Image Inpainting a Novel Technique to Remove Object from an Image

Mahesh M. Mahajan

Department of Computer Engineering, RCPIT, North Maharashtra University, Jalgaon, Maharashtra, India

ABSTRACT

Now a days people taking lots of photos using various modern instruments such as camera, smart phones, etc. having a vast variety of quality standards. Peoples are also trying to preserve their past pictures, Image Inpainting is the method of restoring lost part of an image and reconstructing them based on the background information. This has to be done in an undetectable way. Images Inpainting is a set of techniques for making undetectable modifications to images. Applications of image inpainting cover the removal of an object from a scene to the retouching of a damaged painting or photo. For photography and film, inpainting can be used to reverse deterioration or to add or remove elements from photographs. In each case, the aim is to fill the damaged portion of the image in a visually plausible way and the new image has close resemblance to the original image and one will not able to differentiate between original image and the imprinted image. This survey tries to study various techniques of image inpainting.

Keywords: Image Inpainting, TV model, offset map, Region filling, Directional Filter Bank, Laplacian Pyramid

I. INTRODUCTION

The term inpainting is imitated from an ancient art of image restoration by professional image restorers in museums. Image inpainting is the method of restoring lost part of an image and reconstructing them based on the background information. This has to be done so significantly so that it can't be detected by human eyes. Inpainting techniques range from the automatic methods to those labor intensive retouching methods. Digital Image Inpainting tries to imitate this process and perform the enchanting automatic. This activity consists of filling in the modifying the damaged ones in a visually plausible way by an observer, not familiar with the original images. This is reminiscent of interpolation approaches used in film restoration and the global optimization method. Applications of image inpainting range from restoration of photographs, films and paintings to removal of occlusions such as subtitles, text, publicity and stamps from images.

Now a day it is further extended to remove large objects from an image as shown in figure 1.1 which shows how

an object can be removed from an image and it shows input image and resultant image (with removal of the object). It shows an example of this technique where a building (manually selected as the target region) is altered by information from the remaining of the image in a visually plausible way. Details that are occluded completely by the object to be removed cannot be recovered by any mathematical method. Therefore the objective for image inpainting is not to reconstruct the original image, but to create some image which is look alike of the original image such that it cannot be detected by naked eyes.

(a)   (b)
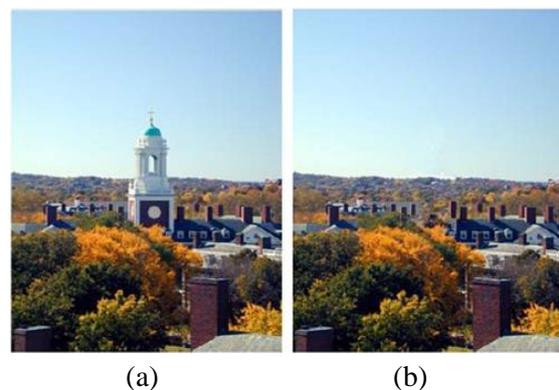
Figure 1. (a) Original image (b) Image after object removal

The algorithm automatically does this in a way that it looks "fair" to the human eye. There is no mathematical method that can recover the details that are hidden/ occluded completely by the object to be removed. Therefore the objective for image inpainting is not to recover the original image, but to build some image that has a close resemblance with the original image. Such techniques has several uses, One can use is in restoring photographs. Ages ago, people were preserving their visual works carefully. As time passes, photographs get damaged and scratched. Users can then use the software to remove the cracks from the photographs. One more use of image inpainting is in creating special effects by removing unwanted objects from the image. Unwanted objects such as microphones, ropes, some unwanted person and logos, stamped dates and text etc. in the image. While transmitting images over a network, there may be some parts of an image that are missing. These missing areas can then be reconstructed using image inpainting.

II. LITERATURE SURVEY

[1]Mr. H. M. Patel,Prof. H. L. Desai, "A Review on Design, Implementation and Performance analysis of the Image Inpainting Technique based on TV model", This paper is a summarized review of an image inpainting techniques by which we can restore a damaged or missing portion of an image. A fast algorithm of image inpainting based on TV (Total variational) model is proposed on the basis of analysis of local characteristics, which provides the extra knowledge about the background that is it shows the more information around damaged pixels appears, the faster information diffuses. The algorithm first detects and filters the pixels around the damaged area, according to priority, and then iteratively inpaint the damaged pixels from outside to inside on the basis of priority again.

[2]Yogita More, Savita Tuplondhe, Dhanashree More, Ashwin Patil, "Image Inpainting Using Exemplar Based Method and Multi-scale Graph Cuts", Yogita more et. al. presents a good formulation of exemplar-based inpainting as a global energy optimization problem and writes it in terms of the offset map. The proposed energy functional combines a data attachment term provides

guarantee that the continuity of the reconstruction at the boundary of the inpainting region and a smoothness term that make sures a visually coherent reconstruction inside the hole. This formulation is adapted to get a global minimum using graph cuts algorithm. In order to reduce the computational complexity, this paper proposes an efficient multiscale graph cuts algorithm. Moreover, to overcome for the loss of information at low resolution levels paper uses a feature representation which is computed at the original image resolution. This allows to alleviate the ambiguity produced by comparing only color information when the image is represented at low resolution levels.

