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Ladderal Structure Of Super Resolution With Support Of Inpainting

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Abstract:

Inpainting is the process of reconstructing lost or deteriorated part of images based on the background information. i. e. image Inpainting fills the missing or damaged region in an image utilizing spatial information of its neighboring region.We address the issue in ability deal of image blurring and low resolution. This paper introduces a new examplar-based inpainting framework. A coarse version of the input image is first inpainted by a nonparametric patch sampling. Compared to existing approaches, some improvements have been done (e.g. filling order computation, combination of K nearest neighbours) A hierarchical super-resolution algorithm is then used to recover details on the missing areas. The advantage of this approach is that it is easier to inpaint low-resolution pictures than high-resolution ones. The gain is both in terms of computational complexity and visual quality.

Keywords- Inpainting, super-resolution, missing areas, priority terms, Low Resolution, High Resolution.

Introduction:

Image inpainting refers to methods which consist in filling-in missing regions (holes) in an image [1]. Existing methods can be classified into two main categories. The first category concerns diffusion-based approaches which propagate linear structures or level lines (so-called isophotes) via diffusion based on partial differential equations [1, 2] and variational methods [3]. Unfortunately, the diffusion-based methods tend to introduce some blur when the hole to be filledin is large. The second family of approaches concerns exemplar-based methods which sample and copy best matching texture patches from the known image neighborhood [4–7]. These methods have been inspired from texture synthesis techniques [8] and are known to work well in cases of regular or repeatable textures. The first attempt to use exemplar-based techniques for object removal has been reported in [6]. Authors in [5] improve the search for similar patches by introducing an a priori rough estimate of the inpainted values using a multi-scale approach which then results in an iterative approximation of the missing regions from coarse to fine levels. Super-Resolution (SR) refers to the process of creating one enhanced resolution image from one or multiple input low resolution images. The two corresponding problems are then referred to as single or multiple images SR, respectively. In both cases, the problem is of estimating high frequency details which are missing in the input image(s). The proposed SR-aided inpainting method falls within the context of single-image SR. The SR problem is ill-posed since multiple high-resolution images can produce the same low-resolution image. Solving the problem hence requires introducing some prior information. The prior information can be an energy functional de-fined on a class of images which is then used as a regularization term together with interpolation techniques. Image Inpainting fills the missing or damaged region in an image utilizing spatial information of its neighbouring region. Inpainting algorithm have numerous applications. It is helpfully used for restoration of old films and object removal in digital photographs. It is also applied to red-eye correction, super resolution, compression etc. The main goal of the Inpainting algorithm is to modify the damaged region in an image in such a way that the inpainted region is undetectable to the ordinary observers who are not familiar with the original image. Existing methods can be classified into two main categories. The first category concerns diffusion-based approaches which propagate linear structures or level lines (so-called isophotes) via diffusion based on partial differential equations and variational methods. Unfortunately, the diffusion-based methods tend to introduce some blur when the hole to be filled-in is large. The second family of approaches concerns exemplar-based methods which sample and copy best matching texture patches from the known image neighborhood. These methods have been inspired from texture synthesis techniques and are known to work well in cases of regular or repeatable textures. The first attempt to use exemplar-based techniques for object removal has been reported in [1]. Nowadays, the image Inpainting technology is a hotspot in computer graphics. And it has important value in a heritage preservation, film and television special effects production, removing

redundant objects etc. In the fine art museums, this Inpainting concept is used for degraded paintings. Conventionally Inpainting is carried out by professional artist and usually its very time consuming process because it was the annual process.

II. Related Work

A. Diffusion based Inpainting 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. Basically these algorithms are based on theory of variational method and Partial Differential equation (PDE). The diffusion- based Inpainting algorithm produces superb results or filling the non-textured or relatively smaller missing region. The drawback of the diffusion process is it introduces some blur, which becomes noticeable when filling larger regions. All the PDE based in painting models are more suitable for completing small, non-textured target region. B. Texture Synthesis Based Inpainting Texture synthesis based algorithms are one of the earliest methods of image Inpainting. And these algorithms are 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. And then strives to preserve the local structure of the image [3]. All the earlier Inpainting techniques utilized these methods to fill the missing region by sampling and copying pixels from the neighbouring area. For e. g, Markov Random Field (MRF) is used to model the local distribution of the pixel. And new texture is synthesized by querying existing texture and finding all similar neighbourhoods.

Their differences exist mainly in how continuity is maintained between existing pixels and Inpainting hole. The main objective of texture synthesis based inpainting is to generate texture patterns, which is similar to a given sample pattern, in such a way that the reproduced exture retains the statistical properties of its root texture [4]. C. PDE based Inpainting This algorithm is the iterative algorithm. The main idea behind this algorithm is to continue geometric and photometric information that arrives at the border of the occluded area into area itself [5]. This is done by propagating the information in the direction of minimal change using isophote lines. This algorithm will produce good results if missed regions are small one. But when the missed regions are large this algorithm will take so long time and it will not produce good results. Then inspired by this work proposed the Total Variational (TV) Inpainting model [6]. This model uses Euler-Lagrange equation and anisotropic diffusion based on the strength of the isophotes. This model performs reasonably well for small regions and noise removal applications. But the drawback of this method is that this method neither connects broken edges nor greats texture patterns. These algorithms were focused on maintaining the structure of the Inpainting area. And hence these algorithms produce blurred resulting image. Another drawback of these algorithms is that the large textured regions are not well reproduced. D. Exemplar based Inpainting. The exemplar based approach is an important class of inpainting algorithms [1]. And they have proved to be very effective. Basically it consists of two basic steps: in the first step priority assignment is done and the second step consists of the selection of the best matching patch.

