

Object Remove Using Structure Oriented In Image Inpainting

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Abstract—Image inpainting is a technique to restore the damage image and fill gape or texts are written in the image. Image inpainting have different application like removal of scratches, restoring damage/missing portions of Image. In recent year image inpainting is high popular in image processing. In this paper we propose the exemplar based inpainting algorithm with solution of proposed application of Sourceforge.net application that is built in Java and using exemplar based image inpainting algorithm we remove the unwanted object and scratches to be contain in image.

Keywords— PDE, inpainting, Textural

1. INTRODUCTION

Inpainting is the art of modifying an image or video in a form that is not easily detected by an ordinary observer or human being. Image Inpainting has become a fundamental area of research in image processing. Inpainting is the process of reconstructing lost or unwanted sections of images. In early years image inpainting techniques gained the high popularity in the field of image processing, used for restoration of damaged images.

The aim of image inpainting is to fill in the missing area or replace damage part in an image which is visible to human eyes. Image inpainting is also applied for reinstallation of old images/films, correction of red-eye, object elimination in digital photographs, removal of spots of dust in image/film, creative effect by removing objects etc.[4]

In the past, this problem has been addressed by classes of algorithms: [4]

1. Partial Differential Equation (PDE) based
2. Texture synthesis
3. Exemplar based
4. Wavelet Transform based
5. Semi-automatic and Fast Inpainting
6. Hybrid Inpainting

Categories of image inpainting:

1) Structure oriented:

- Structure inpainting uses geometric approaches for filling the missing information in the region which should be inpainted.

- These algorithms try to recreate the structures like lines and object contours.
- These are generally used when the region to be inpainted is small. This focuses on linear structures which can be thought as one or two dimensional pattern such as lines and object contours. [5]



(a) Original Image



(b) Inpainted image

Figure 1: structure based image [5]

2) Textural inpainting: [5]

- The main problem is that all the structural inpainting method are not able to restore texture.
- Texture has a repetitive pattern which means that a missing portion cannot be restored by continuing the level lines into the gap.



Figure 2: Removal of labelled text like subtitles, dates or publicity [5]

Exemplar based image inpainting can be used to both texture and structure based inpainting method but mostly in structure based inpainting method to remove the region of image based on background information of missing region. Therefore recently many exemplar based inpainting methods have been developed. We have used a best exemplar based image inpainting algorithm with an improved priority term that defines the filling order of patches in the image.

2. LITERATURE REVIEW

Shilpa J. Kale and P.D.Gawande suggested removing of large occluding objects and thin scratches in their paper “Region Filling and Object Removal by Exemplar based Image Inpainting”, the objective in their paper is the simultaneous propagation of texture and structure information is achieved by a single, efficient algorithm. Computational efficiency is achieved by a block-based sampling process. A number of examples on real and synthetic images demonstrate the effectiveness of their algorithm in removing large occluding objects as well as thin scratches. They used methodology Novel algorithm and efficient algorithm to achieve their objective. As a conclusion they have remove the large object and thin scratches in image using the novel algorithm and efficient algorithm.

Mrs. Waykule J.M. suggest two approach novel and efficient algorithm to get good result on one fourth less time to fill the target region in her paper “Modified Image Exemplar-Based Inpainting” and objective of this paper is presents a novel and efficient algorithm that combines the advantages of these two approaches but applied this same algorithm on modified image this gives the good result on one fourth less time to fill the target region. She recommended novel and efficient algorithm. She concluded that a novel algorithm used for removing large objects from digital photographs. The result is an image in which the selected object has been replaced by a visually believable background that mimics the look of the source region.

Criminisi, P. P’Erez and K. Toyama used Single algorithm, efficient algorithm, exemplar based texture synthesis and exemplar based structure synthesis to remove the large object in image in their paper “Region Filling and Object Removal By exemplar-Based Image Inpainting”. They first note that exemplar-based texture synthesis contains the essential process required to replicate both texture and structure; the success of structure propagation, however, is highly dependent on the order in which the filling proceeds. They propose a best-first algorithm in which the confidence in the synthesized pixel values is propagated in a manner similar to the propagation of information in inpainting. The actual color values are computed using exemplar-based synthesis. In paper the simultaneous propagation of texture and structure information is achieved by a single, efficient algorithm.

Computational efficiency is achieved by a block-based sampling process. They concluded that it is possible to remove the large object in image using the Wavelet transforms method with single and efficient algorithm achieved by a block-based sampling process.

