

Random Matrix Transformation and Its Application in Image Hiding

ABSTRACT

Image coding technology has become an indispensable technology in the field of modern information. With the vigorous development of the big data era, information security has received more attention. Image steganography is an important method of image encoding and hiding, and how to protect information security with this technology is worth studying. Using a basis of mathematical modeling, this paper makes innovations not only in improving the theoretical system of kernel function but also in constructing a random matrix to establish an information-hiding scheme. By using the random matrix as the reference matrix for secret-information steganography, due to the characteristics of the random matrix, the secret information set to be retrieved is very small, reducing the modification range of the steganography image and improving the steganography image quality and efficiency. This scheme can maintain the steganography image quality with a PSNR of 49.95 dB and steganography of 1.5 bits per pixel and can ensure that the steganography efficiency is improved by reducing the steganography set. In order to adapt to different steganography requirements and improve the steganography ability of the steganography schemes, this paper also proposes an adaptive large-capacity information-hiding scheme based on the random matrix. In this scheme, a method of expanding the random matrix is proposed, which can generate a corresponding random matrix according to different steganography capacity requirements to achieve the corresponding secret-information steganography. Two schemes are demonstrated through simulation experiments as well as an analysis of the steganography efficiency, steganography image quality, and steganography capacity and security. The experimental results show that the latter two schemes are better than the first two in terms of steganography capacity and steganography image quality.