Image Inpainting Using Super Resolution

Ms. Manisha P. Dhande
Student, Department of Computer Engineering
Dattakala Group Of Institutions,Bhigwan,
Pune University, Maharashtra, India
manishadhande07@gmail.com

Prof. Amrit Priyadarshi
Assistant Professor
Department of Computer Engineering
Dattakala Group Of Institutions,
Bhigwan,
Pune University, Maharashtra, India
amritpriyadarshi@gmail.com

Sushadevi Shamrao Adagale
Student, Department of Computer Engineering
Dattakala Group Of Institutions,
Bhigwan,
Pune University, Maharashtra, India
Susha0810@gmail.com

Prof. Sujaykumar K. Thorat
Assistant Professor
Department of Computer Engineering
Genba Sopanrao Moze College Of Engineering,
Pune University, Maharashtra, India
Sujaykumar.thorat@gmail.com

Abstract: Image plays an important role in or day to day life. Image inpainting is use to recover the missing part of image effectively. A novel framework for exemplar-based inpainting in which the image inpainting is performed on coarse version of the inpainting image. The inpainting of the low resolution images are simpler than that of the high resolution images. It will gain the more complexity and high visual quality image. The low resolution image is inpainted using different inpainting techniques and then all the results are combined to form the highly inpainted image. For this purpose our system uses the super resolution algorithm which is responsible for inpainting of single image.

Keywords: *Examplar-based inpainting, single-image super-resolution.*

*****

1. Introduction

Image inpainting is the process of reconstructing the lost part or progressively worst part of the image. The inpainting is process of replacing the corrupted part of the image by using the various effective image inpainting techniques which can able to fix and recover the small defects occurring inside the image.

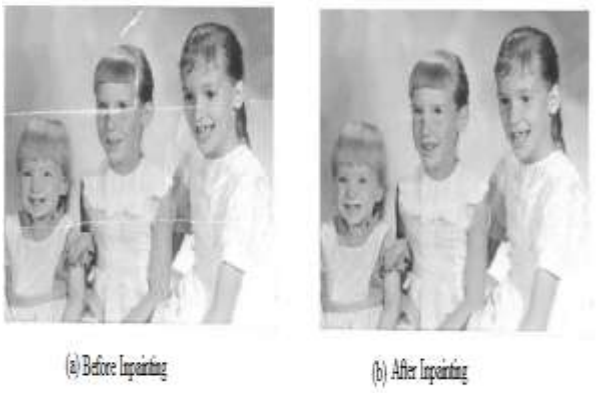

Fig 1: Image Inpainting.

It creates the modification in the image which will not recognize by the observer. In this article we introduce a novel algorithm for automatic digital inpainting, being its main motivation to replicate the basic techniques used by professional restorations. The image inpainting technology is a hotspot in computer graphics and has many applications such as renovation of old films, object elimination in digital photos, red eye alteration, super- resolution, compression, image coding and transmission. Image Inpainting is the method of restoring lost/selected parts of an image based on the background information in a visually possible way. Therefore the objective for image inpainting is not to recover the original image, but to create some image that has a close resemblance with the original image.

Object removal from images is an image manipulation technique. The purpose of region completion varies from remove-undesired object to improve the quality of the image. The process of removing objects from images starts with mask out the undesired object, making the area where the object previously occupies a gap. Then the gap will be filled using graphical techniques. Among the graphical techniques that are used to fill the gap after object removal, two most commonly used are: image inpainting and texture synthesis.

2. Literature Survey.

There are many techniques exists which can be used for inpainting of the image. These techniques can be the diffusion based or the examplar based techniques. Some limitation of above approaches has lead to the development of hierarchical approach of super-resolution based inpainting. This paper briefly describes some image inpainting methods. This paper covers some selected research works published

ISSN: 2321-8169
3835 - 3838

2.1 Traditional image inpainting.

The traditional way of image inpainting is only responsible for filling the some portion of the image. But this approach is not suitable for high quality images. It uses patch based inpainting. The area at which the inpainting algorithm is to be apply is selected here manually by the user. Here this area is marked as the sigma notation. The sigma is nothing but the masking done on the image. This masking is removed by using Efros and leungs algorithm.

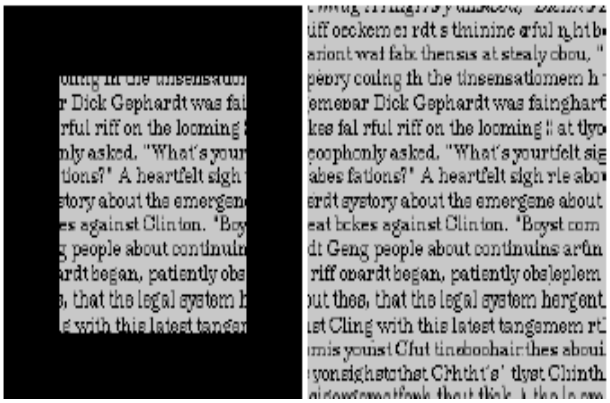

Fig 2: traditional image inpainting.

