# "ENHANCEMENT OF IMAGE FUSION ALGORITHM BASED ON WAVELET TRANSFORMS USING SWARM OPTIMIZATION"

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**ABSTRACT:** *Image fusion is a combination of two or more relevant images information and to form a single image. The final single image contain more informative than previous input images. Feature based image fusion is new area of research in the field of image fusion. The image fusion used lower content of image feature. The lower content of image feature such as color texture and dimension. The texture features are very important component of image. The processing and extraction of texture feature used various transform function such as wavelet transform function, Gabor transform function and many more signal based transform function. In the process of image fusion involve two and more image for the process of fusion. The fused image still image pervious quality as well as new feature and area of improved by new and adopted reference image. In this paper proposed a feature based image fusion technique for the improvement of quality of image of distorted and damage image. The process of proposed algorithm used wavelet transform function for the feature extraction process.*

***Keywords*:** Image fusion, wavelet transform, Feature based image fusion

## 1. INTRODUCTION

The images get in the environment of ubiquitous computing, because of the complexity and their stronger relationship of image information itself, incomplete and inaccuracy, unstructured as well as difficulties in modeling will occur at all layers of the process of image fusion. Artificial intelligence applies to image pervasive fusion, with the better results than traditional methods of calculation (that is, the use of precise, fixed and unchanging algorithm to express and solve the problem), can integrated with their respective advantages, compose intelligent fusion system, expand their original function. There are so many image fusion methods that can be used to generate high-resolution multispectral images from a high-resolution panchromatic image and low-resolution multispectral images. Starting from the physical principle of image formation, Neural network and fuzzy theory is the two main methods of intelligence, the image fusion system based on these two methods of can simulate intelligent human behavior, do not need a lot of background knowledge of research subjects and precise mathematical model, But find the law to resolve complex and uncertainty issues on the basis of input and output data of objects. From these characteristics and the advantages, it can be seen that the use of the approach combined by neural networks and fuzzy theory can better complete the multi-sensor image pervasive fusion. Most of fusion algorithms for multispectral and panchromatic image such as: principal component analysis, contrast pyramid decomposition, IHS method, Brovey method, PCA method, wavelet transformation, Gaussian-Laplace pyramid, and so on.

## 2. RELATED WORK

Om Prakash et. al. [1] proposed a pixel-level image fusion scheme using multi resolution steerable pyramid wavelet transform. Wavelet coefficients at different decomposition levels are fused using absolute maximum fusion rule. Two important properties shift invariance and self reversibility of steerable pyramid wavelet transform are advantageous for image fusion because they are capable to preserve edge information and hence reducing the distortion in the fused image. Experimental results show that the proposed method improves fusion quality by reducing loss of relevant information present in individual images. For quantitative evaluation, we have used fusion metrics as fusion factor, fusion symmetry, entropy and standard deviation. We proposed a pixel level image fusion scheme using steerable pyramid wavelet transform. In the proposed method, two main steps have to be followed: one, the source images are decomposed into low pass and high pass sub-bands of different scale using steerable pyramid, and secondly, low pass sub band is divided into a set of oriented band pass sub-bands and a low pass sub-band.

Liang Hong et. al. [2] representing the fusion framework that are based on data assimilation and genetic algorithm for Multispectral image and panchromatic image. Data assimilation can combine the advantage of model operator and observe operator. Our proposed method can integrate the advantages of DWT and HIS, construct object function according to successive application to satisfy the aim of adaptively adjustment of fusion parameters. Standard

deviation and aver-age gradient are chosen as object function. In general, the higher the value, the better the texture information. And two experiments (Spot, Quick bird) validate this framework. The experiment results show that our proposed fusion frame-work is feasible.

V. T. Ingole et. al. [4] focused on genetic algorithm for medical image registration. Genetic algorithm is a evolutionary algorithm. There are other methods like simulated annealing, mutual information theory for image registration. Apart from this, there are other algorithms like graph algorithm and sequence algorithms. We can implement these algorithms and show the comparative study and get the most suitable for medical applications.

Won Hee Lee et. al. [5] proposed a new motion compensated FRUC framework designed especially to alleviate the occlusion problem. In the framework, first estimate four sets of MV field using a modified optical flow estimation algorithm. We then construct the four intermediate interpolated frames by using the estimated MV fields and the reliability of the MV. Finally, combine intermediate interpolated frames into a single interpolated frame by using a variational image fusion scheme. To define proper energy terms for variational image fusion, they observed the statistical relationship between error distributions of intermediate interpolated frames and the corresponding pixel reliability. Based on the observations, establish a fitted curve function that associates the pixel reliability with a parameter of error distribution. Based on the fitted curve function, the data energy term is defined for image fusion. A smoothness energy term is also defined as prior information for image fusion.

