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MEDICAL IMAGES REVERSIBLE WATERMARKING

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ABSTRACT

This project is an attempt to develop a reversible data hiding in the medical images that would be helping to send the secret data in a highly secured manner. In order to attain this the image is conducted to a lossless compression algorithm with the combination of integer wavelet and the Set Partitioning In Hierarchical Trees (SPHIT). During the coding of the image using the SPHIT the location map algorithm is used develop the higher security in the already secure compression. While compression itself the location map is used to hide the data and as the bit streams thus created after the compression will be having the hidden data also. The lossless compression and decompression and image restoration is attained due to the use of the integer wavelet transform. Matlab M file based implementation is carried out to hide the text on the image and the retrieval is done using the inverse DWT and the reversal of the location map algorithm. The results thus obtained are verified for the percentage of retrieval and the PSNR ratio etc.

Keywords— Matlab, SPHIT, Integer wavelet transform, PSNR ratio, Location map.

I. INTRODUCTION

As of late, telemedicine gives an advantageous way that can give clinical health care regardless of how far between the specialist and patients. In telemedicine, it is often to transmit the medical images and the secret data to a specific people. Thus, the security of medical images and secret data ought to be taken more consideration. Digital watermarking has been considered to understand the copyright assurance. It can embed the secret data into a cover media for data concealing, which can be utilized to confirm validness.

In the use of telemedicine, patient's data can be processed as the secret data and embedded into the cover picture. To avoid the picture distortion that causes the wrong diagnosis, the location map must be recorded for picture recuperating.

Nonetheless, in past review, it didn't require the location map in light of the fact that the locations of watermarked pixels are signified in the coding process. It incorporated the processes of both the lossless coding, set partitioning in hierarchical trees (SPIHT), and the watermark embedding to lessen the capacity size of picture and accelerate the transmission. Rather than sending a watermarked picture, it sent a bit stream containing the data of picture and watermark. With a specific end goal to reestablish the cover medical picture totally, usage of a reversible watermarking is required.

II. EXISTING METOHDS

In our past review [1], it didn't require the location map on the grounds that the locations of watermarked pixels are indicated in the coding procedure. It incorporated the procedures of both the lossless coding, set partitioning in hierarchical trees (SPIHT), and the watermark embedding to diminish the capacity size of image what's more, accelerate the transmission. Rather than sending a watermarked image, it sent a bit stream containing the data of image and watermark. In [2], Lin and Su proposed the new watermarking technique to perform in the frequency domain and for expanding the image quality. In any case, this technique is lossy and it can't reestablish the cover image totally. In [3], Kumar et al. connected the histogram shifting technique and concentrated on the element of medicinal images for expanding embedding limit. In [4], Wu et al. proposed the new watermarking technique to improve the contrast of cover image by utilizing histogram shifting. The technique recorded the change of esteem for every pixel.

III. PROPOSED WORK

To comprehend the straightforwardness of the proposed work let us see the square chart given beneath

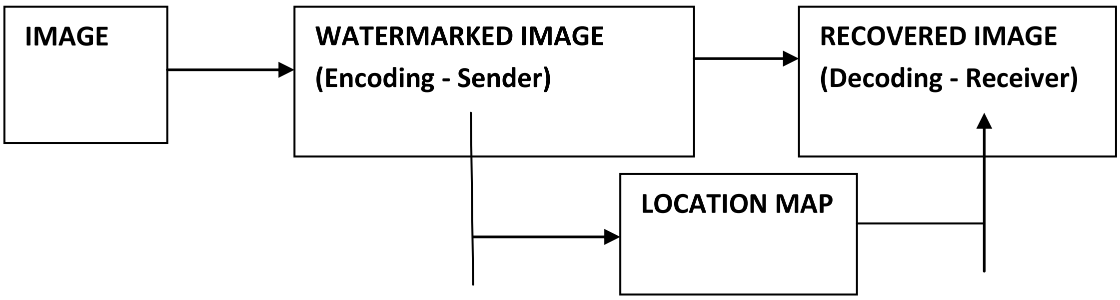


Figure 1: Block diagram of proposed work

IV. WATERMARKED IMAGE

Watermarked image which is the encoding process in the square chart implies that image is watermarked with emdedded message by integer wavelet transform, histogram shifting, SPHIT with location map and watermarking.

