An Image Inpaint Using Texture Synthesis Via Masking

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Abstract---Image inpainting is a art of missing value or a data in an image. The purpose of image inpainting is to reconstruct missing regions which is visibal for human eyes. Image inpainting is the process of reconstructing lost part of images based on the background information. Image inpainting is a technique for restoring damaged old photographs and removing undesired objects from an image. The basic idea behind the technique is to automatically fill in lost or missing parts of an image using information from the surrounding area. It is used for restoration of old films and object removal in digital photographs. It is also applied to red-eye correction, stamped data from photograps, dust spot in film, removing objects to creative effect etc. The main goal of the Inpainting algorithm is to modify the damaged region in an image. In this paper we provide a review of different techniques used for image Inpainting. We discuss tecture synthesis method and inpaint the image using masking.

I. INTRODUCTION

Inpainting is the art of restoring lost parts of an image and reconstructing them based on the background information. This has to be done in an undetectable way. The term inpainting is derived from the ancient art of restoring image by professional image restorers in museums etc. Digital Image Inpainting tries to imitate this process and perform the inpainting automatically. The filling of lost information is essential in image processing, with applications as well as image coding and wireless image transmission, special effects and image restoration. The basic idea at the back of the algorithms that have been proposed in the literature is to fill-in these regions with available information from their environment [5].

In this paper, different types of image inpainting techniques presented are discussed in Section 2, discuss about the patch-based texture synthesis method in Section 3 discuss about experimental results in section 4 and the conclusion in last section.

II. SURVEY ON IMAGE INPAINTING TECHNIQUES

There are mainly two methods found in literature of inpainting:

- Structural inpainting
- Textural inpainting

Structural inpainting uses geometric approaches for filling in the missing information in region. This algorithm focus on the consistency of the geometric structure. This algorithm also used in the decomposition is of bounded variation, representing the underlying image structure [4].

Textural inpainting use to captures the texture and possible noise and also complete the missing regions using similar neighbourhoods of the damaged pixels [4].

Diffusion based Inpainting was the first digital Inpainting approach. In this approach missing region is filled by diffusing the image information from the known region into the missing region at the pixel level. The drawback of the diffusion process is it introduce s some blur, which becomes noticeable when filling larger regions [3].

PDE based algorithm, This algorithm is the iterative algorithm. PDE based technique has been widely used in number of applications such as image segmentation. If missing regions are small one then this algorithm is works a good result but when the missed regions are large this algorithm will take so long time and it will not produce good results.

Another category of Inpainting is exemplar- based Inpainting algorithm. This method of image Inpainting. is an efficient approach to reconstructing large target regions. Exemplar-based Inpainting approach iteratively synthesizes the target region by most similar patch in the source region. These algorithms also overcome the drawbacks of PDE based inpainting. Also it removes smooth effect of the diffusion based Inpainting algorithm [3].

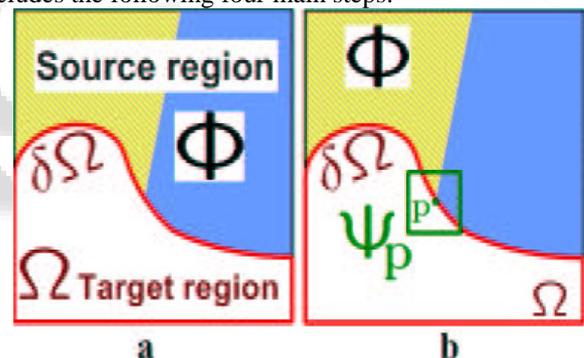Generally, an exemplar-based Inpainting algorithm includes the following four main steps:

Fig. 1: Structure propagation by exemplar-based texture synthesis.(a) Original image, with the target region Ω, its contour δΩ and the source region Φ clearly marked. (b) We want to synthesize the area delimited by the patch ψp centred on the point p ∈δΩ.[2]

Initializing the Target Region, in which the initial missing areas are extracted and represented with appropriate data structures.

Computing Filling Priorities, in this a predefined priority function is used to compute the filling order for all unfilled pixels p ∈ δΩ in the beginning of each filling iteration.

Searching Example and Compositing, in which the most similar example is searched from the source region Φ to compose the given patch, Ψ (of size N × N pixels) that centered on the given pixel p.

Updating Image Information, in which the boundary δΩ of the target region Ω and the required information for computing filling priorities are updated.

III. TEXTURE SYNTHESIS METHOD

The Texture Synthesis methodare used to complete the missing regions using similar neighbourhoods of the damaged pixels. The texture synthesis algorithms synthesize the new image pixels from an initial seed. but depends on user choices on sampling location and content.

Texture synthesis approaches can be categorized into

Three categories:
- Statistical (parametric)
- pixel-based (non-parametric)
- patch-based (non-parametric)

Statistical methods are more likely to succeed in reproducing stochastic / irregular textures, but usually fail to reproduce structured/regular textures. Pixel-based methods "build" on the sample texture pixel-by-pixel instead of applying filters on it, and their final outputs are of better quality than those of statistical methods, but they usually fail to grow large structured textures. Patch-based [7]methods "build" on a sample texture patch-by-patch as opposed to pixel-by-pixel, thus they yield faster and more plausible regular textures.

Recently, a study for patch-based texture synthesis algorithms has shown that "for handling special types of texture we have to develop the special purpose algorithms". Taking this aim and the variety of algorithms for texture synthesis into consideration, we can conclude that there is no universal texture synthesizer is present. Still it remains a goal to be desire.

