A Review Paper on an Approach for Reconstructing the Image with Combine Structure and Texture Image Inpainting using Gradient Descent Algorithm

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Abstract*—In the modern world, The advancement in communication system led the user transmit image and video through mobile. The Image Inpainting is the process of reconstructing and editing of an Image according to our need through which we can get the appropriate image in the receiver side. In this paper, a distorted or damaged image is taken and various types of algorithm introduced is applied to the image, The fill-in is done in such a way that lines arriving at the regions, boundaries are completed in-side. In contrast with previous approaches, the edge detection algorithm and texture synthesis algorithm is introduced with gradient descent structure based algorithm. The all three proposed algorithm is applied step by step and give the accurate and improved output. After that in transmission of image. Image encoding and image decoding algorithm is used by which we get improved PSNR, SNR, MSE.*

Keywords—Image Inpainting, Structure layer, Texture, Gradient Descent

I. INTRODUCTION

The image Inpainting is to very important in the word of image processing it is used to reconstitute the missing or damaged portions of the image .In order recover the distorted image the algorithm is applied to restore its unity .The need to reconstruct the damage image is an unobtrusive way extended naturally from paintings to photography and fill .At the receiver side we used to reconstruct the Image because when we transmit the image some lost of blocks are introduced, At this point, the only user interaction required by the algorithm here introduced is to mark the regions to be in-painted. Although a number of techniques exist for the semi-automatic detection of image defects (mainly in films), addressing this is out of the scope of this paper. Moreover, since the inpainting algorithm here presented can be used not just to restore damaged photographs but also to remove undesired objects and writings on the image. Here we are concerned on how to "fill-in" the regions to be inpainted, once they have been selected.

A. Structure Inpainting

Structure Inpainting uses geometric approaches, it is focused on the consistency of geometric structure. A Structure space of an image contains elements, which allow the basic outline of the image, in many cases structure space is intended to be the edge map of the image.

B. Textural inpainting

Textures are in general divided into two categories, stochastic and deterministic. Stochastic textures do not have easily identifiable primitives (e.g., bark or sand).Often textures in the real world have a mixture of the two (e.g., plowed fields, wood grain). For a textured image the inpainting could be considered as a texture synthesis process. Texture synthesis involves synthesizing an image that matches the appearance of a given texture. The new image may be of arbitrary size and the main goal is to achieve a tileable image (i.e., no seams or borders are visible if the image is periodically extended).

C. Combined structure and texture inpainting

Combine structure and texture Inpainting is used to perform simultaneously filling the structure and texture in the region of missing data. The boundaries between images regions accumulate structural data which is complicated phenomenon. This is the result when blending different textures together.

D. Applications

Image Inpainting technique have many objectives and applications in image processing .to reverse the deterioration for example: cracks in photographs or scratches and dust spots in film. It is also used for removing red eye, the stamped date from photographs and removing logos in videos and removing objects to creative effect. Can be used to replace the blocks in the coding and transmission of image, for examples, in streaming video.

II. LITERATURE REVIEW

"Structure-based image inpainting" is proposed by AdibAkl, EdgardSaad, in (2016). In this paper a structure based image inpainting is proposed, where the image's structure layer is represented and analyzed using the structure tensor field. The structure layer of the image is first inpainted by adapting the Efros and Leung algorithm to the specificities of the Structure tensor , then the obtained tensor field is used to help the image inpainting process. Result shows that using the proposed method, relevant local information can be better inpainted comparing to the initial intensity –based approach that does not consider structural information during the inpaintingprocess[1].

"Image Inpainting: Overview and recent advance" is proposed by Christine Guilllemenotin (2014). Image inpainting refers to the process of restoring missing or damaged areas in an image. This field of research has been very active over recent years, boosted by numerous applications: restoring images from scratches or text overlays, loss concealment in a context of afflicted image transmission system, object remotion in a context of editing, or disocclusion in image-based rendering (IBR) of viewpoints different from those captured by the cameras. Although earlier work dealing with disocclusion has been

published in, the term inpainting first appeared in by analogy with a process used in art restoration. To solve the problem of Image inpainting, it is ill-posed inverse problem,therefore it is necessary to introduce image priors. All methods are guided by the assumption that pixels in the known and unknown parts of the image share the same statistical properties or geometrical structures. This assumption translates into different local or global priors, with the goal of having an inpainted image as physically plausible and as visually satisfying as possible [3].

