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A Survey of Image Quality Assessment for Fake Biometric Detection

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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 sensing, feature extraction, and matching modules. But now a day's biometric systems are attacked by using fake biometrics. This paper introduce three biometric techniques which are face recognition, fingerprint recognition, and iris recognition (Multi Biometric System) and also introduce the attacks on that system and by using Image Quality Assessment For Liveness Detection how to protect the system from fake biometrics. How the multi biometric system is secure than uni-biomertic system.

Keyword:

Image quality assessment, biometrics, security, Attacks.

1. INTRODUCTION:

Fake biometrics means by using the real images 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 system is more secure, Because each person have their unique characteristics identification. Biometrics system is more secure than other security methods like password, PIN, or card and key. A Biometrics system measures the human characteristics so users do not need to remember passwords or PINs which can be forgotten or to carry cards or keys which can be stolen.

Biometric system is of different type that are face recognition system, fingerprint recognition system, iris recognition system, hand geometry recognition system (physiological biometric), signature recognition system, voice recognition system (behavioral biometric). Figure 3 show the type of different biometric [6]. Multi biometric system means a biometric system is used more than one biometric system for one multi-biometric system. A multi biometric system is use the multiple source of information for recognition of person authentication. Multi biometric system is more secure than single biometric system.

In this Survey Base seminar report Image quality assessment for liveness detection technique is used for find out the fake biometrics. Image assessment is force by supposition that it is predictable that a fake image and real sample will have different quality acquisition. Predictable quality differences between real and fake samples may contain: color and luminance levels, general artifacts, quantity of information, and quantity of sharpness, found in both type of images, structural distortions or natural appearance.

For example, fig 1[5] shows iris images captured from a printed paper are more likely to be fuzzy or out of focus due to shaky; face images captured from a mobile device will almost certainly be over-or under-discovered; and it is not rare that fingerprint images which is shows in fig 2. [4] captured from a dummy finger. 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.

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Image quality assessment is a most important topic in the image processing area. Image quality is a trait of any image Usually compared with an ideal or perfect image. Digital images are subject to a large range of distortions during storage, achievement, compression, processing, transmission and reproduction, several of which may result in a degradation of visual quality. Imaging systems introduces some amount of distortion or artifacts which reduces the quality assessment. In general quality assessment is of two type one is subjective visual quality assessment and second one is objective visual quality assessment [2].Objective image quality metrics can be classified on the basis of availability of an original image, with the distorted image is to be compared. Accessible approaches are known as full-reference, meaning that a complete reference image is assumed to be known. In many practical applications, however, the reference image does not exist, and a no-reference or 1 approach is desirable.

