WATERMARK EMBEDMENT & EXTRACTION USING SUPER PIXEL SEGMENTATION APPROACH FOR IMAGE AUTHENTICATION

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Abstract:

Image forensic, copy protection and medical image segmentation are a key concern in digital image communication over Internet now a day. The bulk of information exchange on the internet users is increasing in exponential way. The issues and related challenges are evenly increasing with regards to image authentication. In current days, the use of image segmentations for watermarking domain has been found to increase the performance which proves the authenticity of image. In the various study, novel characteristic of the watermarking such as super pixel based image segmentation has been studied to embed watermark and help to extract the watermark form the each segments of image. Superpixel segmentation algorithms can be very useful as a preprocessing step for computer vision applications like object class recognition and medical image segmentation etc. Based on this concept proposed work use this idea for developing secure watermarking schemes for authentication of an image. Keywords: Superpixel segmentation, watermarking, image authentication

I. INTRODUCTION

Although traditional data authentication technology for message integrity verification was mature, image authentication and tamper detection is still in its development stage, and many significant questions remain open the aim of this paper is to examine the super pixel watermarking methods for image authentication and tamper detection methods using fragile watermarking techniques [9]. Superpixel segmentation methods has already been shown to increase performance over pixel-based methods compare to existing pixel based methods [10]. Operating on superpixels instead of pixels can speed up existing pixel-based algorithms and improve results in some cases. Block based method ignore the image content and so it fail to detect tampered block exactly. Most of Block based fragile method cannot resists some attacks [3, 4]. Dependency of blocks often leads to ambiguous detection, miss matches of blocks, and decrease of detection performance of tampered region [11]. In proposed work SLIC (simple linear iterative clustering) algorithm follows image boundaries, it is faster and more memory efficient, improves segmentation performance. SLIC based Image segmentation algorithm, a super pixel can be defined as a group of pixels with similar characteristics. It is colour content based segmentation. SLIC algorithm clusters pixels in the combined five-dimensional colour [labxy] where [lab] is the pixel color vector in CIELAB colour space with small colour distance between neighborhood pixels [1] [2].

II. RELATED WORK:

There is a need for analyzing existing methods to understand the nature of problems, identify potential research issues, and evaluate the relative performance of different approaches. Following are some watermarking methods are reviewed. Chetan K.R and Dr. N Shivananda [3] purposed existing fragile watermarking methods usually divide an image into regular size square blocks .This fragile watermarking block based scheme used PN seq, LSB, parity checking for tamper detection .This block based Scheme depends on block size and use grey scale images. W Chen and M Wang [4] proposed block based fragile watermarking scheme with the use of Fuzzy c-mean (FCM) clustering for image authentication and tamper detection. FCM create relationship between blocks of image. It is also effective for attacks like cut and paste and VQ attacks. This scheme consists of two procedures: authentication data embedding and tamper detection. Authentication data is generated by combining the membership matrix with a secret-key-generated random sequence. Authentication data is embedded into two least significant bits (LSBs) of each image block. Generate feature sequence and random sequence by prng with secretes key Sk used for data embedding for authentication. Here author used 8bit grey scale image with different sizes256*256 and 320*240 pixels. The image quality of each watermarked image got through these schemes is greater than 40 dB.
M Saiyyad. et al. [5] proposed dual watermark approach for tamper detection and authentication of image. This Fragile Dual watermark scheme use AES algo, DWT LL band, and hash code for finding tamper and make the image authentic. Author generate first watermark UIC is the decimal number which is encrypted using the AES algorithm which provide efficient way to encrypt the BCD code. After that divide image into block and each block converted into DWT domain up to two level decomposition with LL band. Hash code can be calculated on dual watermark embedded image. If it not matches then image can be tampered. Here author used fragile invisible grey scale image with the size512*512 .They use grey scale image only, various attacks not checked by this scheme. S.P.Mohanty and B.K.Bhargava [6] proposed watermarking scheme for authentication of image embedding and extraction of digital watermark. Author used block segmentation for generating synthetic image, compound watermark contain user watermark and image statistics data and embedded into original image. For watermark creation and insertion process, use DCT domain for block segmentation and PR seed key sequence with

the scaling factor for making watermarked image. During extraction and authentication process author compute IDCT from extracted watermark and PR number. He verified compound watermark image with scaling factor with correlation detector.

