International Journal of Technical Research and Applications e-ISSN: 2320-8163,
www.ijtra.com Special Issue 31(September, 2015), PP. 234-238

COMPARISON OF HPS AND DPEHS REVERSIBLE WATERMARKING METHOD WITH DE REVERSIBLE WATERMARKING METHOD

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Abstract*—Many re****versible water marking methods are used for watermarking but not for improving the image parameters. In this paper we are comparing the two methods for enhancing the different image parameters. The first existing method is Difference expansion which is very basic method and the second proposed method is HPS and DPEHS method .From the comparison of two methods the second method gives the better result of image parameters than the first method as mentioned above.***

Index Terms*—Difference Expansion,** ***Pixel Histogram Shifting (PHS), Dynamic Prediction Error Histogram Shifting (DPEHS), Difference expansion reversible watermarking, PSNR, IQ etc image parameters.

I. INTRODUCTION

Reversible watermarking Technique:

Several reversible watermarking technique for visible and invisible watermarking like difference expansion[1] , Frequency domain (DWT,DCT,FFT)[1],Spatial domain .

In Frequency domain the image is divided into frequency component and watermarking is inserted inside it where as in the spatial domain only one of the parameter is changed and the watermarking is inserted inside it.

The histogram shifting technique [2] the pixels are shifted towards the MSB side and the gap is generated between the carriers classes and due this image is distorted and the space is generated for inserting the watermark inside it. As the image is shifted there is image distortion so it is complicated. Now in DPEHS first the difference between the neighboring pixel is calculated and after that the shifting of the pixel and then inserting the watermarking inside it. Since this method is useful for image classification and also it improves the image parameters as compared to difference expansion method. which shown below in the paper.

II. EXISTING METHOD

In Difference expansion we calculate the difference of the neighboring pixel values and select some difference number for difference expansion. The original values of difference numbers and a payload will all embedded into the difference numbers where the extra storage space is obtained by difference expansion.

$l = [x + y/2]$, $h = x - y$;

Where x and y are the pixel value in a gray scale image ,l is the average and h is the difference .The inverse transform above equation is

$x = l + [h+1/2]$, $y = l - [h/2]$;

as the gray scale values are bounded in [0,255]

Algorithm for Difference Expansion-

1) Calculating the difference value.
2) Partitioning difference values into four sets.
3) Creating a location map, collecting original LSB.
4) Data embedding by replacement.

The following figure is the block diagram of the difference expansion.

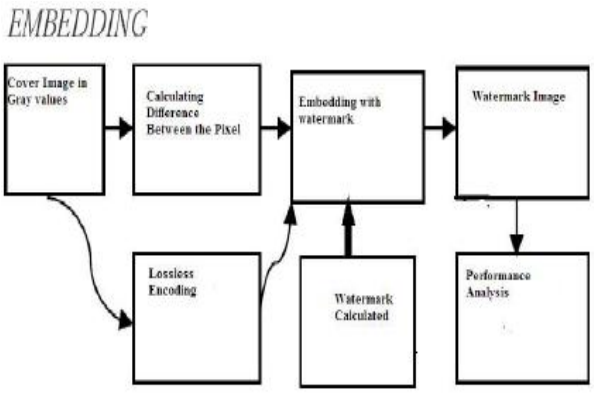


Fig 1: Difference Expansion Embedding

Figure 1 demonstrate the difference expansion embedding .In this the cover image is converted to black and white ,after that the difference between the pixel is calculated .The image is partioned into several parts. After that the location map is generated which will take care of the sets of images sets.

Now the watermark is generated using embedded capacity, header length and the watermark length. That watermark is inserted between the gaps generated between the pixels. The watermark image is generated which is distorted because of difference expansion. The parameters like PSNR, PCC, IQ, SNR and MAE is calculated by the mat lab codes are mentioned in the Table1 Below.

Disadvantage of *Existing System:*

- Not efficient because distortion is more.
- Image is black and white.
- No authentification for the image.
- Image Extraction is difficult.

Due to several passes the neighboring pixel error is not changed .It remain synchronized between the embedder and the extractor block.

While embedding the image in HPS and DPEHS method the peak value of the image ' a' and the minimum value of the image ' b' is calculated for synchronization, authentification and retrieving the original image at the extractor side.This is shown below in the flow chart.

Advantage of the Proposed Diagram:

1) Image classification can be done.
2) Authentification of the Image.
3) Synchronization between the embedder and the extractor .

III. PROPOSED METHOD

The proposed method HPS and DPEHS first the image classification is done. For medical images [3][4] HPS Method is appropriate and for color image DPEHS method is appropriate. After the shifting of the image the watermark logo which can be text, audio, video can be inserted as coded image over the original image.

The HPS modulation is shown below in fig 2.