The exemplar based approach samples the best matching patches from the known region, whose similarity is measured by certain metrics, and pastes into the target patches in the missing region. Exemplar- based Inpainting iteratively synthesizes the unknown region i. e. target region, by the most similar patch in the source region. According to the filling order, the method fills structures in the missing regions using spatial information of neighboring regions. This method is an efficient approach for reconstructing large target regions.

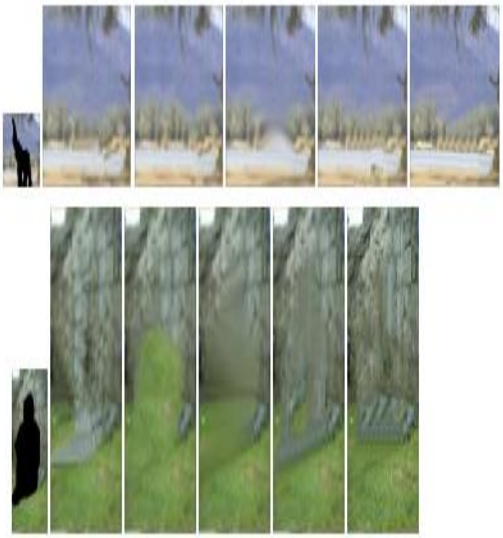
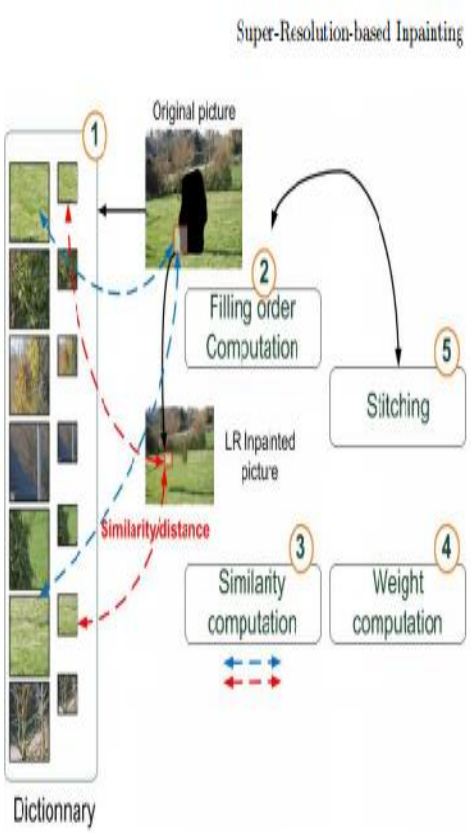


fig 1; after inpainted image

Motivations:

The proposed method is composed of two main and sequential operations. The first one is a non-parametric patch sampling method used to fill-in missing regions.



of super resolution fig 2:procedur

However, rather than filling in missing regions at the original resolution, the inpainting algorithm is applied on a coarse version of the input picture. There are several reasons for performing the inpainting on a low-resolution image. First, the coarse version of the input picture could be compared to a gist [15] representing dominant and important structures. Performing the inpainting of this coarse version is much easier since the inpainting would be less contingent on local singularities (local orientation for instance) or even noise. Second, as the picture to inpaint is smaller than the original one, the computational time to inpaint it is significantly reduced compared to the one necessary to inpaint the full resolution image. The second operation is run on the output of the first step. Its goal is to enhance the resolution and the subjective quality of the inpainted areas. We use a single-image SR approach. Given a low-resolution input image, which is the result of the first inpainting step, we recover its high-resolution using a set of training examples, which are taken from the known part of the input picture.

Conclusion And Future Scope:

In this paper we review the existing techniques of image Inpainting and super resolution. We discussed a variety of image Inpainting techniques such as texture synthesis based Inpainting, PDE based Inpainting, Exemplar based Inpainting, Diffusion based Inpainting techniques. For each technique we have provided a detailed explanation of the techniques which are used for filling the missing region making use of image. From this analysis, a number of shortcomings and limitations were highlighted of these techniques. It is observed that the PDE based Inpainting algorithms cannot fill the large missing region and it cannot restore the texture pattern. The theoretical analysis proved that exemplar based Inpainting will produce good results for Inpainting the large missing region also these algorithms can inpaint both structure and textured image as well. As different methods of super-resolution have been developed using models with unequal assumptions of the existing problem, and because the results provided have been primarily based on subjective measurements, it is difficult to find an unbiased comparison on what super-resolution methods are more appropriate for a given task. There must be considerations like if more than one input images are present then use multi frame super resolution approach and if one or more high resolution training images are available then use single image super resolution approach.

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