

Design of an efficient coloring technique for images using color transfer to process Corruptive Artifacts

Seema Tidke¹, Shrikant Zade²

¹(Computer Science, Priyadarshini Institute of Engineering and Technology/ Nagpur University, India)

Abstract:- In this paper, The system is using two effective techniques which are used to inpaint the part of the image as well as coloring the image. For the First part, we are using Patch Based Inpainting algorithm in which inpaint the missing part of the image. Of course it is patch based Algorithm so first, the image is divided into patches and selected part of the image is inpainted. In the second part we are using patch based Colorization by YcbCr method. The algorithm by which we used luminance evaluation of the reference & target images. This method is used for coloring the Gray scale image by using color from the given image with color difference (Cb Cr) evaluation. By luminance value matching the colorization of images is possible. Both techniques are very effective and speedy to develop the system. The Gray scale image colorization is very useful application in the world of image processing. This work presents a general technique for “colorizing” grayscale images by transferring color between a source color image and a target or grayscale image by matching luminance and texture information between the images. The system uses a very simple algorithm that uses a decorrelated color space and then applies simple operations there. Thus the color space with decorrelated axes is a useful tool for manipulating color images in this work. Colorization of a gray scale image is achieved here by matching by luminance values onto the data points in a simple operation, thus believable output images are obtained given suitable input images. Here, we use some features like energy, entropy, homogeneity, contrast and correlation based on correlation matrix for the purpose of texture matching between two images.

Keywords:- inpainting, colorization, Contrast, Correlation, Energy, Entropy, Homogeneity, luminance, Mean and Standard Deviation, YCbCr Color Space.

I. INTRODUCTION

1.1 About image processing to process corruptive artifacts

Image processing is a method to perform some operations on images, in order to get an enhanced image or to extract some useful information from it. It is a type of signal processing in which input is an image and output may be image or characteristics/features associated with that image. Nowadays, image processing is rapidly growing technology. It gives core research area within engineering and computer science disciplines too.

Image processing basically includes the following three steps: Importing the image via image acquisition tools, analyzing and manipulating the image; Output in which result can be altered image or report that is based on image analysis. There are two types of methods used for image processing namely, analogue and digital image processing. Analogue image processing can be used for the hard copies like printouts and photographs. Image analysts use various fundamentals of interpretation while using these visual techniques. Digital image processing techniques help in manipulation of the digital images by using computers. The three general phases that all types of data have to undergo while using digital technique are pre-processing, enhancement, and display, information extraction.

Different sources of digital images are discussed and examples for each source are provided. The continuum from image processing to computer vision is covered in this paper. Image processing means to perform some task on images like image editing, updating, creating images, removing artifacts & recovery of images, coloring image etc. As per my project of image processing, this is the basic theory regarding Image processing in the form of color transfer as well as to process Corruptive Artifacts. Here one simple process of editing images about image editing. There are some critical operations in image editing but it easily suffers from artifacts. Artifacts are given below:

Color distortion: Some disharmonious or unexpected colors appear which are not included in the reference image.

Grain effect: A phenomenon appear which are not included in the reference image. Grain effect. A phenomenon appears due to enhancing the noise level of the picture under the stretched mapping. Commonly, it looks like some noises or irregular blocks, Loss of details. The fine-level details in the target image are missed after the

color transfer. We noted that it is not a special case. Ideally, color transfer between reference and target images should satisfy the following goals.

Color fidelity: The color distribution of the target should be close to that of the reference image.

Grain suppression: No visual artifacts (grain/blocky artifacts) should be generated in the target image. In the project, for unwanted part, we implemented the technique to remove unwanted part and recover the image by background pixels.

In my project there we found a good solution to rectify artefacts like unwanted part of the image, unwanted part which is not useful for the image. For this, we used the good technique and implement it as well as there is second part to color images by nearer pixels or patch color.

1.2 Background

The performed system is related to image processing .In the background, the techniques are used for image processing to process corrective artifacts. There are various operations, by which, user can perform on the images such as recovery of images from corrective artefacts,coloring,editing,updating or creating or removing features of images or coloring to the images.....etc.

As we know that the image in the form of matrix, a matrix in the form of 0's or 1's, which includes pixels as par row and column wise. Every image is recognized by matrix of pixels. Matrix sizes like 3X3, 4X4, 8X8, 16X16 .etc. Image Processing is the emerging and advanced topic for researching and developing projects. There is tremendous work has been done and still the topic is at up level .Lots of research is going on and the main the image processing system is implemented as Digital Image Processing by which now a days everyone is going through this Digital Image Processing and working on Images for various operations such as Filtering, Coloring, Editing, Video Segmentation,,X-Rays,Sonography etc. Many operations can be done using Digital Image Processing. For making image related any work there are many software like JAVA, VB, and MATLAB etc.

