FPGA Implementation of Robust Image Steganography Technique based on Least Significant Bit (LSB) in Spatial Domain

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Abstract

There are many different data hiding techniques, the Least Significant Bit (LSB) based steganography algorithm is considered as one of the most popular algorithms in the spatial domain. In this paper, the proposed algorithm embeds data in each component of color image, where the signature of the transmitter and the length of the secret text are hidden in Red component, while the binary bit stream of the secret text is hidden in Green and Blue components of the color image. After embedding, the three components are re-combined to form a stego-image. The stego-image is passing through a communication channel and a noise may be added to it. At the receiver, the hidden text can be extracted from the noisy stego-image without any knowledge of the original image after applying a filtration in the pre-processing stage. The embedding and extracting processes in the proposed algorithms are performed using MATLAB and implemented on a field programmable gate array (FPGA) using Xilinx system generator (XSG) based on Hardware/Software Co-simulation. The implementation of the proposed algorithms on FPGA has the advantages of using an embedded multipliers and
large memory. The Mean Square Error (MSE) and Peak Signal to Noise Ratio (PSNR) are used to check and measure the statistical distortion between the cover image and stego-image, while the Normalized Cross Correlation (NCC) is used to evaluate the degree of closeness between them. The experimental results are showing the efficiency of the proposed algorithms as well as proving that embedding larger size of data with better results of MSE and PSNR.

References


Index Terms

Computer Science      Image Processing

Keywords
Image Steganography, LSB, MSE, PSNR, NCC, MATLAB, FPGA and XSG.