4.1 Integer Wavelet transorm

The principal objective is to accomplish the most ideal compression execution for an extensive variety of image classes while limiting the computational and usage multifaceted nature of the calculation. For a compression calculation to be broadly helpful, it must perform well on a wide assortment of image substance while keeping up a practical compression/decompression time on modest PCs. Keeping in mind the end goal to permit a wide scope of usage, a calculation must be amiable to both programming and equipment execution.

The means expected to compress an image are as per the following:

[1] Digitize the source image into a signal, which is a series of numbers.

[2] Decompose the signal into an arrangement of wavelet coefficients.

[3] Use quantization to change over coefficients to an arrangement of binary symbols.

[4] Apply entropy coding to compress it into binary strings.

4.2 Histogram Shifting

Histogram shifting is a sort of reversible watermarking. It tallies the quantity of every pixel value, sets the most extreme one as the shifting focus, indicated as c, and movements other pixel values from the inside. For instance, the pixel value with 128 will be set as c, as appeared in Fig. 1. At that point every pixel value is moved outward far from the inside with the exception of the limit values (0 and 255) for evading overflow and underflow. Therefore, there are two spaces (127 and 129) beside the middle, as appeared in fig.2 (a).

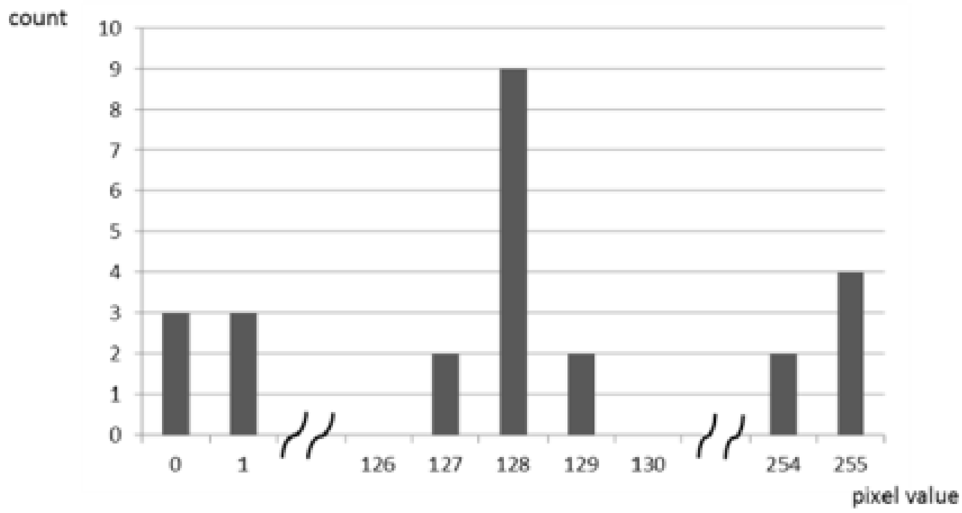


Figure 2(a): Histogram of the Cover image.