This method is responsible for filling the losses inside the image but this feeling is not reasonable.[1]

2.2 Image regularization with PDE's.

This method uses vector valued algorithm for elaborate the diffusion. It is mainly based on the following approaches.

1. Functional minimization.
2. Divergence expression.
3. Oriented laplaciouns.[2]

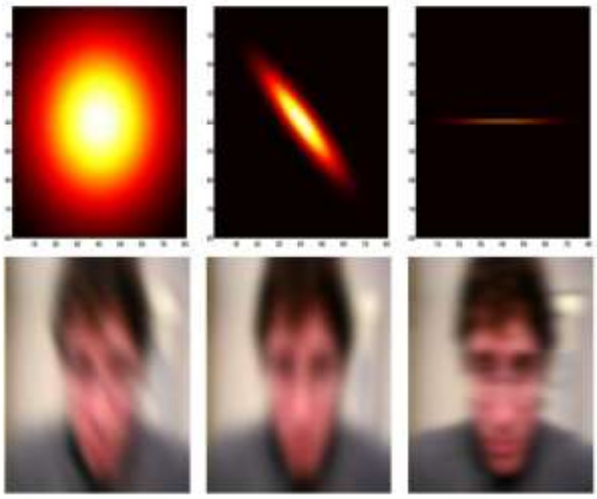

Fig 3: Image inpainting using PDE.

Though it uses some mathematical techniques to inpaint the image, but it is not adopted to represent the big flows.[2]

2.3 Examplar Based method.

This paper introduce a novel examplar based Image Inpainting Algorithm with an improved priority term which defines the filling order of patches in the image. This algorithm is based on patch propagation by propagating the image patches from the source region into the interior of the target region patch by patch. The novel examplar-based model is proposed because it uses a crossisophote diffused PDE to constrain the processing order; therefore, it has a good linear structure preserving property. The size of exemplar is dynamically determined by the local textured information; the seams and block effects are removed by the PDE. Because the examplar-based model could not be used for complex geometric structures completion, the novel model adopts a bi-directional diffused PDE to assist the completion procedure. Then the novel model could be used to restore the natural image with both large target regions and complex geometric structures.[4]

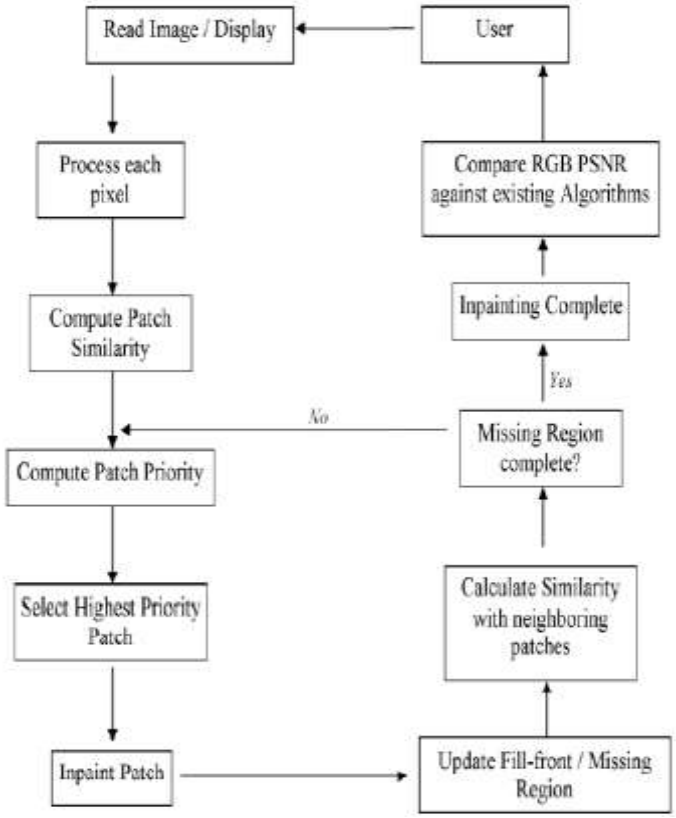

Fig 4: Examplar based inpainting.

2.4 Fragment based inpainting.

This follows the principles of figural simplicity and figural familiarity. Thus, an approximation is generated by applying a simple smoothing process in the low confidence areas. The approximation is a rough classification of the pixels to some underlying structure that agrees with the parts o1f the image for which we have high confidence. Then the approximated region is augmented with familiar details taken by example from a region with higher confidence.

 ISSN: 2321-8169
3835 - 3838

This paper present an iterative process that interleaves smooth reconstruction with the synthesis of image fragments by example. The process iteratively generates smooth reconstructions to guide the completion process which is based on a training set derived from the given image context.

Input: image C, inverse matte $\bar{\alpha}$ ($\exists$ pixel with $\bar{\alpha} < 1$)

Output: completed image, $\bar{\alpha} = 1$

Algorithm:

for each scale from coarse to fine
  approximate image from color and coarser scale
  compute **confidence map** from $\bar{\alpha}$ and coarser scale
  compute **level set** from confidence map
  while mean confidence $< 1 - \varepsilon$
    for next target position p
      compute **adaptive neighborhood** $N(p)$
      search for most similar and frequent source match $N(q)$
      composite $N(p)$ and $N(q)$ at p, updating color and $\bar{\alpha}$
      compute **approximation**, **confidence map** and update **level set**

Fig 5: Algorithm for fragment based inpainting.

