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IRIS RECOGNITION FOR SAFETY

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Abstract: Iris recognition is an automated method of biometric identification that uses mathematical pattern-recognition techniques on video images of one or both of the irises of an individual's eyes, whose complex patterns are unique, stable, and can be seen from some distance. The discriminating powers of all biometric technologies depend on the amount of entropy they are able to encode and use in matching. Iris recognition is exceptional in this regard, enabling the avoidance of "collisions" (False Matches) even in cross-comparisons across massive populations. Its major limitation is that image acquisition from distances greater than a meter or two, or without cooperation, can be very difficult.

Keywords: Iris, Biometric, Pattern-Recognition, Collisions, Entropy, Acuistion

1. INTRODUCTION

Iris authentication technology is believed to have evolved from another very well-known technology, retinal authentication. Iris scanning technology was first proposed in 1936 by an ophthalmologist, Frank Burch. He stated that each person's iris is unique. The probability of its coincidence is about 1078, which is much higher than with fingerprinting. According to the theory of probability, in the entire history of mankind, there have not yet been two people with the same iris. In the early 90s, John Duffman of Iridian Technologies patented an algorithm to detect the iris of the eye.Scientists have conducted several studies showing that the human retina can change over time while the iris remains unchanged. It is impossible to find two completely identical patterns of the eye's iris, even in twins.Glasses and contact lenses, even colored ones, will not affect the imaging process in any way. It should also be noted that the performed operations on the eyes, removal of cataracts, or implantation of corneal implants do not change the iris's characteristics; it cannot be altered or modified.

2. HOW IRIS RECOGNITION WORKS

Iris scanning measures the unique patterns in irises, the colored circles in people’s eyes. Biometric iris recognition scanners work by illuminating the iris with invisible infrared light to pick up unique patterns that are not visible to the naked eye. Iris scanners detect and exclude eyelashes, eyelids, and specular reflections that typically block parts of the iris. The final result is a set of pixels containing only the iris. Next, the pattern of the eye’s lines and colors are analyzed to extract a bit pattern that encodes the information in the iris. This bit pattern is digitized and compared to stored templates in a database for verification (one-to-one template matching) or identification (one-to-many template matching).

Iris scanning cameras may be mounted on a wall or other fixed location, or they may be handheld and portable. Researchers at Carnegie Mellon University are developing long-range scanners that could even be used to capture images surreptitiously from up to 40-feet away. A blind person can also be identified using the iris of their eye. As long as the eye has an iris, its host can be identified. The iris' texture resembles a network with many surrounding circles and patterns that can be measured by a computer. Iris scanning software uses about 260 anchor points to create a sample. In comparison, the best fingerprint recognition identification systems use 60-70 point.

3. FEATURES OF IRIS RECOGNITION

- Highly accurate and fast, iris recognition boasts of having top-class precision among different types of biometric authentication technologies.
- Remains unchanged throughout life. (This does not constitute a guarantee.)
- Since the iris is different between the left and right eye, recognition can be performed separately by each eye.
- Possible to distinguish twins.
- As long as the eyes are exposed, iris recognition can be used even when the subject is wearing a hat, mask, eyeglasses or gloves.
- Because of using an infrared camera, recognition is available even at night or in the dark.
- Without the need to touch the device, contactless authentication is possible, making it hygienic to use.

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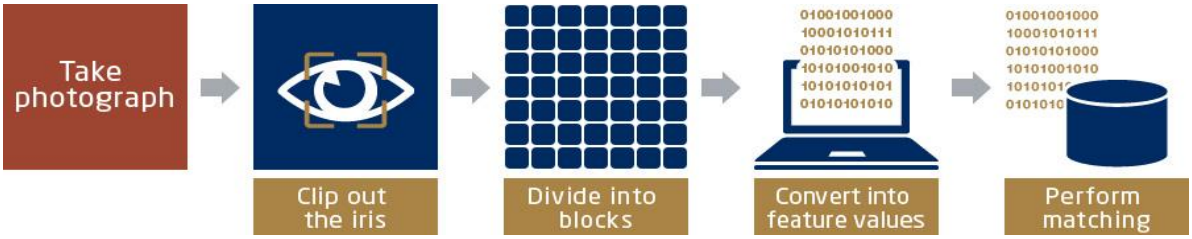
4.MECHANISM OF IRIS RECOGNITION

- First, the location of the pupil is detected, followed by detection of the iris and the eyelids.
- Unnecessary parts (noise), such as eyelids and eyelashes, are excluded to clip out only the iris part, which is then divided into blocks and converted into feature values to quantify the image.
- Matching is then performed with feature data previously extracted in the same methods.



4.1 Immigration Control

- The iris is photographed, and the image is matched with the government's immigration control database during exit or entry procedures at the passport control booth, enabling rapid and stringent personal authentication.
- Our solution provides improved security through stringent recognition, as well as improved convenience through smooth authentication procedures.

