

# Enhanced Diffusion and Confusion Based Encryption Algorithm Using Differential Evolution and Chaotic Mapping

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## Abstract

Encryption is critical to protecting sensitive data, especially images, against potential illegal access and breaches. The use of chaotic maps for image encryption is widespread among researchers. However, it is necessary to set up initial parameters for chaotic maps in order to generate random sequences. These parameters need to be selected with care. To determine the optimal initial parameters for image encryption, evolutionary optimization techniques have been used. This paper proposes an optimized image encryption approach for secure image-based communication. The approach uses the differential evolution optimization method, which is an ideal solution in terms of convergence speed to optimize the parameters of the chaotic map. Furthermore, the security parameters of these techniques are evaluated, including entropy, Number of Pixel Change Rate (NPCR), Unified Average Changing Intensity (UACI), and correlation coefficients. The simulation results of the proposed encryption approach by combining arnolds cat map, chaotic logistic map and optimization method show that the encrypted image is safe against attacks.

**Keywords:** arnold transform, chaotic encryption, differential evolution, logistic map function, metaheuristic optimization