Egyptian Atomic Energy Authority
Nuclear Research Center
Department of Nuclear Reactors
First Egyptian Research Reactor

Biometrics security and privacy protection

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The scope

- The scope of this work is to provide an overview of various methods that used for preserving the privacy and security of the individual's biometrics data including:

  - ➢ Encryption techniques
  - ➢ Visual cryptography
  - ➢ Biometric watermarking
  - ➢ Steganography
  - ➢ Cancellable biometrics, and
  - ➢ Hybrid methods

physical protection system

- Physical security at nuclear facilities is an important licensing and design consideration.
- The ultimate objective of the physical protection system (PPS) is to prevent the accomplishment of unauthorized overt or covert actions to nuclear facilities and nuclear materials.
- Access Control Systems are one of the main pillars of physical protection

What is the Purpose of an Access Control System?

- To prevent unauthorised persons from gaining access to all or part of a given area.
- To allow access of authorised people to given area.

Automatic ACS Equipment (minimum requirements)

- Method of identification.
- Controllable door lock or release.
- Controller.
- Appropriate power supply.
- Communications between the items.
- Method of exit .

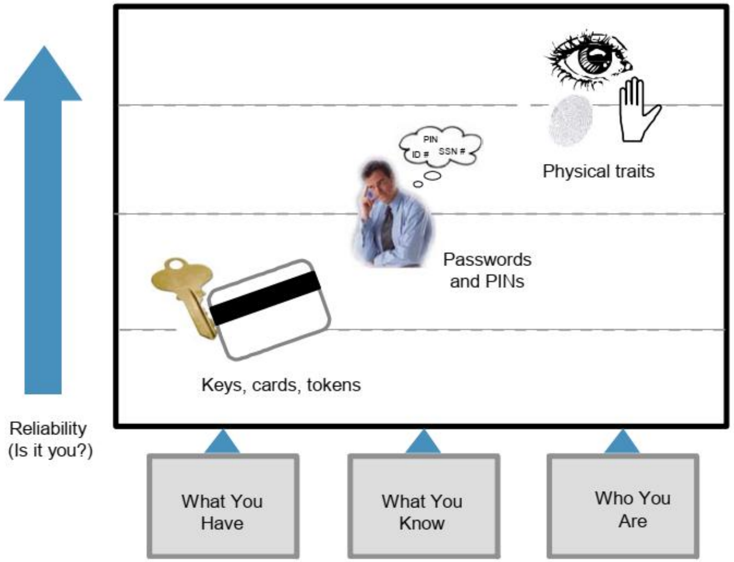
Identification technology

- Identifying people methods fall into three main categories of increasing reliability and increasing equipment cost

