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Spatial Domain-Based Robust Watermarking Framework for Cultural Images

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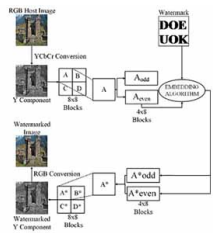
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Abstract

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Framework of the proposed watermark embedding scheme

Abstract: Heritage multimedia, which include photographs, customs, knowledge, arts, rituals, audio, cultural information, and music, are valuable artifacts of any region. The most ... **View more**

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Abstract:
Heritage multimedia, which include photographs, customs, knowledge, arts, rituals, audio, cultural information, and music, are valuable artifacts of any region. The most important attribute of heritage media is the transmission of important features of past generations, which reflect their way of living, innovative attitude, and diversity in archaeological and historical perspectives. However, the proliferation of the Internet has made such data exchange more challenging than ever, allowing unauthorized users to easily access such information. Under such circumstances,

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securing cultural heritage (CH) media is essential. In that regard, herein, we present a spatial domain-based blind and robust watermarking scheme for the ownership verification of colored CH images; this scheme uses DC coefficient modification. In this scheme, the "Y" element of the YCbCr space is used for inserting a watermark. The "Y" element of a host image is divided into non-overlapping blocks with sizes of 8×8. Each 8×8 block is then divided into two 4×8 subblocks. Instead of calculating the DC coefficients using the discrete cosine transform, we independently calculate the DC coefficient of every 4×8 subblock in the spatial domain. We test our method based on standard test images obtained from the USC-SIPI dataset and a self-created dataset of cultural images. Our scheme demonstrates improved robustness and lower computational complexity than frequency-domain-based techniques. The average peak signal-to-noise ratio of the proposed technique for test images is 40.0830 dB, and the structural similarity index matrix value is closer to one under no attack, ensuring the imperceptibility of the technique. Further, we prove the resilience of the proposed algorithm by comparing it with various state-of-the-art techniques.
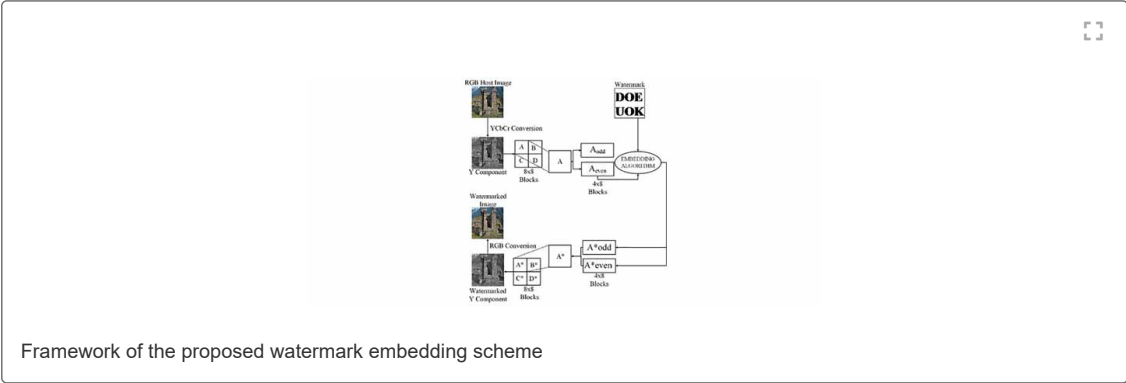
Framework of the proposed watermark embedding scheme

Contents

SECTION I.
Introduction

The term "heritage" refers to the cultures, qualities, and traditions in a region/country that have prevailed over generations and are of great significance to the country. Cultural heritage (CH) is a way of livelihood that mankind has inherited from prior generations and is circumvented to the following generations. CH includes natural heritage (culturally remarkable biodiversity and landscapes), intangible culture (festivals, knowledge, oral traditions, expressions, rituals, and languages), and tangible culture (traditional clothing, artifacts, books, and monuments) [1]. It reinforces the recognition of community culture, thereby enhancing the social economy, and must be leveraged by cultural industries under the protection of intellectual property rights (IPR). Although CH symbolizes an essential asset of a specific society, region, or nation, a justifiable means of its protection is digitization, as proposed by UNESCO in the Convention for Safeguarding the Cultural Heritage in 2003. In addition to ensuring its preservation for future generations, digitization certifies global passage to the various cultures of global heritage and preserves its priceless assets from degradation. However, owing to the rapid advancement in the Internet and the