

Removal of Unwanted Objects using Image Inpainting - a Technical Review

Nirali Nanavati¹, Aayushi Patel², Hemali Patel³, Jenny Patel⁴, Niyati Mavani⁵, Preeti Bhatt⁵

Babu Madhav Institute Of Information Technology, Uka Tarsadia University, Bardoli Mahuva Road, Tarsadi, Dist: Surat - 394 350, Gujarat (INDIA)

ABSTRACT

Image Inpainting, the technique to change image in undetectable structure, it itself is an ancient art. There are various goals and applications of image in painting which includes restoration of damaged painting and also to replace/remove the selected objects. This paper, describes various techniques that can help in removing unwanted objects from image. Even the inpainting fundamentals are difficult to understand and implement.

Index terms- image, image processing, image in painting, image compression, image restoration.

I. INTRODUCTION

During medieval age there were many problems faced due to the quality of the image. They used to have many damaged or missing portions in them. Also there were many unwanted objects. Image inpainting is an ability of reconstructing the missing portions of image inside order to make it more legible and restore its unity [1]. Main objective is to create software that can remove the selected portion of image and fill that left behind portion with its nearby background image.

Image inpainting can be applied using many different techniques and methods. And also there are many algorithms to repair photos, remove the unwanted objects, to provide the special effects and nowadays it is used for video inpainting. But here in this paper, we will focus more on removing the unwanted objects of image and also to compress an image. A digital image can be judge as a individual representation of information possessing both spatial and intensity area[9].

The technique that uses the marginal information of damaged region, and essentially using inpainting algorithm based on partial differential equation(PDE)[2]. Image inpainting is an approach which aims at perceptual feature in its place of pixel wise reliability. Direct technique to use inpainting in compression is to crash some region in encoding but needs to fill up it at time of decoding. Image inpainting in long distance is hard to perform as there pixels are very far away from each other. To solve this problem edging based inpainting is used. In that in its place of completely reducing the information, certain border information is extracted from that dropped region and that transmit in a compacted method to decoder. If the compulsory image does not

match the assets of drop image regions, the restoration can cause severe image artifact[11].

However, to involve image compression in inpainting, it is enviable to drop many region as probable to keep coding bits while also maintaining visuality of image. Parameter Assistance Inpainting is study of different distribution of image in region and fit them in model class relatively than single former. Moreover, we consider distribution parameters as a type of changeable information. Therefore, associate parameters, are increase for more dependable inpainting when huge region of image are drop. Due to assistance parameters, the reliability of inpainting is really enhanced. As huge regions are dropped during encoding, it is achieve higher coding act as compared with fixed image compression methods.

The techniques used for image inpainting are Exemplar based techniques, Texture Synthesis, nonlinear partial differential equation(PDE) model, Time Varying Method, Parameter Assistance are some of them. While using this methods and algorithm the advantage we get is can inpaint the large amount of regions of image, textures, and structure can be rebuilt, also can remove the blur image [3].

There is segmentation module and inpainting module in the system model, the segment damaged area, and the latter is to repair image. Segmentation and inpainting can enhance the inpainting effect. The image characteristic contains- targeted area, shape, roughness degree of portion and so on. They will inspire system to select rules, guild system to select optimal algorithms.[4] Image inpainting is the filling-in of absent or undesired portion of an image. Use the information of the surrounding area of the missing region. These methods are suitable to restore little loss patterns; however they reason smoothing effects

in relatively large missing regions.[5]Using side information can help the image restoration. Large missing regions can be recovered at the expense of blurring the transmitted image.

Image Inpainting methods use the famous image information to improve those absent areas. Image inpainting is a basic problem in image processing and has many applications.The goal of image inpainting is the target region in the image with visual possible information. Filling this region with information that could have been in the image. There are several applications for image inpainting, one of these is the restoration of old images and movies by removing crack from these images and movies. The removal of objects from images, like time stamps or a person.

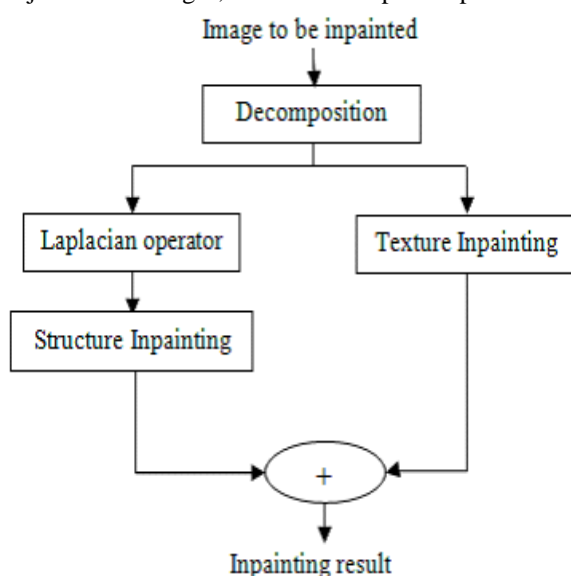


Fig 1:Exemplar based inpainting flowchart

Benefits of Image Inpainting:

Main aim is to create software that can remove the selected portion of image and fill that left behind portion with its nearby background image.To provide better clarity on image after removing unwanted object from image and reduce processing time.