❖ What you have

❖ What you know

❖ Who you are



Individual Characteristics for Biometrical Identification of a Person

- Hand outline (HandKey)
- Fingerprint
- Retina
- Voice
- Iris

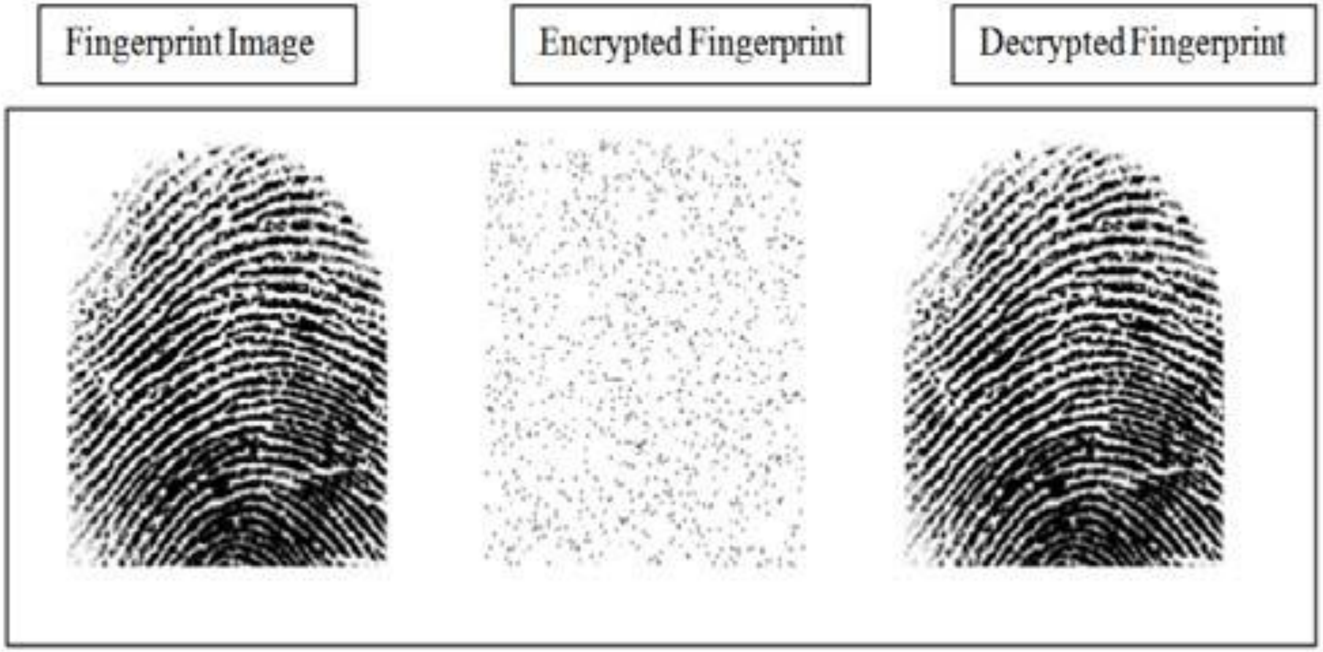
biometrics security and privacy concerns

- Biometrics cannot be revoked or canceled
- Biometrics is not secret.
- Cross application invariance and cross-matching

- So biometrics definitely is sensitive data and therefore should be properly protected.

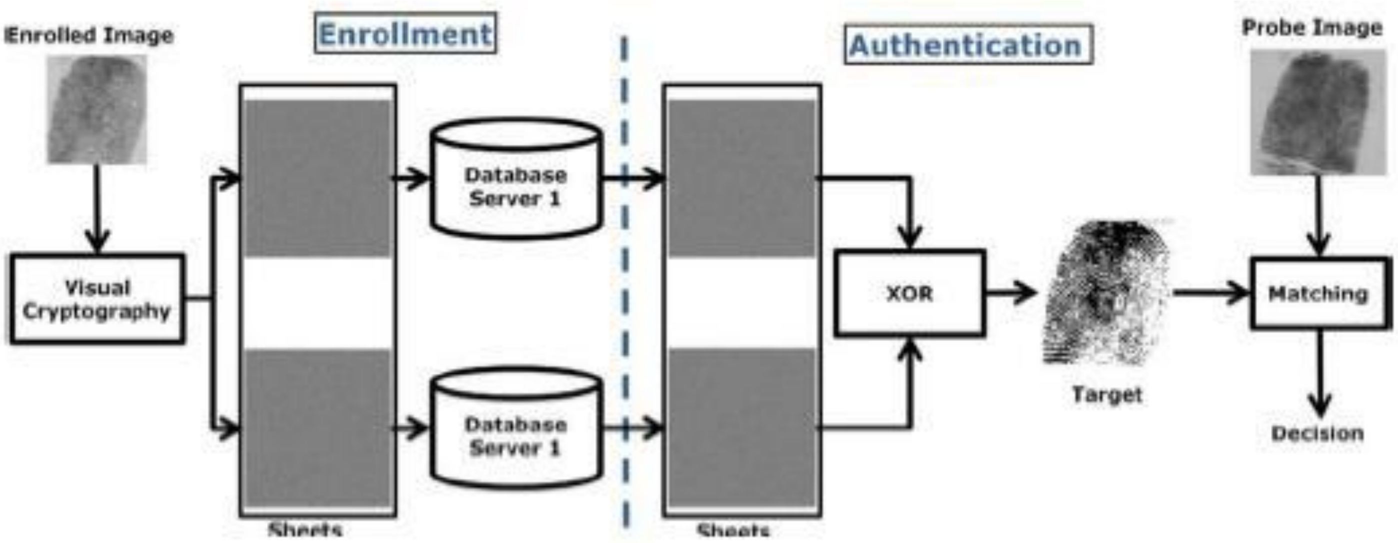
Biometrics security and privacy protection strategies