If it matches then authentication is proven. Author's algorithm results for grey scale and color image observed that watermark present after most of the attacks with the average PSNR 24dB. P Lin et al. [7] proposed a method for image authentication with localization using fragile block wise and content based watermarking. Here author used encrypted signature for watermark which contain CRC check sum for authentication into specified block location. Author experiments collage and cropping attack with 8*8 pixels and for signature authentication extraction author use block LSB with CBC-3DES for verification check. S Solorio and A Nandi [8] proposed image watermarking method for proving an image authentication. Author used secure block wise and iterative pixel wise method which are experimented to cropping attacks and localize distorted blocks of pixels. Here watermarked image contain pixel wise and block wise embedding with a security key. And detect the tampering in each single block with the LSB of every pixel of image for watermark availability if it is there then pixel wise detection validate pixels to improve the localization and recovery done with the existed secrete key. X Qiao et al. [9] proposed fragile watermarking scheme for image authentication based on superpixel mechanism. Here author used superpixel region for watermark self-region embedding using chaotic system. Superpixel content is embedded into another neighbour superpixel region. Superpixel boundaries are marked for extraction process and detect tampered region. Author used Lsb method to embed the watermark into the image.

III. CHALLENGES:

The watermarking methods for targeted access are challenging related to color images for their tampered area detection and authenticating images.

Existing watermarking methods usually divide an image into regular size square blocks which ignore the image pixel color intensity and so it fail to detect tampered block pixels exactly[9]. Dependency of blocks often indicates to ambiguous detection, miss matches of blocks, and decrease of detection performance of tampered region [8]. Generally, an existing approach, watermarks are in grayscale/ binary image which are in a small size compared to cover host image [5]. In existing watermarking scheme either one or dual watermark or sequence of bits is in form of watermark data. So if any image tampering did then watermark data can be destroyed. The existing approaches of watermarking have developed the authentication of an image which faces challenges of enhanced watermarked quality and response time the continued challenge is how to build effectively the stages of features that facilitate the authentication mechanism to support further color images analysis.

IV. EXPERIMENTS :

Following proposed methodology describe segmentation based image partition for embedding watermark into cover image and extraction of it.

Below Table shows experimental work using super pixel segmentation and embedding watermark image into it with different alpha values. Also extracted watermark from watermarked image.

Table1 segmented watermarked image & extracted watermark

Watermark image	Watermarked Image:	Extracted Watermark from super pixel segment based watermarked image
	 	 Watermark extracted from segments

Table 2 Segmented Watermarked image & extracted watermark with alfa=1

		
Cover image	Watermark image	Extracted watermark from superpixel

Table 2.1 PSNR values

Approach	PSNR
Superpixel SVD based image watermarking embedding scheme with the alfa value=1	Watermark embedding in superpixel based image PSNR=14.546239dB
	Original Watermark/Extracted Watermark from superpixel based image PSNR=31.578620dB

Table 3 Segmented Watermarked image & extracted watermark with alfa=.08

	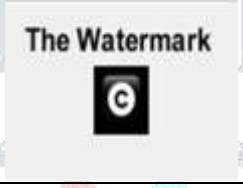	
Segmented Watermarked image	Watermark image	Extracted Watermark

Table 3.1 PSNR values

Approach	PSNR
Superpixel SVD based image watermarking embedding scheme with the alfa value=0.08	Watermark by SVD in superpixel image PSNR=24.670255dB
	Original Watermark/Extracted Watermark by SVD PSNR=34.695485dB

V. OBSERVATION:

Above all results shows that, with the use of superpixel concepts in watermarking domain for image embedment and extraction generate overall satisfactory results and need more experiments to enhance the results in a same domain with the various dimension of superpixel concepts for image authentication.

VI. CONCLUSION:

The paper proposes a method of watermarking done with the concept of super pixels segmentation for an image authentication. A research challenges and approaches for the development of robust and computationally efficient super pixel based watermarking schemes for embedment and extraction has been discussed. There is no any approach that can provide satisfactory performance against all parameters. Many blocks based approaches for embedment and extraction are used to improve multiple performance parameters and the joint effect of them need to be tested practically for refining outcomes. Super pixel concept is better than regular image block and single pixel of image. It can develop various segments by grouping similar features of adjacent pixel and perform embedment and extraction of watermark image. Proposed research direction is exploring the computer vision segmentation areas to protect the integrity and authenticity of an image and also achieve high tamper detection rate.

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