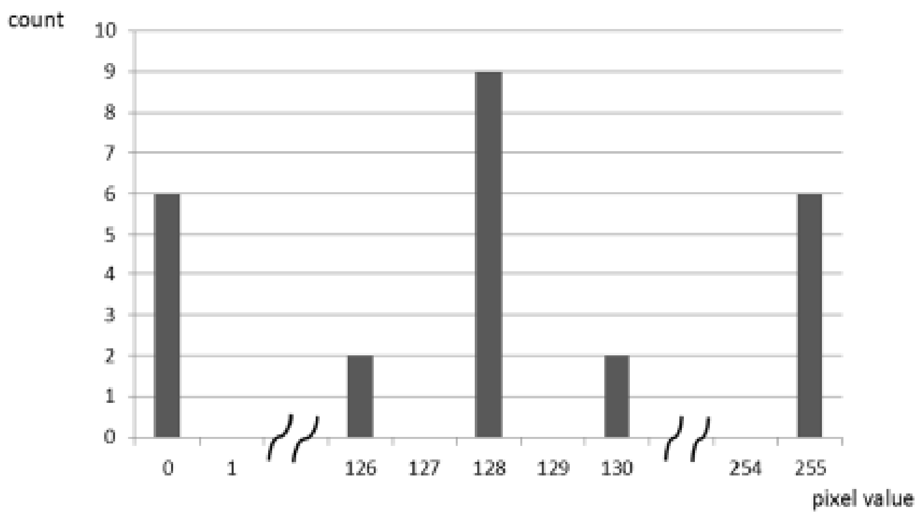


Figure 2(b): Image with Shifted Histogram.

According to the fig.2 (b) The center value is 128 and the close value in the left of the center is 127 and that in the right is 129. The histogram shifting is to clear these two spots to put the concealing information in this place. So the 127 values are diminished to 126 to move that to left and the 129 is moved right by increasing the value of it. In this manner we get the 127 and 129 for adding the information that must be included.

4.3 Location map

The location map is reliant on the boundary values in the picture that is normally 0 and 255 in the medical images. To recognize the two values, we utilize a bit for every boundary value to record whether its value is changed or not. The bit is 0 if the relating boundary value is unaltered. Else, it is 1. For instance, as appeared in Fig.3, a portion of the pixel values are changed (set apart by red digits) after the histogram moving . We record the conditions of boundary values in the raster examine order.Therefore, we can get 000111101000 in the aggregate of 12 bits to record the conditions of boundary values for this block.

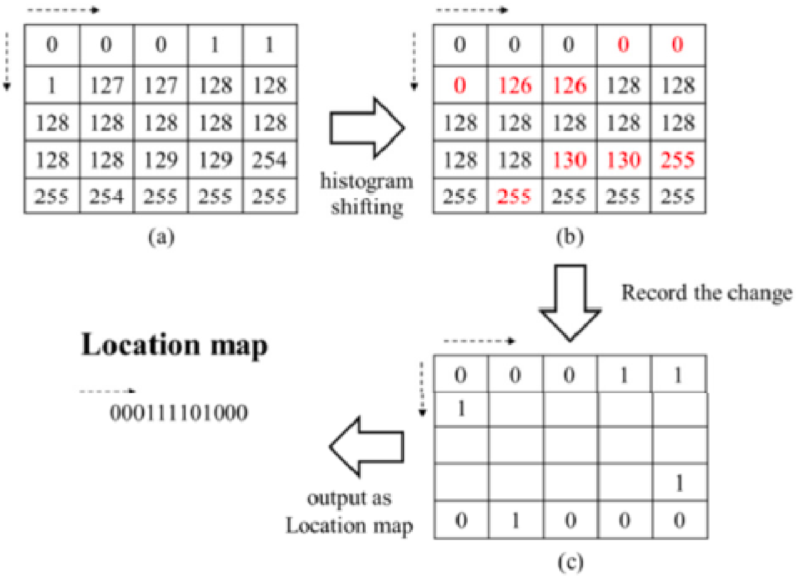


Figure 3. Location Map calculation

4.4 SPHIT

SPHIT(Set Partitioning Hierarchical Tree) is a compression process where the wavelet coefficients are utilized here and changes the watermarked image and the data in type of a bitstream.

