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Object Removal Using Super-Resolution-Based In-Painting

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Abstract: *In-painting is the process of reconstructing lost or deteriorated part of images based on the background information. Image in-painting fills the missing or damaged region in an image, utilizing information of its neighboring region. In-painting algorithm has numerous applications. Such as, it can be used for restoration of old films and object removal in digital photographs. The user select a specific region (target region) to be removed from the image. Super resolution reconstruction algorithm produces high resolution image from sequence of low resolution images. The main aim of super resolution is to improve visual quality of available low resolution images using exemplar based in-painting method.*

Keywords: *In-painting, Image Processing,Examplar-based in-painting, super-resolution.*

I. Introduction

Image processing is any form of signal processing for which the input is an image, such as a photograph. The output of image processing may be either an image or a set of characteristics or parameters related to the image[11]. Since the wide application of digital camera and the digitalization of old photos, in-painting has become an important process, which is to be operated on digital images. More than scratch removing, the in-painting techniques are also applied for object removal and text removal. Furthermore, they can also be observed in applications like image compression and super resolution. Image in-painting is the art of filling the missing data in an image. The purpose of in-painting is to reconstruct missing region in a visually plausible manner so that it seems reasonable to the human eye. There have been several approaches proposed for the same. In the digital world, in-painting (also known as Image Interpolation) refers to the application of sophisticated algorithms to replace lost or corrupted part of the image data (mainly small region or to remove small defect).Image In-painting is defined as a procedure to fill the missing regions in an image[11].

Existing method can be classified into two categories:

1.Diffusion-Based Method-Diffusion based method uses partial equations and various methods. But when the hole to be filled-in is large, the diffusion based method lead to introduce blur in the image. It gives the better result when the hole to be filled is small. This method uses variation theory.

2.Exemplar-Based Method-The exemplar-based method copies the best match patches from the image.It is better than diffusion based method. This technique is very cheap and it generates the new texture by copying the color from the source value. Due to high computational time and problems when the hole to be filled is large there are many difficulties in In-painting algorithms. By using hierarchical approach first convert image into low resolution image and use K-NN(K-Nearest Neighbour)algorithm for in-painting. After In-painting to improve the quality of image super resolution algorithm is used.

3.Super-Resolution(Sr): It is a method of creating one enhanced resolution image form one or multiple low resolution image.

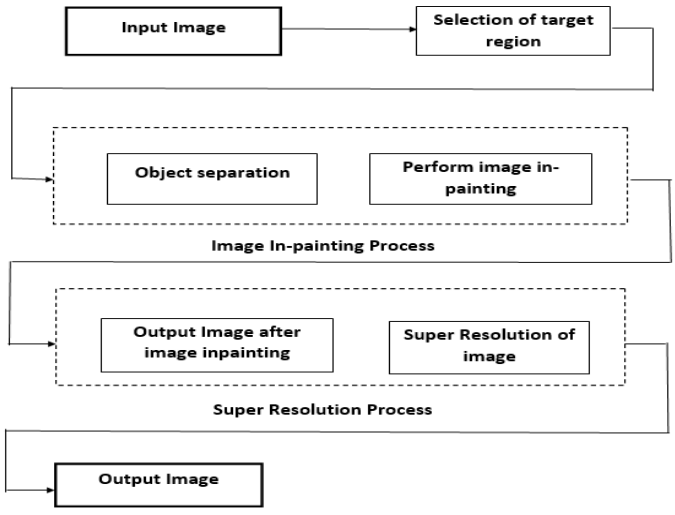

Fig. 1 System Architecture

II. Literature Review

[1]Diffusion Based In-Painting

Diffusion based In-painting was the first digital In-painting approach. In this approach missing region is filled by diffusing the image information from the known region into the missing region at the pixel level. Basically these algorithms are based on theory of variation method and Partial Differential equation (PDE). The diffusion- based In-painting algorithm produces superb results or filling the non-textured or relatively smaller missing region. The drawback of the diffusion process is it introduces some blur, which becomes noticeable when filling larger regions. All the PDE based in painting models are more suitable for completing small, non-textured target region.

[2] Texture Synthesis Based In-Painting

Texture synthesis based algorithms are one of the earliest methods of image In-painting. And these algorithms are used to complete the missing regions using similar neighborhoods of the damaged pixels. The texture synthesis algorithms synthesize the new image pixels from an initial seed. And then strives to preserve the local structure of the image. All the earlier In-painting techniques utilized these methods to fill the missing region by sampling and copying pixels from the neighboring area. For e. g, Markov Random Field (MRF) is used to model the local distribution of the pixel. And new texture is synthesized by querying existing texture and finding all similar neighborhoods. Their differences exist mainly in how continuity is maintained between existing pixels and In-painting hole. The main objective of texture synthesis based in-painting is to generate texture patterns, which is similar to a given sample pattern, in such a way that the reproduced textured retains the statistical properties of its root texture.

[3]PDE Based In-Painting

This algorithm is the iterative algorithm. The main idea behind this algorithm is to continue geometric and photometric information that arrives at the border of the occluded area into area itself. This is done by propagating the information in the direction of minimalchange using isophote lines. This algorithm will produce good results if missed regions are small one. But when the missed regions are large this algorithm will take so long time and it will not produce good results. Then inspired by this work proposed the total variation (TV) in-painting model. This model uses Euler-Lagrange equation and anisotropic diffusion based on the strength of the isophotes. This model performs reasonably well for small regions and noise removal applications. But the drawback of this method is that this method neither connects broken edges nor greats texture patterns. These algorithms were focused on maintaining the structure of the In-painting area. And hence these algorithms produce blurred resulting image. Another drawback of these algorithms is that the large textured regions are not well reproduced.