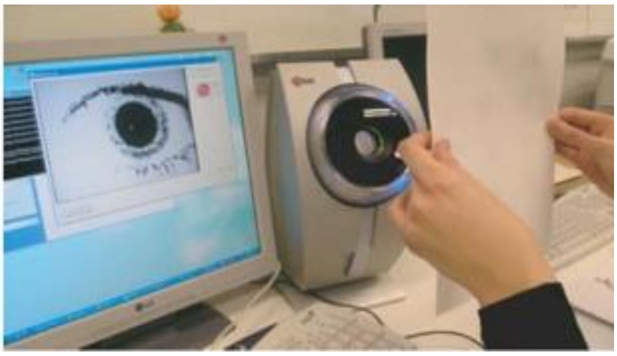

Fig 1: Fake iris

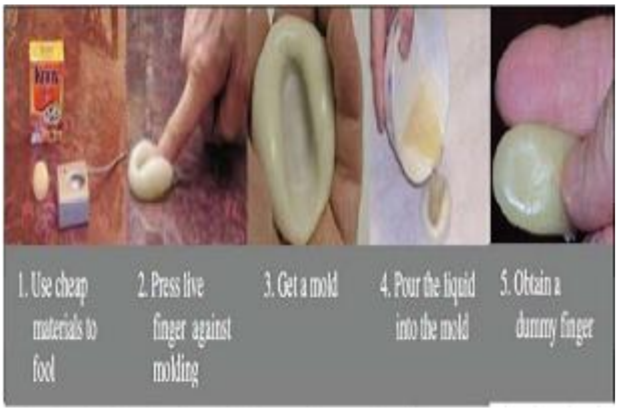

Fig 2: fake fingerprints

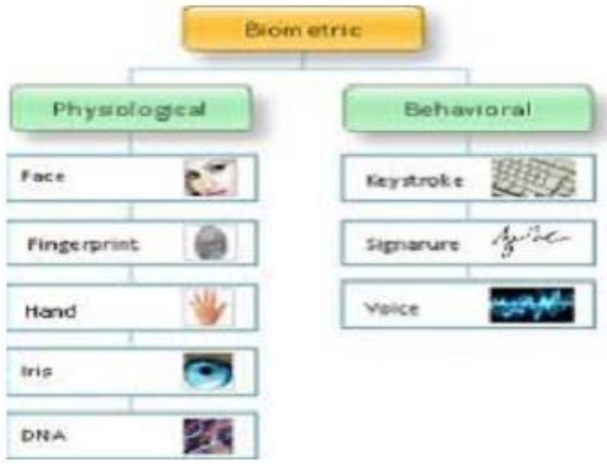

Fig 3: Different types of biometric

2. RELATED WORK:

This related works provides the overview of an image processing started with semi-automated systems to locate the major features on face Semi automated systems used features of faces like mouth, eyes and nose. Ningthoujam Sunita [1] proposed Principal Component analysis, Linear Discriminant Analysis, and Independent Component Analysis constitutes a major part in the facial expression recognition techniques. PCA algorithm is used to evaluate the covariance of the matrix for particular image. K.C.Lee [2] described about Yale database is used to store the images. In neural networks a huge training database of faces is needed which required too much time to train the whole system to get the results.

It gives the 60% of recognition rate. Javier Galbally [3] provided information about Image quality assessment for fake biometric detection: application to iris, fingerprint, and face recognition uses the Quadratic discriminant analysis classifiers method which is used to identify the Fake biometric detection can be seen as a two-class classification problem. Ashish Chittora [4] proposed Face Recognition Using RBF(Radial Basis Function) Kernel Based Support Vector Machine paper in which Support Vector Machine(SVM) is used as a basic concept which is used to seen the face recognition problem as binary tree recognition strategy are used to tackle the classification problem R.Soundararajan [5] presented

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RRED indices: Reduced Reference Entropic Differencing for image quality assessment paper used Reduced Reference Quality Assessment (RRQA) algorithm. The algorithms differ in the nature of the distortion measurement and the quantity of the information required from the reference to compute quality. W. Lin, and M. Narwaria[6] proposed Image quality assessment based on gradient similarity, used Gradient similarity scheme to increase the Robustness and efficiency with six publicly available subject-rated benchmark IQA databases. C.Ding [7] proposed Face images captured in unconstrained environments usually contain significant pose variation, which degrades the performance of algorithms designed to recognize frontal faces.

This novel face identification framework capable of handling the full range of pose variations within ±90° of yaw. Lai ZR [8] presented Extensive experiments on four benchmark data sets in controlled and uncontrolled lighting conditions show that the proposed method has promising results, especially in uncontrolled conditions, even mixed with other complicated variations. Xiao yang Tan [9] presented a simple and efficient preprocessing chain that eliminates most of the effects of changing illumination while still preserving the essential appearance details that are needed for recognition. FAN X [10] focused facial geometries including the co-linearity and those on a larger scale involving more points for more facial components.

In this work, SIFT and SVM algorithm is used to reduce the number of features to be evaluated for the particular image and reduces the processing time for face recognition. This also improves the accuracy of recognition process without the use of specialized equipment. This result compares with the statistical approaches (Quadratic discriminant analysis, linear discriminant analysis and etc...) which gives more output. Guodong Guo[14] proposed with faces that are subjected by correlation mapping between makeup and non-makeup faces on features extracted from local patches.

