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A symmetric image encryption scheme based on 3D chaotic cat maps

Communicated by T. Kapitaniak

Guanrong Chen ^a ... Charles K. Chui ^{c, d}

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Abstract

Encryption of images is different from that of texts due to some intrinsic features of images such as bulk data capacity and high redundancy, which are generally difficult to handle by traditional methods. Due to the exceptionally desirable properties of mixing and sensitivity to initial conditions and parameters of chaotic maps, chaos-based encryption has suggested a new and efficient way to deal with the intractable problem of fast and highly secure image encryption. In this paper, the two-dimensional chaotic cat map is generalized to 3D for designing a real-time secure symmetric encryption scheme. This new scheme employs the 3D cat map to shuffle the positions (and, if desired, grey values as well) of image pixels and uses another chaotic map to confuse the relationship between the cipher-image and the plain-image, thereby significantly increasing the resistance to statistical and differential attacks. Thorough experimental tests are carried

out with detailed analysis, demonstrating the high security and fast encryption speed of the new scheme.



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