

Holographic Encryption of Multi-Dimensional Images and Decryption of Encrypted Multi-Dimensional Images

Communications & Information

Computer/AI/Data Processing and Information Technology

Digital Broadcasting, Telecommunication and Optoelectronics

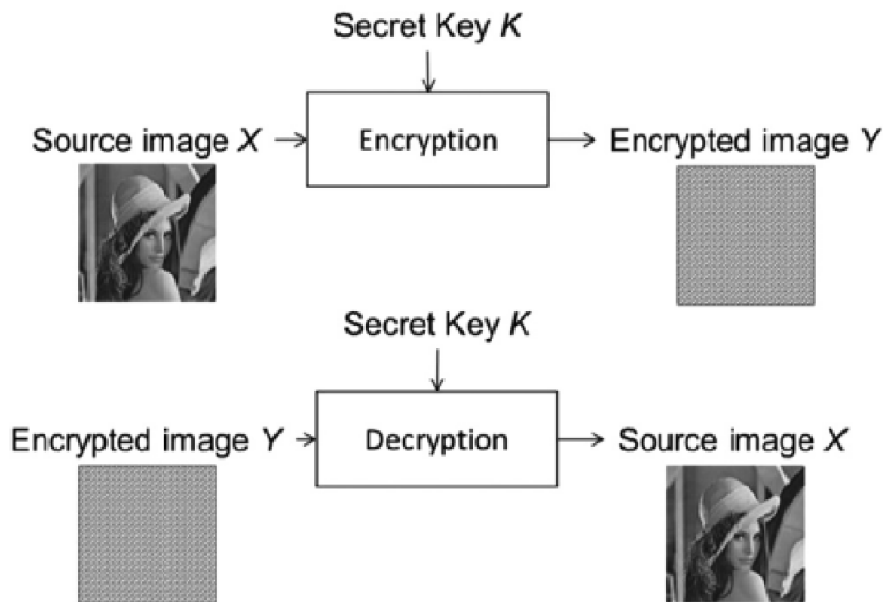



Fig. 1. Concept of encryption and decryption.

IP Status
Patent granted



Technology Readiness Level (TRL) ?

3

Inventor(s)

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Opportunity

Image encryption has been an area of immense interest for many decades, as it protects pictorial contents that are dedicated to a targeted community of illegitimate viewers. The technology has found numerous important applications in the consumer, industrial, commercial, communication, and military sectors.

In the encoder, a source image is converted into a new form (generally referred to as the ciphertext) with the incorporation of a secret encryption key K . In the decoder, the ciphertext would be reverted to the source image if the correct secret key is input. Failure of an image encryption can lead to serious monetary loss and security breach. Research on developing sophisticated image encryption methods has been conducted vigorously for many years.

Technology

The invented technology relates to cryptographic techniques for encrypting images, and decrypting and reconstructing images in order to facilitate preventing unauthorized access to images. A holographic cryptographic



component (HCC) generates complex holograms of multi-dimensional source images of a multidimensional object scene. The HCC generates phase holograms, based on the complex holograms, using a stochastic hologram generation process, and encrypts the phase holograms to generate encrypted holograms based on a random phase mask, which can be the private encryption key. At the decoding end, an HCC overlays a conjugate phase mask on the encrypted holograms to decrypt them, wherein the decrypted holograms are illuminated with a coherent light source to generate holographic images that reconstruct the source images. The source images are only reconstructed properly if the correct phase mask is used. If HCC applies the encryption process repetitively to the same source image, it can generate a different encrypted hologram in each run.

Advantages

- Simple encryption and decryption processes without change of image source.
- Simple optical setups and computational efficiency for decoding in numerical realization.
- Highly resistant to different kinds of attacks.
- Favorable reconstructed image quality.

Applications

- Security in image and holographic communication system against unauthorized access to video and image data, and copyright protection.
- Applicable to the encryption of large source image(s).
- Applicable sectors including Consumer, industrial, commercial, communication, and military, etc.

