International Journal of Advanced Research in Engineering Technology & Science
ISSN: 2394-2819
Email: editor@ijarets.org Volume-4, Issue-5 May- 2017 www.ijarets.org

AN EFFICIENT IMAGE RESTORATION ALGORITHM FOR REGION FILLING AND OBJECT REMOVAL

Navdeep Mor[1], Surender[2]
[1]Ph.D Research Scholar
Department of Computer Applications
SinghaniaUniversity,Jhunjhunu, Rajasthan, INDIA
[2]Dept. of Computer Science & Engineering,
HCTM Technical Campus, Kaithal, Haryana, INDIA

ABSTRACT: If an imaged is damaged due to time or by some other reason then what to do in that situation. We can recover the image manually or by using some automated techniques. For that we will try to improve the quality of degrade image or we can say damaged image. So in that case restoration method helps us. Here in this research I want to achieve this. Here the proposed algorithm for image restoration using filter is implemented and compared to the previous existing exampler approach. Later the comparison is drawn as per our decided objectives. I have also shown the data term, the confidence term, and the masked image also. At the last graphical representation is also shown and a table for comparison is drawn.

KEYWORDS: Exampler approach, Image inpainting, Image restoration, SVM, SDK, MSE, PSNR

I. INTRODUCTION

1.1 **Image Inpainting**: Image inpainting refers to repairing a damaged picture where part of the information has been lost. As shown in Figure 1, for a corrupted image, where the inpainting domain D is missing and the content outside D (Ω) is known, image inpainting is to fill domain D which makes the whole picture "meaningful" and looks like undamaged.

Figure 1: In this picture D is the damaged region on the basis of known region.

1.2 **Restoration Process**: As we know that we want to recover a damaged image and also we want to upgrade the quality of the damaged image [1], [4], [6], [9], [10], [12] (Figure 2)

Figure 2: Restoration Basic Technique [2].

We have already discussed using image inpainting we can recover lost or deteriorated portions of pictures by using information from its neighbours. Next figure has shown the steps how a damaged image can be restored using the masked image.

II. REVIEW OF LITERATURE

Author proposed a method that attempted to restore the lost regions of damaged images by manually demarcating them by the use of some color [5]. Aimed at providing an inpainting method that was based upon the Euler Elastica model. They studied the use of the existing models and partial differential equations for curves and their applicability to image inpainting. Euler Lagrange equation for curvature based inpainting was formulated [7]. Provided an algorithm that could remove considerably larger objects from images. The algorithm used exemplar-based texture synthesis which was modulated by a unified approach to decide the sequence of filling target areas but was high on time complexity [8]. Presented a binarization mechanism for historical manuscripts and images. It divided the process into five distinct steps for the six defined categories of images and applied a refinement procedure on these to obtain enhanced results.

The improved visual quality and readability of the image texture makes this technique viable and efficient to be used in various applications for preliminary processing of document images[11]. Here the researchers analyzed the various kinds of noise that are present in historical documents that are based on Kannada, the predominant language in the state of Karnataka, India. Each noise is categorized by its source, obstacles posed to character recognition and the effects they have.

The major types of noise identified in in historical documents are: a) border, b) skew, c) noisy background, d) touching characters and e) degraded characters [13]. The author proposed an algorithm that uses compressed sensing (CS) in the frequency domain in order to recover damaged images. The image is disintegrated into two functions - structure and textual parts. The method ensured a decent restoration of the structure and quality of the image. The PSNR [14]-[19] is generally high and the method has an edge in terms of time complexity [1].Authors proposed a technique to remove multiple object removal using adaptive patch selection. The method first divides the image into target region and the source region and then locates the best matching source patch based on the target region's surrounding pixels. It provides a better result in terms of its execution time and PSNR [3].

III. OBJECTIVE, PROBLEM STATEMENT AND PROPOSED ALGORITHM

Image inpainting is the procedure of restoring/reconstruction and regenerating unknown regions in the image from the known regions by using their available information. There are many inpainting algorithms however each method has its own set of advantages and shortcomings. Majority of the techniques are working well but my goal is to address the issue of an image by laying emphasis on defects and degradations that are peculiar to such images. The images may contain damages such as: Scratches, Holes, Cracks, Water effects and unwanted marks on the image.

3.1 **Objective**: The objectives of our work will be developing an improved algorithm having a:

- Remove of all types of damages (Scratches/holes/cracks) and reconstruct it.
- Better performance in terms of time, MSE, PSNR values compare to previous exampler based method
- Good visual quality.

