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# Resolution Enrichment Techniques for Image incorporated with Text

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**Abstract**: Resolution is designated as significant holding for images. Resolution is an underlined expression of any image. Gratifying quality images are required almost in every field. For this we propose new modified algorithm having the extention in scaling and the algorithm is applied on image mingled with text for producing the pleasing quality of image. This paper presents a resolution method for enhancing digital gray images. The proposed enhancement technique is based on the interpolation of the high frequency sub-bands obtained by DWT and SWT. The proposed technique uses DWT to decompose an image into different sub-bands, and then the high frequency sub-band images have been interpolated. The interpolated high frequency sub-band coefficients have been corrected by using the high frequency sub-bands achieved by SWT of the input image. The lower sub band obtained by DWT decomposition is interpolated with the same interpolation factor. Afterwards all these images have been combined using IDWT to generate a super resolved imaged. Further we have made up extra enhancement in the image with the help of the fusion.

**Keywords:** Discrete wavelet transform (DWT), Inverse dual-tree complex wavelet transform (IDT-CWT), DWT-SWT.

## I. INTRODUCTION

Resolution of an image is an important consideration in all image and video processing applications like satellite image resolution enhancement, video resolution enhancement and feature extraction. Satellite images are used in many applications like astronomy, geo scientific studies and geographical information systems. Resolution enhancement of images is a pre-process that is to be used for many satellite image processing applications such as vehicle recognition, building recognition, and bridge recognition. Image resolution enhancement methods can be categorized into two major classes namely.

The term spatial domain refers to the image plane itself and approaches in this category are based on direct manipulation of pixels in an image. Spatial domain techniques lag in extraction and preservation of high frequency components of an image. This suggests that some other technique not involving spatial domain is to be used. So the image needs to be converted to some other Domain, processed and then converted back to spatial domain. The domain can be Fourier domain, wavelet domain or any other. Fourier domain is more suitable for spectral filtering.

### INTERPOLATION

Interpolation is the process of defining a function that takes on specified values at specified points. There are two closely related interpolants: the piecewise cubic spline and the shape-preserving piecewise cubic named pchip. Interpolation is the process of estimating the values of a continuous function from discrete samples. Image processing applications of interpolation include image magnification or reduction, subpixel image registration, to correct spatial distortions, and image decompression, as well as others. Of the many image interpolation techniques available, nearest neighbour, bilinear and cubic convolution are the most common, and will be talked about here. Since Interpolation provides a perfect reconstruction of a continuous function, provided that the data was obtained by uniform sampling at or above the Nyquist rate. Since Interpolation does not give good results within an image processing environment, since image data is generally acquired at a much lower sampling rate. The mapping between the unknown high-resolution image and the low-resolution image is not invertible, and thus a unique solution to the inverse problem cannot be computed. One of the essential aspects of interpolation is efficiency since the amount of data associated with digital images is large.

### NEED OF IMAGE RESOLUTION ENHANCEMENT

Resolution of an image has been always an important issue in many image and video-processing applications, such as video resolution enhancement, feature extraction, and satellite image resolution enhancement. Interpolation in image processing is a method to increase the number of pixels in a digital image. Interpolation has been widely used in many image processing applications, such as facial reconstruction, multiple description coding, and image resolution enhancement. The interpolation-based image resolution enhancement has been used for a long time and many interpolation techniques have been developed to increase the quality of this task.

There are three well-known interpolation techniques, namely, nearest neighbour, bilinear, and bicubic. Bicubic interpolation is more sophisticated than the other two techniques and produces smoother edges. Wavelets are also playing a significant role in many image-processing applications. The 2-D wavelet decomposition of an image


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is performed by applying the 1-D discrete wavelet transform (DWT) along the rows of the image first, and then the results are ecomposed along the columns. This operation results in four decomposed sub band images referred to low-low (LL) low-high (LH), high-low (HL), and high-high (HH). The frequency components of those sub bands cover the full frequency spectrum of the original image. Image resolution using wavelets is a relatively new subject and recently many new algorithms have been proposed. Carey et al have attempted to estimate the unknown details of wavelet coefficients in an effort to improve the sharpness of the reconstructed images.

