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Heartbeat Biometric Authentication- An Updated Surrey

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ABSTRACT

Heartbeat biometrics are believed to be highly accurate and similar B. For fingerprint or retina recognition .There are a variety of wearable devices, but the largest uses an electrocardiogram (ECG) Widespread now. This white paper also includes heartbeat biometrics Electrocardiogram. This topic was chosen because the inherent human electrocardiogram cannot be erroneous. created or restricted like any other biometric data such as fingerprint or retina Cardiac biometric authentication that realizes high safety and certainty and is useful for personal identification .However, his lost current ECG-based biometric algorithm is computationally intensive or resort to relatively large ECG samples that are incompatible with the above Application Areas Here we present methods with low computational cost, including simpler methods. A mathematical operation that identifies a person from just three of her ECG morphologies Characteristics of a single heartbeat

Introduction

Human authentication has become an important aspect of daily life . One of the causes is the growing application of technology to improve human activity and lifestyle. Human authentication or unique recognition is generally how humans demonstrate the uniqueness of their use of services by demonstrating their originality. Passwords and tokens are common , traditional types of authentication ,yet each associates with disadvantages: passwords are easily guessed, therefore easily stolen ,for example, just through "shoulder surfing." Moreover , most password authentication methods offer insufficient security levels, increasing the risk of un authorised access. They include the widespread use of easily   memorised   passwords, simple password combinations, and the practice of writing down difficult-to-remember passwords.a token can also simply be lost, making it hard to issue many new passwords over time. biometrics, however, resolved these password and token problems .Attributes of biometrics cannot be lost, destroyed, or stolen by physical access, unlike passwords and tokens. Moreover, the features of biometrics are very difficult to hack because a real person must use it today,millions of people use online applications to purchase goods. Reduce the possibility of hacking, we need an authentication system with high security like fraud.

WHY BIOMETRICS IS IMPORTANT?

Biometric arrangements are based on physical, corporal, and behavioral traits.Unique among individuals .Anatomical features are based on representative body parts that are not light weight Features observable by humans,such as the shape of a face or hand.Physiological biometrics are directly involved Measurement of human body parts such as ear recognition,mark, touch print,iris recognition Heartrate detection Some behavioral characteristics reflect individual characteristics psychology.Traditional biometrics are getting better,but they also have their peculiarities and weaknesses.Traditional biometrics found in fingerprints,retinas,human facial recognition,etc.are inconsistent High performance,high cost, non-standard,low useradoption,and impedes collectability. not yet Heart beat biometrics can solve the current hort comings of traditional biometrics.Biometrics works primarily using heartbeat signals detected from the livingbody .there are some Benefits of Heartbeat Biometrics

WHY HUMAN HEART BEAT CAN BE ACCURATE BIOMETRIC IDENTIFIER ?

Researchers say **that human** heartbeat characteristics can be used as **biometrics** to identify **individuals** with high accuracy. The **research** is being **conducted** by **a** research **team at** the Universidad Carlos III de Madrid **(UC3M),** Spain, in collaboration with the Shahid **Rajayi** Teacher Training **College,** Iran. According to an announcement on **UC3M's** website, this can be done by analyzing **an electrocardiogram** (ECG) and **his** five characteristics associated with music. These qualities, **including** dynamics, rhythm, timbre, **pitch,** and tonality, are applied to the **heartbeat sounds** from which measurements are **taken.** The combination of these parameters is unique **to** each person and can be used for identification with **96.6%** accuracy in **the first experiment.** Research team members say this **"heartbeat biometric"** identification system **is superior to** other forms of **biometrics. This is because** some people cannot be identified using certain **biometrics** due to **injuries** or other human and natural factors. **On** the other hand, **heartbeat** is a **biological signal that** all **people have** without **exception. "Biometrics** based on cardiac **recordings have** been studied for **many years and have proven** to be effective. From there, we analyze **that** sound wave using qualities commonly used to characterize **music: heartbeat** biometrics for **authentication** or one-to-one **matching is more established** than the same modality for one-to-many **matching using B-Secur, which received** FDA

clearance for its ECG solution last **year.According to researchers, the** identification **technique** is still scientific and technological **It is in commercial development** and **is committed** to **completing research before considering commercialization. According to** the **researchers, analyzing systems** based on a **person's activity (walking,** running, resting, **exercising,** being in stressful **situations, etc.)** is **an important** area **of research.**

HEART BEAT AS A BIOMETRIC TOOL?

