

# A Survey on Different Image Watermarking features and Evaluation Parameters

Rajkumari Lalwani, Pushpa Singh, S. R. Yadav, Avinash Sharma, Deepak Patel

**Abstract-** Digital information sharing is not a big task in this era, as the number of internet users are increasing day by day. This sharing of data is done only by providing secure network, but this is not possible due to some packet loss. For overcoming this problem different researcher work by using various approach. This paper focus on image watermarking different techniques and its feature combinations. Paper focus on various attacks for the watermark and evaluation parameters for analyzing watermarked algorithm.

**Index Terms-** Digital Watermarking, Image segmentation, LSB, Self Embedding.

## I. INTRODUCTION

As the number of internet users are increasing day by day transferring of data get fast. Different software and hardware help in this work such as mobiles, camera, etc. This raise to one new problem of harming the proprietorship. So privacy of the individual get lo easily, where most of images get pirates very easily. In order to handle this problem it is required to provide watermark the image. As watermarking is broadly divide into two category first is visible and other is invisible in case of video data visible watermark is satisfactory such as shown in fig. 1 and 2 where fig.1 is for image watermarking while fig. 2 for video watermarking [1]. One of the live example of video watermarking is television where each channel has its own logo on right or left top of the frame. It is obtain from the figure that digital visible watermark is not fruitful in all kind of images, such as in paintings, scenery, etc. So other possibility of watermarking is invisible watermark where watermark information is present in data but it is not seen by naked eyes. So work on this type of watermarking is done in this paper.

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Fig. 1 Example of visible watermark in digital page.



Fig. 2 Example of visible watermark in video.

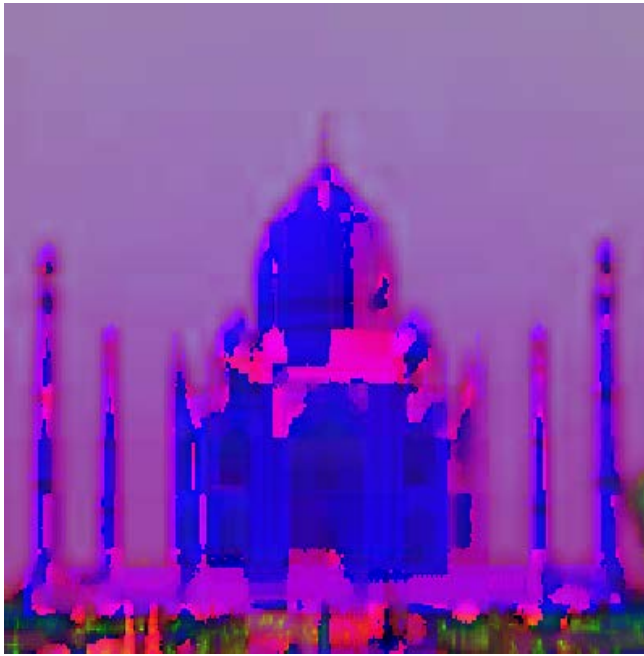
Most of watermark technique is divide into frequency based and other is spatial based both technique has its own advantage and disadvantages. Our work is based on LSB technique which is spatial techniq=ue for invisible watermarking. Basic approach of the work is develop technique that not only identify the watermark but also regenerate watermark from the rest.

## II. FEATURES FOR WATERMARKING

As Image is collection or sequence of pixel and each pixel is treat as single value which is a kind of cell in a matrices. In order to identify an object in that image some features need to be maintained as different object have different feature to identify them which are explain as follows:

**Color feature:** Image is a matrix of light intensity values, these intensity values represent different kind of color. so to identify an object colure is an important feature, one important property of this feature is low computation cost .

Different Image files available in different color formats like images have different colure format ranging from RGB which stand for red, green, and blue. This is a three dimensional representation of a single image in which two dimensional matrix represent single color and collection of those matrix tends to third dimension. In order to make intensity calculation for each pixel gray format is use, which is a two dimension values range from 0 to 255. In case of binary format which is a black and white color matrix whose values are only 0 or 1. With the help of this color feature face has been detected efficiently in [8].



**Fig. 3 Represent the HSV (Hue Saturation value) format of an image.**

Edge Feature : As image is a collection of intensity values, and with the sudden change in the values of an image one important feature arises as the Edge as shown in figure 4. This feature is used for different types of image object detection such as building on a scene, roads, etc [5]. There are many algorithms that have been developed to effectively point out all the images of the image or frames which are Sobel, Peritt, Canny, etc. Out of these algorithms Canny edge detection is one of the best algorithms to find all possible boundaries of an image.