3. Proposed System.

In our proposed system we are going to apply several number of inpainting techniques on the input image. The combination of the result of these all images will then combined. This combined output is again processed under single image super resolution algorithm.

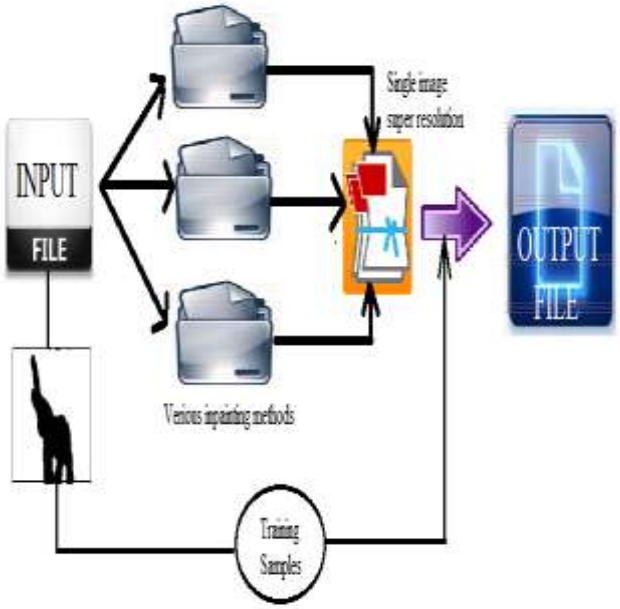

Fig 6: Architecture of proposed system.

The super resolution algorithm needs either dictionary values or the neighborhood values. The dictionary values are those values which are store in the database during the scanning of the input image. And the neighborhood values are calculated by the analysis of the all the adjacent pixel to that pixel to be examine.

The super resolution algorithm scan for the better match to be fit into the lossy area of the image which is results to the better quality inpainting of the image.

4. Conclusion

Here we come to conclude that our proposed inpainting method gives better output and it can be a capable of overcoming the limitations of the all existing work done by previous authors. Our approach uses the super resolution algorithm which fills the gaps present inside the image. As the input to the super resolution algorithm is combined resultant image of all inpainting algorithms, it will be responsible for generation of high quality inpainted image.

References

[1]. M. Bertalmio, G. Sapiro, V. Caselles, and C. Ballester, "Image inpainting," in *Proc. 27th Annu. Conf. Comput. Graph. Interact. Tech.*, Jul. 2000, pp. 417–424.

[2]. D. Tschumperlé and R. Deriche, "Vector-valued image regularization with PDEs: A common framework for different applications," *IEEE Trans. Pattern Anal. Mach. Intell.*, vol. 27, no. 4, pp. 506–517,Apr. 2005.

[3]. T. Chan and J. Shen, "Variational restoration of non-flat image features: Models and algorithms," *SIAM J. Appl. Math.*, vol. 61, no. 4, pp. 1338–1361, 2001.

[4]. A. Criminisi, P. Pérez, and K. Toyama, "Region filling and object removal by examplar-based image inpainting," *IEEE Trans. Image Process.*, vol. 13, no. 9, pp. 1200–1212, Sep. 2004.

[5]. I. Drori, D. Cohen-Or, and H. Yeshurun, "Fragment-based image completion," *ACM Trans. Graph.*, vol. 22, no. 2003, pp. 303–312, 2003.

[6]. P. Harrison, "A non-hierarchical procedure for re-synthesis of complex texture," in *Proc. Int. Conf. Central Eur. Comput. Graph., Vis. Comput. Vis.*, 2001, pp. 1–8.

[7]. C. Barnes, E. Shechtman, A. Finkelstein, and D. B. Goldman, "Patch- Match: A randomized correspondence algorithm for structural image editing," *ACM Trans. Graph.*, vol. 28, no. 3, p. 24, Aug. 2009.

[8]. A. A. Efros and T. K. Leung, "Texture synthesis by non-parametric sampling," in *Proc. 7th IEEE Comput. Vis. Pattern Recognit.*, Sep. 1999, pp. 1033–1038.

[9]. O. Le Meur, J. Gautier, and C. Guillemot, "Examplar-based inpainting based on local geometry," in *Proc. 18th*

IEEE Int. Conf. Image Process., Sep. 2011, pp. 3401–3404.

[10]. O. Le Meur and C. Guillemot, "Super-resolution-based inpainting," in *Proc. 12th Eur. Conf. Comput. Vis.*, 2012, pp. 554–567.

Author Profile

Taro Denshi received the B.S. and M.S. degrees in Electrical Engineering from Shibaura Institute of Technology in 1997 and 1999, respectively. During 1997-1999, he stayed in Communications Research Laboratory (CRL), Ministry of Posts and Telecommunications of Japan to study digital beam forming antennas, mobile satellite communication systems, and wireless access network using stratospheric platforms. He now with DDI Tokyo Pocket Telephone, Inc.