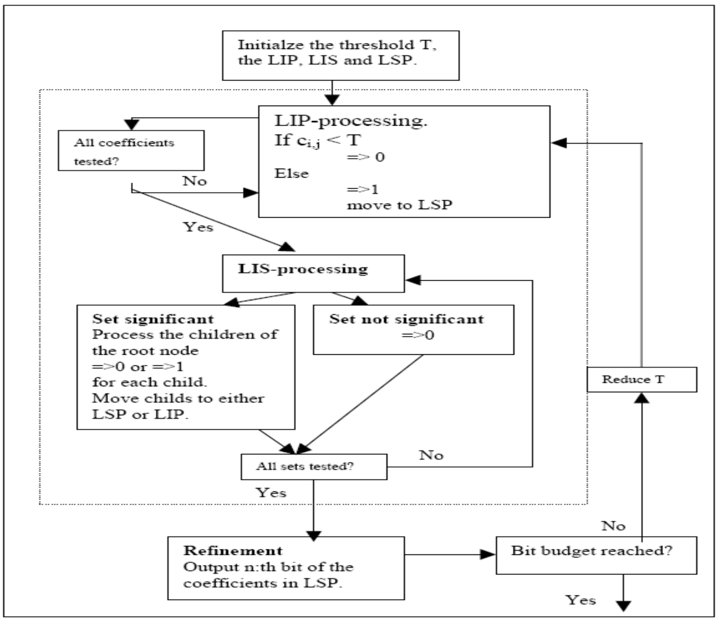


Figure 4: Parents and children (SPHIT)

4.5 Watermarking

The yield of the histogram shifting makes the crevice in the histogram such that the information can be covered up in that space. In the event that the information is the picture it is changed over into the bit stream and if the information is content then it is changed over to ascii values. Thus the information will be in bit stream arrange. At that point the accompanying equation is utilized to put the incentive in the histogram moved picture. In the piece appeared in the figure 3. We can see that where the 126 and 130 is available the information will be

$$\overline{p}_{c-2} = p_{c-2} + i \qquad (1)$$

$$\overline{p}_{c+2} = p_{c+2} - i \qquad (2)$$

shrouded utilizing the accompanying equation where c is the center position. And p is the first picture and the p bar is the changed pixel subsequent to watermarking and is watermark bit (either 0 or 1).

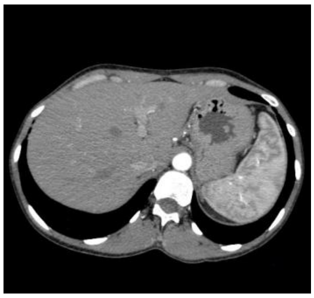
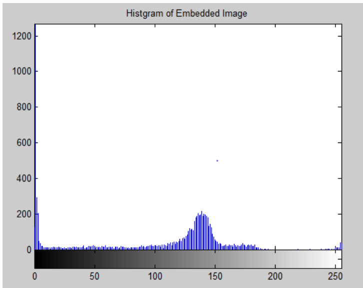
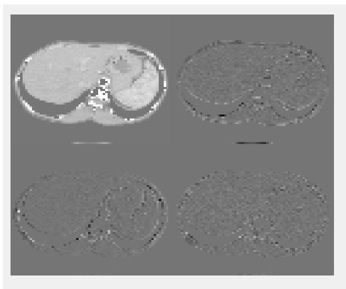
V. RECOVERED IMAGE

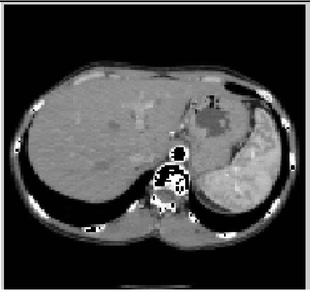
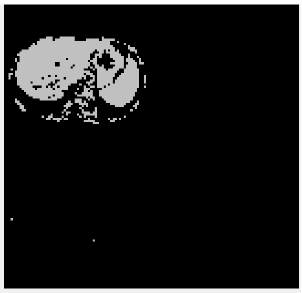
In the receiving end the following steps are taken care

1. Apply SPIHT reconstruction
2. Apply reverse integer wavelet transform

3. Apply Histogram and reverse Histogram shifting
4. Retrieve Data and Image

VI. RESULTS

Sr.No	Process	Images after process
1	Original Image	
2	Histogram shifting of the embedded image	
3	Integer wavelet transform	
4	Embedded image	

