

# Design and Development of Artificial Intelligence based Model for Securing Digital Content

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**Abstract:** In today's technical oriented world, digital communication has grown proficiently. Owing to the proliferation of World Wide Web and galloping expansion of high-speed Internet, a huge amount of digital contents such as images, videos, audios and texts are easily available and accessible to almost any layman across the globe. With the wide spread use of the Internet in our society, it is greatly facilitated that each and every person can communicate by distributing and exchanging the multimedia content. So, in techno-oriented world modification, manipulation, replication of digital content has become ubiquitous and becoming a serious issue in the present scenario. In addition to this, illegitimate copies of digital data can be handily produced using the advancements in the technology today. As a result, any malicious or unauthorized user can access the original documents namely movies, songs, photographs or texts, henceforth misuse them; leading to somber threats to the rights of content owners. To deal with these problems, digital watermarking with Artificial Intelligence has become advantageous solution for providing ownership of digital content. In this paper, we represent digital watermarking using fusion of Fuzzy Logic and Neural Networks. Moreover, this paper also demonstrates the working of this hybrid technique with various inputs and obtained results.

**Index Terms:** Artificial Intelligence, Digital Watermarking, Fuzzy Logic, Neural Network

## I. INTRODUCTION

In this era when the technology has come so far with a tremendous advancement in high speed internet, anyone can easily distribute pictures, video and text to the entire world. Nowadays, the availability of digital data has been increased rapidly in daily routine. As a result, there is a pressing need to cop up and protect the illegal replication of data and avoid malicious access of digital data. Due to immense spreading of broadband networks, easy copying, and new developments in digital technology, copyright protection or authentication of digital data has become precarious matter. As a solution, digital watermarking is united with Artificial Intelligence technique to afford ownership or endorsement of digital data [12].

## II. DIGITAL WATERMARKING

Digital watermarking is one kind of data hiding technique in which watermark is embedded into the host data. On the basis of requirement, watermark is extracted. The host data can be any digital content like audio, video, images or text; while watermark can be anything like digital signal, pattern, logo,

digital signature or biometric data which is inserted into a digital data to provide ownership of the authenticated users only. Fig. 1 shows different categories of Digital watermarking which can be done according to numerous criterions.

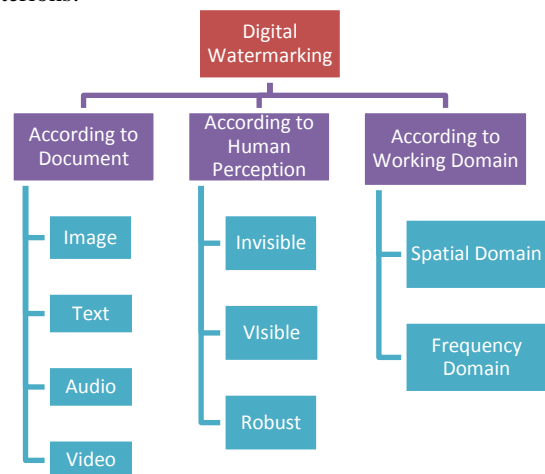


Fig. 1. Classification of Digital Watermarking

Spatial domain focuses on modifying pixels of one or two randomly selected subsets of images. Frequency domain is also called transform domain in which values of certain frequencies are altered from their original. To do so different transform domain methods, such as DCT, DWT, and DFT are used [8].

## III. ARTIFICIAL INTELLIGENCE

Artificial Intelligence is a branch of Computer Science which pursues the creation of computers or machines as intelligent as human beings. Computational Intelligence is a sub-branch of Artificial Intelligence. Computational Intelligence (CI) is the study of adaptive mechanisms to enable or facilitate intelligent behavior in complex and changing environments. A system is called computationally intelligent if it deals only with numerical (low-level) data, has a pattern recognition component, and does not use knowledge in the AI sense. In current trends, Digital Watermarking (DW) using computational intelligence (CI) is presently creates a center of attention from the research area. Many authors and researchers have identified five main paradigms of computational intelligence such as: Artificial Neural

Networks, Evolutionary Computation, Swarm Intelligence, Artificial Immune Systems, and Fuzzy Systems [1].