Four categories of features are proposed to characterize cosmetics, including skin color tone, skin smoothness, texture and highlight. A patch selection scheme and discriminative mapping are presented to enhance the performance of makeup detection.

3. Literature Survey

A survey that appeared in 2008 covered the field from its inception in the early 1990s through roughly the end of 2007 [21]. This new survey is intended to update the previous one, covering roughly the period 2008-2010. However, as illustrated in Fig. 4, there has been tremendous growth in the literature in this area. Due to this growth, this new survey does not attempt as exhaustive a coverage of the field as the previous survey. We focus primarily on papers that appeared in SpringerLink or in IEEE Xplore, as these appear to currently be the two major sources of publications in this field. We also omit coverage of some subareas of work judged to be of less importance. These omissions are explained at the appropriate points in the survey.

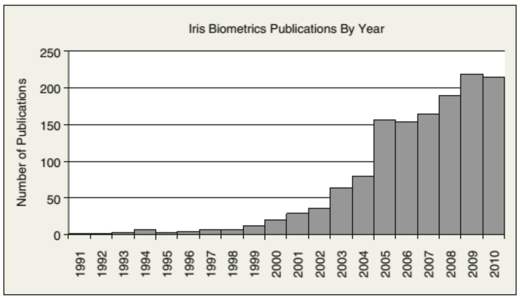

Fig. 4 Iris biometrics papers in Google Scholar from 1990 through 2010 (This data was taken using Google Scholar's "advanced search" facility, searching for "iris biometrics pupil" appearing in articles, excluding patents, in the Engineering, Computer Science, and Mathematics literature)

The main body of this survey is organized into the following sections:

2. Iris image acquisition
3. Iris region segmentation
4. Texture coding and matching

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5. Multi-biometrics involving the iris
6. Privacy and security
7. Datasets and evaluations
8. Performance under varying conditions
9. Applications
10. Theoretical analyses

Papers are grouped into a section according to their perceived main area of contribution. In some instances, a paper is mentioned in more than one section. The survey ends with a short discussion and a list of recommended readings.

There are several overview or introductory type articles that can be mentioned in this section. Gorodnichy [59] gives a good overview/introduction to biometrics, emphasizing evaluation of biometric system performance based on a dynamic, or life cycle view of operational systems. Bhattacharyya et al. [14] give a short, high- level overview of biometrics, primarily emphasizing iris biometrics. Phillips and Newton [14] present a short "point of view" type article on biometric evaluation, emphasizing issues such as the number of persons represented in the dataset and the longitudinal time over which biometric samples are collected. Each of these articles contains important elements for anyone new to the field of biometrics.

Iris Image Acquisition

There are still major research issues in the area of iris image acquisition. One issue involves imaging the iris with a sensor system that allows the person to be more "at a distance" and "on the move." Matey and Kennell [11] present a comprehensive tutorial on the issues involved in acquiring iris images at a distance of greater than 1 m. The tutorial includes a partial list of commercial iris recognition devices released between 1995 and 2008 and a description of several successful applications of iris biometrics. The authors describe acquisition issues including the wavelength of light used, the type of light source, the amount of light reflected by the iris back to the sensor, required characteristics of the lens, signal-to-noise ratio, eye safety, and image quality. Capture volume, residence time, and sensitivity to subject motion are also discussed.Wheeler et al. [7] describe a prototype "standoff" iris recognition system designed to work at sensor-to-subject distances of up to 1.5 m. The system uses two wide-field-of-view cameras to perform face location in the scene and an iris camera and illuminator to image the iris. Dong et al. [12] discuss the design of a system to image the iris "at a distance," allowing a standoff of 3 m. Although current commercial iris biometrics systems all use near-infrared (NIR) illumination and most research assumes NIR imaging similar to that used in current commercial sensors, Proenca [15] argues for visible-wavelength imaging as the more appropriate means to achieve "at a distance" and "on the move" imaging.