Their estimation was carried out by investigating the evolution of wavelet transform extreme among the same type of sub bands. Edges identified by an edge detection algorithm in lower frequency sub bands were used to prepare a model for estimating edges in higher frequency sub bands and only the coefficients with significant values were estimated as the evolution of the wavelet coefficients. In many researches, hidden Markov has been also implemented in order to estimate the coefficients. In this paper, we propose a resolution-enhancement technique using interpolated DWT high-frequency sub band images and the input low-resolution image.

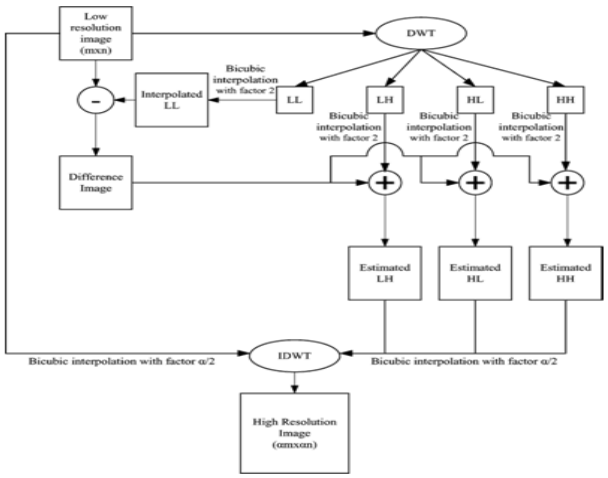


Figure 1 Block Diagram for types of Resolution Enhancement Algorithms

## SUPER-RESOLUTION RECONSTRUCTION OF IMAGES

The super resolution reconstruction problem is an ill-posed inverse problem having matrices of very large dimensions. This problem has been previously treated in the literature The first treatment to the supper resolution reconstruction problem was an iterative frequency domain treatment since the Fourier transform has superior properties for translational shifts between observations. The maximum a posteriori (MAP) estimation algorithm has been implemented in the field of image super resolution .The special nature of this problem forces most image super resolution reconstruction algorithms to have an iterative nature. These algorithms aim at reducing the computational cost of the matrix inversion processes involved in the solution by using successive approximation methods for the estimation of the HR image. The iterative

Implementation of the regularization theory in image super resolution has been the most popular procedure to solve the problem. Although these algorithms avoid matrix inversions, they are still time consuming and can't be implemented beyond a certain limit of dimensionality. In this framework, we propose four non-iterative algorithms for image super resolution.

## II. LITERATURE REVIEW

[1] S. E. El-Khamy, M. M. Hadhoud, M. I. Dessouky, B. M. Salam, and F. E. A. El-Samie "NEW TECHNIQUES TO CONQUER THE IMAGERESOLUTION ENHANCEMENT PROBLEM", Progress In Electromagnetics Research B, 2008.

This paper presents some new techniques for high resolution (HR) image processing and compares between them. The paper focuses on two main topics, image interpolation and image super resolution. By image interpolation, we mean extracting an HR image from a single degraded low resolution (LR) image. Polynomial based image interpolation is reviewed.

Some new techniques for adaptive image interpolation and inverse image interpolation are presented. The other topic treated in this paper is image super-resolution. By image super resolution, they mean extracting a single HR image either from multiple observations or multiple frames. The paper focuses on the problem of image super resolution using wavelet fusion and presents several super resolution reconstruction algorithms based on the idea of wavelet fusion.

2. P.Subbulakshmi1, S.Bhavani" Enhancement of Satellite Images Resolution Using Dual-Tree Complex Wavelet Transform", International Journal of Innovative Research In Electrical, Electronics, Instrumentation and Control Engineering.

Resolution enhancement(RE) methods that are independent of wavelets(interpolation methods) leads to blurring as high frequency components are lost.RE scheme based on Discrete wavelet transform(DWT) produces artifacts due to shift variant property. A complex wavelet-domain image resolution enhancement algorithm based on interpolation of the high-frequency subband images obtained by dual-tree complex wavelet transform (DT-CWT) is proposed.

In this scheme, decomposition of the low resolution image into different subbands is done followed by the interpolation of the high frequency sub band images and the input image. This method uses forward and inverse dual-tree complex wavelet transform (DT-CWT) to generate the high-resolution (HR) image from the given low-resolution (LR) satellite input image. The HR image is reconstructed from the LR image by combining all these interpolated images using the inverse dual-tree complex wavelet transform (IDT-CWT). The quantitative peak signal-to-noise ratio (PSNR) and results are presented to reveal the superiority of the proposed technique through

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comparisons between state-of-the-art resolution enhancement methods.

