Color Image Enhancement in RGB Space

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Abstract– Image Processing is very important area in the era of technology. Images on the internet and messages are nowadays a strong medium of communication. Images play a very important part in communication and data sharing. Hence image processing also becomes a topic of research. In current scenario image processing is the future of multimedia information processing. Image processing consists of image enhancement which further consists of Edge detection, Edge smoothening and many other things. The main problem in degraded images is that the information present in such images is not properly visible.The image processing techniques are used in captcha, forensics and many more applications. In these papers we are going to analyse the techniques by which image enhancement is achieved and the filters that are used for the same. We will also discuss the application of enhanced images.

Index Terms– Edge detection, Edge SmootheningForensics, Image filters,

I. INTRODUCTION

Image enhancement is a very important step in many areas. These images are often degraded with blur and noise or blur and noise simultaneously [1]. Enhancement was earlier referred as increase in quality or standard but is now evolved and now we can use it to refer to the increase in standard or quality of image. Hence operations that can be done to enhance the image quality are edge detection,edge smoothening and denoising [1]. Several Image filters, Partial differential equations [2], Algorithms etc. are used. Some techniques used in image processing include Pixilation, Linear filtering etc... Noise is an unwanted disturbance present in the image. Similarly blur is present because of movement of the camera or the object which is being captured. Both the above conditions are undesirable.Because in these conditions the information in the image is not delivered to the user. Many applications require very fine and specific details from images. The main challenge before image enhancement techniques is to extract the information from the image bypassing all the above mentioned hurdles. In these methods we are concentrating on Image filters. These filters have dominated the research work about image processing both in mat lab and java. About 110 filtersare developed for these purposes. Filters which are used in this paper are:

Unsharp Mask Filter [3], Gaussian Filter which are very handy in noise elimination, image enhancement, and edge detection. Once the image is processed by removing noise, removal of blur then such image can be used for research purposes. Techniques used for image enhancement in Java and mat lab are different. Stambouli- Bettahar [1] filter is one such type of filter used in mat lab. Such enhanced image can be used in many applications like agriculture, forensics etc.

II. RELATED WORK

The Partial differential equations used in digital image processing are evolved from the differential equations used in digital signal processing and heat transfer equations. Many such possible techniques have been discussed by researchers like Salim Bettahar [1]. The filters used in image processing resemble to the water filter which also removes unwanted entities.Ana log image processing is different from digital image processing because in digital image processing a wide range of algorithms can be applied. A lot of work related to image processing like classification, feature extraction, pattern recognition, projection, image segmentation is done.

III. SYSTEM MODEL

The image enhancement techniques can be divided broadly in two categories i.e. Frequency domain and spatial domain [5]. In Frequency domain we directly work on the frequency and transformation function of the image like Fourier transformation. But in Spatial domain work is done on a pixel and the neighbouring pixels. Spatial domain is considered as more easy and simple than that of Frequency domain because work is done on pixels directly. In our proposed system we are going to work in spatial domain [5]. Here we have used image filters for smoothening, denoising and other purposes. Filters used in our proposed model are Unsharp mask filter, Gaussian filter, Convolve filter.The operationsperformed before all this processing on image are image acquisition, loading of image and then passing the image through each filter to remove unwanted details and extract the information.Image acquisition can be done by various ways like capturing an image through sensors or camera. Also image can be loaded from database, acquired from hard disk or any folder on computer. In our proposed system we have provided new facility of acquiring image directly from internet by placing an URL in the system. After image acquisition, the next

step is loading the image in the system. In the system mentioned here the image is loaded as a buffered image in the system by using a class in JAVA. Then finally the filters present in the system are applied one after another to the image to get desired results. The filters are coupled with each other i.e. the output of one filter goes to other filter for further processing and simultaneously an array of dead pixels is created. The results of this technique can be observed through GUI. We can simultaneously see the enhanced image as well as the original image and compare both to find out the proportion and quality of enhancement.

