largely deployed biometric modalities such as the iris, the fingerprint and 2D face, using publicly available databases with well-defined associated protocols. This way, the results in proposed system contain some conclusions. It adapts the different biometric details by high performance method, it able to analyses multi biometric details, and it is simplest, accurate and less complexity method.

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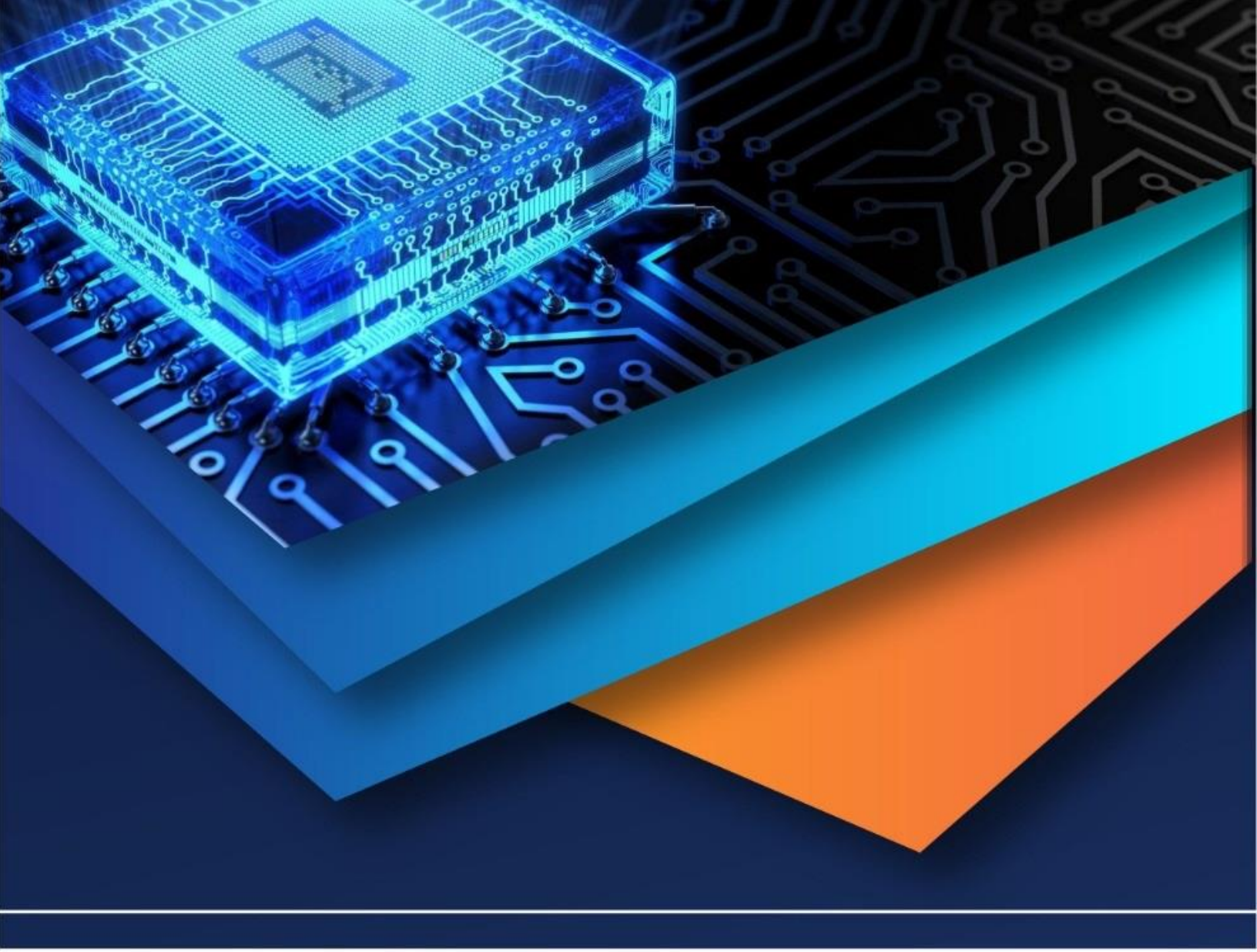

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