

## ABSTRACT

In the digital era, multimedia plays a crucial role in disseminating information across the globe. Multimedia content such as audio, video, and images can be easily accessed and shared, but they are also at high risk of misuse and copyright infringement. Image watermarking is a method used to protect multimedia content by embedding secret information into a carrier image, thereby safeguarding copyright. Although digital image watermarking is an effective method, it also faces challenges, particularly from attacks aimed at damaging or removing the watermark. Therefore, a robust watermarking algorithm scheme is required to protect multimedia content from attacks. This research proposes a modified turtle shell based watermarking scheme to improve the insertion capacity and robustness against attacks. In this scheme, Least Significant Bit (LSB) technique is used to embed the watermark image and modified turtle shell technique for watermark coordinate mapping. We evaluate imperceptibility using Peak Signal to Noise Ratio (PSNR) and Mean Opinion Score (MOS). The average PSNR result obtained in the proposed method is 51.24 dB and the MOS value is 4.48. We also evaluate the robustness of the watermarked image against attacks such as Gaussian Noise, Salt and Pepper, Compression, Low Pass Filter, Rescaling, Speckle Noise, and Median Filter using BER parameters. The BER before the attack is zero, and after the attack results in varying BER values. The results show that the scheme is robust against Gaussian Noise (BER: 0.08), Salt and Pepper (BER: 0.003), and Speckle Noise (BER: 0.003) attacks, but less robust against Compression (BER: 0.13), Low Pass Filter (BER: 0.45), Rescaling (BER: 0.43), and Median Filter (BER: 0.45) attacks.

**Keywords:** Image Watermarking, LSB, Robustness, Turtle Shell .