4.2 National ID

- Iris recognition is used as one of the methods for acquiring biometric data needed for issuing unique IDs.
- Accurate and fast authentication is possible even without an ID card.
- Combined use with mutually complementary biometric data, such as fingerprint and face, enables rigid personal authentication and a robust approach against impersonation.
- In addition to National ID, the solution is suitable for passports, driver's licenses, and voter ID systems.
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4.3 Crime Investigation

A multimodal biometrics database for managing multiple biometric authentication data is created by taking images of the face, fingerprint, and palm print, as well as the iris.

- Combining with fingerprint and other biometric authentication systems enables more accurate identification of an individual.
- Combined use of biometric data allows recognition even when the fingerprint, for example, could not be used for identification due to injury.

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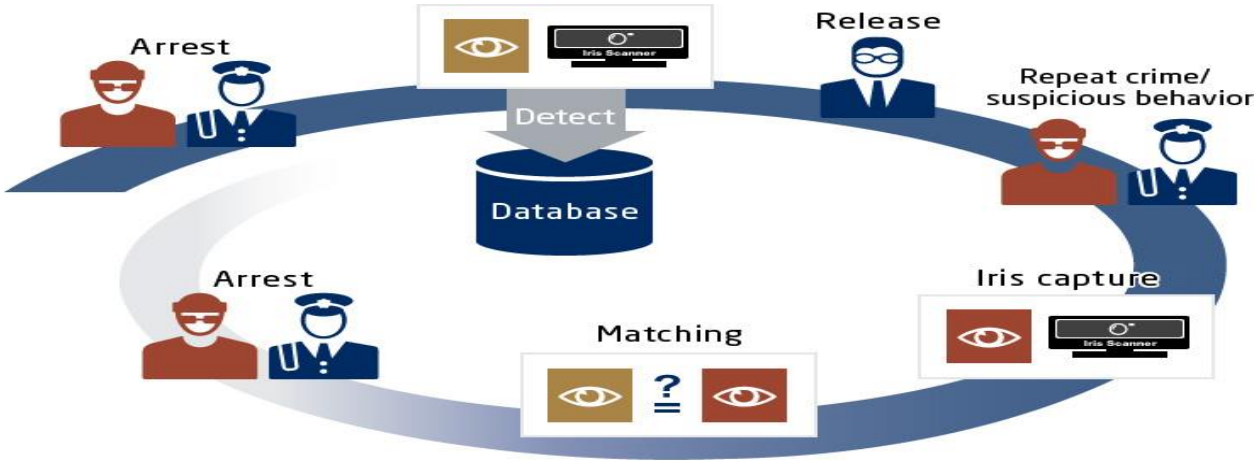

5. HOW ACCURATE ARE IRIS SCANNERS?

The iris is one of the unique biometric characteristics used for identification. During verification, about 260 key points are used (in comparison, fingerprint verification uses about 16 key points). Simultaneously, the template itself takes up a small amount of memory, which allows you to quickly authenticate a user and use massive databases with relatively little computing resources.

Access control and accounting systems with iris identification have FAR — 0.00001% and FRR — 0.016%. According to the NIST (National Institute of Standards & Technology), iris recognition accuracy is 90-99%. ScienceDirect has also conducted a study that showed 100% effectiveness using the iris recognition method.

6. FUTURE OF EYE SCANNING

Iris recognition remains one of the most promising biometric technologies for personal recognition. Especially in demand is the realization of the iris' potential for use in non-contact scenarios identification and a face image — and possibly other contactless biometric identifiers.Therefore, the most relevant research directions are to improve recognition in non-invasive scenarios due to improving sensors, improving the system's informative signs, and integration with other modalities. Of particular interest is the use of the iris in cryptographic applications and secure identification.Eye scan recognition has certain advantages over other biometric technologies that make this technology one of the most preferred mobile devices. In recent years, several companies have introduced smartphones equipped with iris authentication technology. Biometric authentication is a promising technology that will eliminate the usual authentication schemes using a password. This will increase the convenience of working with the device, and at the same time, increase the level of protection of personal data.

7. USE CASES

Iris recognition's use cases range from national citizen ID programs, to physical access control for organizations, to border management and defense. Iris recognition can also be used as a form of mobile authentication on those devices with special IR-enabled cameras; for example, the Samsung Galaxy S8 and S9.

8. CONCLUSION

Iris recognition remains one of the most promising biometric technologies for personal recognition. Especially in demand is the realization of the potential of the iris for use in non-contact scenarios identification together with a face image and possibly other contactless biometric identifiers. Therefore, the most relevant research directions are to improve recognition in non-invasive scenarios due to improving sensors, improving the system's informative.

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