## 3. PROPOSED MODEL

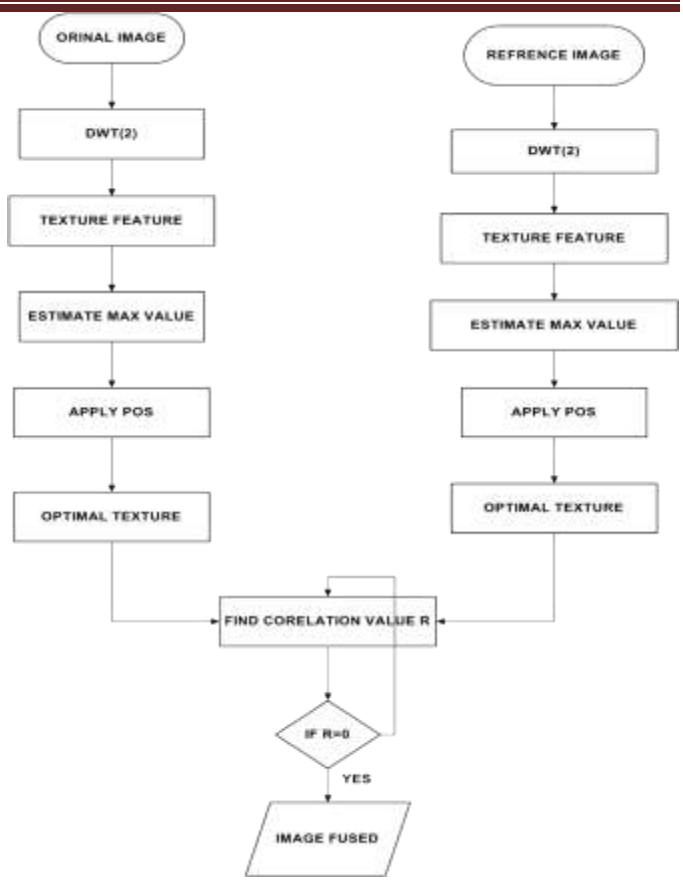


**Figure 1**: Proposed model of image fusion technique based on feature optimization

## 4. DESCRIPTION OF MODEL

In this section describe the process of proposed model. The proposed model contain with wavelet transform function and particle of swarm optimization. The swarm optimization used for the feature optimization process. Here discuss step of proposed model.

Step 1. Initially put the original image and reference image for the processing of feature extraction

Step 2. After processing of image discrete wavelet transform function are applied for the texture feature extraction

Step 3. After the texture feature extraction calculate the maximum value of feature using mean standard formula.

Step 4 the maximum value of feature set is global value of fitness constraints of particle of swarm optimization

Step 5. The particle of swarm optimization select the all feature as particle and measure value of difference and move according to feature direction for the processing of optimal

Step 6. The selection of optimal feature in both image estimate the correlation coefficient function of value R.

Step 7. If the value of R is 0 image are going on process of image fusion.

Step 8. If value of R not equal to 0 the processing going to estimation function.

## 5. RESULT ANALYSIS

To investigate the effectiveness of the proposed method for image fusion based on wavelet transform function and particle of swarm optimization. We used MATLAB software 7.14.0 and some reputed image used for experimental task such as the name given head image, head CT image, head MRI image, Heart image and Hand image.

| IMAGE NAME | Name of method | MSER | PSNR | IQI |
|---|---|---|---|---|
| Head | DWT | 22.03 | 18.30 | 0.955 |
| Head | DWT-POS | 26.18 | 20.17 | 0.947 |

**Table 1:** Shows that the comparative result analysis for the Head image with using DWT and DWT-POS method and we find the value of MSER, PSNR and IQI.

| IMAGE NAME | Name of method | MSER | PSNR | IQI |
|---|---|---|---|---|
| Head CT | DWT | 17.38 | 15.82 | 1.96 |
| Head CT | DWT-POS | 23.67 | 18.29 | 0.953 |

**Table 2:** Shows that the comparative result analysis for the Head CT image with using DWT and DWT-POS method and we find the value of MSER, PSNR and IQI.

| IMAGE NAME | Name of method | MSER | PSNR | IQI |
|---|---|---|---|---|
| Head MRI | DWT | 15.89 | 14.43 | 1.964 |
| Head MRI | DWT-POS | 22.15 | 16.84 | 0.957 |

**Table 3:** Shows that the comparative result analysis for the Head MRI image with using DWT and DWT-POS method and we find the value of MSER, PSNR and IQI.