Applications of Image Inpainting:

- Repairing photography: With age, photographs often get damaged or stretched. We can revert distortion using image inpainting.
- Remove unwanted objects: Using image inpainting, we can remove useless objects, text, etc. from the image.
- Special effects: This is use in produce special effects.
- Video inpainting: If extended to video inpainting, it would be able to present a great tool to create unique effects etc.

II. LITERATURE REVIEW

A new algorithm is planned for remove objects from digital images and filling the hole left after it. Image inpainting is an skill of reconstructing the missing portions of image in order to make it more legible and restore its unity [1].

Author describes in paper [3] that while the drop area might have a different division from its known background, the principle of minimizing a total variation may result in severe distortion. When the missing regions are small and consistent in those case inpainting based on a predefined prior gives good results. However, to provide efficient coding inpainting-based compression system requires many regions to fill-in the dropped regions. Since the distribution of dropped region is different from its surroundings, it may result severe distortion when minimizing a total variation. With a PDE prior we may fails to deduce the exact progression pattern in the dropped region. Actually, we believe such inpainting problems are too difficult to be solved without any other assistance.

Therefore, to develop inpainting method in compression more effectively, the regions of image to be recovered are restricted to class of parametric distributions rather than a fixed prior. Generally, the compression system performance is evaluated by its rate-distortion (R-D) characteristic.

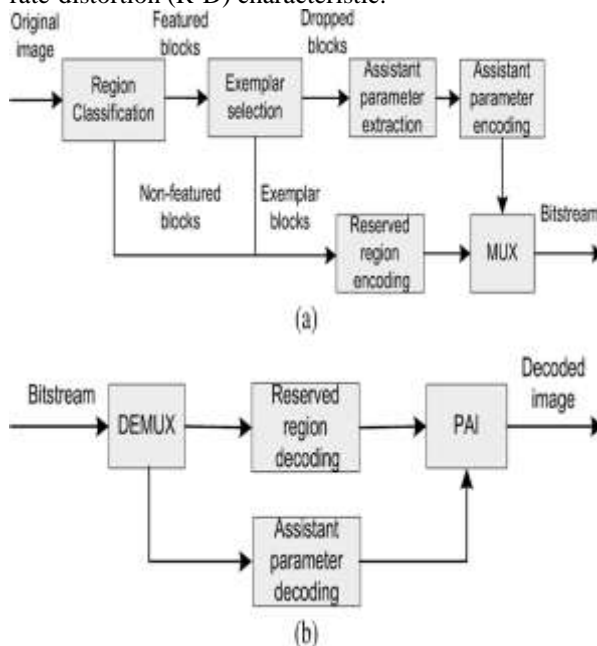


Fig 2. Framework of PAI based compression system a) encoder b) decoder [3].

Based on the proposed PAI method, we aim at high perceptual quality image compression system. The framework is shown in fig. 2. At the encoder side a), the original image is classified in two blocks featured and non-featured. Small portions of featured block are used for exemplar blocks and some

portions are extracted from dropped blocks as assistance Parameters.

Then all the reserved blocks and the assistance parameters are encoded/multiplexed and transmitted to decoder. The decoder side compression system is depicted by (b). The decoder decodes the reserved regions and the assistance parameters and the image gets restored automatically by PAI. The assistance parameter is described and compressed into bit stream in a condensed manner. Different features are extracted for more flexibility and adaptability.

Author describes in paper[5], a new image inpainting method based on property of much information of the image which are sparse in the transform domain. The redundancy is added to the original image by mapping the transform coefficients to the small amplitudes to zero. The information from resultant sparsity pattern is used for the recovery stage. The estimation of the sparsity pattern is done if the information is not available. To recover consecutive projecting is done between spatial and renovate sets. The experiment result shows that this method is best for structural and texture images. appropriate to the unique sparsity pattern of the normal images, the compacted version introduces small overhead to the transmit data. The sparsity sample may be incorporated in the header data of the compressed sparse images. It suggests an capable approach to conflict the block loss in the density schemes. In transform-based compression methods like JPEG, it is suggested to join the sparsity and density stages to achieve more efficiency. Also we proposed a method to guess the sparsity pattern if the region information is not available in the recipient. Our method overcomes the smooth effect of the PDE-based methods in surface images and unwanted objects of the exemplar-based techniques in structural images [5].

