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# Spatial based hybrid Image Compression for Telemedicine Application

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***Abstract: - MRI (Magnetic Resonance Imaging) is used to scan humanely with the use of magnetic field which is 10,000 times greater than the earth's magnetic field. These images need more memory to store in database for e.g.: in hospital we needs at least 5 to 15 GB to store those images per day and also its need high bandwidth to transmit via network to monitor the patient condition. By reducing the size of the image will cause the quality so we need the efficient algorithm to retain its quality. For these problems the SPATIAL technique was introduced so this paper deals with SPATIAL based hybrid image compression. The most of the images contains the important part than the other regions. We are applying different algorithms to compress those image parts by clustering. Lossless compression is used to constrict the images and also we can decompress without changing the authentic of an image e.g.: zip, rar. In LOSSY compression we can decompress into original image but some details will be lost for these two reasons we apply these techniques in two regions SPATIAL and NON-SPATIAL in this paper we discussed how to identify these regions. The lossless compression is applied for SPATIAL region and LOSSY compression is applied to a NON-SPATIAL region. These compression regions can able to transmit via network with less bandwidth and also it can be easily reconstructed the diagnostic region for treatment.***

***Keywords:-Spatial, lossless, LOSSY, clustering, MRI***

## I. INTRODUCTION

A huge quantity of photo copy is produced in tract of therapeutic photograph, in the form of magnetic resonance image (MRI) and ultrasound images which are stored in the hospice report scheme it is very difficult to maintain for hospice. In medium scale hospice they need a minimum of 5-15 GB per day to store and maintain the data this is the crucial task to handle. The huge volume of data needs high bandwidth to transmit via network. Decreasing the size of the image gives you more storage space and also requires less bandwidth to transmit through the net.

The bonding process is classified into lossless and LOSSY. In medical hospitals even though the LOSSY bounding gives 10% they don't use this process because in LOSSY compression we will lose some data. In affixing causation of lawful questions store house of medicinal photo copy is typically ambiguous due to demand to retain quality of image which usually loss the need for lossless compression. There are some lossless compression premises like:

1) Tremendous compression ratio
2) Resolution scalability – ability to decode the encoded image at various resolution
3) Quality scalability – ability to decode the compressed image at various quality

Digital image contains the header which holds the information about the image and information about the patient to compress this kind of files which gives more importance to the header information. The LOSSY compression is implemented by wavelet coefficient which gives a more compressed image with good quality. But the LOSSY compression not used in many hospitals so the SPATIAL code concept arrived it boost up the nature of the image in a specific region of interest by assigning the lossless compressing technique in that region.

## II. LITERATURE REVIEW

The lossless compression gives up to 80% of the quality and in LOSSY compression it gives more than the lossless compression up to (5-30%) even though the LOSSY compression gives high quality we couldn't use that, because there may be lose during diagnosis of an image. In medical image the small portion of the image is more important than other region that part should be compressed in a high quality than the other region for that we need a hybrid compression to preserve the important part as well as it gives the highest quality image. Most part of the image contains diagnostic part in the small region (5-10%) and that part should be compressed effectively during transmission the diagnostic part should be transmitted first.

The comparison of distinct SPATIAL based coding technique JPEG2000 standard has been tested the previous paper the main drawback of this standard is doesn't support the LOSSY-lossless compression. Further the SPATIAL based coding technique discreet wavelet transform has been arrived, the main drawback of this standard is to maintain the sub band information about the SPATIAL may increase the complexity hence in our proposed system we reduced the complexity. Usually the photo copy of the hospice contains 3 parts of SPATIAL region and it is the diagnostically

important region, non SPATIAL region other than the diagnostic part and last one is background. The background the gray scale value is zero even though it having black (ideally grey value is one)

```
Hosimg [i,j]<= b_th;
Then
Hosimg [i,j]=0;
```

Here b_th is the background edge value of the image which is having the value lesser than or equal to the background edge value and that values are forced to be zero. The primary region is detected automatically by removing unwanted region, the background is set to zero and the foreground is set to one. This primary region is compressed by using lossless coding and other regions are compressed using LOSSY coding to achieve higher performance and efficiency.

