A Study Of Different Types Of Biometric Techniques

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Abstract

This papers discusses and gives a brief overview of the popular physical and behavioural biometric techniques used in identification and recognition of users to create secure systems. A wide variety of systems require reliable personal recognition schemes to either confirm or determine the identity of an individual requesting their services. The purpose of such schemes is to ensure that the rendered services are accessed only by a legitimate user, and not anyone else. Examples of such applications include secure access to buildings, computer systems, laptops, cellular phones and ATMs.

1.Introduction

The question of "how to identify a Human by a machine" has always intrigued researchers until it was found that it may do by expoiting the unique biological trait of a human being. For this reason most security systems try to identify a person by his unique biological traits which cannot be copied. Using Biometric passwords overcomes this problem since it uses the unique biological trait of a particular user that cannot be copied or stolen or replicated. The human face itself can serve as an unique biometric key, apart from that, the eye, iris, fingerprint, hand geometry , voice, DNA, retina are among the few other examples of objects that have been found useful to serve as the biometric key, because of their uniqueness from person to person.

2.Techniques

2.1 Fingerprint Recognition:

Fingerprint recognition is a process that tires to find a match between fingerprints of users from its existing database. These patterns, the ridge of the properties, and the minutia points, which includes unique features are not found in the patterns. There are three basic fingerprint ridge patterns of the arch, loop, and the cycle:
i. Arch: The ridges enter from one side of the finger, rise in the centre forming an arc, and then exit the other side of the finger.
ii. Loop: The ridges enter from one side of a finger, form a curve, and then exit on that same side.
iii. Whorl: Ridges form circularly around a central point on the finger.
The main features of the fingerprint ridge of minutia.
Minutia: ridge end, bifurcation, and a short ridge (or dot). At the end of the ridge, which is close to a ridge? Bifurcations are points at which only the ridge of a ridge between the two splits. A small ridge (or dot) is significantly shorter than the length of the ridge that the average fingerprint ridge top. And a small part of the analysis of patterns of fingerprints is very important, since no two fingers have been shown to synchronize. Adjust the algorithm to authenticate the applicant's Fingerprints are used to compare the fingerprints of previously stored template. Be directly compared with the original image so that it is a candidate image or certain features must be compared A model - based algorithms in, template type, size, and orientation patterns are aligned in the fingerprint image. Candidate fingerprint image template and the degree to which they are

graphically compared with a matched set.[1][2][3][4]

Figure 1. Fingerprint Bitmap

2.2 Iris Recognition:

Iris recognition is a biometric identification system that uses the eyes of a person, which is unique, complex and has random patterns can be seen from some distance to the video images of the irises mathematical pattern - Recognition technology used. Do not be confused with other, less common, visual - based technology, retina scan, iris recognition technology; the camera is sensitive to infrared illumination with a rich, complicated structure of the iris in the image. Iris recognition system with many millions of people in various countries around the world, the name of the record, such as a passport - free automated border-crossings have been intended as a convenience, and the national ID system based on this technology is being deployed. Matching the speed and ultimate prevention of false matches in addition to the benefits of an iris recognition, an internal, protected, as part of the eye is still visible on the outside of the iris stability. Black iris biometric identification for the human body model has been described as part of the reason:

A. This is an internal organ that is a very transparent and sensitive membrane (cornea) is better protected against damage and wear

B. Iris is mostly flat, and the geometric configuration of the two complementary muscles (sphincter papillae and dilator papillae) is controlled only by controlling the diameter of the pupil. It is much more predictable than the bow shape, for example, that face.

C. Similar to a photograph of an iris scan, and about 10 cm to a few meters away from the place can be. [5]

Figure 2. Image of IRIS

2.3. Retina Recognition:

It is based on the blood vessel pattern in the retina of the eye as the blood vessels at the back of the eye have a unique pattern, from eye to eye and person to person. Retina is not directly visible and so a coherent infrared light source is necessary to illuminate the retina. The infrared energy is absorbed faster by blood vessels in the retina than by the surrounding tissue. The image of the retina blood vessel pattern is then analyzed. Retina scans require that the person removes their glasses, place their eye close to the scanner, stare at a specific point, and remain still, and focus on a specified location for approximately 10 to 15 seconds while the scan is completed. A retinal scan involves the use of a low-intensity coherent light source, which is projected onto the retina to illuminate the blood vessels which are then photographed and analyzed. A coupler is used to read the blood vessel patterns. A retina scan cannot be faked as it is currently impossible to forge a human retina. Furthermore, the retina of a deceased person decays too rapidly to be used to deceive a retinal scan. A retinal scan has an error rate of 1 in 10,000,000, compared to fingerprint identification error being sometimes as high as 1 in 500[6]

