A new image encryption algorithm based on single s-box and dynamic encryption step

ABSTRACT

Chaotic-based S-box image encryption schemes promise to be a practical solution for securing digital images. However, the high-dimensional continuous chaotic has increased the algorithm's complexity. Recent alternatives that focused on double or multiple S-boxes approaches, on the other hand, have been proven vulnerable to differential attacks. This paper presents an efficient and secure chaotic-based S-box image encryption scheme. Firstly, a single S-box with a size of 10 × 26 was constructed by using a low-dimensional chaotic system. Without a complex mathematical operation, the constructed single S-box has obvious efficiency advantages and achieved a higher image entropy rate than recent double or multiple S-boxes. Secondly, a new dynamic encryption step method is proposed to solve the high correlation and deterministic problems in multiple S-box encryptions. Under the control of the dynamic encryption step algorithm, it effectively destroys the correlation between the source image's pixels. The experimental results and security analysis show that the proposed scheme enjoys higher security and is more efficient to secure digital images in real-world applications.