

ABSTRAK

Perkembangan teknologi digital menuntut peningkatan keamanan data, salah satunya melalui steganografi yang menyisipkan pesan ke dalam media seperti gambar. Penelitian ini mengimplementasikan metode *Least Significant Bit* (LSB) untuk menyisipkan file gambar ke dalam citra digital berformat BMP 24-bit. LSB memodifikasi bit paling tidak signifikan pada setiap piksel, sehingga perubahan visual sulit dideteksi. Penelitian ini juga menerapkan *Initialization Vector* (IV) untuk mengacak pesan (*shuffling*) dengan tujuan meningkatkan keamanan data tersembunyi. Evaluasi dilakukan dengan metrik *Mean Squared Error* (MSE) dan *Peak Signal-to-Noise Ratio* (PSNR). Hasil menunjukkan bahwa penyisipan hingga 100% kapasitas masih mempertahankan kualitas visual gambar, dengan PSNR > 50 dB dan MSE rendah. Penggunaan IV terbukti menambah kerahasiaan tanpa menurunkan kualitas gambar secara signifikan. Hasil ini menunjukkan bahwa kombinasi LSB dan IV efektif dalam menyisipkan pesan secara aman dan efisien dalam citra digital.

Kata kunci: steganografi, LSB, citra digital, BMP, *Initialization Vector*, MSE, PSNR

ABSTRACT

The development of digital technology requires increased data security, one of which is through steganography, which embeds messages into media such as images. This research implements the Least Significant Bit (LSB) method to embed image files into 24-bit BMP format digital images. LSB modifies the least significant bit in each pixel, making the changes visual changes are difficult to detect. This research also applies Initialization Vector (IV) to shuffle messages with the aim of improving the security of hidden data. Evaluation was conducted using the Mean Squared Error (MSE) and Peak Signal-to-Noise Ratio (PSNR) metrics. Results show that embedding up to 100% capacity still maintains image visual quality, with PSNR > 50 dB and low MSE. The use of IV was proven to enhance confidentiality without significantly degrading image quality. These results demonstrate that the combination of LSB and IV is effective in securely and efficiently embedding messages within digital images.

Keywords: steganography, LSB, digital images, BMP, Initialization Vector, MSE, PSNR