#### IV. PROPOSED TECHNIQUE FOR SECURING DIGITAL DATA

Here, to secure digital data we have implemented hybrid technique of AI with DW. The proposed system is developed using fuzzy-neuro based watermarking. To provide greater security biometric data such as fingerprints are used as a watermark. Image or video is taken as host data for the proposed technique. The above-mentioned technique includes two modules: watermark embedding and extracting. In watermark embedding process, we input host image or video frame having size 512\*512 and fingerprint having size of 64\*64. Then RGB separation is performed on the inputted data and green plane is selected. After that green plane is

divided into 8\*8 blocks and apply DCT on each sub image. Different HVS parameters such as edge, luminous and text sensitivity are calculated. Then luminous and edge sensitivity both are fed into Fuzzy Inference System as an input. The neural network is trained for frequency sensitivity by obtaining FIS output and texture sensitivity as an input. These values are used in embedding process by doing so the frequency domain coefficients of the sub image are not varied by an unknown quantity, thus the blocks coefficients values remain unchanged even after inverse DCT is applied. While at the extraction side, the trained neural network along with FIS is used so as to obtain a similar set of data which is used to embed the watermark into the host image and by performing the DCT operation the watermark is extracted from the watermarked image. Fig 2. shows the working of the proposed architecture.

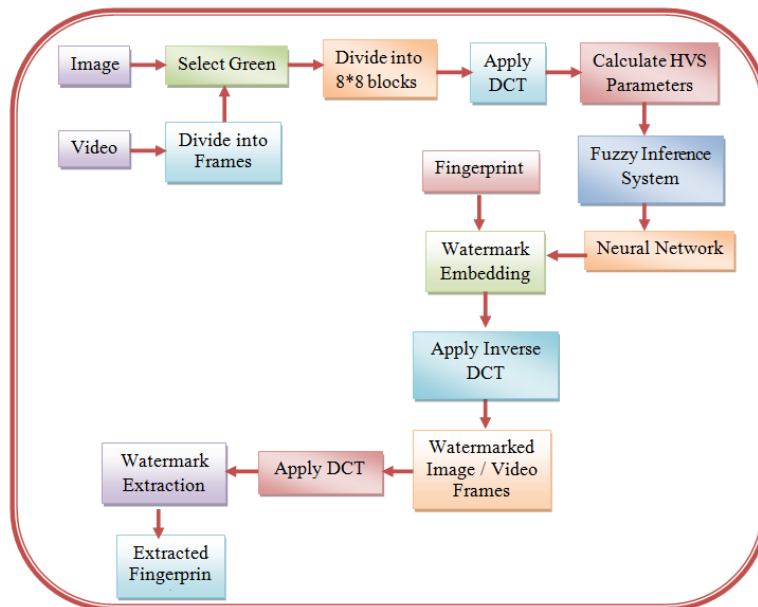


Fig. 2. Proposed Architecture

#### V. RESULTS

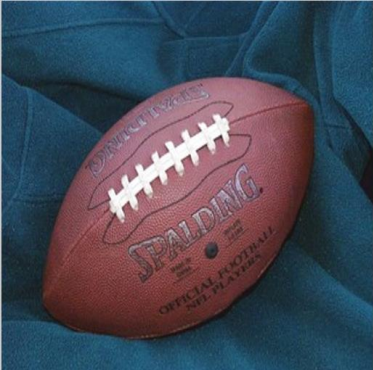

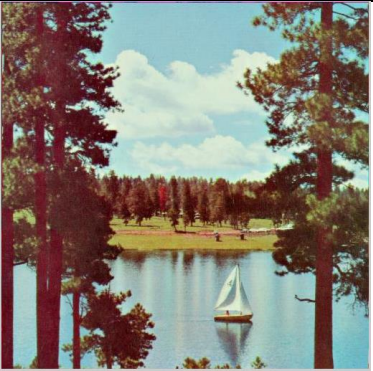
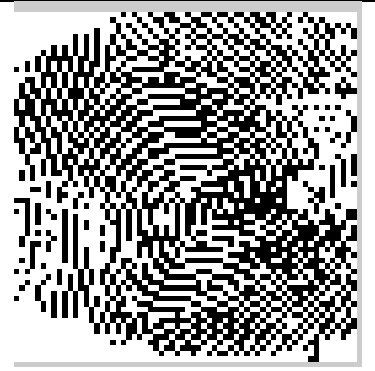

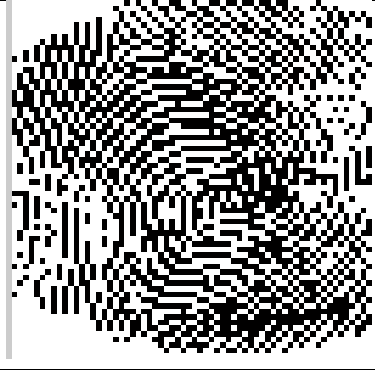

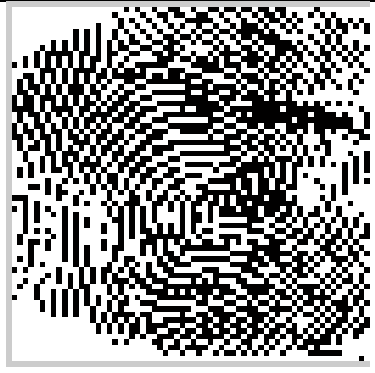
Firstly, user should input the cover image by clicking on “Input Image” button and watermark image by pressing “Input Watermark” button. Fig. 3 demonstrates how watermark is embedded on the cover image when use will click on “Watermark Embedding” button.



Fig. 3. Inputs for Watermark Embedding

