BIOMETERICS IN FORENSIC SCIENCE

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INTRODUCTION:

Biometrics is one of the most interesting works or a way to solve crimes happening in day-to-day life. It's a science based on the identification of a person by physical and behavioural attributions. The relation between forensics and biometrics is mainly concerned with the identification of a person based on characteristics that include voice recognition, facial recognition, fingerprint, iris, palm prints, ear prints, etc.

Biometric systems make use of characteristics like fingerprint patterns, geometry of hands, iris and facial arrangement, voice prints, etc. Due to these advancements, biometrics is said to be a strong alternative for crime detection. It makes an endowment in crime detection by analysing traces of persons stored in databases, those which rank in identifying persons and result in comparison.

HOW DOES BIOMETRICS WORK?

Biometrics is a solely adopted automated system for identification purposes based on the physical and behavioural characteristics of a person. It extracts a salient feature set from the data and compares the acquired feature set from the crime scenes to the stored data set in databases. A biometric system includes analysis and verification steps.

ANALYSIS: This includes the identification of a person by comparing templates of individuals present in the databases; it conducts many analysing steps to prove the identity of a person.

VERIFICATION: This step includes verifying the person's identity by comparing his own templates in the stored databases.

TYPES OF BIOMETRICS

- FINGERPRINT BIOMETRICS: Fingerprints are the most important evidence that plays a crucial role in crime detection because of their robustness and uniqueness. Fingerprints are the patterns formed by the friction ridges on the fingertips. When a latent fingerprint is collected from the crime scene, these are scanned, and all the minutiae and patterns are noted down by the biometric system and compared with the information stored in the database.

Fig. 1: Fingerprint scanner

- FACE BIOMETRICS: Face biometry-based identification is a technology where a person is identified based on his/her facial characteristics. A picture or a video of a person is collected and matched with a stored copy in the database. The extracted features from this biometric system are based on facial alignment, facial landmarks, etc. When they are compared with the biometric database, it gives the calculated similarity score.

Fig.2: Facial biometric scanning device

- DNA BIOMETRICS: DNA, standing for deoxyribonucleic acid, is an organic biochemical compound that holds all the genetic information of a person. Due to its individuality and uniqueness, it plays an important role in identification. DNA biometrics is done using the biological samples left at the crime scene. The biological samples can be the hair strands of a person, saliva, semen, or anything else that holds biological information about a person. The usage of DNA for analysis is said to be DNA profiling in forensic science.
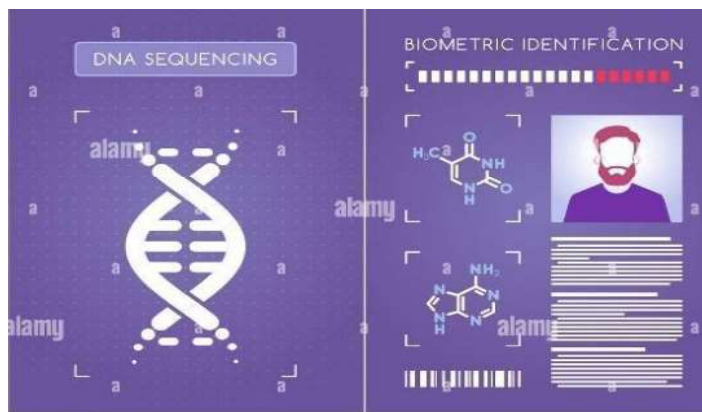

Fig.3: DNA sequencing

- PALMPRINT BIOMETRICS: Besides fingerprints, palm prints also play an important role in forensics. They have the same patterns, valleys, and ridges as on fingertips. They do play an important role in identification. The area of the palmar region is much higher and broader than that of the fingers, so the palm print databases in palm print biometrics provide a positive identification for investigators.

In palm print biometrics, high-resolution palm prints are captured, and all the minutiae characteristics are collected and stored in the databases

Fig.4: A palmprint biometric scanner

VOICE BIOMETRICS: Voice biometrics deals with the voice identification of a person because the voice is also a kind of trait available to a person. If the voice is the only available evidence found related to a suspect, then it is extracted from sources like gadgets (telephones, mobiles, etc), and it is compared with the available recordings or databases.
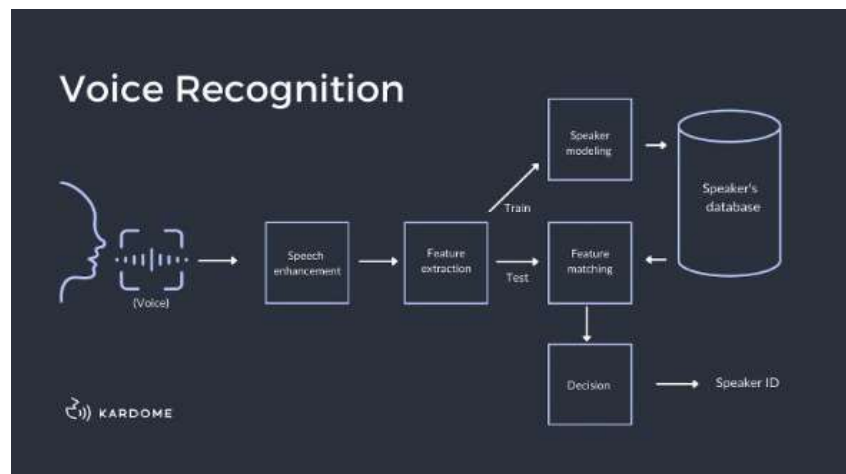

Fig.5: Working of a voice biometric detector

IRIS BIOMETRICS: It is a kind of identification based on the patterns of the iris of an eye. The iris is an annular white region bounded by the pupil. So, when the suspect is under custody, his/her iris features are compared with the available iris databases, and the similarity score is calculated.
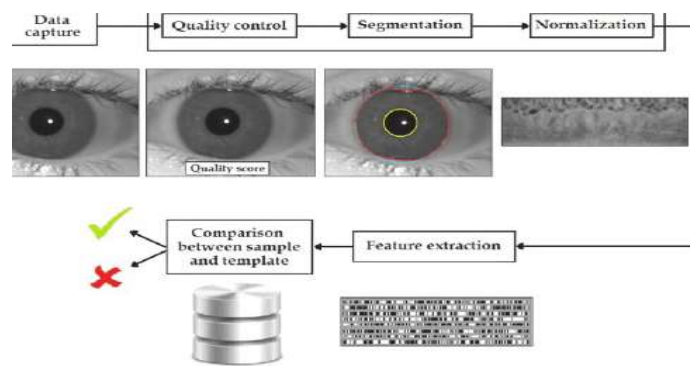
Fig 6: Iris recognition base algorithm

BIOMETRICS AND FORENSICS

Biometrics and forensic science make a good combination in crime detection. In spite of having similarities, they also have differences among them. They work on different approaches. Forensic science works after the event occurs, whereas biometric technology works before. The evidence found by forensics is unknown, but in biometrics, the information of the data is already known and needs to be verified.

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