Figure 3. Image of Retina

2.4. Face Recognition:

This process tries to automatically detect and match a face from a digital image or a video frame from a video source with the existing databases. The facial image database is compared with the facial features. It is commonly used in security systems, fingerprint or eye iris recognition systems, and these can be compared to other Biometrics. These features are then used to search for other images with features for matching. Note the facial features of a template of the earliest successful systems from a set, mouth compressed representation of how the strategy is based on. The two main approaches to recognition algorithms, geometry, which is considered a specific feature, or photometry, which is the value of a statistical method that distils an image and the template can be divided into comparison with the values chosen variances. Improved accuracies achieved by a newly emerging trend, claimed, it is three-dimensional face recognition. This method is 3D face shape capture information about the use of the sensor. This information is then faces the surface of the distinctive features such as eye sockets, nose, chin, and is used as the contour. 3D face recognition is an advantage that it is not affected by other techniques, such as the light changes. A three-dimensional data points from the most advanced facial recognition precision. It works by projecting onto a structured light sensor. Even a perfect expression to the 3D-matching technique can be sensitive. Metric geometry of the components from the Technion, a group that aims to treat the expression as isometrics. A company called Vision Access 3D face recognition is a robust solution designed for. This technique, called skin texture analysis, a mathematical space is unique in the line, sign, and a clear mark on the person's skin. Tests that analyze skin texture as well, with the faces of 20 to 25 percent increase in performance can be shown. [7][8][9]

Figure 4. Recognition of face from Body.

2.5 Speaker Recognition:

The voice is a unique feature of every individual and using voice recognition, it is possible to identify an user from the existing database, by utilizing the unique features of the voice, including the pitch, time, amplitude, intensity. The voice recognition must not be confused with speech recognition system that tries to predict the user's speech. These two terms are often confused. The acoustic patterns of both the anatomy (e.g, size and shape of the throat and mouth) and reflects the behavioural patterns (e.g., voice pitch, speaking style) learned. Speaker verification is a "behavioural biometric" is classified as a speaker recognition has been earned. Speaker recognition technology and the process has two main applications. If the speaker can claim a certain identity and voice are used to verify this claim, verification or authentication, this is called. From a security perspective, the identification is different from that. This system operates with the user's knowledge, and usually requires their cooperation. During enrolment, speaker, voice, and recorded a number of common features to a voice print, template, or model of the structure are extracted. Verification stage, in a speech sample, or "voice" is compared against a previously created voice print. Detection systems, speech to print more than one voice against the best match (es), when a voice print verification system to compare against a set compared to the speaking. Involved in the process of verification is faster than identification. And the voice of the printing technology used to store the frequency estimation, hidden Markov models, Gaussian mixture model, pattern matching algorithms, neural networks, matrix representation, Vector Quantization and included in the decision tree. Some systems are also "anti-speaker" techniques such as group model, and using the world model. [10]

2.6. Hand Geometry Recognition:

Hand geometry is a biometric method that identifies users by the shape of their hands. Hand geometry readers to a user's hand along many

dimensions, and measurement criteria to compare the size of a file to be saved. Sustainable hand geometry device the early 1980s, after you have finished creating the first biometric hand-geometry has been used to broad-teller machines. It remains popular; common applications include access control and time and attendance operations. Since fingerprints or hand geometry to be unique, it is not as irises, fingerprints and iris recognition technology is preferred for high security applications. Hand geometry identification is very reliable as other forms, such as identification on cards or personal identification number, when combined with. Large population, the so-called hand geometry, one - to - many applications, where a user without his or her biometric identifier to another is not suitable for detection.[11][12]


