

## IMPLEMENTATION OF BCH CODING ON ARTIFICIAL NEURAL NETWORK-BASED COLOR IMAGE WATERMARKING

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**ABSTRACT.** *This study suggests a novel watermarking technique that uses artificial neural networks (ANN) and BCH (Bose, Chaudhuri and Hocquenghem) coding together to protect intellectual property rights of a color image. BCH error correction coding method is used to improve the performance of watermark extracting. With this composed technique, image is divided into sub-blocks, and a bit-sequence which is used to train both ANN and the watermark is added to the selected sub-blocks. In the watermark embedding process, besides embedding the bit-sequence as is, the watermark is embedded by encoding the watermark into the original image through BCH coding method. ANN is trained by using the features obtained from the selected sub-blocks to which the bit-sequence is embedded. The extraction process is implemented by using the trained ANN and the features obtained from the selected sub-blocks to which the encoded watermark is embedded. After the extraction process, the extracted watermark is obtained by using BCH decoding method. The results of the study are obtained by using the watermark as is and by encoding with BCH coding method. By using BCH encoding method, watermark extraction success is considerably increased, especially on the watermark extraction cases with low success rates. The watermark is extracted considerably successfully from the watermarked image after various image processing attacks as well.*

**Keywords:** Color image watermarking, Artificial neural network, BCH coding

1. **Introduction.** According to Moore's Law, computer chips double their output every 18 months. It has butterfly effects on computers' processing power and data transportation speed. As a consequence, the transactions previously made as hardcopy are carried to digital environments. Illegal distribution, duplication and modification of media posed a serious problem in terms of protecting intellectual property. The watermarking process is utilized to prevent this illegality [1,2].

Watermarking is the process of embedding the watermark into the digital media to protect the intellectual property rights. This watermarking process can be performed by visible or invisible embedding [3,4]. The main advantage of visible watermarking is the process of simplifying the identification of the digital media owner. TV logos are an example of this visible watermarking process. The chief advantage of invisible watermarking process is the difficulty of unauthorized elimination of the watermark. However, the high cost of invisible watermarking is the major disadvantage.

Digital watermarking is categorized into two classes, namely, spatial and frequency domain as regards to the embedding domain [5-7]. The watermark is embedded into the least significant bits of the original image in the basic model of digital watermarking system [8]. This method is vulnerable to image processing attacks. Another technique