ECG is a linear representation of **the motion of the heart muscle.** The myocardium (the **muscle** layer of the heart) **periodically** contracts and **relaxes, causing** cellular **oscillations. An electrocardiogram** converts electrical signals from cells into **graphs** that can be **deciphered** by **an expert.** This type of test can **provide** valuable information **about many abnormalities related to heart rhythm that can lead to** heart disease, heart attack, and heart **failure.** When extracting information from an **electrocardiogram, the expert considers her** five **factors** usually associated with music and **sound. Treat** dynamics, rhythm, timbre, **pitch** and **quality** as sound **waves in nature.** In this way, **the electrocardiogram is converted** into **an** audio **file** that can be used to identify **individuals** and distinguish them from **others**

USES AND RESTRICTIONS

A biometric system that **uses** heartbeats **has** two purposes: **Authentication** or identification, **research** writes. **Authentication** mode is used to verify a person's **identity. The** system **verifies** if **this** person is who they say they are. The identification **process** compares **a person's characteristics to** those stored in **a** database to find out who that **person** is. These systems are useful in **a variety of areas, including: B. Security (inside the enterprise), government,** police (to identify criminals), transportation, and **most recently** as a payment method. Ultimately, **for** this type of **procedure,** the heartbeat could be a better biometric identification tool than fingerprints, facial features, eyes, or other methods currently in use. After all, everyone has a **mind,** but the same cannot be said **for** other parts of the body. Some are **crippled,** others have suffered **injuries** that **have** led to **amputations and deformed** facial features. Pregnancy **can** also **change** the normal rhythm of the **heart muscle. Your** body **will change with your** baby. **Increases blood volume by** up to 50% and **increases** heart **rate.** During labor, the heart is also **overloaded due to sudden changes in** blood flow and **pressure. Heart rate** can **also** be **affected** by daily **activities such as** running, exercising, **sleeping,** or **by** strong **emotions such as** anger, stress or **fear. Since heart rate changes with age, age must** also be **taken into account, so** the **biometric** information **must** be constantly updated in the system. Biometric systems have been **around** for a long time, **ensuring security** and efficiency. **The heartbeat** seems to **have taken hold around here** and has become the **newest identification tool. It's** still being tested, but experts believe the approach will pay off in the long **run.**

ADVANTAGES OF HEART BEAT BIOMETRICS

1) **Immediately available**

An **undeniable** advantage of heartbeat biometrics over other modalities is its **24/7** availability. **Some** modalities **such as** fingerprint, face, voice, **and** gait biometrics may be **excluded** for some **individuals** due to injury or other **reasons.**

2) Improved accuracy

There is **an arms race going** on between digital **identity** systems and **scammers. As biometric** AI gets smarter, **scammers** are experimenting with **ways** to **trick** facial recognition **systems. For example,** wearing **a mask,** wearing **asymmetrical** makeup, tilting the head at a certain angle, using lasers to disable **the camera,** or wearing **an infrared** LED **hat** that **confuses the camera. Others.**

3) Safer

Heartbeat biometrics **provide an additional level of security.** Fingerprint systems leave **a residue** that can be **exploited. Facial** recognition applications are **full of** information that **can be harmful** if mishandled. On the other hand, **as** an internal biometric, heartbeat biometrics **are** much **more difficult** to **counterfeit, steal,** or **spoof.**

4) Continuing Certification

Another **advantage** of heartbeat biometrics over other modalities is continuous authentication. **Passwords** and fingerprints are a **"one-time" method, while heartbeats** effectively send credentials every **second, allowing for uninterrupted authentication. Also,** the ECG is inherently **a "live" signal,** providing the ultimate **in** presence **detection. In other words,** the person **must** be physically present for authentication to **occur.**

5) Portable

Miniaturization of ECG **equipment** has proven to be **beneficial** for **heart rate** biometrics. **In fact, the** Apple **Watch** has successfully implemented ECG for years. **The company** has patented an application **that uses the watch's** pulse oximeter to determine the biometric signature of a user's heartbeat. **This** data is used to **identify the user** and unlock the **watch,** much like **his** TouchID or FaceID **on** the iPhone.