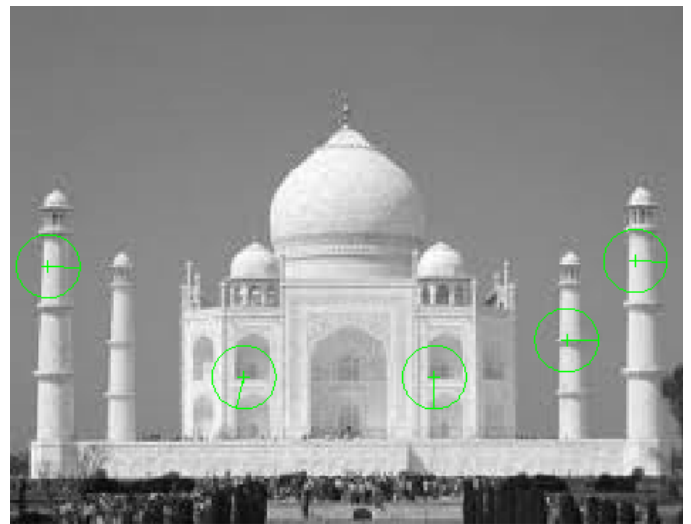


**Fig. 4 Represent Edge feature of an image.**

Texture Feature : Texture is a degree of intensity difference of a surface which enumerates properties such as regularity and smoothness [1]. Compared to color space model, texture requires

a processing step. The texture features on the basis of color are less sensitive to illumination changes as same as to edge features.

Corner Feature: In order to stabilize the video frames in case of moving camera it requires the difference between the two frames which are pointed out by the corner feature in the image or frame. So by finding the corner position of the two frames one can detect, resize the window in original view. This feature is also used to find the angles as well as the distance between the object of the two different frames. As they represent a point in the image so it is used to track the target object.



**Fig 5 Represent the corner feature of an image with green point.**

### III. WATERMARK ATTACKS

Different kinds of attacks are done on the digital watermarked video, the main effect of these attacks is that extraction of watermark is quite difficult or not possible by the algorithm if proper precaution is not taken in prior steps of watermark embedding.

Noise Attack: As watermarked video is sent in the channel for communication then some kind of noise normally generated by which exact water is not extracted from the received data [6]. Different kinds of noise are: Salt&Pepper Noise, Gaussian Noise Attack, Speckle Noise Attack, etc.

Filter Attack: Here video is passed through different filters, which is generally done after receiving signal from the network. So this attack normally happens and for this the embedding as well as extraction algorithm of the video watermarking should be robust, so that an effective method is developed. Some filtering attacks are: average filter, median filter, sharpen filter and motion filter [6, 7].

Compression Attack: Here video is passed through different compression techniques, which is generally done after receiving signal from the network [7]. So this attack normally happens and for this the embedding as well as extraction algorithm of the video watermarking should be robust, so that an effective method is developed. Some filtering attacks are: MPEG compression, Mp4 compression, etc.

#### Detection-disabling attacks

Some time watermarking algorithm are base on the correlation and to make detection of the watermark so by changing this correlation make it impossible to fetch watermark from the received data. Correlation based detection and extraction fail when rotation or scaling is performed on the watermarked image because the embedded watermark and the locally generated version do not share the same spatial pattern anymore [3, 6]. Mostly, they make some geometric distortion like zooming, shift in temporal direction, rotation, cropping or pixel permutation, removal or insertion.

#### Ambiguity attacks

Here by introducing different watermark to confuse the detector by producing fake watermarked data to discredit the authority of the watermark by embedding several additional watermarks.

#### IV. EVALUATION PARAMETER

As combination of different features leads to various algorithms of embedding and extraction. In order to evaluate those algorithms it is required that some specific set of parameters are decide for the analysis of the various approaches. So algorithm having higher values on those parameter is better then lower values algorithm.

#### Peak Signal to Noise Ratio

PSNR is use to find the amount of data present from the received signal as it may corrupt by the presence of some noise. So it is term as the peak signal to noise ratio. PSNR is the ratio between the maximum possible received information and the noise that affects the fidelity of its representation.

$$PSNR = 10 \log_{10} \left( \frac{Max\_pixel\_value}{Mean\_Square\_error} \right)$$

#### Bit Error Rate:

In this parameter one can obtain the ratio of number of error bit received after the extraction to the total number of bits use for embedding. BER is zero means no error is obtain or all the watermark bits are successfully retrieve.

$$BER = \frac{Total\_Watermark\_Bit - Correct\_Watermark\_bit}{Total\_Watermark\_Bit}$$

#### Structural Similarity index

SSIM term is a method for finding the similarity between two images. The SSIM method use for evaluating the image quality based on an initial uncompressed or distortion-free image as reference. It is introduce to improve the traditional schemes like PSNR and MSE, which have proven to be inconsistent with human eye perception.

#### Extraction Rate

This is the reverse of the BER where value is obtain by the ratio of the correct bits received after extraction to the total number of bits embed at the sendier. The extraction rate  $\eta$  is defined as follows:

$$\eta = \frac{n_c}{n_a} \times 100$$

where  $n_c$  is the number of correctly extracted bits, and  $n_a$  is the total number of embedded bits.

#### V. CONCLUSION

This paper focus on invisible image different approaches follow by the various researchers. It has been observed that during extraction watermark is the main focus of most of the researcher but few of them work on original image as well but reverse process of both watermark and original image is still not done. Watermark is mainly compare on the basis of the attack but most of the paper work on the spatial attack and show effective results in various attacks with different levels. Concentration on the geometric attack is very less and not done by most of the papers. So Strength and weakness of the different papers, features, and techniques are well discussed in the paper. A unique algorithm is still reired which focus on both watermark and original image with high robustness against spatial as well as geometric attacks.

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