3.2 **Problem Statement**: After reviewing the literature work done in this field I observe that Image inpainting is a very extensively researched and useful technique for image restoration. All algorithms developed so far have provided great ideas and directions to the restoration but have been quite application specific in their parameter consideration, methodology etc. Historical image restoration is a field that has special requirements to be considered as the deformations in such images are far from those in other types of images. Using the existing algorithms is not very fruitful in case of historical image

restoration. In my research, a novel approach is proposed 'An Adaptive Hybrid Digital Image Inpainting Approach Using SVM for Historical Image Reconstruction'. The proposed methodology aims to combine the texture synthesis (global) and structural diffusion based (local) inpainting techniques to generate a hybrid inpainting technique while making best use of the SVM classifier to produce more efficient results and performance.

3.3 **Proposed Algorithm:**

THE ALGORITHM

Step: 1 Load Images

- Load Reference Image
- Load Corrupted Image
- Load Mask Image (Green color is chosen for creating a mask)

Step: 2 Apply filter to Original image

- Use filter (wiener2) to the original image to improve the visual clarity

Step: 3 Call Restoration Method

- Inpainting(Dimg,Mimg)
- Dimg= Damaged Image
- Mimg= Masked Image

Step: 4 Show the Output

- Confidence Term, Data Term and, Reconstructed Image

Step: 5 Compare and evaluate the Results

- Comparative results in respect to MSE and PSNR
- Graphically Presentation of Results

Figure 3: The proposed algorithm

IV. **IMPLEMENTATION AND RESULTS**

4.1 **Object Removing**: The meaning of object removing is to removing of an unwanted object or objects f from an image. Let us see the object removal process.

a) Firstly we have to load the two images first image will be the original image or it may be called the referenced image. Secondly we will load the edited or the corrupt image from where we want to remove the object as shown in the figure 4 and figure 5.

b) When we have both the original and the edited image. Now Our main focus is on removal the unwanted object from the image (edited image) so now we have to mark the area of second object which we don't want to use in this image. To identified the effect area of the image. We have to create the mask image for the area from the image. Here we have already created the mask image so it is the time to load the mask image. The steps of loading mask image are same as discussed before.

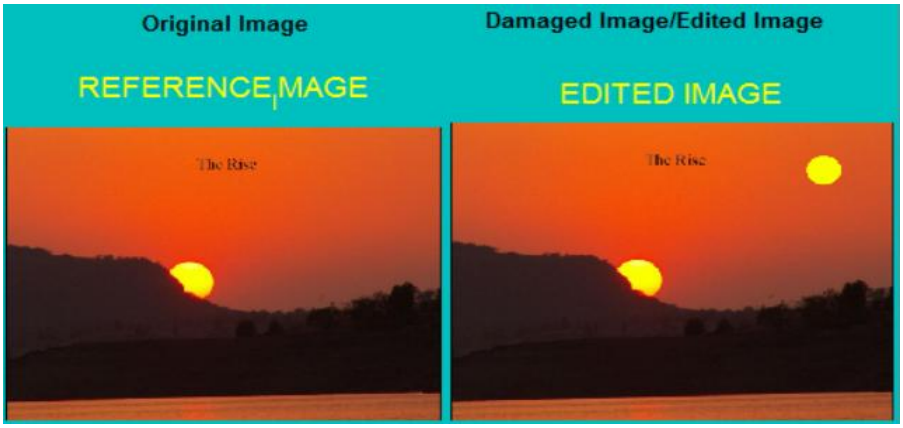

Figure 4: Loaded Images Original and Edited images.

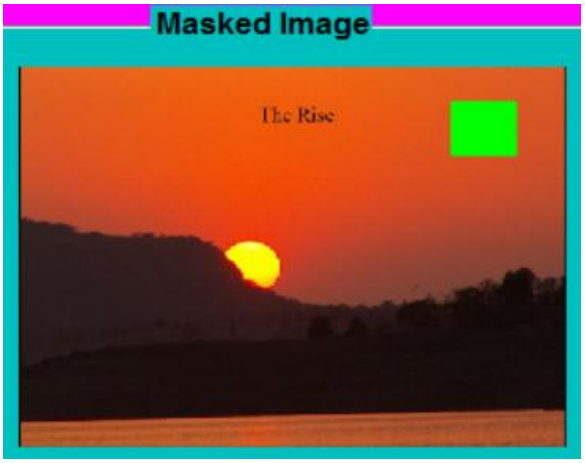

Figure 5: Masked Image

c) Now it is the time to execute the both methods previous approach and the proposed approach. The execution results of our proposed work are shown in the figure6. The result image (restored image) by our approach is shown at the right side.

Figure 6: Result by both the approaches

d) Figure 7 is showing the confidence term and the data term all are appear on the right side.

