IMAGE FUSION TECHNIQUES

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ABSTRACT

The conventional image embedding technique is watermarking which applies DCT to the host image. The problem appeared in this technique is that the size of the host image should be greater than the signature image , thereby reducing the signal to noise ratio and degrades the system performance. In our proposed system image fusion techniques are being used. At the basic two signature images are being fused. Both significant and insignificant pixels of two images are transmitted. This project can fuse different types of images like RGB images, Gray scale images(medical, satellite),normal photo images. The proposed system discussed is a User Interactive Model. User Interactive in the sense, merely four different compression techniques can be simulated and the performance measure can also be done. The user can choose his/her compression techniques based on the specifications they need.

Two levels of security are being embedded with images. The sizes of images are not a constraint in this system as computations are in array editor. Varied dimension images can also be used. Fusing multiple images upto 8 has been proposed in this system. The simulation process is done by MATLAB 7.0. In order to improve the efficiency of the project, Memory allocated for the program, Elapsed time for the compression to run and compression ratio for fused image and compressed image is being formulated.

Keywords*:* *DCT,Gray scale image,security,fusion*.

1. INTRODUCTION

The development of information technologies makes it convenient for people to transmit mass data through Internet. However, it also provides vast opportunities for hackers to steal valuable information. Therefore, security becomes an important issue. Digital data hiding can hide sensitive information into multimedia for secure communications. Most multimedia data hiding techniques will distort the cover media in order to insert the additional information. But as they are in medical field or satellite images, a very small distortion matters a lot. Image embedding is considered as insertion of an image in an image in a way that prevents the observer knowing that the hidden image exists in the image.The image that is used to carry the embedded data is called *host image*. The embedded data is referred to as *signature*. Since the embedded data is in the form of an image, it is called as *signature image*. The signature image is often smaller than the host image. Image embedding is achieved by modifying the content of host image. When the embedding process is complete, the host image is slightly changed. The goal of image embedding is to ensure that embedded data can be recovered. The signature image is only recoverable by the owner who has the key to decoding the hidden data.Most multimedia data-embedding techniques modify and, hence, distort the host signal in order to insert the additional information. The fusion right on the source images, which often have serious side effects such as reducing the contrast. With the introduction of pyramid transform in mid-80's, some sophisticated approaches began to emerge. People found that it would be better to perform the fusion in the transform domain. Pyramid transform appears to be very useful for this purpose. The basic idea is to construct the pyramid transform of the fused image from the pyramid transforms of the source images, then the fused image is obtained by taking inverse pyramid transform. Here are some major advantages of pyramid transform: It can provide information on the sharp contrast changes, and human visual system is especially sensitive to these sharp contrast changes. It can provide both spatial and frequency domain localization.

2. IMAGE DECOMPOSITION TECHNIQUES

A.Pyramid Decomposition Methods

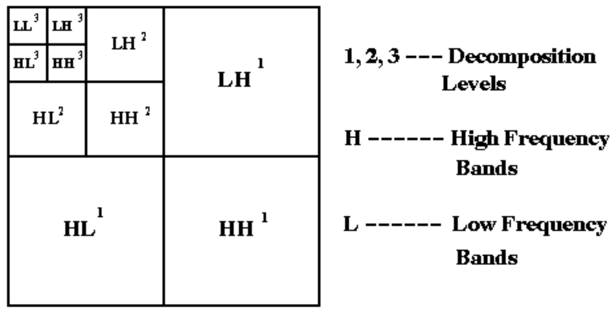
- ✓ Improved reliability
- ✓ Improved capability