1- Encryption techniques



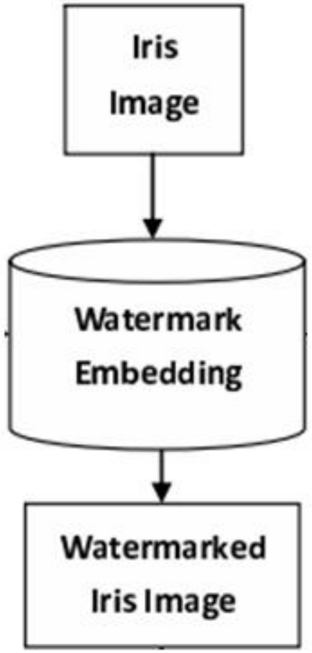
Security Schemes for Biometric securing

2- Visual Cryptography Technique



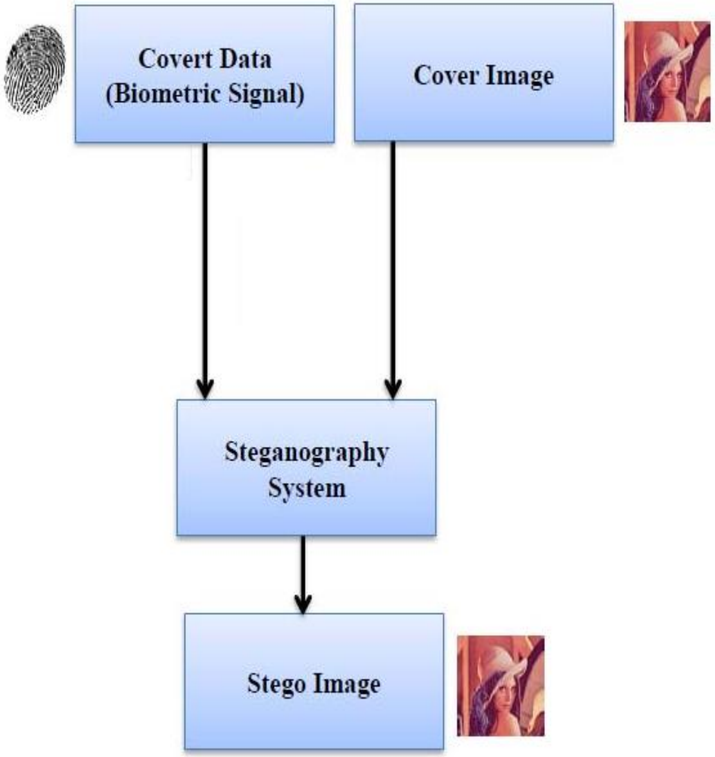
Security Schemes for Biometric securing

3- Biometric watermarking



Security Schemes for Biometric securing

4- Steganography Techniques



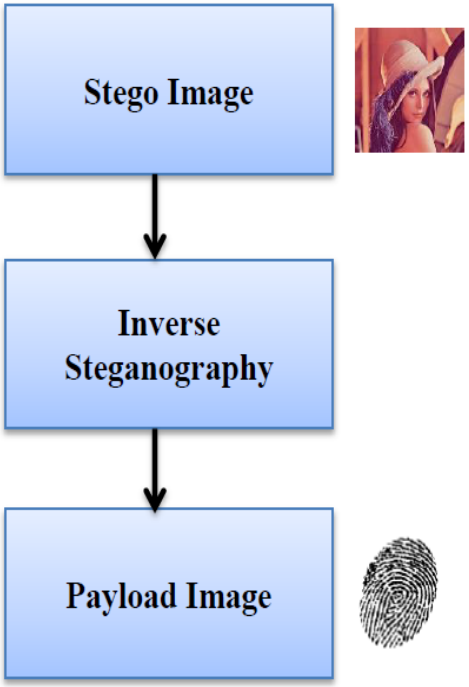
Covert Data (Biometric Signal)

