

## ABSTRACT

At this time a lot of data and information is presented in digital format, either in the form of text, images, audio, or video. Problems arise if the digital image is a work that needs to be protected, for example, images from photography, images from remote sensing, medical images, and so on. Examples of problems that arise include ownership issues (ownership), copyright infringement, and authenticity issues. These problems can be overcome by using digital watermarking. Digital watermarking is a technique for inserting certain information into digital data which is called a watermark. Watermarks in digital data can be detected or re-extracted. Watermarking is useful for proving ownership, copyright protection, authentication, fingerprinting, tamper profiling, distribution tracing, and so on.

This final project designs a watermarking system for medical images using DTCWT and Spread-spectrum methods. The medical image watermarking process is divided into two processes, namely the insertion process and the extraction process. The embedding process is done by inserting a watermark image which was previously processed with a random matrix, spread spectrum, and added to the host image with a DTCWT coefficient to produce a watermarked image. While the extraction process is carried out on the watermarked image that has been generated through the embedding process, by performing the DTCWT process to determine the desired subband.

The DTCWT and Spread-spectrum methods used have superior resistance to overcome several attacks that have been tested. The system performance is determined by the BER, PSNR, and NC parameters. In the research that has been done the system has a BER = 0%, PSNR = 52,035 dB, with a NC value = 1 for testing without attack so it can be concluded that the proposed system is able to maintain imperceptibility.

**Keyword :** *watermark, spread-spectrum, DTCWT, PSNR, NC*