

## Abstract

In the modern health care facilities, medical images have been used as one of the objects to diagnose the patient. Digitally formatted medical images is easier to be stored and distributed but also easier to be modified for illegal purposes. This illegal modifications of medical images can be very dangerous because can affect doctor's diagnosis. So, a system that can verify the integrity and authenticity of medical images is needed.

Digital image watermarking offers a solution to protect digital medical images. By embedding fragile authentication watermark, the watermarking system can detect and localize the tampered area of medical images. Moreover, by embedding the feature extraction in the form of average intensities of the image, an original image can be recovered from the tampered image

In this final project, a watermarking scheme using LSB Modification is used to perform tamper detection and recovery in the ROI. To make this watermarking scheme *reversible*, RLE is used to embed the original LSBs in the RONI.

The experimental results show that this watermarking system can detect and localize tamper from block modification, sharpening, and brightness or contrast adjustment attack with up to 100% accuracy. This watermarking scheme can also perform image recovery from block modification attack with up to 100% recovery rate.

**Keywords:** LSB Modification, medical image, tamper detection, recovery, RLE, reversible, watermarking