Cover Image

Steganography System

Stego Image

Embedding Algorithm



Stego Image

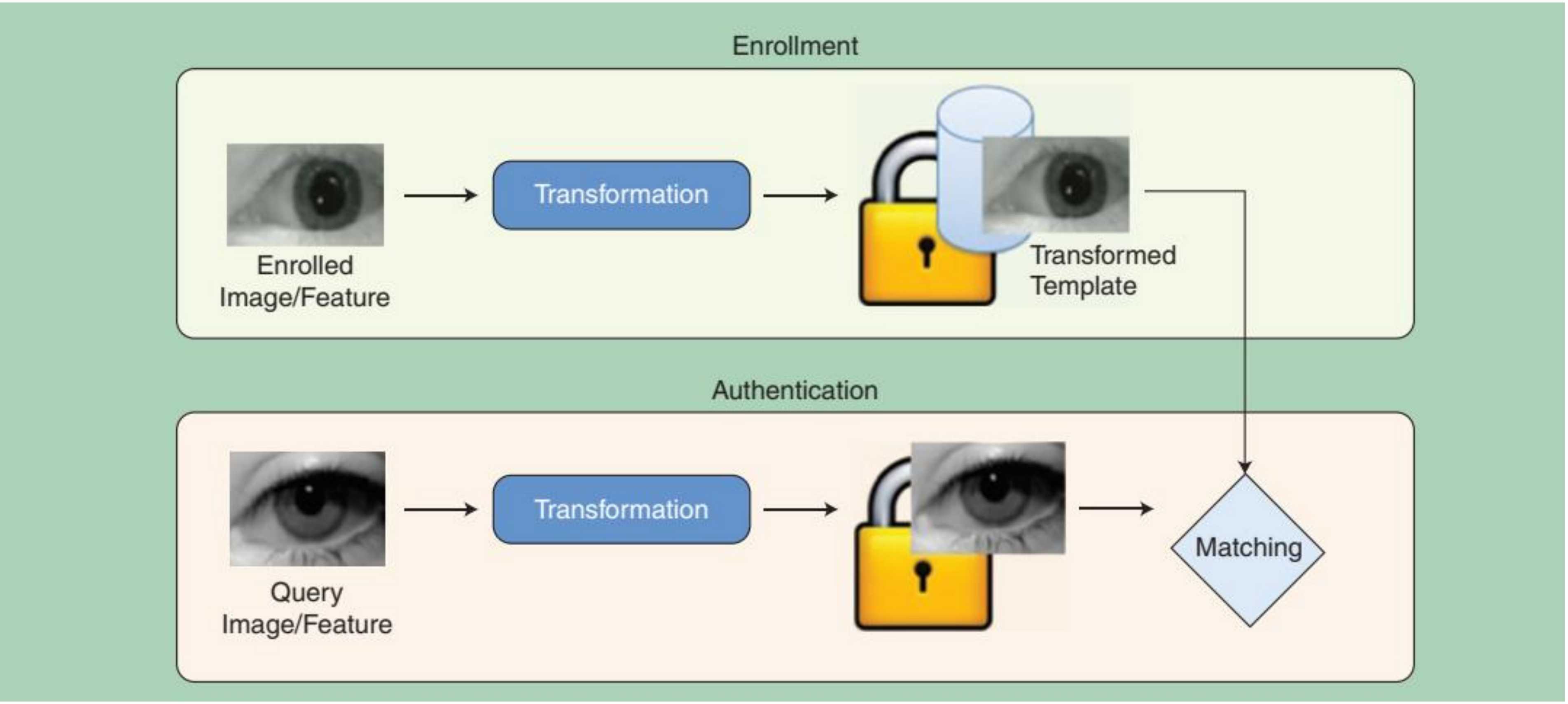
Inverse Steganography

Payload Image

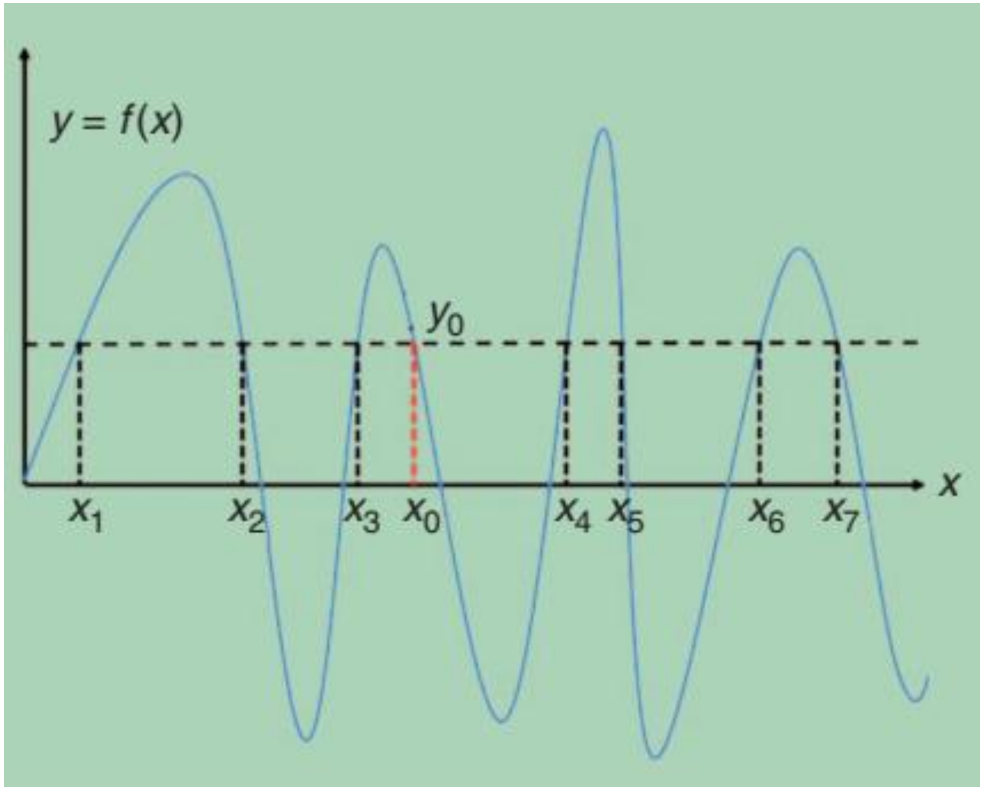
Extraction Algorithm