Why we have to use patch-based texture synthesis algorithm instead of pixel-based algorithm explain as follows: [8]
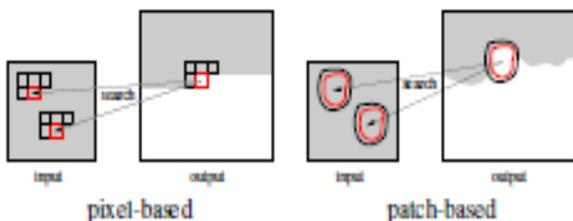

Fig. 2: Comparison between pixel and patch.

In pixel-based algorithm, the copy is just a copy.

However, in patch-based algorithms, the issue is more complicated as a patch, being larger than a pixel, usually overlaps with the already synthesized portions, so some decision has to be made about how to handle the conflicting regions. new patches simply overwrite over existing regions. By using patches with irregular shapes, this approach took advantage of the texture masking effects of human visual system. [3]

Problem behind this concept is overlapping the selected patches in the image.

Using Texture Synthesis method we can select the patches and also handle the conflicting region with the overlapping the patches.
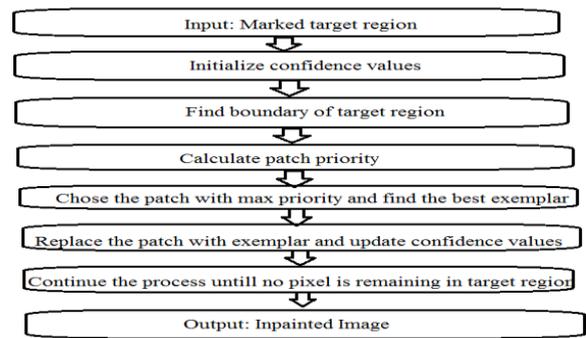

Fig. 3: flow of work

Work flow is mention in figure 3, first select the patch with the boundary that is target region which we have to inpaint. Overlapping with two patches is handle by texture synthesis method and then calculate the max priority patch with the best exemplar algorithm.

IV. EXPERIMENTAL RESULTS

To verify our methods, we conduct experiments on a lot of natural images, which we will describe concisely.

Figure 4 shows some results, left side above image is original image generate the mask on it by user i.e user select the mask on image it means user select the target region which area will be inpaint. In the second figure highlight the mask only in third image mask will be burn a part from whole image. In the forth image background area will be highlight for using inpaint the makable image. And in the last image is cropped that selected part for inpainting now we have to inpaint only that cropped part from the background image.
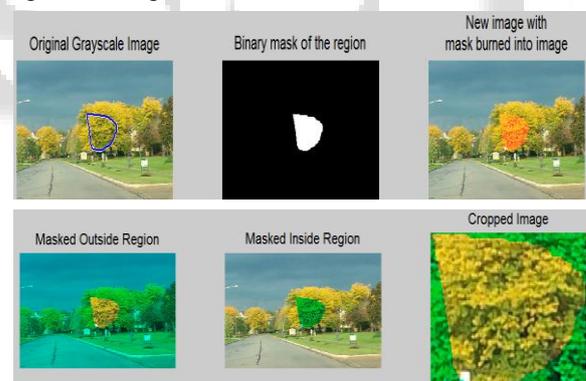

Fig. 4: Implementation result

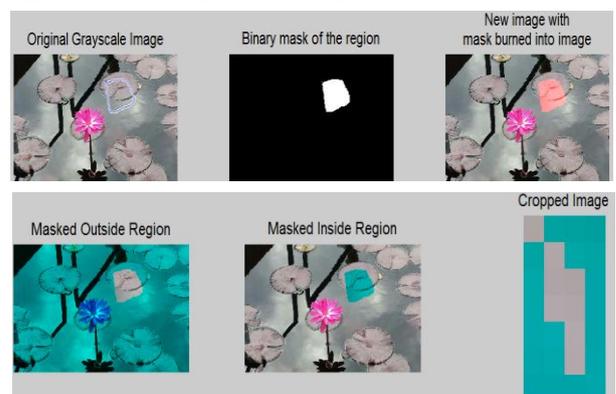Same as implemented results with the natural images shown in Figure 5 and figure 6.
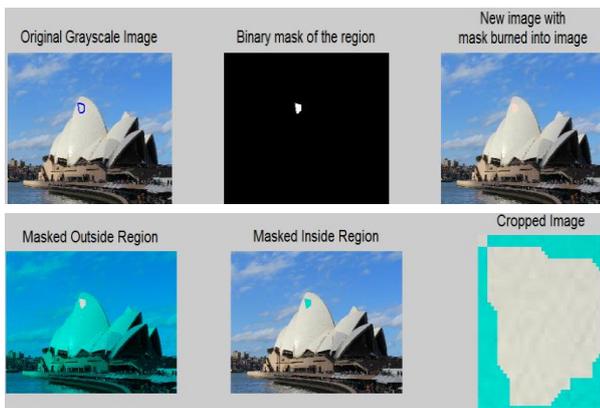

Fig. 5: Imaplemented Result

Fig. 6: Implemented Result

V. CONCLUSION AND FUTURE WORK

A famous texture synthesis based inpainting algorithm proposed by [2] selects the most suitable patch from the source region at each step, thus it can be viewed as a special case of our algorithm if we constrain that only one patch is selected in each step. texture synthesis is actually a sparse representation method with the constraint that L0 norm (the number of nonzero entity in vector) equals to 1. Thus, the gap between texture synthesis and sparse representation is bridged. However, in general, our algorithm selects several columns of the dictionary, i.e. several different patches if we construct the dictionary by directly sampling patches, and use a linear combination of them to fit the target patch. Thus, our algorithm has higher capability to fit diverse patches for its form of linear combination.

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