		
5	Image after inverse wavelet	
6	Decoded image	

4.1 GUI (Graphical User Interface)

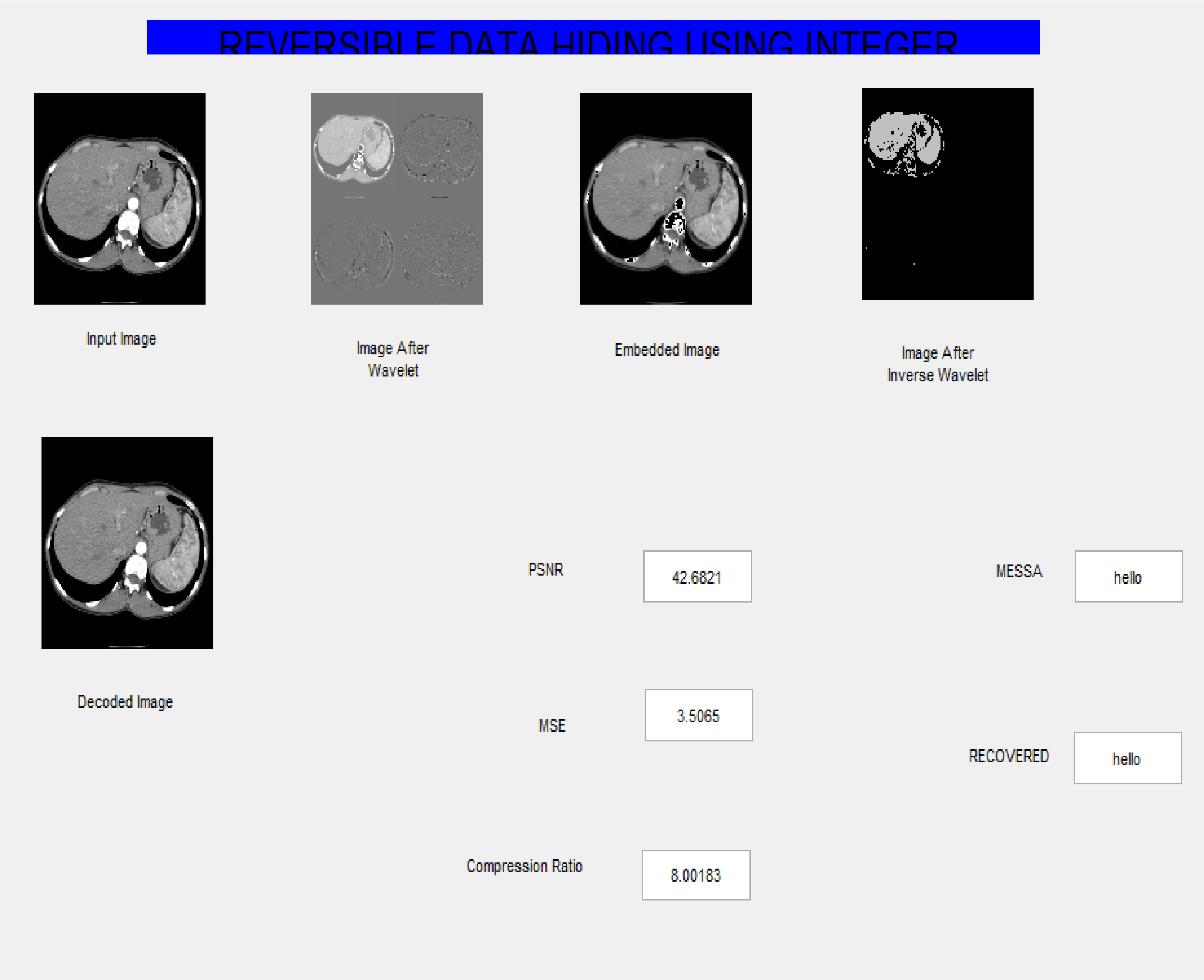


Figure 5: GUI

Shown above is a GUI which shows all the required images plus PSNR value, MSE compression ratio, Message embedded during encoding and Recovered message after decoding.

VII. CONCLUSION

The main ideas of this study are designing and implementation of Advanced digital watermarking system so that there is immense protection in medical images or any other media. Graphical user interface is provided so it will be easy to view all the images which is listed down in the results section for the user in addition it shows PSNR (Peak signal-to-noise ratio), MSE (Mean squared error), Compression ration, Message and the recovered message.

VIII. ACKNOWLEDGMENT

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H. G. Virani (Head of department), Department of electronics and telecommunication, and Dr. V. N. Shet (Principal), Goa College Of Engineering.

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