"Exemplar-based image inpainting algorithm using adaptive sample and candidate patch system" is proposed by Fan Qian, Department of Electrical Engineering and Electronics, Kyushu Institute of Technology, Fukuoka 804-0015, Japan in (2015)." The concept of digital image inpainting is firstly mentioned by Bertalmio in 2000, for many reasons, one image may be destroyed by human, nature and other factors, some regions in the image may lost its information. Digital image inpainting technology is by using the remaining part of the image to maintain the integrity of the original image and now it is becoming a very important topic and comes out a lot of applications of preserving ancient painting, movie processing, image,coding and transmission.[4]

III. PROBLEM IDENTIFICATION

The image inpainting is process of restoration. In this context, the inpainting problem will be stated first and two different perspectives of the digital inpainting paradigm will be introduced and, second, the digital Inpainting tools.

Pure Inpainting– Signal processing solutions which the main goal is restoring damaged or removed areas using information from undamaged areas, e.g. restoring cracks in photographs, occlusion recovery, in the most transparent way, i.e. an observer would not be able to notice that an inpainting procedure had taken place; therefore, the user would not be able to distinguish the original undamaged image from its restored image.

Inpainting-based Coding– Signal processing solutions which main goal is exploiting digital Inpainting tools to significantly increase the compression efficiency in comparison with standard-based coding solutions. From the pure inpainting perspective, the inpainting problem

Fig. 3.1: Illustration of the inpainting problem

from the pure inpainting perspective and from the coding perspective at the decoder side. From the pure inpainting perspective, digital inpainting consists mainly in repairing objects in images or video sequences by filling-in target areas, eventually according to some previously chosen assistant information, extracted from the source image areas which may also include the area to be inpainted if repairing is the problem, or neighbor source areas if filling a hole is the problem; this task has to be performed in the most transparent way as defined.

IV. PROPOSED METHODOLOGY

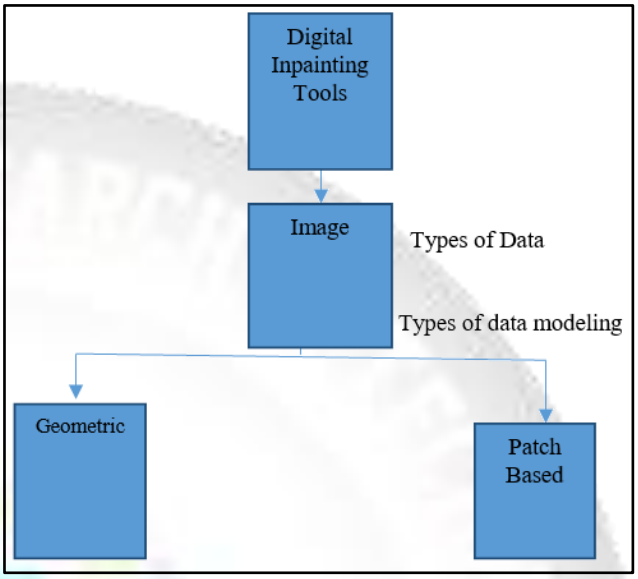

Fig. 4.1 – Proposed Synthesis for digital inpainting tools

In the majority of signal processing problems, the various ways to study the in painting problem can be classified depending on the technical concepts and tools used. Based on the literature review made for the purpose of understanding and structure based in painting problem, this means image in painting, some texture synthesis emerged as more relevant for in painting solutions helps in understanding their relationships, notably similarities and differences between available and emerging solutions. In this context, the main edge texture synthesis proposed to problem and classify the technologies and solutions for image and in painting, as shown in Figure 4.1.