[4]Examplarbased Imagein-Painting And Approaches To Improve The Performance

The performance of exemplar based image in-painting algorithm by introducing two different techniques. Both the techniques utilize the patch propagation by internally propagating the image patches from the source area into the interior of the target area patch by patch. In the first technique of exemplar-based image in-painting an easy patch shifting technique is utilized. In traditional exemplar-based in-painting technique errors often arise when little number of well-known pixels is used to represent a big unknown area. The patch shifting technique offers more significant target patch than traditional exemplar-based technique. In this technique, the target patch which has well-known pixels fewer than predefined threshold would be shifted in the way that enhance the number of wellknown pixels, means the possibility to filling in every patch obviously increase. The second technique of exemplar based image in-painting utilizes area segmentation. In this technique segmentation map is used to enhance the performance of robust in-painting, in which a segmentation technique is employed to utilize spatial information in the source area. By means of segmentation map, it adaptively finds out patch size and decreases search area. The exemplar-based image in-painting technique offers great outcomes as compare to PDE-based image in-painting technique. This technique reduces the number of iterations and error.

[5]Robust Exemplar Based Object Removal In Video

In a robust exemplar-based video in-painting technique that restores the area of the removal object, and the technique can be further employed to extract the back ground of videos. At first,video is changed into number of frames object tracking in each frame by utilizing normalized cross correlation. Exemplar-based image in-painting algorithm iteratively finds the source area and fills the missing/damaged area, with the most related patch in the source area. This technique automatically picks the values of parameter for the robust priority function and decrease the search area, with segmentation map. The candidate source areas are

discovered by using structure texture information. This technique can decrease the number of iterations error propagation caused by inaccurate matching of source patch.

[6]Region Filling And Object Removal By Exemplar Based Image In-Painting

The implementation of Criminiss technique for eliminating large objects from digital images/photographs and then improves it with Chengs robust algorithm. Criminiss technique utilizes an exemplar-based synthesis technique transformed by an integrated scheme to find out the fill order of the target area. Confidence values of pixels are maintained, along with image isophotes, that together influence filling priority. Criminiss technique is proficient in transmitting both linear structure 2-dimensional textures into target area with one, simple algorithm. Comparative experiments show that a simple selection of the fill order is necessary and sufficient to handle this task. Cheng developed a generic priority function to facilitate the image restoration. The algorithm proposed by author is more.

[7]Modified Fast And Enhanced Exemplar Based In-Painting Algorithm For Solving Unknown Row Filling Problem

An adapted fast and improved exemplar based image in-painting technique to solve the unknown row filling difficulties. This modified technique is adaptation in updating criteria in fast and enhanced exemplar based image in-painting algorithm proposed by Anupam .A technique that give the answer to the problem, if two or more than two patches have same mean square error, so to choose patch which is most appropriate for the patch to be filled is made by calculating variance. Reduced search area is suggested, in order to decrease the computational difficulty instead of finding in whole image. The proposed algorithm resolve the difficulty of unknown row filling and provides better results than original fast and enhanced exemplar based image in-painting algorithm. But the resultant images produced by this approach still suffer from some difficulties due to which it adds few unwanted incorrect information from background in the photograph.

[8]Exemplar-Based Image In-Painting Base On Structure Construction

An exemplar based image in-painting technique by integrating Bzier curves to build missing edge information. The foundation of this technique is the contour lines restoring and exemplar based image in-painting technique In this approach at first, make use of mean shift segmentation to understand color segmentation in damaged photograph/image. Then, Bzier curve is utilized to join the missing contour lines to rebuild main structure in damaged area. At last, use the exemplar based image in-painting technique to locate a best related patch from other source area which holds real information and attach it into corresponding location.

[9] Image In-Painting Using Exemplar Based, DCT And FMM Algorithm

The unnecessary objects or data from the original photograph/image but this modification is not observed by the user. Thus this will be made by utilizing the three algorithms that is: Exemplar Based Image In-painting Technique, DCT (Discrete Cosine Transform) Based Technique and FMM (Fast Marching Method). Exemplar based image in-painting technique and DCT based technique, which economically and efficiently produce new texture by sampling copying color values from source. Exemplar based technique and DCT based technique is utilized for eliminating big objects from digital images/photographs and replacing them with visually probable backgrounds. The Fast Marching Method (FMM) is utilized to eliminate all scratches within the photograph/image. This technique has several benefits like- easy to implement, efficient than other in-painting techniques, it generates most similar outcomes than other in-painting techniques and it can be easily adapted to utilize different local in-painting techniques.

[10] Novel Exemplar Based Image In-Painting Algorithm For Natural Scene Image Completion with Improved Patch Prioritizing

A new exemplar based in-painting algorithm with an enhanced priority term that describes the filling sequence of patches in the photograph/image. The proposed algorithm is based on patch transmission by inwardly transmitting the image patches from the source area in to the inside of the target area patch by patch. The exemplar based image in-painting algorithm with best patch match is introduced in this work and for obtaining this best patch match an enhanced patch priority term and a suitable search region is introduced. This research is not only limited to construct the damaged area or the matching area complete accurately, but also repair the images minute spots, scratches the big damaged area completely. The results of proposed method show that it has an obvious enhancement in visual quality as compared to the conventional exemplar-based image in-painting algorithm. This work deal with in-painting of images/photographs, it can also be expanded for in-painting of video frames.

III. Conclusion

A new In-painting framework has been proposed to solve In-painting problem which combines a super resolution method and patch sampling method.The proposed method improves on the exemplar-based In-painting methodsby proposing a new framework by combination of multiple In-painting followed by a single-image exemplar based SR method ,advantages are less demanding in terms of computational resources and less sensitive to noise,high resolution quality images less noise,visual relevance,increased robustness.lt is used in satelliteimaging, medicalscience, surveillancevideo,military.

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