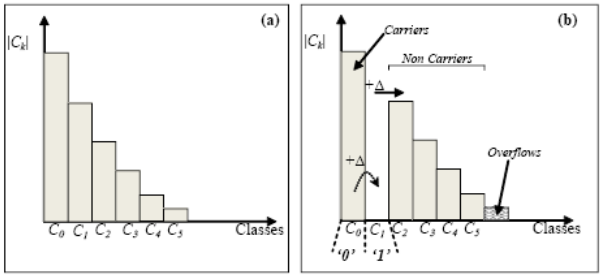


Fig.1. Histogram shifting modulation. (a) original histogram (b) histogram of the watermarked data.

Fig 2 Histogram shifting Modulation.

In [5] represents the histogram Shifting modulation in which The carrier class is generated the carriers belonging to carrier maxima that is zero are shifted towards maxima side and the non carriers that is ones are shifted towards the left side. The carrier maxima are demonstrate the higher information. It is highly applicable to medical image. The watermark image can be embedded inside it because of the shifting there is some space generated .

Now in Dynamic Prediction Error Histogram Shifting [6] modulation the error between the neighborhood pixels is generated and after that dynamically the histogram shifting is done. The carrier which are not belonging to the carrier class is shifted are termed as non carriers. The equation for generating error is

$$Eij=Pij – P'ij$$

Where Eij =Error between the Predicted pixel value Pij and the neighbor predicted pixel value P'ij.

IV. PROCESS FLOW CHART:

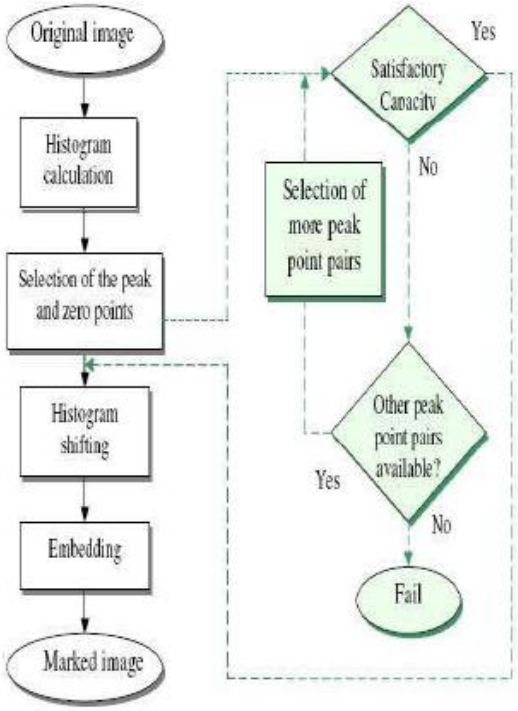


Fig 3 Embedding Flow chart

The Embedding flow chart is shown in Fig 3.

Embedding Process:

In embedding the cover image is selected. Depending upon the image HPS calculation is done. The peak points and the zero points are calculated .The histogram shifting is done and the embedding of the image with the secret logo is done to get the watermark image.

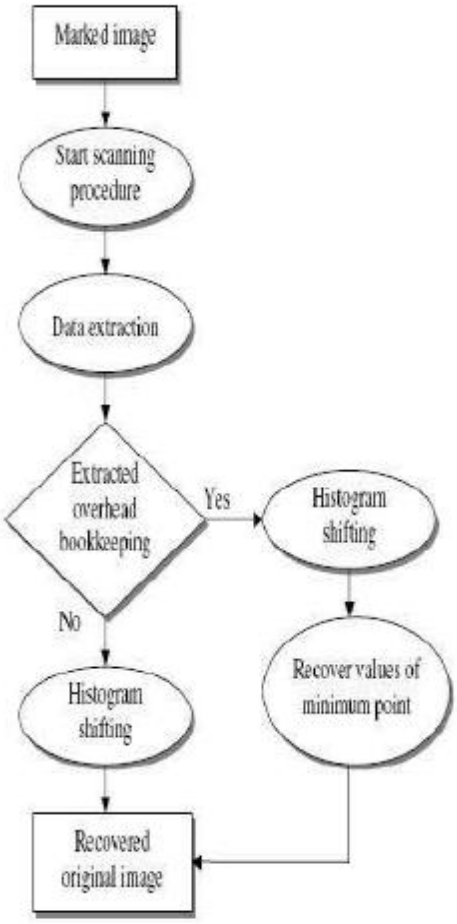


Fig 4 Extraction Flow Chart

Extraction Process:
In this the watermarked image scanning is done between the peak point and the minimum point .The pixel lying in between the range are not shifted are recovered as it is but which are outside those are shifted towards the minimum point and the original image is recovered.

V. RESULTS

1)Watermarking Results OF DE for Images
Figure below shows the embedding of the Baboon image using difference expansion. The original image and the watermarked image.

