

## A Review On Different Biometric Techniques

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### Abstract

*This papers discusses and gives a brief overview of the popular physical and behavioral biometric techniques used in identification and recognition of users to create secure systems.*

### 1. Introduction

The question of “how to identify a Human by a machine” has always intrigued researchers until it was found that it may be done by exploiting 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. A password is used to give the user a unique access to certain sectors, that are otherwise classified to the other users. But a text based password system does not ensure the maximum security of the system, since it can be stolen, or copied or guessed by another user, that may lead to become a security threat later. 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 a 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. Using these require complex algorithms and mathematics to aid the machine. This paper briefly discusses the few popularly used physical and behavioral biometric procedures.

### 2. Techniques

**1. FINGERPRINT RECOGNITION:** Fingerprint recognition or fingerprint authentication is a process that tries to find a match between fingerprints of users from its existing database. The analysis of the fingerprints matched the print

pattern to be compared in various settings. These patterns, the ridge of the properties, and the minutia points, which includes unique features are not found in the patterns. Structure and properties of human skin so that it is successfully employed in the imaging technology. 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.

Scientists have found that family members often share the same general fingerprint patterns, leading to the belief that these patterns are inherited.

The main features of the fingerprint ridge of 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. Pattern-based algorithm, and a candidate for the fingerprint template stored in the fingerprint patterns (arch, whorl, and loop) to compare. This is the image that needs to be aligned in the same orientation. To do this, the algorithm to find the fingerprint image, and the centers of the central points. 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.<sup>[1][2][3][4]</sup>

**2. 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. Some facial recognition algorithms to retrieve landmarks, or features of the face of an image to detect faces. For example, an algorithm can be analyzed relative to the location, size, and / or the eyes, nose, cheekbones, and jaw shape. These features are then used to search for other images with features for matching. See a gallery of images from other algorithms, and then normalize all data to be compressed, only the image data which is useful for face detection. A probe face image is then compared with the data. 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 distills an image and the template can be divided into comparison with the values chosen variances. Principal component analysis of popular recognition algorithms eigenfaces, linear discriminate analysis, elastic bunch graph matching algorithm, by mouth, hidden Markov models, and the neuronal motivated dynamic link matching is used. Improved accuracies achieved by a newly emerging trend, claimed, it is three-dimensional face recognition. This method is a 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. This is the view angle can be detected in a range from a profile with us. A three-dimensional data points from the most advanced facial recognition precision. Research sophisticated sensors to capture 3D imagery to a 3D face has been enhanced by the development of good work. It works by projecting onto a structured light sensor. The CMOS image sensor from the top dozen or more of the same chip can be placed on - the part of the spectrum of each sensor captures. 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. Biometric Access Company, Inc., a company which is an organic scrypt 3D version was obtained

after the first pass, as they develop. Emerging trends evident in other details of the skin, the value of using digital or scanned image as a prisoner. 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.<sup>[5][6][7]</sup>

**3. 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 users speech. These two terms are often confused. In addition, the provision of authorization (as speaker verification or speaker authentication is commonly called) and the identity of a difference there. Finally, the speaker recognition (recognizing who is speaking), and the speaker diarisation (recognizing that the speaker is speaking) is the difference between a. Speaker recognition has a history dating back some four decades, and the acoustic properties of speech has been found that individuals use to the individual. The acoustic patterns of both the anatomy (eg, size and shape of the throat and mouth) and reflects the behavioral patterns (eg, voice pitch, speaking style) learned. Speaker verification is a "behavioral 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. On the other hand, the identification of an unknown to the speaker's identity is performed. Speaker verification is a sense in which one speaker as a template for a 1:1 match (also known as a "voice print" or "voice model") to the speaker identification is shown in a 1: N, where N voice is compared against the template match. From a security perspective, the identification is different from that. Speaker verification is a "gatekeeper" to be appointed as a secure system (such as telephone banking) provide access. This system operates with the user's knowledge, and usually require their cooperation. Enrolment and verification, speaker identification system can be implemented invisibly to the user without the knowledge of a topic for the talkers, the speaker, the automatic alarm system, if a user already has a system that is registered in the name of the test, and each speaker recognition system has two phases. During enrollment, 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.