Thus, different images are taken as inputs and different results will be obtained which are shown in below table I.

Table I. Watermarked Images and Extracted Watermarks

Cover Image Name	Watermarked Image	Extracted Watermark
Football.jpg		
Boat.jpg		
House.jpg		
Tree.jpg		

By implementing the proposed fuzzy-neuro based image watermarking technique, a perfect observation can be made that this method gives highest PSNR value and generates

more robust watermarked image. PSNR and MSE values for different cover images are shown in below table II.

TABLE II. PSNR AND MSE VALUES USING FUZZY-NEURO BASED IMAGE WATERMARKING

Image Name	PSNR	MSE
Football.jpg	69.341db	0.00757
Boat.jpg	66.932db	0.01318
House.jpg	68.127db	0.01001
Tree.jpg	63.685db	0.02783

For video watermarking, user has to click on “Input Video” button to enter video and similarly click on “Input Watermark” button to enter watermark. Then, watermark

embedding and extracting operations are performed by clicking on “Watermark Embedding and Extraction” buttons. Fig. 4,5 and 6 display the obtained results.



Fig. 4. Inputs for Video Watermarking



Fig. 5. Obtained watermarked video



Fig. 6. Extracted Watermark

When the embedding and extracting process is completed the PSNR and MSE values are calculated and displayed in respective controls. The PSNR value of this is 69.559 db and MSE value is 0.00720.

VI. CONCLUSION

In this paper, a hybrid digital watermarking algorithm combined with computational intelligence is proposed. Here fuzzy-neuro system is used for embedding and extracting the watermark in host that is image or video. In this system, fingerprint is used to embed in the mid frequency band of the

DCT coefficients of cover. In the embedding process the fuzzy-neuro system is used to remember the watermark embedding weights and to retrieve the watermark bits at extracting process. The experimental results show that the proposed algorithm embeds the fingerprint in such a way that the host data will not be distorted and generates robust watermarked data having good PSNR value. In future we will use other medium as host or cover like audio and text with DWT based digital watermarking using computational intelligence technique.

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