## III. HOW TO DETECT SPATIAL REGION

Detecting the region of interest in magnetic resonance imaging is quiet interesting. The algorithm finds the SPATIAL based on the grey scale level of the image in other images like pathological images the SPATIAL region specified in a black color for those images we have given a new technique called slicing. The main principle of slicing is blurring the images based on the human perception. In medical field the human perception is most important. The steps to perform slicing are given below

1) Get the image from the database and its dimension
2) Transform the image into hue, saturation, intensity if the MRI is a color image. The HIS is more consistent than the RGB form
3) Contrast is the most important in this slicing by doing the contrast the most important region (diagnostically part) is visible to his human perception.
4) Find the salience by using the formula

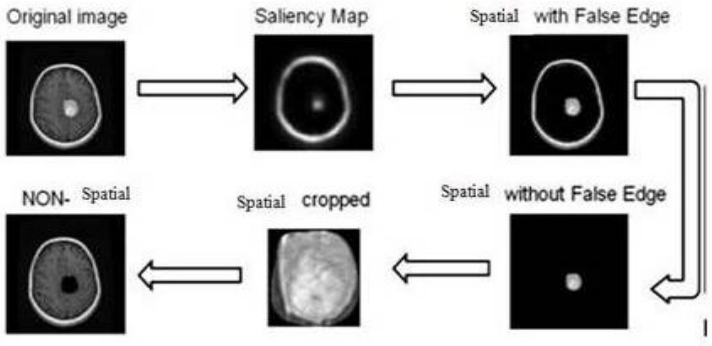
   Sal(x)= summation pow(x*y),z=0) (delI(a,b)+delH (a,b)+delS(a,b))

   Wr,

   x*y= total pixels in an image
   delI->Intensity between a and b, delI=|I (a)-I(b)|
   delH->Hue between a and b, delH=|H (a)-H(b)|
   delS->Saturation between a and b, delH=|H (a)-H(b)|
5) Find segmenting

   Mask(x)= Sal(x)<threshold put 0
   Sal(x) ≥threshold put 1
   Threshold =2×E(S)

   Wr, E(s) is a salience map expectation




The extraction of the SPATIAL region is shown above. The SPATIAL is extracted by removing the black colors in an image. The SPATIAL is more complex if they selected the skull has SPATIAL region. The above problem can be solved using the morphological technique. Morphological operator used the binary image dilation and erosion are performed multiple times on structuring the element.

The region of interest is compressed with lossless coding techniques such as arithmetic coding and non region of interest is compressed with LOSSY coding by using the SPIHT algorithm after integer wavelet transform.

## IV. INTEGER WAVELETS TRANSFORM

The integer wavelet transform is used to calculate the integer coefficient. In existing system we having wavelet transform is used to get the floating point coefficient this is used to reconstruct into the original image with good quality. The integer coefficient gives a more quality image with less complexity. The steps involved in integer wavelet transform are:

1) Faster computation than the wavelet transform
2) Allows to calculate the wavelet transform

3) Compute only integer coefficient it will reduce the complexity
4) The integer wavelet can also be reversible by lifting

## V. SPIHT ALGORITHM

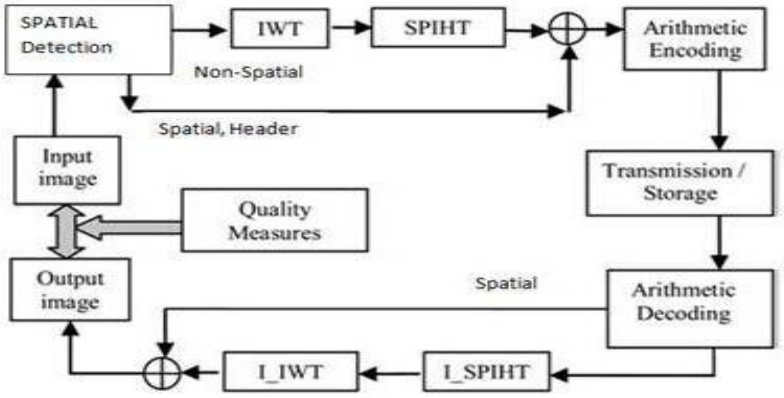
The best algorithm to compress the image. The SPIHT is used for LOSSY data compression after that when you combine both IWT and SPIHT; it is used for both LOSSY and lossless compression. The main advantage of the SPIHT is, it gives a better compression ratio than the other compression techniques. The steps for algorithm are shown below:

1) Get the image from the database or from the user
2) Apply threshold to remove the background color
3) Apply slicing to find the SPATIAL region
4) Crop the SPATIAL region from the slicing image
5) Apply SPIHT for non SPATIAL region and apply IWT and SPIHT for SPATIAL region
6) Combine the both SPATIAL and non SPATIAL and header to get the whole string

| SPIHT encoding time | SPIHT decoding time | Output final size KB | Compression KB |
|---|---|---|---|
| **1.52** | **0.43** | **6.53** | **97.9** |
| **2.34** | **0.86** | **8.43** | **99.9** |
| **2.7** | **0.99** | **6.43** | **87.8** |
| **3.7** | **1.23** | **8.8** | **99.98** |
| **2.3** | **0.88** | **7.8** | **95.90** |

## VI. EXPERIMENTAL RESULT

The magnetic resonance imaging is given to the software. The data bits are in arranging manner in a encode and it is easy to transmit through a network. The output of the decode gives you the best quality compressed image.




## VII. COMPARISON WITH OTHER TECHNIQUES

The below table shows the comparison between the SPIHT and EZW (embedded zero-tree wavelet). The SPIHT is more efficient than the EZW.bpp refers to the bits per pixel it means the time required to encode and decode the data.

| Image | PSNR(EZW) | PSNR(SPIHT) |
|---|---|---|
| **No:1Normal image** | 25.4951 | 26.7486 |
| **No:2Normal Image** | 19.33 | 21.41 |
| **NO:3With SPATIAL** | 19.28 | 21.26 |
| **NO:4With SPATIAL** | 24.45 | 28.95 |
| **NO:5With SPATIAL** | 36.25 | 40.04 |

In earlier days we used JPEG2000 compression to encode. It uses two coding techniques like scaling based method and maximum shift. It requires the shape coding to select the shape of the SPATIAL which increase the complexity. The proposed method is suitable for choosing multiple regions at a time. This paper we proposed only for eclipse and rectangle shapes. In future we will propose to select multiple SPATIAL in one image.

There are many techniques to compress an image they are MAXSHIFT, EZW, and SPATIAL-VQ. The SPATIAL-VQ requires an auxiliary coefficient to decrypt the data and this may cause blockage of system.

The region growing algorithm which is similar to our algorithm. The disadvantage of this algorithm is, it needs an initial seed point this approach is called semi automated and it will fail to detect multiple SPATIAL. Our proposed system can

able to achieve multiple regions SPATIAL and also we are trying to achieve texture based SPATIAL which is more decisive task than the region based.

## VIII. CONCLUSION

This paper debates a SPATIAL based medical photo copy compression. The integer wavelet transform gives the integer coefficient which is easy to reconstruct the image. There are many different algorithms are applied for SPATIAL and NON-SPATIAL regions it depends on the requirement of the application. In this paper we have used IWT and SPIHT for compression. Many images contain spatial part which is more important than the other region is called as SPATIAL. The SPATIAL is the important region even though we want to encode NON-SPATIAL region to give the accurate position of the SPATIAL region. The SPATIAL based compression gives the better quality images and also preserve the diagnostic part from his lose. This technique is less complexity and also it will increase the concert of the execution. This method is proposed for telemedicine application mainly for rural areas where network resources are limited. The future enhancement of our proposed algorithm is the compression based on textual content.

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