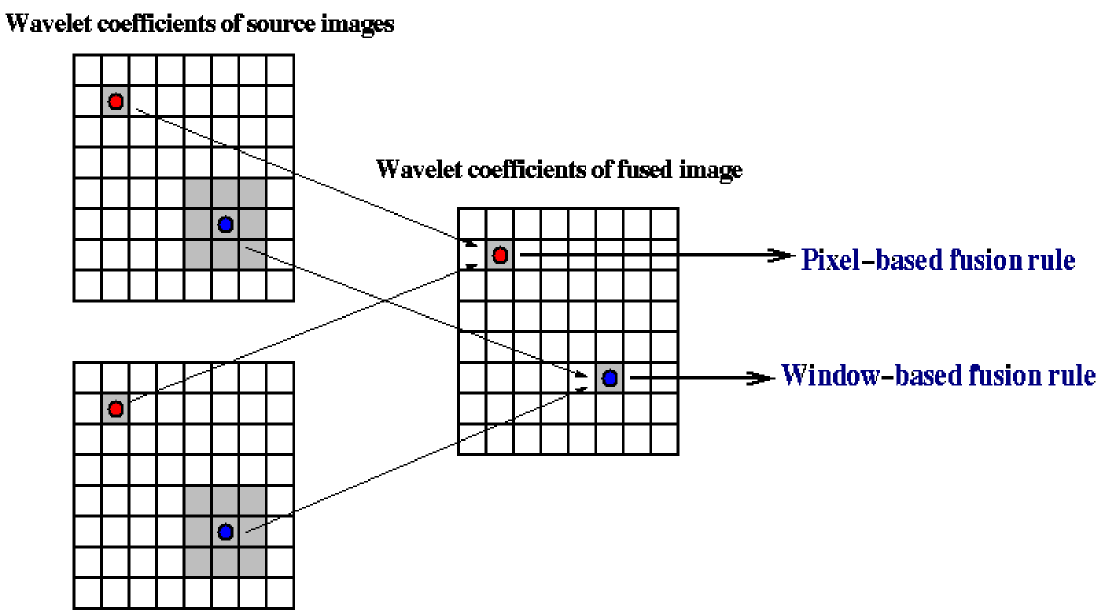
B.Wavelet Decomposition Methods

- ✓ Region based method
- ✓ Pixel based method

3. WAVELET DECOMPOSITION

TABLE I





<u>Pixel based fusion rule:</u>

Manipulation occurs at respective pixel values.

The rule is that ,the resultant pixel value depends on the highest magnitude among two input images.

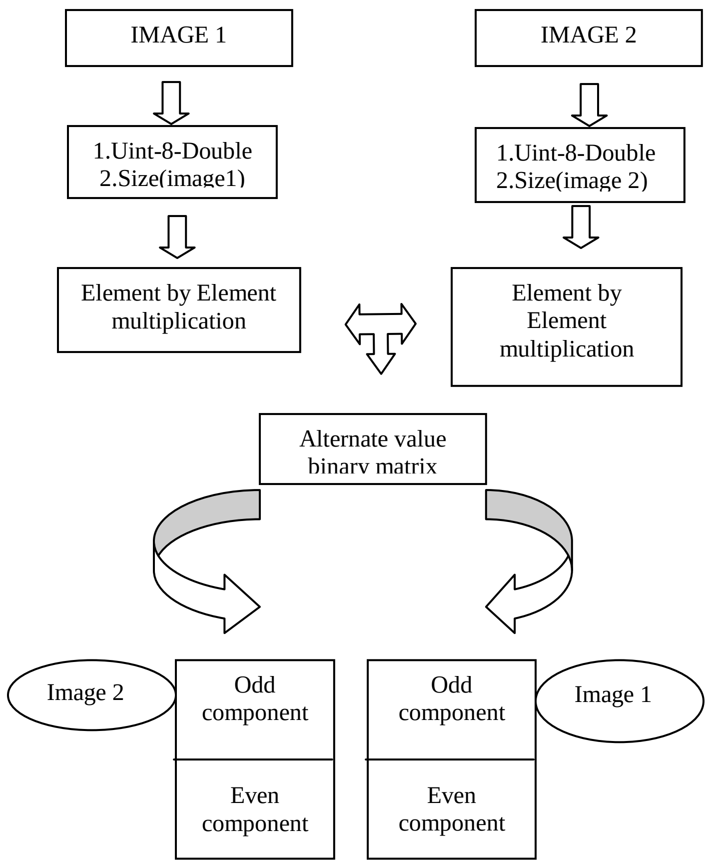
<u>Window based fusion rule:</u>

The fused pixel depends on the neighbourhood pixels of the respective one.