Figure 5. Hand Geometry Scanner

2.7**. Signature Verification:**

Handwriting recognition and the ability to get a computer, such as paper documents, photographs, touch-screens and other devices, such as the sources from which intelligible handwritten input. Text of a paper image of an optical scanning (optical character recognition) or intelligent word recognition by a fragment from the "off line" sensed it. Otherwise, the pen tip to the "line" sensed to be a pen - based on the computer screen. Off-line handwriting recognition to write a letter code that computers and automated text processing application to convert the image is usable. Off-line handwriting recognition more difficult, as different people have different handwriting styles. Automatic on-line handwriting recognition to convert the text as it is involved in a special digitizer or PDA, where a sensor break-up on the cutting edge of switching

pen-up/pen-down as it is written. That kind of data as digital ink and handwriting is a dynamic representation is considered. Signal processing applications received in the mail code that the computer and the text is converted to usable. Signature verification is a part of the hand-writing recognition system. In this case, try to find your signature style. Signature cones, paper and other deciding factors on the pressure. [13][14][15]
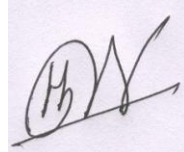
Figure 6. A Signature taken using Tablet

2.8. DNA Recognition:

A DNA-binding domain (DBD), a motif that is independently folded protein domain that is at least one double or single stranded DNA is recognized. DNA binding domain of one or more additional domains is often part of a larger protein, consisting of various actions. DNA with the DNA binding domain and copy function due to the structure, repair, storage, and the DNA methylation status of the change, biological role. The control of gene expression of involved in DNA binding domain contains. Most of the cellular signaling cascades, as described in the final output of gene regulation.

Major or minor groove of DNA by DBD DNA recognition, may occur during or sugar – phosphate backbone DNA can. DNA recognition by proteins specific to each type of function is like. For example, DNA - DNA cutting enzyme DNAse I and DNA in a non-random sequence - with a particular method will be blocked. Many of the specific DNA-binding domains of transcription factors such as the specific gene, or the enzyme telomerase, which is the site of the restriction enzyme and DNA changes, such as active as the DNA sequences of the DBDs, must be identified. DNA minor groove DNA major groove hydrogen bonding pattern that is degenerate, in a sequence - specific DNA recognition of the more interesting sites. DNA-binding proteins studied in many biochemical and biophysical specificity, such as gel electrophoresis, analytical ultracentrifugation,

calorimetry, DNA changes, modify or alter the protein structure, nuclear magnetic resonance, x-ray crystallography, surface Plasmon resonance, electron paramagnetic same techniques can be used resonance, and micro-scale cross-links Thermophoresis (MST).[16][17][18]

2.9. Keystroke Recognition:

Keystroke dynamics biometric wherehe keyboard or the keypad on the behaviour of a different kind of character. And the desire to use the method for a user keystroke rhythms of a unique typing pattern for future authentication of users surveyed have developed biometric template.

Keystroke timing data recorded on a unique neural algorithm, which is then processed through the future compared to the initial pattern set. Similarly, the use of vibration data in both the identification and authentication process may create a pattern for future use Researchers in this keystroke dynamic information, which is usually ignored, or even verify the identity of the person producing those keystrokes are interested in trying to determine. This is often because it has been possible to produce some features of the handwriting or keystroke as a separate signature. Keystroke dynamics is a behavioural Biometrics Biometrics is also known as part of a larger class, the type of statistical patterns. It is commonly held beliefs, such as fingerprints or retinal scans the behavioural Biometric Body, or use DNA as a Biometric authentication is not as reliable. This well-defined for the individual risk mitigation - some physical biometric technologies may never achieve. Keystroke dynamics is another advantage: they start up the chain - not just to be captured and adequately correct the system, or any other person to double-check the situation may trigger the alarm. [19][20]