[3]A. Criminisi, P. Perez and K. Toyama, "Region filling and Object Removal by Exemplar Based Image Inpainting", A new algorithm for removing large objects from digital images are proposed in this paper. The challenge is to fill in the hole that is left behind in a undetectable way. In previous approaches, this problem has been addressed by two classes of algorithms:(i) "texture synthesis" algorithms for constructing large image regions from sample textures, and (ii) "inpainting" techniques for filling in small image gaps. The former has been presented for "textures" – repeating two-dimensional patterns with same pattern; the latter focus on linear "structures" which can be thought of as one-dimensional patterns, such as lines and object contours. This paper presents an efficient algorithm that merges the advantages of these two approaches. First, note that exemplar-based texture synthesis includes the mandatory process required to replicate both texture and structure; the success of structure, propagation, however, is fully dependent on the sequence in which the filling is done.

[4] K. Sangeetha, Dr. P. Sengottuvelan, "An Extended Exemplar Based Image Inpainting Technique for Effective Region Filling Using Texture Primitive", In this paper an exemplar based image inpainting using contourlet trans-form is proposed. The image inpainting, also called as image completion, is such a kind of art that transform an image or video with the available information outside the region that is background information about the region to be invented so seamlessly that cannot be detected by the ordinary observers. It is a new multiscale and multidirectional image representation which is efficient in capturing the edges and contours of images. The approach used by K.

Sangeetha et.al is the they use contourlet transform is an extension of wavelet transform in two dimensions, which combines Laplacian Pyramid (LP) with a Directional Filter Bank (DFB). The use of Laplacian pyramid is to catch the point discontinuities, and is then followed by a Directional Filter Bank (DFB) to link point discontinuities into linear structures. Results found after this work is: The wavelet inpainting is the existing method in which problem of filling missing or damaged data of inpainting will occur.

[5] Ankur G. Patel,Shashwat kumar,Ankit D. Prajapati, "Analysis of Exemplar Based Image Inpainting", In real world, many people need a technique to recover damaged photographs, designs, drawings, art works etc. damage maybe due to various reasons like scratches, stamps, folds, overlaid text or graphics etc. Inpainting technique has many applications such as, object removal, removal of forced objects (date,stamps ,logo etc.), such as large unwanted regions, red eye correction, super resolution, restoration of old films and paintings etc. During the transmission of images over a network, there may be some regions of an image that are missing. These parts can then be reconstructed using image inpainting. In these recent years many works on Inpainting have been proposed. The image is to decompose the original image into a structure and a texture image. Modification of each image is performed separately. The missing information in the structure component is reconstructed using a structure Inpainting algorithm, while the texture component is repaired by an improved exemplar based synthesis technique.

[6] Alexandru Telea, "An Image Inpainting Technique Based on the Fast Marching Method," Digital inpainting provides a way for reconstruction of small damaged portions of an image. Although the inpainting basic concepts are straightforward, even though most inpainting techniques published in the literature are complex to understand and implement. Here's a new algorithm for digital inpainting based on the fast marching method for level set applications.

III. CONCLUSION

This comparative study reviews the existing techniques of Image Inpainting. The survey provides a concept and a description of the different techniques for image Inpainting. This analysis also highlighted a number of disadvantages and limitations of these different techniques. Future study also focused Most of the new exemplar based algorithms.

IV. REFERENCES

[1] Mr. H. M. Patel, Prof. H. L. Desai, "A Review on Design, Implementation and Performance analysis of the Image Inpainting Technique based on TV model", 2014 IJEDR | Volume 2, Issue 1, ISSN: 2321-9939

[2] Yogita More, Dhanashree More, Ashwin Patil, "Image Inpainting Using Exemplar Based Method and Multi-scale Graph Cuts", International Journal of Research in Advent Technology, Vol.2, No.4, April 2014

[3] A. Criminisi, P. Perez and K. Toyama, "Region filling and Object Removal by Exemplar Based Image Inpainting", IEEE transactions on image processing, VOL 13, 9 Sep 2004.

[4] K. Sangeetha, Dr. P. Sengottuvelan, "An Extended Exemplar Based Image Inpainting Technique For Effective Region Filling Using Texture Primitive", Vol. 4 No.06 June 2012

[5] Ankur G. Patel, Shashwat kumar, Ankit D. Prajapati, "Analysis of Exemplar Based Image Inpainting", (IJCSIT) International Journal of Computer Science and Information Technologies, Vol. 5 (1) , 2014, 800-804

[6] Alexandru Telea, "An Image Inpainting Technique Based on the Fast Marching Method," Eindhoven University of Technology, Vol. 9, No. 1: 25—36

[7] S, Borikar, K. K. Biswas, and S. Pattanaik, "Fast Algorithm for Completion of Images with Natural Scenes," graphics. cs. ucf. eduiborikarlBorikarPaper. Pdf

[8] Qiang Chen, Yingxiang Zhang and Yuncai Liu, "Image Inpainting With Improved Exemplar-Based Approach," Springer, 2005