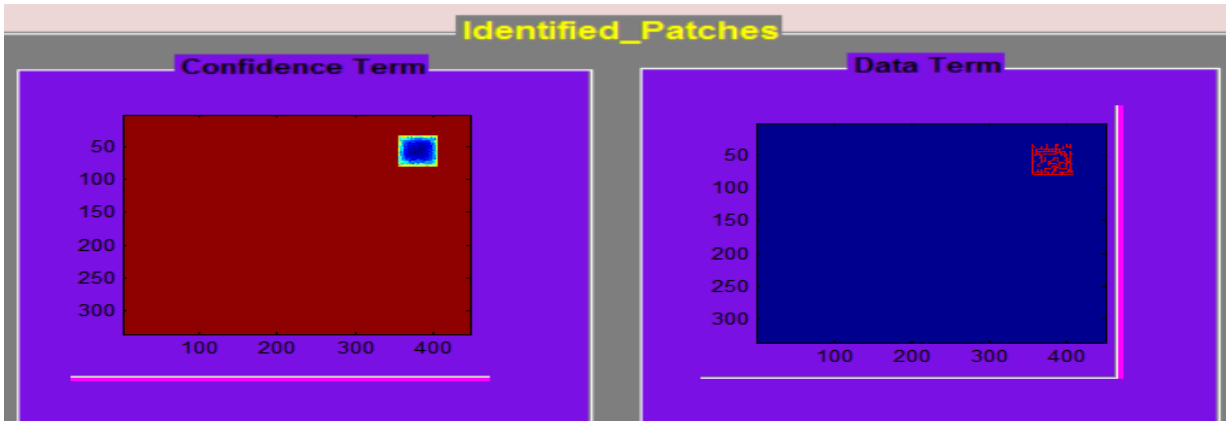

Figure7: Result by both the approaches

Result and Analysis: Next work is to compare the results of both the previous approach and our proposed work. The results are analyzed in term of MSE, PSNR and Time taken values. Figure 8 is showing the comparative list of both the approaches.

	MSE	PSNR	TimeTaken
Previous Method	6.1380	40.2505	13.4457
Our Approach	0.8475	48.8494	11.6388

Figure 8: Comparison results by both the approaches

4.2 **Scratch Removals**: As we have discussed earlier that, this approach is also helpful for removing of scratches from an image. So now we will see the example of removing of scratches from an image. The procedure is same as we have done in object removal. To implement the removal of scratch load the first original image. Then load the corrupted image as shown in the figure 9.

Figure 9: a)corrupt image b) Masked image c) Previous Approach d) Our Approach

Result and Analysis: As it can be seen in the above figure there are four pictures, first corrupted image second masked image, third restored by previous approach and the last restored image by our approach. The confidence and the data term can be seen in the figure 10 and 11.

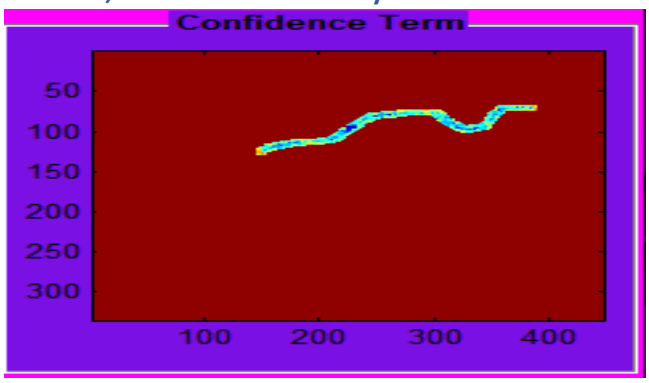

Figure 10: Showing the confidence and the Data Term for scratch removal

	MSE	PSNR	TimeTaken
Previous Method	6.1417	40.2479	21.9456
Our Approach	2.5614	44.0460	17.6468

Figure 11: Comparative List of methods with MSE and PSNR values.

V. CONCLUSIONS

As it is cleared with the implementation and the results process that our designed algorithm is providing the better results in comparison to the previous approach in both the object removal and the scratch removal cases. So we have achieved all the objectives whether its better performance or the better visualized.

In the last we can say that this new approach is suited well to restore an image from the scratches and it can also remove an unwanted object from an image. Our above results show us that this new approach is better than the old image inpainting approach. Later we have also compared those results of object removal by both the approaches and the removal of scratches in terms of RMSE and PSNR values shown in above figure.