IV.   IMAGE FILTERS

Each filter used in our proposed model hasitsown purpose. The filters used are unsharp mask filter, Gaussian filter, Convolve filter. Unsharp mask is a type of spatial filter. Amount, Threshold and Radius control the working of unsharp mask. Amount determines the contrast that is to be added to the edges. Radius affects the size of edges to be enhanced. In our system it has been used to make system less blurry. Gaussian filter is used in both signal processing and image processing. Gaussian filter is a low pass filter. In this system it is used for edge detection and enhancement. In some cases Gaussian filter is used to reduce Gaussian noise. Third type of filter used is Convolve filter. It is used for two purposes i.e. Rap and Clamp. Rap is used to combine pixels together and make them a part of image. Unlike Clamp is used to separate the pixels on the edges from image. When the image is loaded in the system it is operated by Unsharp mask, Gaussian filter and Convolve filter respectively. Output of each of these filter is coupled to each other and finally enhanced image obtained can be saved in the database and used for further applications. The working of filters can be understood from Figure 1. The Algorithm which we have developed for edge detection and edge enhancement works in following way: It calculates the values of one pixel and its surrounding six pixels. If the pixel value has range tending towards white on RGB scale then the pixel is turned white and if the pixel has value tending towards black then the pixel is turned black. In this way edges can be smoothened according to their surrounding pixels.

Fig.1.Original Image

Fig.2. Enhanced Image.

V.   OBSERVATIONS

To assess the performance of our algorithm we have compared our algorithm with existing algorithms. We compared our system with .In these other techniques and methods we can see that it produces several jitters [6] on the edges of object in the image. In existing methods the

overall quality of the image is enhanced but there are undesirable ringing artifacts [6]. But using the proposed model with unsharp mask algorithm and Gaussian filter we can see that the noise in the image is removed to certain extent. The edges in the image are detected very clearly. The main observation from the above experiments is that the edges of the image are smoothened and the image looks clear. We can refer to Fig.1. to see the results of the experiment. We can see that when image is zoomed to certain level the edges in the image are detected and look more clear than that of original image. Same takes place in case of noise. The noise in the image is considerably removed. Also this process is much faster than the existing image enhancement techniques. The main advantage of our system is that we have coupled one filter with another filter hence the system does not move in single direction unlike existing systems.

VI.   CONCLUSION

In this paper we have presented a technique of image enhancement. This technique is based on the filter framework. We have used four types of filters: Unsharp mask filter, Convolve filter and Gaussian filter. The proposed technique performs denoising, edge detection and edge smoothening. Results obtained using the proposed techniques are more fruitful than that of previous techniques. We have used Gaussian filter to remove Gaussian noise. Similarly unsharp mask is used for smoothening of edges. Denoising, Edge smoothening, Edge detection can be carried using above mentioned filters which yields better visual results. We can extend the work related to this paper in other fields like Feature extraction, Palm print, Pattern recognition etc... Also we are currently working on the same operations on black and white images to solve the problems. These technique can be applicable in many areas like Agriculture, Forensic, Microscopic image processing etc..

APPENDIX

1. RGB- Red Green and Blue
This algorithm is used to calculate RGB values of image.
2. URL-Universal Resource Locater
This is used to access data on internet.
3. GUI- Graphical User Interface.
Through which user communicates with the system or machine.

REFERENCES

1. Salim Bettahar, Amine Boudghene Stambouli, Patrick Lambert, Alexandre Benoit, "PDE-Based Enhancement of Colour Images in RGB Space",IEEE TRANSACTIONS ON IMAGE PROCESSING, VOL. 21, NO. 5, May2012.
2. S. Balamurugan, R. Somyalakshmi, "Higher Order Partial Differential Equation Based Method for Image Enhancement", June 2013.
3. Kwang-Wook Lee, You-Sun Kim, Sang-Hee Park, Suryanto,and Sung-Jea Ko, "Effective Colour Distortion and Noise Reduction for Unsharp Masking in LCD", May 2010.
4. Yanan Fu,Ting fang Yan,DavidW.Zhang, Max Q.-H. Meng,"A Partial Differential Equation Algorithmfor Image Enhancement",Proceeding of the IEEE International Conference on Information and Automation Shenyang, China, June 2012.
5. S.S. Bedi, Rati Khandelwal,"Various Image Enhancement Techniques- A Critical Review",International Journal of Advanced Research in Computer and Communication Engineering Vol. 2, Issue 3, March 2013.
6. Iyad F. Jafar, Khalid A. Darabkh, "A Modified Unsharp-Masking Technique for Image Contrast Enhancement",8th International Multi-Conference on Systems, Signals & Devices,2011.

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