**4. 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 irides 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. New mathematical and statistical algorithms by these patterns to encode unambiguous template for a positive identification can be different. Data record template matcher engine per second (single core) CPU-speed is measured in millions of queries per template, and the infinitesimally small, with the rate of false matches. 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. The fingerprints, that manual labor may be difficult to identify specific types of years later, it's different.

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

C. A fine texture of the iris, like fingerprints - are randomly assigned to have the embryo during gestation. Finger-like, it is very difficult (if not impossible) to prove that the iris is unique. But many elements of the structure of the textures (iris and fingerprint) to the false ones that are likely to have extremely low. Even genetically identical individuals have completely independent iris textures.

D. Similar to a photograph of an iris scan, and about 10 cm to a few meters away from the place can be. No equipment has been recently touched by a foreign person to touch this, there is no need for this, except that in some cultures, which has a fingerprint scanner, which has a finger to touch a surface, or a retinal scan has to be eliminated, where the eye Bring an eyepiece (such as looking in a microscope) to be very close.

E. Though the methods of treatment and surgery, and the overall shape of the iris color can have a fine texture remains remarkably stable over many decades. In some bow successful identifications for nearly 30 years.<sup>[8]</sup>

**5. 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 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.<sup>[9][10]</sup>

#### **6. HAND RECOGNITION AND 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, for example by surface. Optical character recognition

for the handwriting recognition entails. Although this process is a complete handwriting recognition system configuration management, and the most believable character in the segmentation will be performed to find the words. Off-line handwriting recognition to write a letter code that computers and automated text processing application to convert the image is usable. Static representation of a signature on this form is received by the data is considered. Off-line handwriting recognition more difficult, as different people have different handwriting styles. As for today, and, primarily, OCR engines, machines, hand-printed "printed" (written in capital letters) for writing text, and focused on the ICR. No OCR / ICR engine that's as handwriting recognition support. 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 are 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.<sup>[11][12][13]</sup>

**7. 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. A specific DNA sequence in a DBD (a recognition sequence) or a DNA from the general interest can be detected. Some DNA-binding domain and may be included in the folder structure of nucleic acids. DNA-binding domain of one or more additional domains are often part of a larger protein, consisting of various actions. Additional DNA-binding domain in a domain often controls. DNA binding of the two roles sometimes overlapping functions with the structural or involved in transcription regulation. 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 proteins involved in DNA binding domain contains. For example, proteins called transcription factors that regulate transcription by binding DNA. Most of the cellular signaling cascades, as described in the final output of gene regulation. DBD DNA, a DNA sequence - a sequence of specific or non - specific ways of interaction with the nucleotides, but not - in order - and the proteins involved in specific recognition of DNA tests on some of the complementarily of molecular order. 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. But, anyway, DNase I am familiar with a specific 3-D structure of DNA, the DNA cleavage patterns in a way that a technique called DNA recognition by DNA foot printing may be useful for studying its contributors. Many of the specific DNA-binding domain 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).<sup>[14][15][16]</sup>

**8. RETINA RECOGNITION:** A retinal scan, more correctly, the "iris scanner" is usually confused with a biometric method of identifying patterns that are unique to a person on the retina. There are other people in the - based technology, iris recognition can not be confused. The retina is a thin tissue of the posterior neural cells that formed the eye. Capillaries that supply blood to the retina with a complex structure, unique to each person's retina. Retinal blood vessels in the network is so complex that even identical twins do not share a similar pattern. Although retinal patterns, diabetes, degenerative diseases of the retina or glaucoma may be altered, usually the retina remains unchanged from birth until death. Due to its unique and immutable nature, from the retina to be the most specific and reliable biometric. That it supports scanning of the retina that is the only one in a million that the error rate is estimated to have been resolved. A retinal scan is a biometric identifier, known as a person's retina patterns unique to the map. Blood vessels in the retina absorb light more readily than the surrounding tissue and easily find the appropriate lighting. A retinal scan is a low-energy infrared light in a person's eyes as they are stealthy scanner beam pattern of the eyepiece is performed by the study. The standard path of the light beam of a trace on the retina. The retinal blood vessels in the lid to rest more than absorbing the light, it may be a reflection