In the previous method, Example-based color transfer was used in image editing but easily suffers from some corruptive artifacts in the mapping process. For these artifact's problems, we studied a novel color transfer framework to deal with these corruptive artifacts by integrated a self-learning filtering scheme into the iterative probabilistic color mapping model. This method is used for preventing the color distortion and grain effect in the process of transfer, but also achieves the effect of detail preserving or enhancing. This framework had some limitations. If the amount of the referred colors is limited, it is likely to produce two major problems. One is the in harmony of color appearance, the other is the color bleeding-like artifacts. Then dealing with the grain effect, color distortion, and loss of details. Addition to the one-to-one transfer, our framework was extended to the multiple-reference color transfer, HDR color transfer and style transfer to demonstrate its flexibility. Because of some disadvantages of this novel color transfer method we studied and used YCbCr method for coloring images.

As par the project there are three types of tasks that we performed: 1) Image Inpainting 2) Coloring the images and 3) Combining part-1 and part-2 to form single module. The system can work for real as well as static images. The advance concept is of Video Editing and advanced operations on that.

For such types of image related operations there are some software which are used to develop image processing system .Software like JAVA, VB6 and the latest is MATLAB. MATLAB is very popular language to develop image related operations

II. OVERVIEW

2.1 Image Inpainting

In Image Inpainting, suppose user wants to remove unwanted part of the image then user can remove unwanted part by image patch inpainting algorithm. For image inpainting we used patch based algorithm to process corruptive artifacts. We used novel object removal algorithm which is based on patch sparsity.First resize the image then select the inpainting region to remove. After selecting the part the image, the system removes that part .By nearer matching patch again recover that removed part .This is the technique that is used for unwanted part removal.

2.2 Colorization of image (Gray to Color)

Colorization of images by YcbCr method is worked successfully. This is the conversion of gray scale image to color image by YcbCr2RGB method. The match between the gray scale pixels to RGB image's pixels is the important factor for colorization. The decorrelated color space YCbCr for colorization purpose. YCbCr color space also provides three decorrelated channels Y, Cb and Cr. Channel Y is achromatic luminance channel, whereas chromatic channels Cb and Cr correspond to the difference between blue component with a reference value and difference between red components with a reference value, respectively. This space also allows selective transfer of chromatic Cb and Cr channels from color image to grayscale image without introducing cross channel artifacts. The operation is performed via "pixel by pixel".

2.3 Combination of Module1 and Module 2

Finally Combined Module 1 and Module 2 to form single system of Image inpainting and colorization of image .Single module is useful for image inpainting as well as colorization of images. As compared to previous methods ($\alpha\beta$), efficiency is best, it needs less time to get output. This system can work on gray scale images various sizes in YcbCr coor space.Here ,a reference colored image or source image which is similar in texture to the target gray scale image.it it necessary that this image is colorized version of the target gray scale image, it can be any similar colored image. The quality of output depends on the choice of this reference or source image. The system converts target and source images in YcbCr decorelated color space, to avoid cross channel artifacts and divide image in windows of equal size. The luminance values of the pixel in this best matching window are transferred to the corresponding gray scale image pixel. As per result, this YcbCr method gives better quality visually.

III. DESIGN AND IMPLEMENTATION

3.1 Image Inpainingnting implementation

Image inpainting is the process of filling - in of the missing regions in an Image. Inpainting technique is the modification of the images in an undetectable form. Nowadays Image has become an important media of communication in the world. Image inpainting [1] is performed in the spatial domain whereas Image inpainting is performed in the spatial-temporal domain [2].

Image inpainting also plays a vital role in the field of image processing and computer vision as that of the image inpainting. There are numerous goals and applications of the Image inpainting technique from the restoration of damaged Images [3] and paintings to the removal or replacement of the selected objects in the Image.

Image inpainting is used to remove objects or restore missing or tainted regions present in a Image by utilizing spatial and temporal information from neighboring [2]scenes. The overriding objective is to generate an inpainted area that is merged seamlessly into the Image so that visual coherence is maintained throughout and no distortion in the affected area is observable to the human eye when the Image is played as a sequence.

For implementing algorithms we used MATLAB 13 .By using MATLAB13 We are able to implement the algorithms by coding for the project or image work.The MATLAB is also very popular for Graphics design with lots of graphics objects and functions. Win video object is used for video input. Get snapshot (vid) is used for get the snapshots of the image. Many functions and objects are used to develop this project

Diagram –1 (Removing Unwanted Part by using Inpaining Algo)



Steps For Part-I (Patch based inpainting Algorithm)[4]

1. Input image & convert into gray scale.
2. Resize the image into Standard size
3. Select the region to inpaint
4. Divide the image into patches
5. Search in neighboring section to get matched patch
6. Get the matched patch
7. Replace the matched patch with removed patch
8. Show the image after inpainting