Boddeti and Kumar [16] investigate the use of wavefront-coded imagery for iris recognition. This topic has been discussed in the literature before, but Boddeti and Kumar use a larger dataset and present experiments to evaluate how different parts of the recognition pipeline (e.g., segmentation, feature extraction) are affected by wavefront coding. They propose using unrestored image outputs from the wavefront- coded camera directly and test this idea using two different recognition algorithms. They conclude that wavefront coding could help increase the depth of field of an iris recognition system by a factor of 4 and that the recognition performance on unrestored images was only slightly worse than the performance on restored images.

There is little published work dealing with imaging the iris under different wavelength illumination. Ross et al. [17] look at imaging the iris with illumination in the 950-1,650 nm range, as opposed to the 700-900 nm range typically used in commercial systems. They suggest that it is possible to image different iris structure with different wavelength illumination, raising the possibility of multispectral matching as a means to increased recognition accuracy.Grabowski et al. [11] describe an approach to iris imaging that is meant to allow characterization of structures in the iris tissue over changes in pupil dilation. They use side-illumination, fixed to glasses frames worn by the subject, with imaging resolution that allows an 800-pixel iris diameter. This is many more "pixels on the iris" than in current commercial sensors. Chou et al. [10] describe an iris image acquisition system meant to handle off- angle views of the iris and to make iris segmentation easier and more reliable. Their system uses a dual-CCD camera to acquire a color RGB image with one CCD and a near-infrared image with the other. The color image is exploited to improve the reliability of the segmentation. The non-orthogonal-view iris image is rectified to an orthogonal-view iris image using the pupillary boundary.

He et al. [13] design their own iris camera with the goal of being more economical than commercial alternatives while still acquiring high-quality images. They use a CCD sensor with resolution of 0.48 M pixels and add a custom glass lens with a fixed focus at 250 mm and NIR-pass filters that transmit wavelengths between 700 and 900 nm. The illumination unit consists of NIR LEDs of 800 nm wavelength, which they arrange to try to minimize specular reflections on the iris.

4. IMAGE QUALITY ASSESSMENT FOR LIVENESS DETECTION

The use of image quality assessment for liveness detection is motivated by the supposition that: "It is expected that a fake image captured in an attack attempt will have different quality than a real sample acquired in the normal operation scenario for which the sensor was designed."[1] Predictable quality differences between real and fake samples may contain: color and luminance levels, general artifacts, quantity of information, and quantity of sharpness, found in both type of images, structural distortions or natural appearance. For example, iris images captured from a printed paper are more likely to be unclear or out of focus due to trembling; face images captured from a mobile device will most likely be over- or under-exposed; and it is not rare that fingerprint images captured from a gummy finger present local gaining artifacts such as spots and patches.

Also, in an ultimate attack in which an unnaturally produced image is directly injected to the communication channel before the feature extractor, this fake sample will most likely lack some of the properties found in natural images.The potential of general image quality assessment as a protection method against different biometric attacks (with special attention to spoofing). Different quality measures present diverse sensitivity to image artifacts and distortions. For example, measures like the mean squared error respond additional to additive noise, while others such as the spectral phase error are extra sensitive to blur; while gradient-related features respond to distortions concentrated around edges and textures. Therefore, using a large range of IQMs exploiting complementary image quality properties should allow detecting the aforementioned quality differences between real and fake samples expected to be found in many attack attempts (i.e., given that the technique with multi-attack protection capabilities). So consider that there is sound proof for the "quality-difference" theory and that image quality measures have the possible to achieve success in biometric protection tasks.

5. CONCLUSION

Image quality assessment for liveness detection technique is used to detect the fake biometrics. Due to Image quality measurements it is easy to find out real and fake users because fake identities always have some different features than original it always contain different color and luminance levels, general artifacts, quantity of information, and quantity of sharpness, found in both type of images, structural distortions or natural appearance. Multi¬Biometric system is challenging system. It is more secure than unibiometric system. In this paper studied about the three biometric systems that are face recognition, iris recognition, fingerprint recognition, and the attack on these three systems. Multi biometric system is used for various applications. And in future for making this system more secures adding the one more biometric system into this system and trying to improve the system.

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