Edge preserving and Enhance resolution of satellite Image

Sushma Lalwani, Mr.Yogesh Rathore

RITEE, CSVTU
RAipur,INDIA
slsushma110@gmail.com

RITEE,CSVTU
yogeshrathore23@gmail.com

***Abstract*— This paper presents, a resolution algorithm and contrast setting and edge preserving is used to enhance the resolution of satellite images .The main aim is bad focused or corrupted satellite images is improved image using new methodology. Satellite images are imperative in many areas of remote sensing. Image enhancement is a process involving changing the pixels intensity of the input images It reduces the effect of blur and noise and composed of several successive independent processing steps which suppress noise, enhance contrast, preserves the edge and increase the resolution of the image. Experimental results show that the proposed algorithms provide a flexible and reliable way for enhancing the overall quality of satellite image .various image quality parameters are applied for evaluating the performancne such as MSE,PSNR etc**

***Keywords*—Satellite image, contrast setting, resolution,PSNR, MSE**

I. INTRODUCTION

Satellite remote sensing (RS) is significant input to Earth observation, providing various kinds of imagery every day, , but low spatial resolution remains a critical bottleneck in a lot of applications, restricting higher spatial resolution analysis.Problems arises in remote sensing are **Cloud-related shadows** represent areas with low illumination conditions that affect remote sensing image quality. **Camera shake**, in which an unsteady camera causes blurry photographs, is a chronic problem for photographers. Many photographs capture ephemeral moments that cannot be recaptured under controlled conditions or repeated with different camera settings. If camera shake occurs in the image for any reason, then that moment is "lost

Lots of satellite images affected by the shadow of the clouds in the sky, the shadows caused by these clouds represent areas with low illumination conditions that are harder to detect but have the potential for enhancement. Cloud-related shadow removal is normally handled by first detecting the cloud and shadow areas. Then, image intensities in the shadow regions are adjusted to enhance the image quality. Different methodologies are developed and implemented for shadow detection that utilizes geometric constraints in addition to the image spectral characteristics [1] [2].. Some of these methods identifies and removes the image illumination variations using surface reflectance and variations constraints [3] [4]. Such methods were implemented mostly on high spatial resolution imagery and suffer costly computational overhead in addition to shadow edge processing problems. In satellite images, all open space area have the same characteristics will fail to extract total open space area. In addition, the light and weather conditions have big impact over images. Therefore, it is impossible to predict what and where objects are, and how they look like in a raster image. All these uncertainties and complexities make the extraction very difficult. Due to its importance, much effort has been devoted to this problem [5, 6]. Similarly, there are numerous factors that can distort the edges, including but not limited to blocking objects such as trees and shadows, surrounding objects in similar colors such as roof tops. As a matter of fact, the result of edge detection is as complicated as the image itself. Edges of open space area are either missing or broken and straight edges correspond to buildings, Therefore, edge-based extraction schemes is always needed to increase the visual appearance of such images. One of the most important quality factors in images comes from its resolution. Interpolation in image processing is a well-known method to increase the resolution of a digital image. Interpolation has been widely used in many image-processing applications such as facial reconstruction [7], multiple-description coding [8], and resolution enhancement [9],[10]. Popular class of methods solves the problem of resolution enhancement in the spatial domain.

II. PROPOSED METHOD

The flow chart of methodology used in (Fig 1)proposed method for enchancement of satellite images.in this algorithm four steps are there.in this algorithm input is satellite image and ouput is enhanced satellite image in which applying methods for enhancement image.the steps are first is noise removal of satellite image,second is settting of contrast of image or enhancing the contrast then after contrast setting apply edge preserving then finally increase the resolution of satellite images.

A. Input Image

Here input image is a bad focused or noise effected satellite image. The quality of satellite images degraded by lots of factor like heat of sun light, noise presence in environment, rotation of satellite camera and shape of earth. .