Security Schemes for securing Biometric data

5- Cancelable biometric

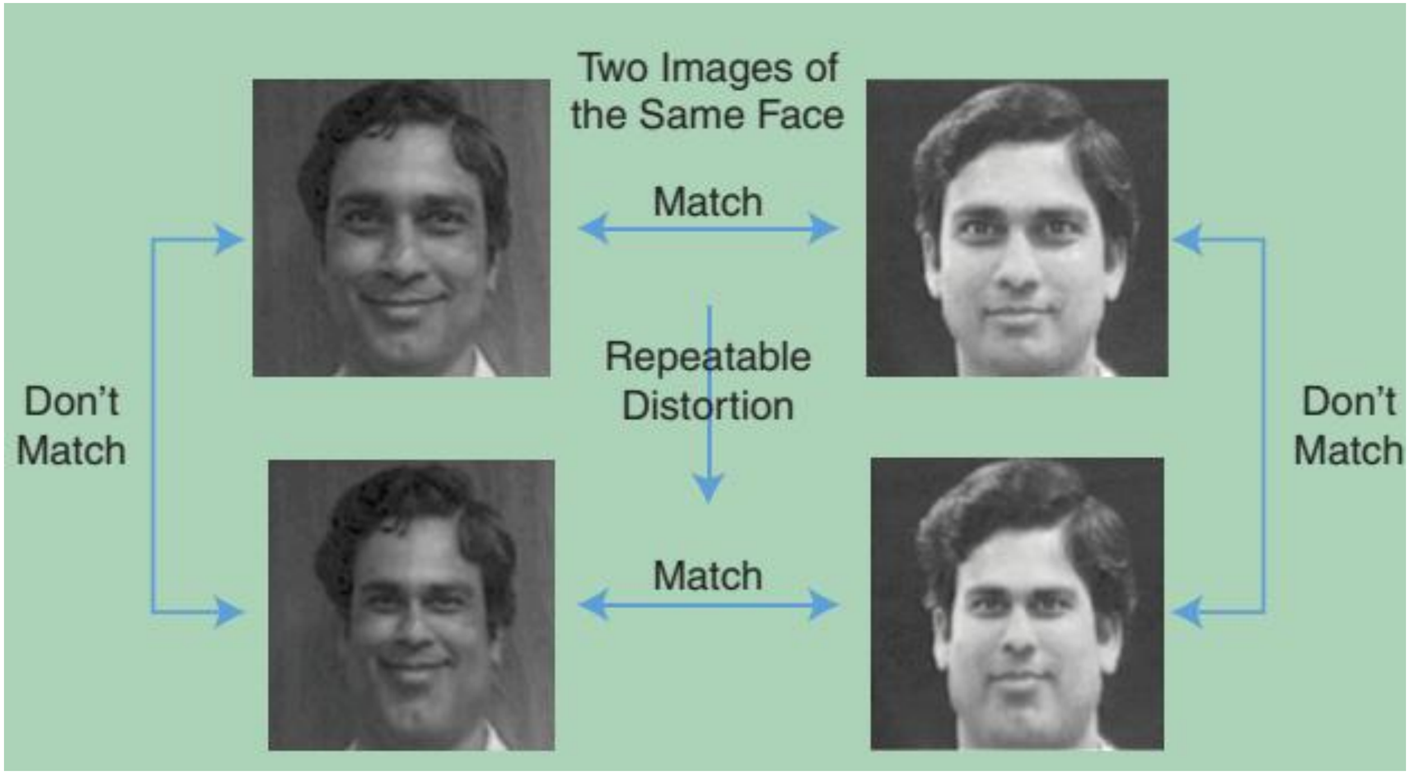


Cancelable biometric example applied in the feature domain for fingerprint biometric



Feature-domain nonlinear transformation