In these paper [6] author describes, a novel inpainting algorithm that is capable of filling in holes in overlap surface and picture image layers. This algorithm is a direct extension of a recently developed light representation based image decomposition method called MCA (morphological component analysis). Filling-in 'holes' in images is an attractive and imperative opposite problem with many applications. Removal of scratches in old photos, removal of overlay copy or graphics, filling-in missing blocks in unreliably transmitted images, scaling-up images, predict values in images for better density, and more, are all manifestations of the above problem. Real images contain both geometry and texture. The based on image segmentation each pixel as either cartoon or texture. That absent pixels fit as expected into the layer separation framework [6].

The authors recommend a new image inpainting algorithm based on propogating an image smoothness estimator along the image grade. The image

efficiency is predictable as a subjective average over a known image neighborhood of the pixel to inpaint. Absent regions are treat as levels sets and use the fast marching method (FMM) to propagate image information.

Digital image inpainting provides a means for restoration of small damaged portions of an image. Although the inpainting basics are directly further most image inpainting techniques published in the literature are complex to understand and implement. We represent here a new algorithm for digital image inpainting based on the fast marching method for level set applications. To reduce time duration of processing on image for better clarity and when inpainting regions are thicker than 10—15 pixels, then analytical study on image inpainting based on Fast Marching method implementation is work. This approach provides several advantages:

- It is very simple to execute.
- It is considerably faster than other inpainting methods.
- It is produce very parallel results as compare to the other methods.
- It can easily be modified to apply special limited inpainting strategies.

In exemplar based algorithm there is one approach that is exemplar based texture synthesis. It contains the essential process required to replicate both texture and structure.

Restoration can be done using two approaches- 1) image inpainting and 2) texture synthesis. In first, approach restoring of absent and spoil part of images. The second approach is filling unknown area on the image by using surrounding texture information or from input texture sample.

An exemplar based inpainting algorithm involves the following steps:

- i. select the target region.
- ii. get the margin of the target region.
- iii. Select a area from the region to be inpainted.
- iv. Find a area from the image which best matches the selected area.
- v. Update the image information [7].

Analysis of Exemplar Based Image Inpainting:

Image Inpainting is an art of modifying the digital Image Inpainting is technique in which it mainly used to filling the area which are spoiled and want to improve from unwanted object by collecting the information from the neighboring pixels.

Exemplar based Inpainting-

- 1) Select the Target Region, in which the initial missing areas are extract and represent with suitable data structure.
- 2) Compute Filling Priorities, in this a predefined priority function is used to calculate the filling

order for all unfilled pixels in the beginning of each filling iteration .

- 3) Search pattern and Compositing, in which the most related pattern is searched from the source region to arrange the given area, that centered on the given pixel.
- 4) Update Image Information, in which the border of the target region and the require information for compute filling priorities are update Numbers of algorithms are developed for the exemplar based image[8].

Fast Iteration Method (FIM):

The main idea of FIM is to selectively update the nodes without maintaining computationally exclusive data structures.

It workings on the following:

1. The algorithm must not use any particular order to scan the grid nodes.
2. The algorithm must enable the simultaneous update of grid nodes.
3. The algorithm should not use various data structures to be ordered for storing the active nodes[10]

III. COMPARATIVE STUDY

Methods	Advantages	Dis-advantages
Partial Differential Equation(P DE)	Very well result and stores all structural information.	Results display blurring objects when applied to large missing regions.
Texture synthesis based inpainting	Results do not display blurs.	Not valid for thick spoiled regions and warped structure.
Exemplar based texture synthesis	Gives effective results and stores all structural and textual information.	Gives unacceptable results of the ruined region is spread along most of the image area.
Morphological components Analysis(M CA)	Filling in holes in image is an interesting and important inverse problem with many applications.	Do not Apply on Large regions.
Fast Marching Method	It is faster than all other methods of inpainting	Selectively updates the grid nodes by the narrowband with the help of a heap structure. Alternative is Fast Iteration Method.

IV. CONCLUSION

In these paper we referred to different techniques and methods like PAI, MCA, PDE, Texture synthesis, fast marching method that are used for removing unwanted objects in images. By referring this methods and techniques we hereby conclude that fast marching method is more simple, easy to implement and also produces faster result than any other methods.

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