B. Noise Removal

We can use linear filtering to remove certain types of noise. Certain filters, such as averaging or Gaussian filters, are appropriate for this purpose. For example, an averaging filter is useful for removing grain noise from a photograph. Because each pixel gets set to the average of the pixels in its neighborhood, local variations caused by grain are reduced.
Here, we are using median filter. Median filtering is similar to using an averaging filter, in that each output pixel is set to an average of the pixel values in the neighborhood of the corresponding input pixel. However, with median filtering, the value of an output pixel is determined by the median of the neighborhood pixels, rather than the mean.

C. Contrast setting

The contrast stretching algorithm is used to enhance the contrast of the image. This is carried out by stretching the range of the color values to make use of all possible values. When the contrast stretching algorithm is applied to color images, each channel is stretched using the same scaling to maintain the correct color ratio. The first step is to balance the red and green channel to be slightly the same to the blue channel. This is done by stretching the histogram into both sides to get well-spread histogram.
Contrast value may also enhance using histogram equalization method, which equalize the gray values all over the image .

D. Preserving Edge Components

Edge-preserving smoothing is an image processing technique that smooths away textures whilst retaining sharp edges. When we need to preserve edge information and at the same time preserve the edges. Even when uniform smoothing does not remove the boundaries, it does distort them. This is not acceptable in the context of, for example, medical imaging. An alternative to linear filtering, called anisotropic diffusion. It is related to use a similar nonlinear diffusion processes to model human vision. The motivation for anisotropic diffusion (also called non uniform or for anisotropic diffusion (also called non uniform or variable conductance diffusion) is that a Gaussian smoothed image is a single time slice of the solution to the heat equation, that has the original image as its initial conditions. Anisotropic diffusion includes a variable conductance term that, in turn, depends on the differential structure of the image. Thus, the variable conductance can be formulated to limit the smoothing at ―edges‖ in images, as measured by high gradient magnitude.We use the bilateral filter to contain the true color and brightness of satellite images and preserve edge components.And then applying adaptive edge enhancement method to highlight the edge component clearly.

E. Resolution

Most of the resolution image reconstruction methods consist of three basic components: (i) motion compensation (ii) interpolation and (iii) blur and noise removal.Using the saturation parameters we can get the true color of satellite images and finally by setting the intensity values the resolution and visual appearance of image is increased.

F. Output Image

The resulting image is better than the original image. And the output image will be improving the image contrast and visual appearance of image will be clear

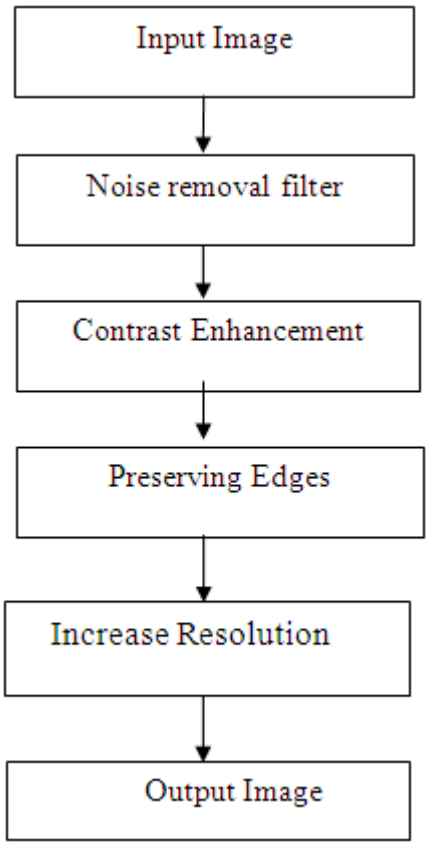

Fig. 1 Flow chart of methodology

III.STEPWISE RESULT

Figure 3 shows thestepwise output after applying the proposed method on an image taken from satellite in day time, in such images a good amount of noise and blur present due to effect of sun light, its quality is analyze after each step in methodology And then finally the proposed algorithm is applied on night time satellite images where less blur and

noise occurs but visual appearance of image is very badly affected due to darkness of the night. The Figure 2 shows the stepwise output after applying each algorithm.