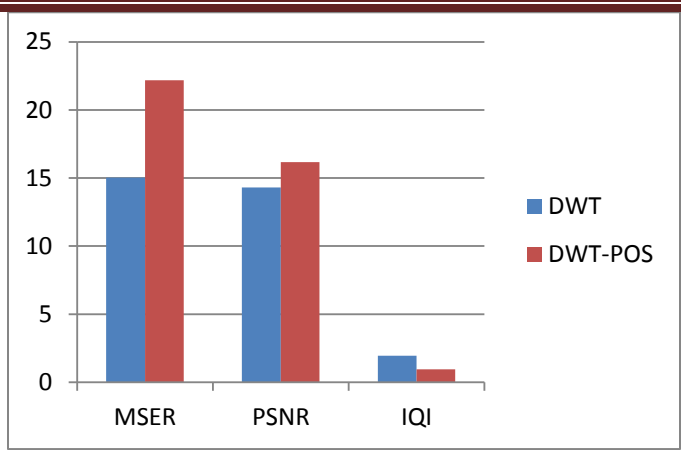


**Figure 1:** Shows that the comparative result graph for Head image with using DWT and DWT-POS image fusion method and find the value of MSER, PSNR and IQI.

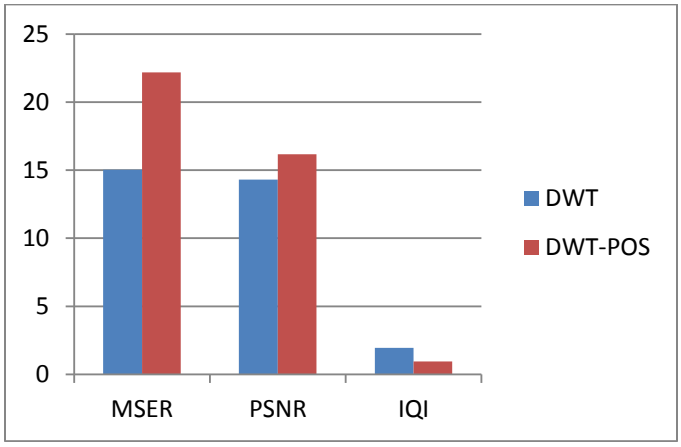


**Figure 2:** Shows that the comparative result graph for Head CT image with using DWT and DWT-POS image fusion method and find the value of MSER, PSNR and IQI.

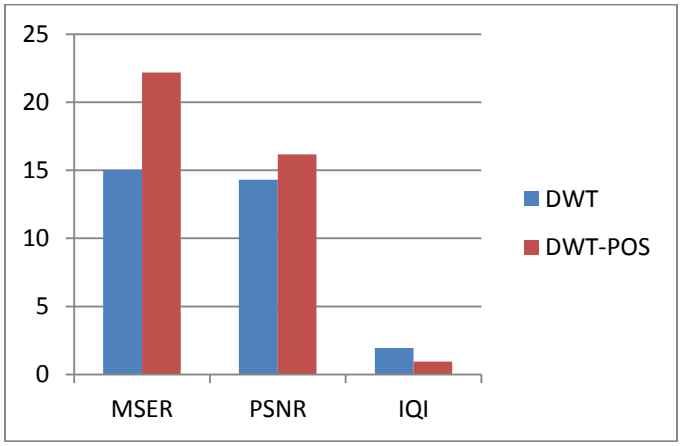


**Figure 3:** Shows that the comparative result graph for Head MRI image with using DWT and DWT-POS image fusion method and find the value of MSER, PSNR and IQI.

## 6. FUTURE WORK

The proposed method of image fusion is very efficient for the process of image quality improvement. The process of fusion produces good result in term of quantitative analysis. But it still need some improvement in IQI parameter. The maximum value of IQI is 1. But in this dissertation only reached 97-98% for quality factor. In future improve the value of IQI up to 1. For this used two or more feature combined with texture feature.

## 7. CONCLUSIONS

In this paper proposed a feature based image fusion technique for the improvement of quality of image of distorted and damage image. The process of proposed algorithm used wavelet transform function for the feature extraction process. The wavelet transform function extract the lower content of texture feature. The lower content of texture feature used for the process of feature optimization process. The feature optimization process done by particle of swarm optimization. Particle of swarm optimization is dynamic population based optimsation technique. The correlation coefficient factor estimate the relation of original image and reference image. If the value of correlation is 0 then image are fused. If the value of relation is not equal to zero the estimation factor recall. Measure the quality of fused image measures are considered. These measures play an important role in various Image Processing applications. Goal of image quality assessment is to supply quality metrics that can predict perceived image quality automatically. While visual inspection has limitation due to human judgment, quantitative approach based on the evaluation of "distortion" in the resulting fused image is more desirable for mathematical modeling. The goals of the quantitative measures are normally used for the result of visual inspection due to the limitations of human eyes. In Mathematical modeling, quantitative measure is desirable. One can develop quantitative measure to predict perceived image quality. In this dissertation used PSNR, IQI and MSER for estimation of quality of image.

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