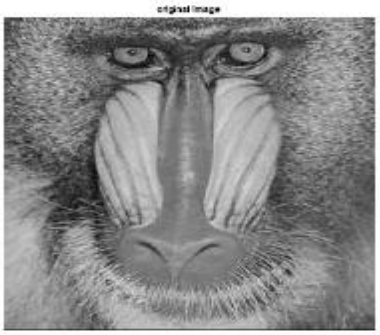


Fig 5 Original Image of Baboon.

The original Image of baboon before watermarking.

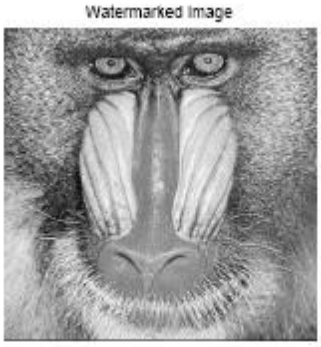


Fig 6 Watermark Image of Baboon

The watermark image of baboon with watermark length =31 and Pay load=0.000473.

Figure below shows the embedding of the Throat image using difference expansion. The original image and the watermark image.

Fig 7 Original Image of Throat

Fig8 Watermark Image of Throat

The watermark image of Throat with watermark length =27193 and Pay load=0.414932

2) Watermarking Results of HPS and DPEHS:

Fig 9 Embedding Of the Baboon Image:
In embedding process the Baboon image[7] is taken and its Peak point and the minimum point are calculated for retrieving the image at the extractor side.

Similarly the embedding process of Throat image is shown below

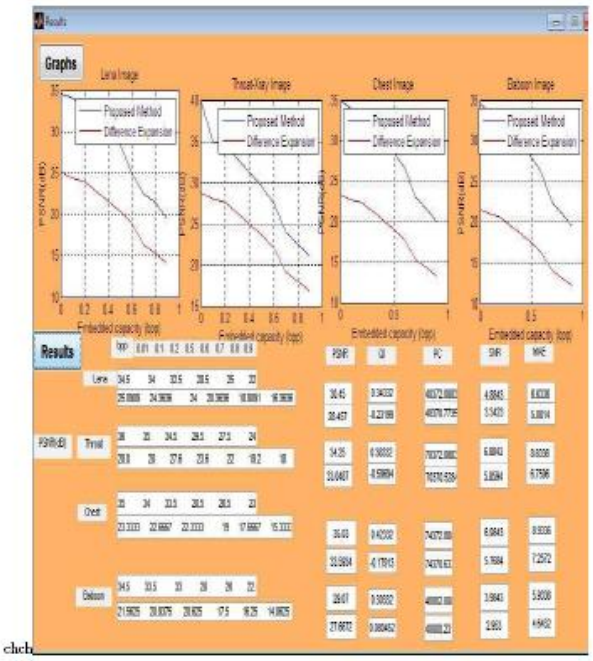
Fig 10 Embedding of Throat Image:

In embedding process the Throat image is taken and its Peak point and the minimum point are calculated for retrieving the image at the extractor side.

Observation Table for the different Parameters

Parameters	Baboon Image	Throat Image
PSNR DE	27.66	33.04
PSNR Proposed Method	29.07	34.25
IQ DE	0.080	-0.596
IQ Proposed Method	0.303	0.383
PCC DE	40000.23	70370.52
PCC Proposed Method	40002.08	70372.08
SNR DE	2.95	5.85
SNR Proposed Method	3.984	6.884
MAE DE	4.643	6.759
MAE Proposed Method	5.933	8.633

From the above table 1 following observations are made that all parameters are improved by HPS and DPEHS as compared to DE:



Above graph shows the comparison of different parameters of different images with difference expansion method. The HPS and DPEHS method shows better results as compare to difference expansion.

VI. Conclusion:

In this paper, thus from the observation table we conclude that Histogram Shifting and Differential Prediction Error Histogram Shifting method applied successfully over the natural and the medical Image as compare to Difference expansion method. Also it has improved the image parameter like PSNR, IQ, PCC, SNR and MAE as compared to difference expansion method. The PSNR parameter of the medical image is improved by the proposed method as compare to the natural image. The IQ parameter of the images is maintained below one. The PCC parameter of the medical image is better as compare to natural image. The SNR parameter below ten for all images. The MAE parameter is also maintained below ten for all images. The Difference Expansion output image is black and white because two vectors are taken so image classification is not possible in this method. At last we conclude that HPS and DPEHS method is more better as compared to Difference Expansion.

VII. Acknowledgement:

The successful completion of any master thesis requires a lot of guidance and assistance .I take this opportunity to express my deep sense of gratitude and sincere thanks to my project guide Prof Shweta Ashtekar and Co guide Amruta Chintawar for spending their valuable time and guidance given to me for successful completion of my project work.

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