

# **Development of an Image Encryption Algorithm using Latin Square Matrix and Logistics Map**

## **ABSTRACT**

The goal of this study was to develop a robust image cryptographic scheme based on Latin Square Matrix and Logistics Map, capable of effectively securing sensitive data. Logistics mapping is a comparatively strong chaos system which enciphers with an unpredictability that significantly reduces the chance of deciphering. Additionally, the Latin square matrix stands out for its uniform histogram distribution, thereby bolstering its encryption's potency. The consequent integration of these algorithms in this study was therefore grounded in the scientific rationale of establishing a strong and resilient cypher technique. The study provides a new chaos-based method and extends the application of the probabilistic approach to the domain of symmetric key image encryption. Permutation and substitution approaches of image encryption were deployed to address the issue of images volume and differing sizes. The issue of misplaced pixel positions in the image was also adequately addressed, making it an effective method for image encryption. The hybrid technique was simulated on image data and evaluated to gauge its performance. Results showed that the algorithm was able to securely protect image data and the private information associated with them, while also making it very difficult for unauthorized users to decrypt the information. The average encryption time of 184( $\mu$ s) on seven (7) images showed that it could to be deployed for real-time systems. The proposed method obtained an average entropy of 7.9398 with key space of  $1.17 \times 10^{77}$  and an average avalanche effect (%) of 49.9823 confirming the security and resilience of the developed method.