2.10. Gait Recognition:

Gait analysis, to assess if, and to walk in their ability to affect people with medical conditions are used. This is usually in sports biomechanics from the athlete to perform more efficiently and with the posture-related or movement-related problems used to help identify. Survey quantification, i.e. the measurable parameters of gaits and the introduction of the analysis, as well as an explanation encompasses, i.e. different conclusions about its gates to the animal (health, age, size, weight, speed, etc.) drawing. A typical gait analysis laboratory of the cameras (video and / or infrared), placed near a walkway or a treadmill, a computer is involved. The body of the patient's reference point (such as the iliac spines of the pelvis, ankle malleolus, and the knee of the condyles), or the team located the body of the markers from the ruler of the half. The patient walks down the catwalk or the treadmill on three levels of each marker in the trajectory calculation. A model is applied to determine the underlying bone. The complete breakdown of the movements of each joint. The use of dynamics, but the private wing of the extensor or flexors muscles, but such information so as not to muscle groups. Identify the activities and contribution to the movement of muscles, muscle electrical activity, it is necessary to investigate Normal kinematic, kinetic, or EMG to determine the patterns of deviation from the specific pathologies, treatment results, predict or determine the effectiveness of training programs[21][22]

2.11. Ear Recognition:

Human ear can be used to recognize a person. The biological pattern and structure of an ear of a human vary from person to person. The ear of every person has a unique pattern and structure. By this pattern a person can be identified. This pattern is unique biological trait of every human. The researchers use this biological uniqueness to identify a person uniquely. The technology may use a secondary identification and recognition system.[23][24][25][26]

2.12. Finger Vein Recognition:

Finger vein recognition is a biometric authentication method that the wider recognition of the skin beneath the surface of the finger vein patterns using image-based technology. Biometrics of finger vein recognition is used to verify the identity of the person and identify them.

A variety of technologies, applications, credit card authorization, automobile safety, employee time and attendance tracking, computer and network authentication, end point security, and Automated Teller Machine is currently in development with the use or not. Database record, a separate insert a finger on a terminal near a attester infrared-LED (light-emitting diode) lighting, and a monochrome sisidi (charge - coupled device) camera to obtain a holding pattern for Blood hemoglobin near infrared-LED lamp, which is a line of dark vein pattern as shown in the absorption system. Camera image and the raw data recorded, digitized and sent to the registered image and a certificate from the database. The authentication process takes less than two seconds. Vein patterns are unique to each individual, such as fingerprints or iris patterns as well as other biometric data. Some biometric system to another, vein patterns are almost impossible to fake because they are located inside the skin's surface. Finger vein ID system is much more difficult, because it allows only a living person's fingers can fool. [27][28]

2.13. Thermograms Recognition:

Infrared thermography (IRT), thermal imaging, infrared and thermal imaging video is an example of science. Thermal infrared imaging camera, electromagnetic spectrum range (9,000-14,000 nanometers, or about 9-14 μm) to detect the radiation and the radiation image, the thermograms of production A thermal imaging camera, when viewed through, warm up well against the background material on the cold, warm-blooded animals and humans through the environment, easily visible against the night or day. As a result, thermography is especially useful for surveillance cameras and military and other users. Firefighters through smoke, find people to see, and the use of thermography to localize the base of a fire. Technicians to create a thermal insulation to create a signature that the errors in the leaks about the report indicates, and the results from the heat diskriptarera heating and air-conditioning unit, you can use the skills you develop. Some people are warm-blooded animals, and other physiological changes during the

clinical diagnostics can be monitored with a thermal imaging.

2.14. Body Order Recognition:

Body odor or body odor is present in both animals and humans, and the intensity of the (behavioural patterns, survival strategies) can be affected. Body odor in both animals and humans have a strong genetic basis, but it is strongly affected by various diseases and mental conditions can be. Human olfaction from the person that the blood-related relatives (mothers and children and husbands and wives) can be detected. Stepchildren and biological children but not their mothers by the body odor can be detected. I find them full of half-sibling, but olfactorily Preadolescent children or step-siblings, and this may be explained by incest avoidance and the Westermarck effect. Children and their mothers by smell and the smell is detected by the mothers and other relatives of a child can identify. Functional olfactory receptor genes in humans than in rats and dogs, and the olfactory receptor cells are compared. This part of the beak depth perception as well as to reduce the size of a change related to bipedalism. However, it's that big of brain regions associated with olfactory perception than other species may have been controversial. [29] [30] [31]

3. Conclusion

This paper briefly reviews the present's notions and ideas associated with the biometric techniques for recognition of users of system. Biometric systems for today's high security applications must meet stringent performance requirements. The fusion of multiple biometrics helps to minimize the system error rates. Fusion methods include processing biometric modalities sequentially until an acceptable match is obtained. More sophisticated methods combine scores from separate classifiers for each modality.

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