[3] P. Karunakar1, V. Praveen2 and O. Ravi Kumar3 "Discrete Wavelet Transform-Based Satellite Image Resolution Enhancement", Research India Publications, 2013

Satellite images are being used in many fields of research. One of the major issues of these types of images is their resolution. In this paper, they propose a new satellite image resolution enhancement technique based on the interpolation of the high-frequency sub bands obtained by discrete wavelet transform (DWT) and the input image. The proposed\ resolution enhancement technique uses DWT to decompose the input image into different sub bands. Then, the high-frequency sub band images and the input low-resolution image have been interpolated, followed by combining all these images to generate a new resolution enhanced image by using inverse DWT. In order to achieve a sharper image, an intermediate stage for estimating the high-frequency sub bands has been proposed. The proposed technique has been tested on satellite benchmark images. The quantitative (peak signal-to-noise ratio and root mean square error) and visual results show the superiority of the proposed technique over the conventional and state of- art image resolution enhancement techniques.

[4] Pingxiang Li, Huanfeng Shen, and Liangpei Zhang" A METHOD OF IMAGE RESOLUTION ENHANCEMENT BASED ON THE MATCHING TECHNIQUE".

In the field of digital photogrammetry, it is very important to enhance the image resolution. By enhancement, a clearer image with higher resolution is produced. So far, the enhancement technique is widely applied in various photogrammetric images. However, because of the restriction of the CCD sensor itself, the number of pixels on the sensor isn't much enough in some case. The image quality is affected and restricted. To solve this problem, the enhancement techniques are expended mainly in two categories: One is hardware solution; the other is software solution. In this paper, we propose a software algorithm for the enhancement of the image resolution considering inaccurate sub-pixel matching. In the proposed algorithm, the shifts, the gray values of the low-resolution images and the enhancement ratio are used to calculate the gray values of the higher- resolution image iteratively. Thus, the new image has higher resolution, so that it has higher definition. Experimental results indicate that the proposed algorithm has more universal applications.

[5] Shantanu H. Joshi, Antonio Marquina,, Stanley J. Osher, Ivo Dinov, John Darrell Van Horn1, and Arthur Toga" Image Resolution Enhancement and its applications to Medical Image Processing".

This paper focuses on a new image resolution enhancement method based on the TV regularization model by Marquina and Osher. The low resolution images considered in this paper are natural images as well as 3D anatomical MRI scans of patients. The idea of image resolution enhancement concerns with the improvement of image resolution based on the fusion of several acquisitions of low resolution observations by the imaging sensor. They also demonstrate the course to fine effect of the Bregman iterative procedure that helps to recover
Finer scales from the reconstructed image. Additionally, they propose a new edge preserving up (down) sampling operator that yields a significant improvement during the up/down sampling stage of the method.

[6] Alptekin Temizel, Theo Vlacho "WAVELET DOMAIN IMAGE RESOLUTION ENHANCEMENT USING CYCLE SPINNING AND EDGE MODELLING" Honeywell Video Systems-Visioprime.

In this paper they present a wavelet domain image resolution en-hancement algorithm. An initial high-resolution approximation to the original image is obtained by means of zero-padding in the wavelet domain. This is further processed using the cycle-spinning methodology which reduces ringing. A critical element of the algorithm is the adoption of a simplified edge profile suitable for the description of edge degradations such as blurring due to loss of resolution. Linear regression using a minimal training set of high-resolution originals is finally employed to rectify the degraded edges. Their results show that the proposed method outperforms conventional image interpolation approaches, both in objective and subjective terms, while it also compares favourably with state-of-the-art methods operating in the wavelet domain.

## III.PROPOSED METHODOLOGY

### 1. Problem Statement

The work is about to Analyse the structure of image with its resolution from previous history. The main problem in this area is image enrichment. Mathematical problem in biomedical imaging. In medical imaging four key problems:

1. Segmentation
2. Registration
3. Visualization
4. Simulation

Image Mosaicking -Transformation between image and image then transforms one of them and blend them together. This problem can be divided into three sub-problems:

1. Determine undifferentiated points between the two images.
2. Measure transmutation between the two images.
3. Alter and interfuse the images.