example for fingerprint biometrics. each minutiae (feature) position is transformed using a noninvertible function.

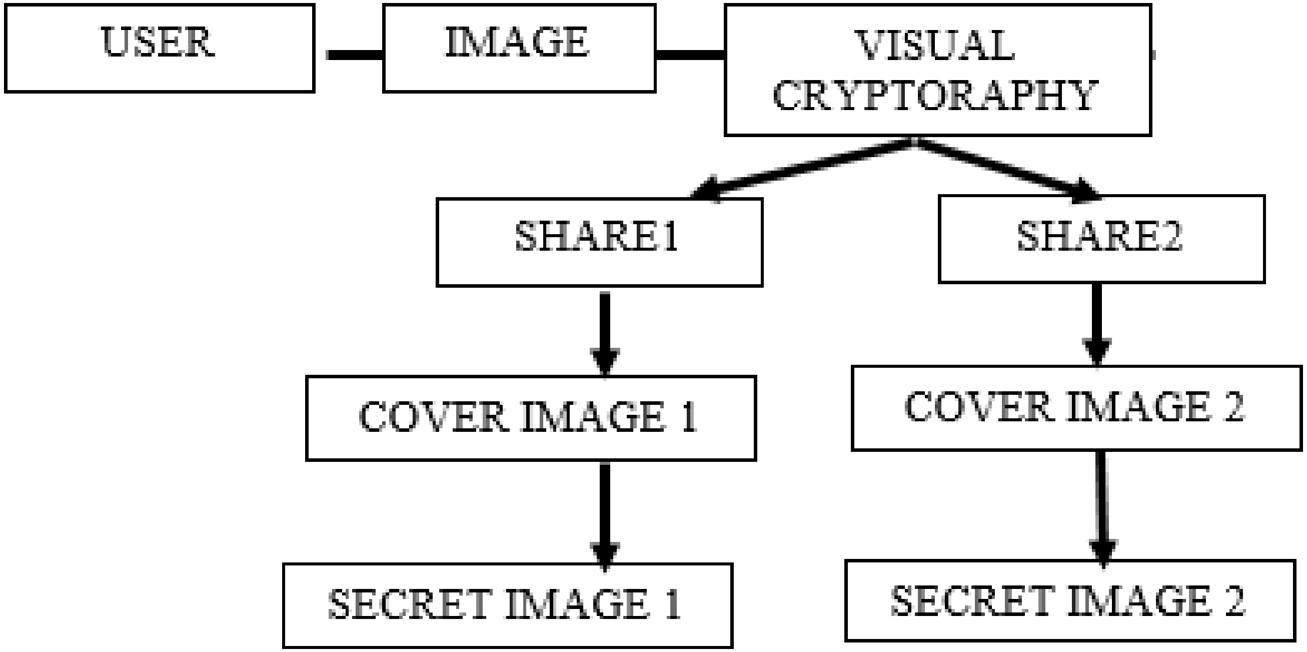
Cancelable biometric example applied in the signal domain for face biometric.