Table 1 and Table 2 shows the PSNR and MSE of noise removal filter and edge preserving components in which compare two noise removal filter (median filter and blind deconvolution)on the basis of PSNR and MSE then select best one and same in case of edge preserving components.

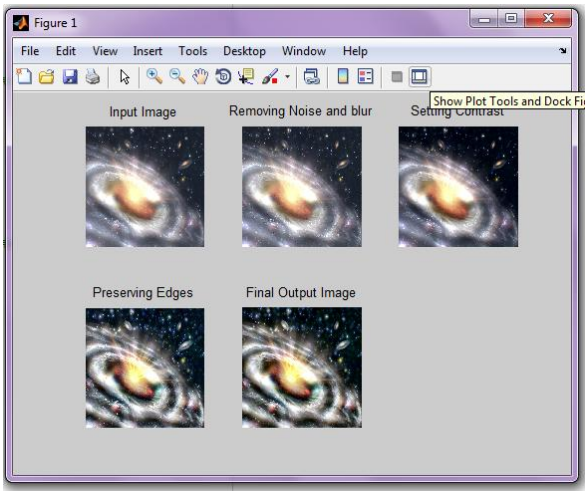

Fig. 2 Result of Proposed algorithms on Satellite image (Galaxy

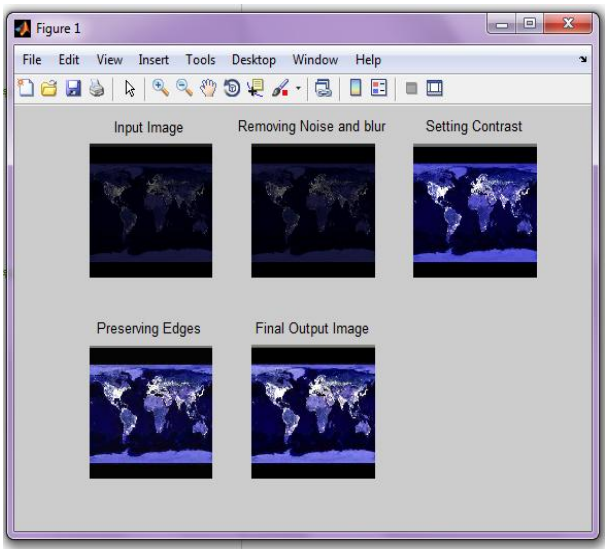

Fig. 3. Result of Proposed algorithm on night time Satellite image

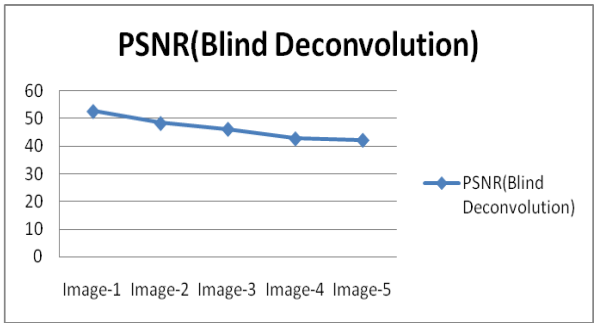

Fig 4 PSNR of Blind Deconvolution filter

Table 1 shows two edge preserving filters (bilateral filter and adaptive filter) and compare these two filters and weselect one filter for project on the basis of PSNR and MSE analysis on different images.and Table 2 shows the comparsion of output for noise removing using two filter such as median filter and blind convolution filter and comparing the filters on the basis PSNR ans MSE on different images we select blind convolution is good for for next step.