3.2 Colorization of Images implementation

Colorization is the process of coloring images. Here, We used colorization process with YCbCr method. Using luminance value we color the image. Calculation of luminance[6] values through differences achieved color value[6][7]. This is the part-2 used for coloring images through YCbCr method. Gray Scale[7] images can be colored by referenced or source colored image[6]. The step by step method is given below with example:

For Part-2(Exemplar Based Coloring Algorithm)[7][6]

1. Input gray image
2. Converting to YCCr color space
3. Compare luminance values of both G and C
4. Get the Luminance matching
5. Find the difference between the image color palette and the current gray scale image
6. After getting minimum difference
7. Replace the colors in the gray image
8. Construct the colored image

Colorization of Gray Image to Color



Referance Image



Target Image

Colored Image →



IV. Result and Discussion

After the execution of the project, the output is getting successfully as per algorithms implemented. Both patch based Image inpainting and object removal algorithms for the removing unwanted part of the image

and also used Exemplar Based Coloring Algorithm using luminance comparison with YCBCR method. Both algorithms are very effective and efficient in manner by Which the project output is with good accuracy as compared to previous methods .The table 1.1 has been shown the accuracy report and exact time of the execution with comparison previous algorithm. Using MATLAB 13 In the result is 90%.In the result, we found that the method those we used in the project is very effective and good in accuracy and speed. The aim of this project is to work both inpainting and colorization process in parallel manner with less or efficient time. At a time the system performed both processes in parallel manner.

V. Conclusion and Future Scope

Experiments showed that the exemplar-based patch Based object removal algorithm can produce inpainting results consistent with the original image. In this paper, images with background is considered. In future, background with multiple scales and orientations. This work can be extended to wide areas of applications, including video special effects and restoration and enhancement of damaged videos or images.

In this work we have successfully colorized gray scale images of various sizes in YCbCr color space. Here we take a reference colored image or source image which is similar in color to the target gray scale image, it is not necessary that this image is colorized version of the target gray scale image, it can be any similar colored image. The quality of output depends on the choice of this reference or source image. We convert both the target and source images in YCbCr decorrelated color space, to avoid cross channel artifacts, and divide the source image in windows of equal size. The size of window usually 7X7 suffices for all the images but may be increased for some problematic images. The properties of these windows are compared with those of target image based on texture features matching to find the best matching window. Then the luminance values of the pixels in this best matching window and gray scale image are compared and the chromatic properties of best matching pixel in source window are transferred to the corresponding gray scale image pixel We compare our results with the output obtained by colorization using very popular technique of using only mean and standard deviation in $l\alpha\beta$ color space and come to the conclusion that the results obtained by colorization in YCbCr color space using our method are of better quality visually as well as on the basis of image .

This system can be extend for future research and for digital image processing at advance stage.

References

- [1]. Idan Ram, Michael Elad, Fellow, IEEE, and Israel Cohen, Senior Member, IEEE “*Image Processing Using Smooth Ordering of its Patches*”, Published in IEEE TRANSACTIONS ON IMAGE PROCESSING, VOL. 22, NO. 7, JULY 2013.
- [2]. Chetan Bhele, Aslam Kazi2, “*Image Inpainting Using Patch Sparsity*”, IOSR Journal of Electronics and Communication Engineering (IOSR-JECE) e-ISSN: 2278-2834, ISSN: 2278-8735. Volume 9, Issue 2, Ver. VIII (Mar - Apr. 2014), PP 121-125 www.iosrjournals.org
- [3]. Pranali Dhabeekar, Geeta Salunke, “*The Exemplar-based Image Inpainting algorithm through Patch Propagation*” Publish in International Journal of Recent Technology and Engineering (IJRTE), ISSN: 2277-3878, Volume-1, Issue-4, October 20124.
- [4]. B.Vidhya,S.Valarmathy,“*Novel Object Removal in Video Using Patch Sparsity(Base Paper)*”, International Journal of Scientific & Engineering Research Volume 2, Issue 4, April-2011 ,ISSN 2229-5518
- [5]. Zhuo Su, Student Member, IEEE, Kun Zeng, Li Liu, Bo Li, and Xiaonan Luo,“*Corruptive Artifacts Suppression for Example-Based Color transfer*”, IEEE TRANSACTIONS ON MULTIMEDIA, VOL. 16, NO. 4, JUNE 2014
- [6]. Mrs.V.Karthikeyani, Dr.K.Duraiswamy, Mr.P.Kamalakkannan,“*Conversion of Gray-scale image to Color Image with and without Texture Synthesis*”,IJCSNS International Journal of Computer Science and Network Security, VOL.7 No.4, April 2007.
- [7]. Mrs. Smriti Kumar, Mr. Deepak Singh”*Colorization of Gray Scale Images in YCbCr Color Space Using Texture Extraction and Luminance Mapping(Base Paper)*,IOSR Journal of Computer Engineering (IOSRJCE),ISSN: 2278-0661 Volume 4, Issue 5 (Sep.-Oct. 2012), PP 27-32, www.iosrjournals.org