The complication is to assign the labels to each and every pixel. For solving labelling problem we can use graph cut algorithm. On the other hand, multi-label issue cannot be globally underestimated.

### 2. Objective

The general goal of the synopsis is to provide an overview of different image resolution enhancement methods which had been studied so far and modify a popular method for

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efficiently improving the image enhancement. Our objective is to compare the implemented algorithm on the basis of various parameters like usability and its application areas and time required for study. The objectives of this research work are:

1. To understand the working of the Image resolution.
2. To analyze the different methods of image resolution Enhancement.
3. To analyze the different kind of parameters on which the algorithm work.
4. To develop efficient image resolution algorithm for analyze the images resolution.
5. To improve the SNR of images after resolution Enhancement.
6. To implement the designed algorithm in any tool.
7. To generate and compare the results of modified algorithm

## IV. RESULTS

The database security over the web has been considered for improve the security and data has been written in binary form. The TSFS algorithm has been proposed for maintain the security. This approach has been implemented in ASP.Net with VC# and SQL Server 2008 has been considered as backend for save the information encrypted by the algorithm. The crucial part is password which is highly requirement of organization that should be encrypted.

The technique to enhance images is implemented using MATLAB. MATLAB is a tool for numerical computation and visualization. The basic data element is matrix. An image in MATLAB is treated as a matrix. MATLAB has built in support for matrices and matrix operations, rich graphics capabilities and a friendly programming language and development environment. In image contrast enhancement following steps will be followed:

The performance measure used here is PSNR i.e Peak Signal to Noise Ratio. The image has been enhanced by Histogram Equalization. The proposed algorithm is as follows:

1. Set up and initialize Input Grayscale Image
2. Set Frame=2
3. For Each Frame, the generate enhanced image
4. Normalize Each value to [0,255].
5. Generate the Histograms of the images after and before resolution enhancement.
6. Generate PSNR ratio to identify the results accuracy

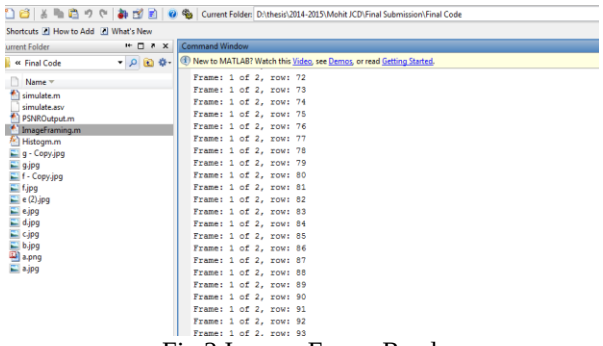


Fig 2 Images Frame Read

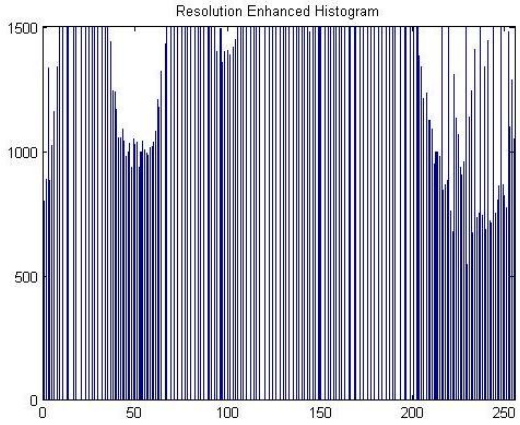


Fig. 3 Output Image Histogram

The PSNR values has been measured is: 42.41

## V. CONCLUSION

We have seen the significance and requirement of the image resolution enhancement. We have studied the DWT-SWT based method of image resolution enhancement. We have analyzed the problem associated with these method and proposed a different technique for the same. Further implemented this technique and finally we compared with proposed method on the basis of the parameters i.e. PSNR and SSIM. All the results are shown in the tabular form. From the results, found that proposed technique significantly better than the other techniques. The proposed method works good for both satellite and medical image. Thus it's a better technique for both the applications. We may utilize this for the enhancement of other poor resolution images also. In the future, we may try to get some technique which provides more improvement in the PSNR and the SSIM, to get the super resolution images.

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