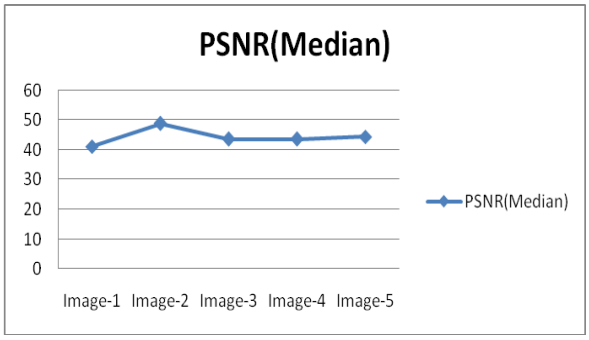

Fig 5 PSNR of Median filter

Sr. No	Image	Median		Blind Deconvolution	
		PSNR	MSE	PSNR	MSE
1	Image-1	41.1061	5.0405	52.6719	0.3528
2	Image-2	48.8749	0.8427	48.3572	0.9492
3	Image-3	43.5243	2.8887	46.2639	1.5426
4	Image-4	43.6667	3.2477	42.8084	3.4081
5	Image-5	44.412	2.3643	42.2891	3.9921

Table 1. Analysis of satellite image for noise removal using different filter

Sr. No.	Image	Bilateral Filter		Adaptive Filter	
		PSNR	MSE	PSNR	MSE
1	Image-1	39.2335	7.7619	22.7377	347.295
2	Image-2	41.9034	4.2036	23.941	273.072
3	Image-3	44.2325	2.5128	24.0484	259.276
4	Image-4	40.5875	5.7042	23.2896	305.166
5	Image-5	40.0075	6.7123	24.3414	240.012