Security Schemes for Biometric securing

6- Hybrid methods

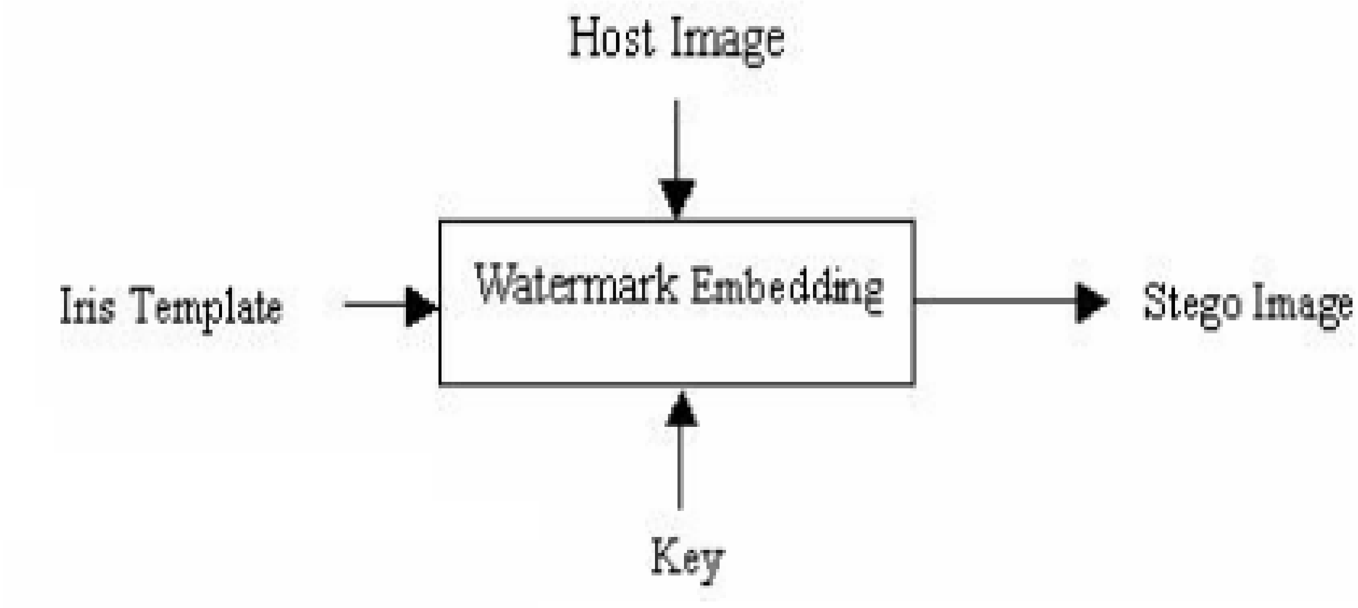
Combination of Visual Cryptography and Steganography



Security Schemes for Biometric securing

6- Hybrid methods

Combination of watermarking and steganography scheme



Conclusion

- Nowadays, biometric technologies provide a reliable solution for identity verification problem that allows restriction access to confidential data via unauthorized users.
- With the widespread deployment of biometric systems in various applications, there is an increasing concern that biometric technologies can be compromised and misused by any attacker.
- So, biometrics definitely is sensitive data and therefore it should be properly secured.
- This article presented a review of recent protection schemes developed for preserving the privacy and security of biometrics data which included encryption techniques, visual cryptography technique, watermarking, stegnography, cancellable biometrics and hybrid methods.
- cancellable biometric scheme has been widely recognized as one of the desirable solutions towards more secure biometrics.

Thank you for your attention