A. Image Inpainting Tools

In the proposed synthesis, digital inpainting tools are divided into two main categories, in geometric and patch based depending on the type of data being considered, notably images. The main differences between these two types of data are the world they live in and the amount of information to be processed. Images live in a 2D world which is spatially constrained by two coordinates. Recently, there is emerging a new direction to exploit perceptual redundancy and to improve visual quality .original images are available at encoder, various distinctive features can be extracted from removed regions and transmitted as assistant information, which may greatly empower the inpainting or synthesis methods. Here, the assistant information can be heeded as a compact description of some image regions. From the inpainting point of view, assistant information makes inpainting a guided optimization for visual quality instead of a blind optimization. We try to look into the capabilities of inpainting as well as given edges as assistant information. Our proposed work is an image coding scheme, in which some blocks are removed at encoder side but the edges relating to them are transmitted. At decoder side, we

will design edge-based inpainting and applying texture synthesis for our schema, in order to fully utilize edges to restore the removed blocks. Data based results demonstrate the efficiency of our schema in terms of great reduction in bit-rate.

B. Edge-Based Inpainting Algorithm

Proposed EBI method is executed based on individual edges. For each edge, EBI is completed in two steps as shown in Figure 4.2.First, a linear interpolation is adopted to generate the unknown pixels on the edge from the known ones on the same edge. Second, the neighbourhood of an edge, known as influence region, is progressively filled-in by pixel generation.

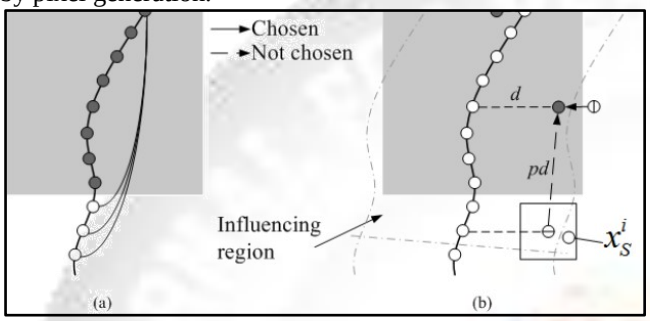

Fig. 4.2: Edge-based inpainting. (a) Unknown edge pixelsare restored by interpolation; (b) the other unknown pixels aregenerated one by one, each of which is filled-in by one of two Candidate pixels.

C. Image inpaintingencoding and decoding Algorithm

The objective of this inpainting-based image coding solution is to design a fully automatic frame work towards image compression, which aims at significantly reducing visual redundancy inherent to natural images while achieving good restored image perceived visual quality. In this context, some distinctive features are extracted from the originals at the encoder side, which help selecting the regions to be and not to be in painted; therefore, allowing the system to choose, for each region, the most suitable coding approach from those available. In the proposed solution, edges have been chosen as the features to be extracted since the human visual system relies on them to identify and interpret the objects' attributes and their mutual associations; thus, it is expected that their inclusion in this in painting-based image coding solution will positively impact the restored image perceived visual quality.

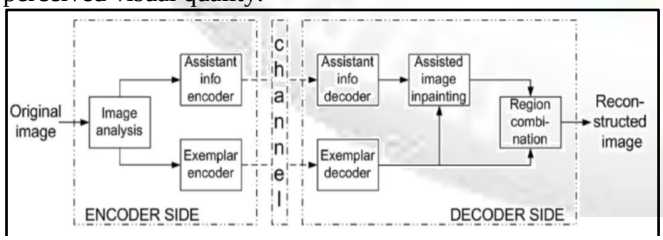

Fig. 4.3: Image encoding and decoding algorithm

In our proposed schema as shown in Fig 4.3, the normal image encoder/decoder can be any of the existing compression systems. Block-based coding methods are more suitable because our exemplar selection is also block-based. In this paper, we test our scheme on image intra coding. The edges related to the removed blocks are collected and coded. One binary map, which indicates whether a block is removed or not, is also coded into the bit stream .In the comparison with standard JPEG, we use the image and set the quality parameter from 50 to 95. Since PSNR is not quite suitable here, the method proposed is adopted to evaluate the quality of decoded image.

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