Table 2 Analysis of satellite image for edge preserving using different filter

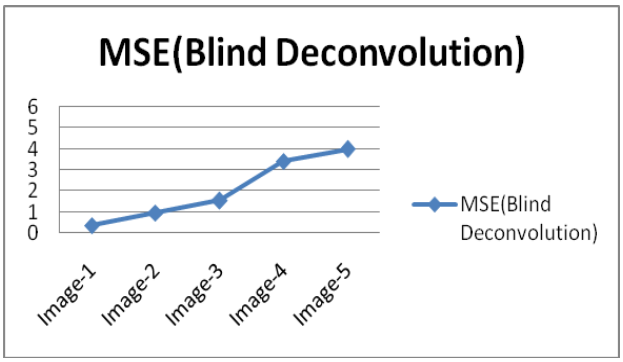

Fig 6 MSE of Blind Deconvolution filter

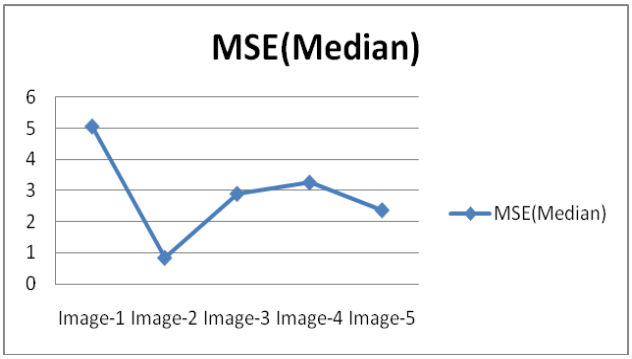

Fig 7 MSE of Median filter

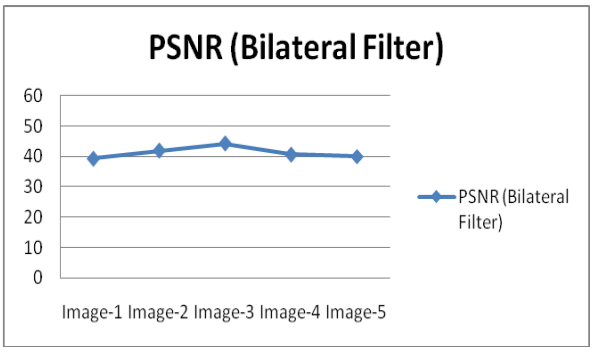

Fig 8 PSNR of Bilateral filter

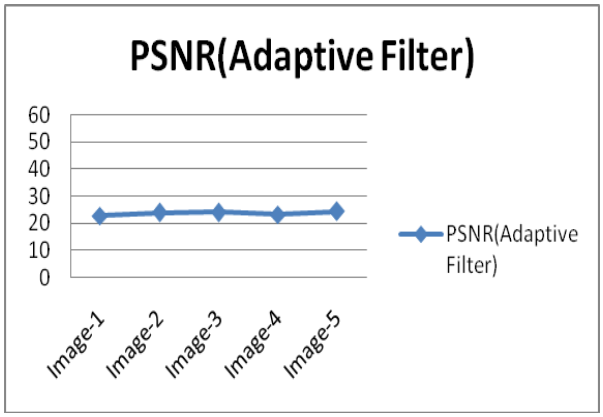

Fig 9 PSNR of Adaptive filter

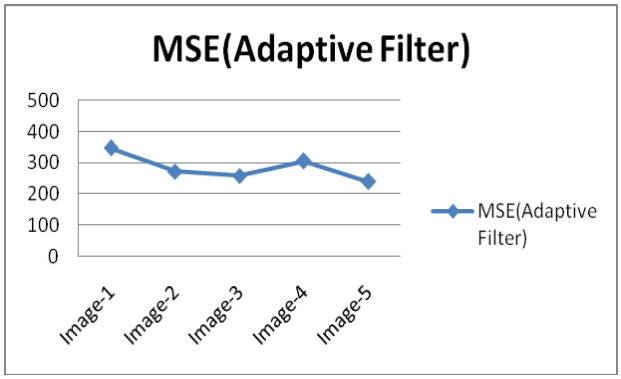

Fig 10 MSE of Adaptive filter

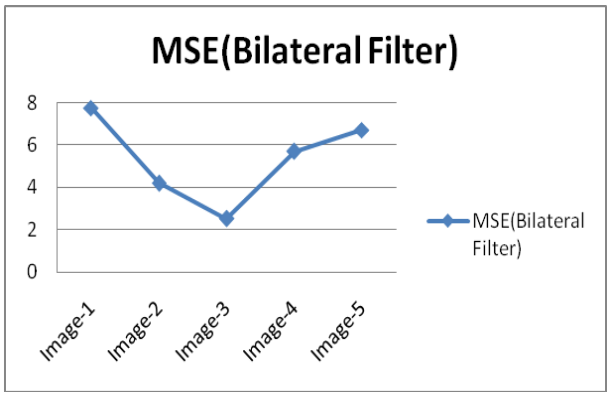

Fig 11 MSE of Bilateral filter

The step one used is noise removal filter that is median filter and blind deconvlution filter compare this filter with the value PSNR(peak signal to noise ratio) and MSE(mean square error).and analysis with the help graph in five different satellite images in project. with the help of fig 4 and fig 5analyze that value of PSNR comes good in blind

convolution filter as compare to the value of PSNR in median filter,so select deconvolution for remove noise in image.
Figure 8 and Figure 9 represent plot on various satellite image and find out that value of PSNR comes good in bilateral filter as compare to the value of PSNR in adaptive filter,then apply adaptive filter for edge preserving in satellite image in proposed method.and applying edge preserving in different images of satellite and then conclude adaptive is applied for preserving edges in satellite images. In the step fourth for edge preserving two filters are compares that is bilateral filter and adaptive filter on the basis of comparing the of PSNR and MSE we can concluded that adaptive filter is applied in satellite image for better result and fig 10 and fig 11 shows represent MSE on different egde preserving.

IV. CONCLUSIONS

The resolution of satellite image in increased. And increase the visual appearance of satellite image because of decreasing the mean square error (MSE) and increasing the peak signal to noise ratio (PSNR).Figure 4,5,8 and 9 shows that PSNR value is increase that's means quality increase. From figure and table we can conclude that MSE(mean square error) is decreased and PSNR is increased. The enhanced image is a sharper image than the original. Particularly interesting is the fact that textural information has been rendered visible in the enhanced image

ACKNOWLEDGMENT

I would like to extend my gratitude and my sincere thanks to my honorable, esteemed supervisor **Mr.Yogesh Rathore**, Sr.Lecture, Department of CSE and my parents . I would like to show my greatest appreciation to him. I can't say "thanks" is enough for his tremendous support and help. I feel motivated and encouraged every time I meet him. Without his encouragement and guidance this project would not have been materialized

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