3. METHODOLOGY

Exemplar based image inpainting Method: Exemplar based image inpainting can be used to both texture and structure based inpainting method but mostly in structure based inpainting method to remove the region of image based on background information of missing region.. Therefore recently many exemplar based inpainting methods have been developed. We have used a best exemplar based image inpainting algorithm with an improved priority term that defines the filling order of patches in the image.

Patch prioritizing: In the procedure of patch selection, patch priority should be defined to encourage the filling-in of patches on the structure with highest priority. Confidence term can serve as a measure of the amount of reliable information surrounding the pixel point p in an image. When this point is surrounded by many pixels from the original image, the more reliable information from the source region is contained within the patch that is matched.

Patch selection: Most often, the patch that most resembles the selected patch lies very close to the patch selected to be inpainted. Based on this assumption, we provide an approach on how to reduce the computational complexity of the algorithm.

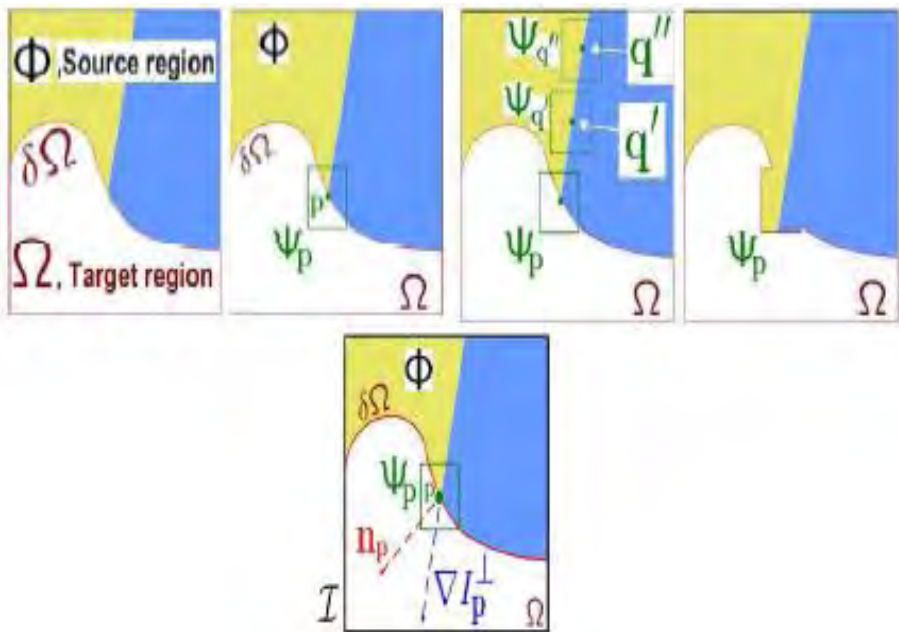


Figure 3 : Data flow diagram of Exemplar based inpainting process [3]

Where ($\alpha = 255$),

Patch Ψ^P , n_p is normal to the contour $\delta\Omega$ of the target region Ω and ∇I_p^\perp is the isophote at point p .

$$C(p) = \frac{\epsilon(\Psi^P \cap \Theta) * C(q)}{|\Psi^P|}$$

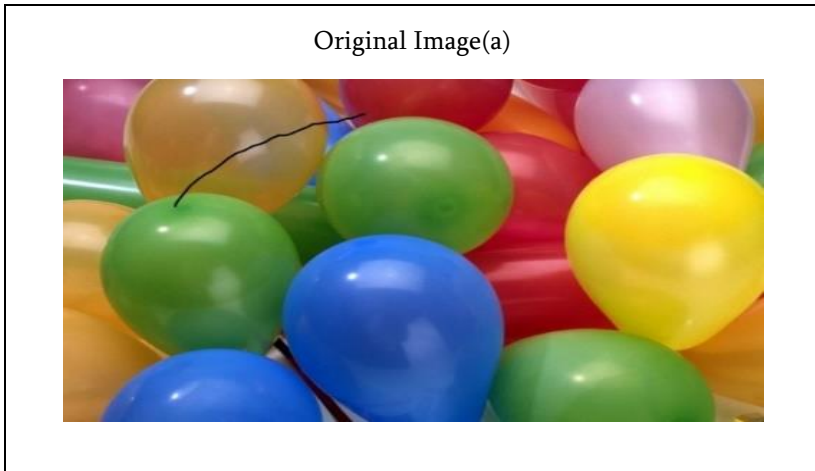
$$D(p) = \frac{|\nabla I_p^\perp \cdot n_p|}{\alpha}$$

Following are the steps adopted for the region Felling :=

- A) Original image, with the target region Ω , its contour $\delta\Omega$, and the source region Φ .
- B) Synthesizing the area delimited by the patch Ψ^P centered on the point $p \in \delta\Omega$.
- C) The most likely candidate matches for Ψ^P lie along the boundary between the two textures in the source region. e.g. Ψ^q and $\Psi^{q'}$.
- D) The best-matching patch in the candidates set has been copied into the position occupied by Ψ^P , thus achieving partial filling of Ω .