of the amount of scan time. Converted into computer code and pattern variations are to be stored in a database.

**9. 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  $\mu\text{m}$ ) to detect the radiation and the radiation image, the thermograms of production. All objects above absolute zero, since the infrared radiation of the black body radiation is emitted in accordance with the law, thermography, with or without visible illumination, it is possible to see where your environment. The amount of radiation emitted by an object increases with temperature, therefore, thermography, one can see from the temperature variation. 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. Maintenance technicians to overheating and power lines in the joints, the use of thermography to detect signals that are near failure. 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.

**10. GAIT RECOGNITION :** Gait analysis of systematic research on animal locomotion, human studies offer a more specific, eye and brain of the observer, using body movements, body mechanics, and instrumentation for the measurement of muscle activity. 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 jakhamera used to help identify. Survey quantification, ie the measurable parameters of gaits and the introduction of the analysis, as well as an explanation encompasses, ie 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. Dynamics to compute, most Labs floor - on the transducers are fitted to the load, force platform, ground reaction forces and the magnitude, direction and position (called the load center), with pain, also known as size. Spatial distribution of forces can be measured pedobarography equipment. To add to the dynamics of each body part, Newton-Euler motion about each joint in each stage of the gait cycle of the net and the ball Computations based on the equation of time to be able to solve equations. The computational method for the inverse kinematics is known as. 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. For example, many labs are also attached to the skin surface electrodes from the electrical activity of the electromyogram (EMG) to detect, using the leg of a muscle. This is the way to some degree, their level of activation - which to assess their contribution to the gates of muscle activation times, and can be investigated. 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<sup>[17][18][19]</sup>

**11. KEY STROKE RECOGNITION :** Keystroke dynamics biometric where the keyboard or the keypad on the behavior 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. The raw measurements are available from the keyboard to record most of the time (when a key is pressed) and Flight Time ("What's up" and later "the bottom" of the time), the bus can be set. 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. This is the power and sophistication of the techniques used vary widely, and statistical techniques from artificial intelligence and neural - nets range. Keystroke dynamics is a behavioral 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 behavioral Biometric Body, or use DNA as a Biometric authentication is not as reliable. The reality here is that the behavioral measure of confidence in the use of Biometrics, a instead of the traditional pass / fail criteria. For example, the false accept rate (until now) and false reject rate (FRR) is a linear relationship to traditional benchmarks. Keystroke dynamics benefits (such as other behavioral Biometrics) is away from the FRR / personal level, the threshold can be changed regularly. 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. <sup>[20][21]</sup>

**12. 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. <sup>[22][23][24][25]</sup>

**13. 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. ID, a biometric finger vein authentication system, which previously received data will be matched with a different finger in the vascular pattern. Hitachi finger vein ID system improved and a 2005 patent. 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. For approval before the finger and compare the scan data is sent to the registered image 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. Based on biometric fingerprint system fitted with an artificial finger with a copy of the fingerprint can not be fooled; voice and face of nature - based system for recording and using high-resolution image can be fooled. Finger vein ID system is much more difficult, because it allows only a living person's fingers can fool. <sup>[26][27]</sup>

**14. BODY ORDER RECOGNITION:** Body odor or body odor is present in both animals and humans, and the intensity of the (behavioral 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. <sup>[28][29][30]</sup>

### 3. Conclusion

This paper briefly reviews the presents notions and ideas associatiated with the biometric techniques for recognition of users of system.

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