DISADVANTAGES OF HEART BEAT BIOMETRICS

Misinformation

Stolen **biometric data** can be used to **generate** false positives. **A false positive** in **biometrics** means **that** the system incorrectly accepts **a** user as a match. False positives occur **because the** data used for authentication **is stolen** or **because the faces are** very **similar.**

Scanner compatibility

If you have long or different eyelashes, the scanner **may have trouble** registering **your device's** retina **lock.**

Expensive

A **secure** and reliable biometric system can **be** expensive. **Manufacturers must maintain user security features, biometric** reliability and **durability.**

Malfunction

A system error can cause the biometric software to **fail. Insufficient** power **can** lead to biometric **system failure.**

privacy issues

Employers can misuse **employee** fingerprint **data. Therefore,** employee or **individual privacy may** be **at ris**

APPLICATION OF HEART BEAT BIOMETRICS

Identification

Justice/Law Enforcement

mobile biometrics

Banks and financial institutions

network login solution

PC/laptop security

time and **existence**

biometrics in healthcare

CHARACTERISTICS OF HEART BEAT BIOMETRICS

1. Stability:
   The heartbeat signal is sustained and stable

2. **Robust:**
   Cardiac signals are robust because they cannot be **tampered with.**

3. Accuracy:

   These features **allow** the system **to achieve** the highest accuracy.

4. Uniqueness:

   Since our heartbeat patterns are unique, so are **the** heartbeat intervals. **Allow these** variation uniqueness.

HOW HEART BEAT BIOMETRICS COULD BE THE NEXT BIG THING?

it has to do with specialized cells that **cause the** electrical impulses **that cause** the **heart to pump.** These **electrical surges** create **waveforms** that can be measured **on** an electrocardiogram (**EKG** or EKG). Five **features** are considered **Dynamics,** rhythm, timbre, pitch, tonality. **Together, these** parameters form a unique heartbeat signature for each **individual, which** can be used **for identification. This experiment shows** an accuracy of **96.6%.** According to researcher Carmen Cámara **of the** Carlos III **University of** Madrid, biometric **authentication** based on **heart recordings** has been **shown** to be effective. **"The** main novelty of our **study** is that we look at ECG **recordings,** which **are transient signals,** as if **they were.**

YOUR HEART BEAT CAN GIVE AWAY YOUR IDENTITY ,LIKE A FINGER PRINT?

Like our fingerprints and faces, **our heartbeats** are unique. The **characteristic** waveforms **produced** by **the expansion** and **contraction of the heart** differ from person to person **and** can be **distinguished. In other words, your heart rate** could serve as **your biometric. It is** a unique physiological characteristic that can be used to identify **individuals.** Some scientists **believe that your** heartbeat could be a better identifier than the fingerprints **you**

use to unlock **your phone today. Startups are now creating discreet** heart monitors that can detect drowsiness **while driving** or **provide permanent** user authentication in high-security **factories.** These monitors could eventually replace fingerprint scanners **in smartphones and** key fobs **used** to enter office **buildings,** a **researcher in the computer science department** at the University of **Oxford told OneZero. Authentication** via **beats** comes with its own privacy **concerns. In particular, the** heartbeat is a window into **a person's** emotional state and **health. It's hard to ignore the** potential **exploitation** of **biometrics** hidden **within us, sending** data every **second. Heartbeat provides** continuous authentication. **Typing a password** to access **a** secure **application, or swiping your finger once, can cause your** heartbeat **to** send **the** password **virtually** every **second.**

CONCLUSION

But even with **these overwhelming benefits, heart rate** biometrics **are** not without flaws, **so it's wise to keep your expectations in check. Most concerning are** the legal and ethical concerns that **fingerprints do not. For** example, **an electrocardiogram may** contain sensitive information about a person's emotions and health. **If such** data **falls** into the wrong **hands, it can lead to discrimination,** using an employee's heart **disease** as a pretext for **dismissal. Of course, a safety barrier should** be **put** in place to **protect your privacy.** Heartbeat biometrics **are significantly** slower than other **modalities, taking him a second to make** a full **beat. It also lags** behind **ultra-fast** fingerprint readers.

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