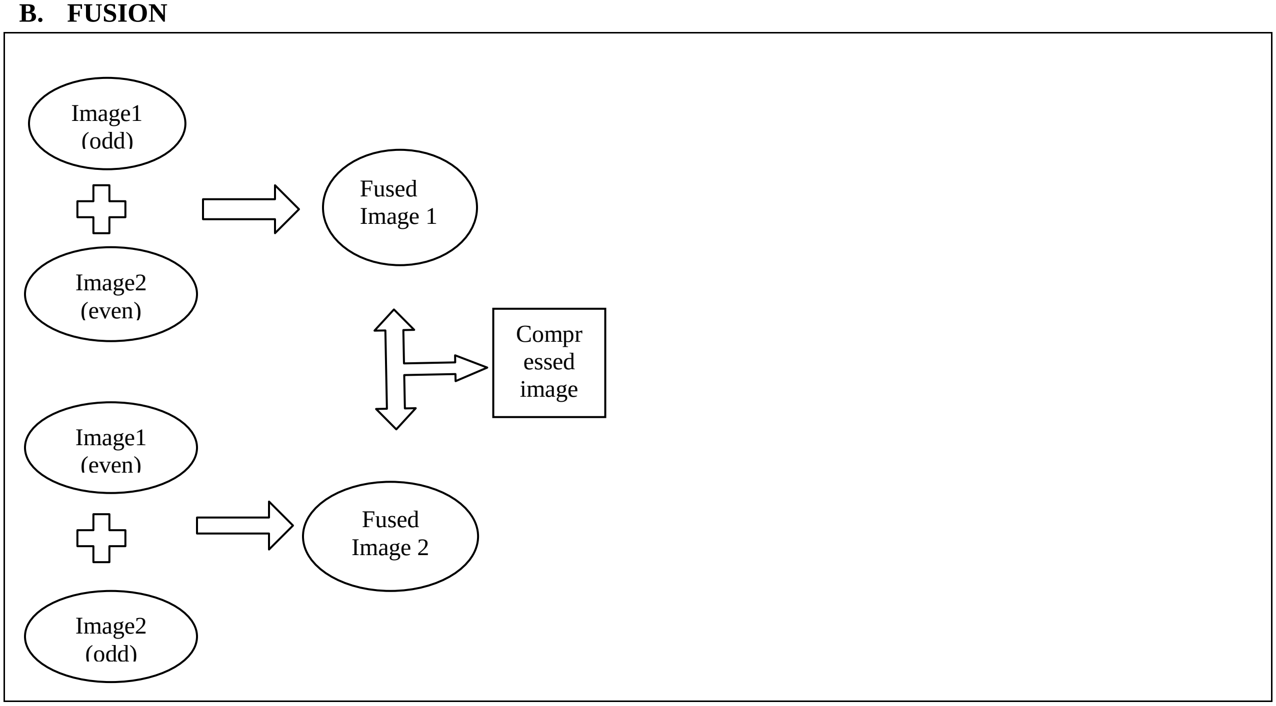
4. BLOCK DIAGRAM:

A. TRANSMISSION:

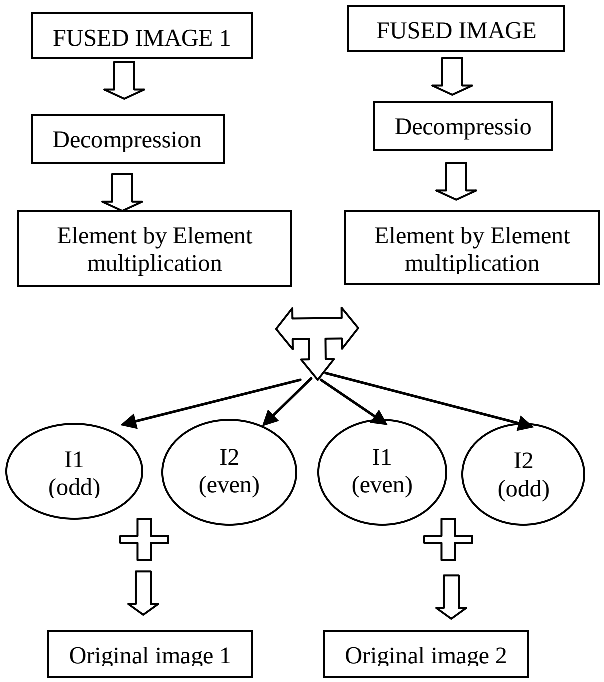
SEPERATION OF INPUTS INTO ODD & EVEN COMPONENTS



B. FUSION



C. RECEPTION



The inbuilt function in MATLAB will do fusing of images that are shaded or shadowed.But there is no option for defusing the images.In our proposed system,Retrieval of fused images can be obtained easily. The project discussed is a User Interface system.The first level belongs to fusion which two images gets hided and the second level belongs to the compression for extra security purposes.Fusion involves taking even and odd parts of two images and vice versa.For the fusion , a matrix is being developed by 1's and 0's.Element by element operation (pixel by pixel) over the matrix is performed. By multiplying by the 1's and 0's matrix to the original image,the image is having two parts i.e. an image with 1^{st} and 3^{rd} position retains and another matrix with 2^{nd} and 4^{th} position retains.Thus the matrix divides into its even and odd parts and the same operation is performed in the second image. The odd part of first image and even part of second image are fused and the even part of first one with odd of the second.Thus two significant fused images developed. Not only for two images, fusion of eight images has also been done.We have formed an image with 4 images including in that by simply assigning 4 images as elements of a 2*2 matrix.Fusion follows same pixel by pixel method.Instead of ordinary retrieval,retrieval used Orthogonal Matrix.

As user interactive design is being concerned, a user can do 4 types of compression .It is possible to add more compression techniques but due to increase in computational complexity,we have confined our project to 4 methods.

5. ALGORITHM:

(a)Encoding Algorithm(Transmission)

1.Read two external images of any type.
2.Find the size of two images. Let us assume the size of two images be S1 &S2.
3. if(S1==S2)

3(a) .Form the computation matrices according to the size of original images.

3(b).Let us assume those matrices be A1 & A2.

3(c).Do element by element multiplication and get four images by multiplying two images with two computation matrices.

3(d).The odd and even components of two images are being formed. Add the odd component of 1st image and the even component of 2nd image and vice versa..Two fused images are being formed.

4. else if(S1=!S2)
If S1(m,n) m=n=even ||
m=n=odd
If S2(m1,n1) m1=n1=even ||
m1=n1=odd , where m=!n
m1=!n1

4(a).Equalize the size of two images by padding the small dimension image by the following;
Row padding=(m1-m)/2;
Column padding=(n1-n)/2;

4(b).Follow steps from 3(b).

5.else S1(m,n) m=even || n=odd
m=odd || n=even

S2(m1,n1) m1=even || n1=odd
m1=odd || n1=even

5(a).Perform image resizing of images in such a way that they alike those represented in step 4. 5(b).Follow steps from 4(a).
6.Compression of two fused images.Let fused images be F1 & F2.
7.Calculate compression ratio using non-zero elements,elapsed time and memory allocated for the fused image.

b. Decoding Algorithm(Reception):

Reverse process of encoding is being adopted.
1. Decompress the fused images by respective compression methods.Let the decompressed images be D1 &D2.
2.Multiply D1 & D2 by computation matrices ,thus four images gets displayed.i.e.the odd & even components of original images.
3. Add respective images to retrieve the original image efficiently.
Algorithm For Computation Matrix:

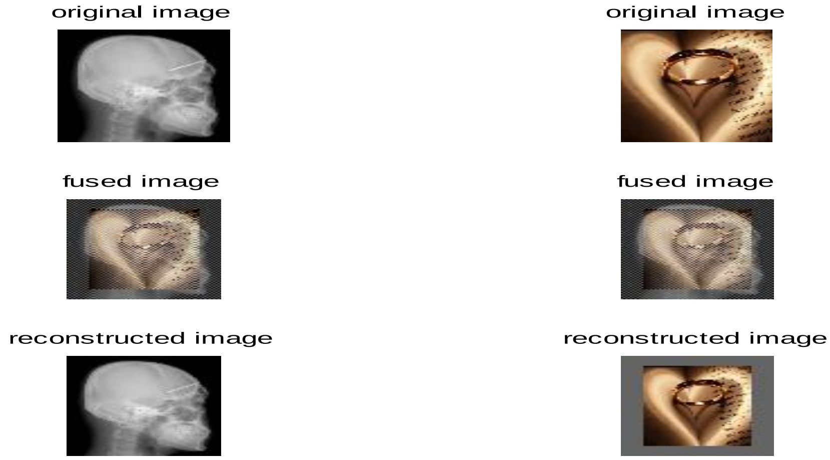
```
for f=1:3    % for three dimensional  color images
for m=1:k
  for n=1:k1
    if m==n
      a(m,n,f)=1;
    elseif mod(abs(m-n),2)==0
      a(m,n,f)=1;
      elseif mod(abs(m-n),2)==1
      a(m,n,f)=0;
    else
      a(m,n,f)=0;
    end
  end
end
end
```

6. EXPERIMENTAL RESULTS AND DISCUSSION

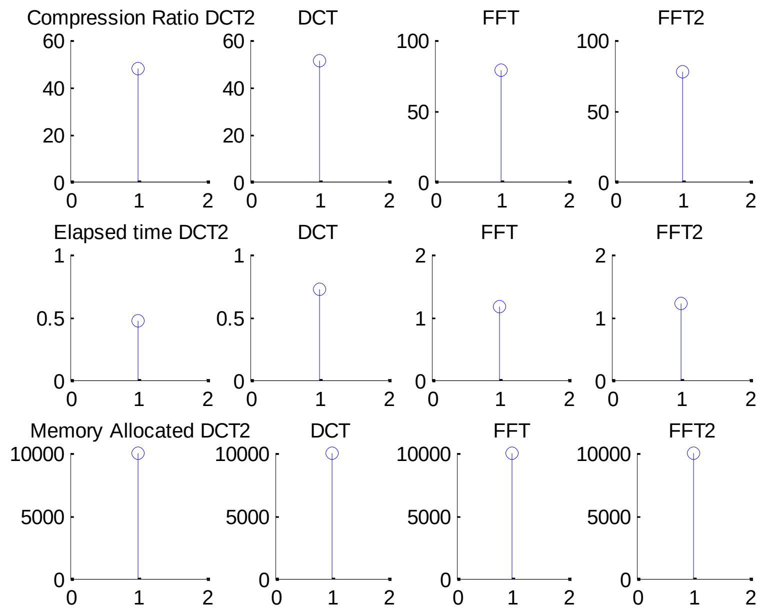
Several image databases are built in order to test the system.A number of experiments are performed on images of different sizes as described below.We fuse the two signature images using encoding algorithm.The robustness of the project is tested by the calculation of compression ratios of various compression techniques, memory allocation and elapsed time.

Experiment 1: -Medical Image (a) Original image 1 (b) Original image 2 (c) Fused image

Medical images:



PERFORMANCE ANALYSIS



7. CONCLUSION

In this paper, we have discussed a new method for image fusion.We tested the system performance by different experiments considering image sizes as same and different,elapsed time and memory allocation.

8. REFERENCES

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