Results

As shown in figure (a) is original image with the unwanted object, (b) is the inpainted image by existing system that object is not removed, (c) is the inpainted image by proposed solution that object is removed and display time to be inpaint the image. In first image tree is available and using our proposed system using exampmer based image inpainting the tree can be remove.



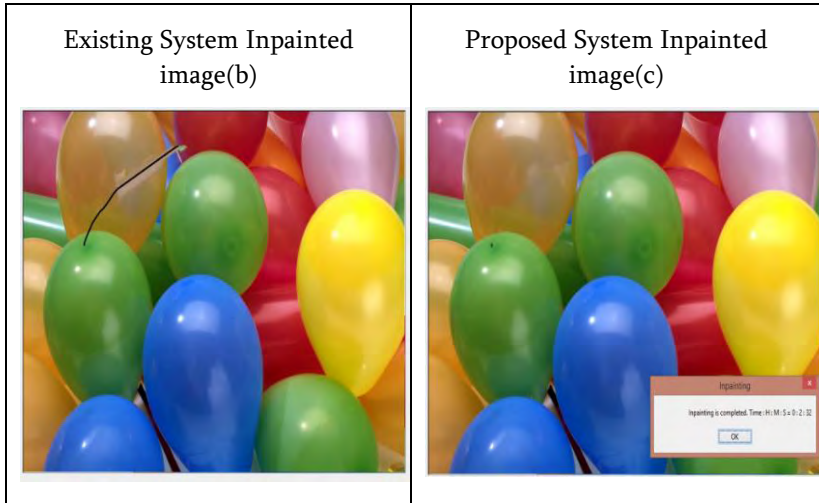


Figure 4 : Scratches Remove Using inpainting method



Figure 5: Object Remove Using inpainting method

4. DATA ANALYSIS

Analysis of Existing System Data:

We have referred Sourceforg.net application is developed in java. This application works on exemplar based image inpainting algorithm. If we select large region to inpaint it overlap surrounding patch of pixel.

Using this data start to inpaint the selected region using the patch priority of neighboring pixel column by column. But here the problem is that it inpaint only for small region and if user try to inpaint large region it overlap the region and object.

```

for (i = 0; i < temp[0].length; i++)
{
    for (j = 0; j < temp.length; j++)
    {
        if (temp[j][i] > 0)
        {
            dR.add(i*temp.length + j);
            Nx.add(sourceGradX[j][i]);
            Ny.add(sourceGradY[j][i]);
        }
    }
}

```

Analysis Of Proposed System Data :

To overcome existing problem, we first made changes at adding the coordinates of boundary pixel to dR and their gradients Nx and Ny where row pixel to column pixel and column pixel to row pixel. We implement the timer to check how much time it take to inpaint the selected region. Result of timer is the proposed solution takes longer time then existing solution but it gives accurate result of inpainted region then Existing System. There is a no overlap occurring while inpainting the selected damage region. This Gave Accurate Result then existing system.

```

for (i = 0; i < temp[0].length; i++)
{
    for (j = 0; j < temp.length; j++)
    {
        if (temp[j][i] > 0)
        {
            dR.add(i*temp.length + j);
            Nx.add(sourceGradX[i][j]);
            Ny.add(sourceGradY[i][j]);
        }
    }
}

```

5. CONCLUSION

In summary, here in this proposed application we providing the feature that user can inpaint the image for large region by using modified Exemplar-Based Inpainting algorithm. First we refer the different algorithms and identify that Exemplar-Based Inpainting algorithm is appropriate to inpaint large region of image. In the second phase we do modification in the existing application. The modification that done in application is we convert row pixel to column pixel and column pixel to row pixel. After experiment we found that we successfully able to inpaint large region of the image. The result is almost accurate but it consume bit of time compare to earlier one.

6. REFERENCES

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7. AUTHORS' PROFILE



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