ABSTRACT

Transferring a medical image from one place to another place or storing a medical image in a particular place in a secure manner has become a challenge. To overcome this, secure medical image Lossless Compression (LC) schemes have been proposed.

The original input grayscale medical images are encrypted by Tailored Visual Cryptography Encryption Process (TVCE) which is a proposed encryption system. To generate these encrypted images, four types of processes are adopted which play a vital role. These processes are Splitting Process, Converting Process, Pixel Process and Merging process. The encrypted medical image is compressed by three proposed compression algorithms, i.e. Pixel Block Short algorithm (PBSA), Modified 4-Bit Run Length Encoding (RLE) and Modified 8-Bit Run Length Encoding (RLE) along with these compression algorithms two of the conventional Lossless Compression (LC) algorithms have been adopted (RLE and JPEG 2000LS). The above said five compression methods are used to compress the encrypted medical images separately. And also, decompressions have been done in a separate manner. The
encrypted output image which is generated from decompression of the various proposed compression algorithms, RLE and JPEG 2000LS are decrypted by the Tailored Visual Cryptography Decryption Process (TVCD). To decrypt the encrypted grayscale medical images, four types of processes such as Segregation Process, Inverse Pixel Process, 8-Bit into Decimal Conversion Process and Amalgamate Process were involved. From these processes, five original images have been reconstructed which are the outcome of five compression algorithms.

Ultimately, five combinations are compared with each other based on the parameters of Picture Quality, Time, Size, Correlation Coefficient, Mean Squared Error (MSE) and Compression Ratio are considered for analyzing the best algorithm. Using the proposed combination, the size is reduced to 85% of the original image size and 98% of the encrypted image size. Apart from this PBSA combination, the modified 8-Bit RLE combination provides a better performance in the field of secure compression. These techniques can be implemented in the field for storing and transmitting images of X-Ray, MRI Scan, CT scan, Coronary Angiogram and Ultrasound Scan in a secure manner. The Confidentiality, Integrity and Availability (CIA property) of a medical image have also been proved by the experimental results.