REFERENCES:

1. N. Khanna, P. Verma: "A New Texture Synthesis Based Image Restoration Approach With Image Filter" ISSN : 2349-2819, Volume 3, Issue 2, Feb-2016.
2. Z. Xie; F. Zhang; C. Zhang: "An adaptive matching algorithm for image inpainting,", International Conference on Electronics, Communications and Control (ICECC), vol., no., pp.1293,1296, 9-11 Sept. 2011.
3. M.D. Kawade, A.S. Ufade: 'Multiple Object Removal Using Exemplar based Image Inpainting'. International Journal of Computer Science & Engineering Technology, Volume 5, Issue 5, pp. 488-493, May 2014.
4. S. Jangra, YS Sangwan and K. Kaur: Histogram based Watermarking using Entropy and DWT with PSO in Digital Images, published in, "Int'l J. of Control Theory and Applications", Vol. 9(21), 2016, Pg. 242-246, ISSN: 0974-5572.
5. Shen, Jianhong, S. H. Kang, and Tony F. Chan: 'Euler's ElasticaAnd Curvature-Based Inpainting'. SIAM J. Appl. Math. 63.2 (2003): 564-592.
6. Y. S. Sangwan, S. Jangra and K. Kuhar: Facial Skin Segmentation using BFO and PSO, Int'l J. of Control Theory and Applications, Vol. 10 (2017), Issue No. 18, Pg. 31-39, ISSN: 0974-5572.
7. S.P. Awate, R.T. Whitaker: "Unsupervised, information-theoretic, adaptive image filtering for image restoration," Pattern Analysis and Machine Intelligence, IEEE Transactions on Pattern Analysis and Machine Intelligence (TPAMI), vol.28, no.3, pp.364,376, March 2006.

8. Ntogas, Nikolaos and Ventzas, Dimitrios: "A Binarization Algorithm for Historical Manuscripts", International Conference on Communications, pp. 41-51, 2008.
9. S. Jangra, S. Goel and A. Selwal: Hyper Spectral Image Restoration Approach using LRMR and LDA, IEEE Xplorer, Pg. 415-418, 2015, e-ISBN: 978-1-5090-0148-4.
10. T. Kumar, S. Jangra and S. Bhushan: Face Recognition with Decision Tree using SVM and SURF", Published in, "Int'l J. of Control Theory and Applications, Vol. 10 (2017), Issue No. 15, Pg. 173-180, ISSN: 0974-5572.
11. Li, Q., Han, Y., & Dang, J. : "Image decomposing for inpainting using compressed sensing in DCT domain", 2014 Frontiers of Computer Science, Volume 8, Issue 6, pp 905-915 , 905-915.
12. Pandey A,Bansal K.K. (2014) "Performance Evaluation of TORA Protocol Using Random Waypoint Mobility Model" International Journal of Education and Science Research Review (IJESRR) Vol.1(2) pp 193-199
13. Yadav R.K., Bansal K.K. (2012) "Analysis of Sliding Window Protocol for Connected Node " International Journal of Soft Computing and Engineering (IJSCE) Vol.2(5) pp 292-294
14. S. Kaushik and S.Jangra: Finger Vein Biometric Authentication Scheme using Repeated Line Tracking and DWPT based Scheme, Int'l J. of Control Theory and Applications, vol. 10 (2017), Issue No. 18, Pg. 289-294, ISSN: 0974-5572.
15. A. A. Efros and T. K. Leung: "Texture synthesis by non-parametric sampling," in IEEE Conf. Computer Vision, 1999, pp. 1033-1038.]
16. A. Selwal, S.K Gupta and S. Jangra: A Hybrid Template Security Scheme for Multimodal Biometric System based on Fingerprint and Hand Geometry, Int'l J. of Control Theory and Applications, vol. 10 (2017), Issue No. 15, Pg. 143-152, ISSN: 0974-5572.
17. A. Selwal, S.K Gupta and Surender: Low Overhead Octet Indexed Template Security Scheme for Multimodal Biometrics System, Journal of Intelligent & Fuzzy System 32 (2017), pp. 3325-3337, DOI:10.3233/JIFS-169274, IOS Press.
18. A. Selwal, S.K. Gupta and S. Kumar: A Scheme for Template Security at Feature Fusion Level in Multimodal Biometric System, Advances in Science and Technology Research Journal, Vol. 10, No. 31, Sept. 2016, Pg. 23-30.
19. A. Selwal, S.K. Gupta and Surender: Fuzzy Analytic Hierarchy Process based Template Data Analysis of Multimodal Biometric Conceptual, Procedia Computer Science (Elsevier), 85 (2016), Pg. 899-905.
20. A. Selwal, S.K. Gupta and Surender: Template Security Analysis of Multimodal Biometric Frameworks based on Fingerprint and Hand Geometry, Perspectives in Science (Elsevier), (2016) 8, Pg.705-708, ISSN: 2212-0209.
21. A. Selwal, S. K. Gupta, Surender and Anubhuti: Performance analysis of template data security and protection in Biometric Systems, IEEE Xplore, 2015, pp. 1-6. e-ISBN : 978-1-4673-8253-3