Image Mapping and Object Removal Using ADM in Image Inpainting: Review

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Abstract :- Image inpainting is a technology for restoring the damaged parts of an image by referring to the information from the undamaged parts to make the restored image look "complete", "continuous" and "natural". Inpainting traditionally has been done by professional restorers. For instance, in the valuable painting such as in the museum world would be carried out by a skilled art conservator or art restorer. But this process is manual so it is time consuming. Digital Image Inpainting tries to imitate this process and perform the Inpainting automatically. The aim of this work is to develop an automatic system that can remove unwanted objects from the image and restore the image in undetectable way. Among various image inpainting algorithms Alternating Direction Method (ADM) is used for image restoration. ADM works well for solving inverse problem. In this paper, various applications of ADM method for image restoration are discussed.

Keywords:- *Image inpainting, Alternating Direction Method.*

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I. INTRODUCTION

Inpainting is the art of restoring lost parts of an image and reconstructing them based on the previous information. The effect of removing object should not be noticeable. The term Inpainting is derived from the ancient art of restoring image by professional image restorers in museums etc. The filling-in of lost information is essential in image processing, with applications including image coding and wireless image transmission (e.g., recovering lost blocks), special effects (e.g., removal of objects), and image restoration (e.g., scratch removal). 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. For visual inspection, large areas with lots of information lost are harder to construct again, because information in other parts of the image is not enough to get an knowledge of what is missing. When we take a snapshot, there may be some unwanted object that comes in between. There is a need of system that can efficiently remove the marked object from the image. Details that are completely hidden /occluded by the object to be removed are to be filled in visually plausible way using the background information. Various methods are available for Image inpainting as Structural inpainting, Texture synthesis based Image Inpainting, Partial Differential Equation (PDE) based algorithm, Exemplar based Image Inpainting, Wavelet Transform based, Semi-automatic and Fast Inpainting, Alternating Direction Method (ADM) based inpainting.

Fig 1: Process of Image Inpainting.

II. RELATED WORK

Image restoration is an ill-posed problem, according to [2] Blind image deblurring (BID) is an ill-posed inverse problem, typically solved by imposing some form of regularization (prior knowledge)on the unknown blur and original image. This approach, although not requiring prior knowledge on the blurring filter, achieves state-of-the-art performance for a wide range of real-world BID problems [2]. In this paper a new version of method is proposed in which both the optimization problems with respect to the unknown image and with respect to the unknown blur are solved by the alternating direction method of multipliers (ADMM) .ADMM provides optimization tool that has recently sparked much interest for solving inverse problems. Blind image deblurring (BID) is an inverse problem where the observed image is modeled as resulting from the convolution with a blurring filter and possibly followed by additive noise. The goal is to estimate both the underlying image and the blurring filter. Furthermore, the convolution operator is itself typically ill-conditioned, making the inverse problem extremely sensitive to inaccurate filter estimates and to the presence of noise [2]. In this paper, an improvement is done on method [3].Without increase in computational cost ADMM is used to solve the minimizations required by method [3]. Image estimate obtained by gradient descent and filter estimate by conjugate gradient are calculated then such two steps can be efficiently calculated by ADMM method. Experimental result shows that both results give best ISNR (Improvement in signal to noise ratio). Instead of periodic boundary conditions, the author extended the images with values equal to the nearest boundary and both methods were run assuming unknown boundaries. The average ISNR and processing times in shows that the proposed method clearly outperforms the baseline from [3]. A significant speed up (by using the ADMM) and the ability to handle unknown boundary conditions (more realistic than the usual periodic ones). Experiments with synthetic and real blurred images are performed.

Wei Li, Lei Zhao [4] gives efficient and accurate algorithm for solving the image completion problem, which is a widely discussed topic in recent years. This algorithm is inspired by recent progress in the matrix completion field. The core idea of ADIC is to transform the image completion problem into the matrix completion problem, then the alternating direction method (ADM) is employed to get an optimal solution [4].In many computer vision and graphics application image completion is a crucial issue. Image completion means filling of missing elements or pixels from image. The problem lies on how to build relation between known and unknown elements. In this paper overview of some methods is given using which this problem can be solved formerly. PDE-based algorithms [5] [6] and BP-based methods [7] [8] mainly focus on the local relationship. The former ones try to fill the missing region of an image by propagating information from the boundary towards the interior of the missing region. The latter ones first build Markov random field (MRF) on an input image and then seek the global optimization through message exchange between neighbor nodes. Both of them assume that the missing entries mainly depend on their neighbors and there is little dependence between two parts which are far away. To achieve better performance fast global based approach is proposed which is inspired by Chen's matrix completion algorithm. In which, the image completion task is transformed into a Convex optimization problem and then the alternating direction method (ADM) can be employed to solve the problem efficiently. This algorithm can efficiently use for image restoration, image denoising and for Object removal. An experimental result shows that the value of penalty parameter for the violation of the linear constraint β will have great influence on the convergence speed. They concluded as ADIC is fast and it works even when an input image has only a small number of known values. ADIC assumes that the input data should be of low-rank and when there exist very large missing blocks in the input image, the output is usually unpleasant. Extend the application of ADIC to other fields, such as video processing and image compression can be possible.

Mariana S. C. Almeida and Mário A. T. Figueiredo in [9] gives ADMM as flexible and efficient optimization tool for solving inverse problem .It uses divide and conquer strategy to achieve state-of-the-art speed. This paper extends ADMM-based image deconvolution to the scenario of unknown boundary, in which observation operator is modeled as the composition of a convolution with a spatial mask that keeps only pixels that do not depend on the unknown boundary. Previous versions of this class of methods were limited to deconvolution problems with periodic boundary conditions. The proposed algorithms are able to address a more general class of problems, where the degradation model includes a convolution with some blur filter and also loss of pixels (the so-called image inpainting problem). Total-variation regularization as well as frame-based analysis and synthesis formulations are considered and gave convergence guarantees for the algorithms proposed. Experiments using large blur filters and several noise levels showed the adequacy of the proposed approach. Future work includes the application and extension of the approach to video deblurring; image and video super-resolution; spatially varying regularization.

Mario A. T. Figueiredo and Jose M. Bioucas-Dias in [10] the problem of restoring Poissonian images for medical and astronomical applications are discussed. However, the restoration of these images using regularizers those based upon multi-scale representations or total variation is an active research area, because the associated optimization problems are quite challenging. In this paper, alternating direction optimization method is proposed to deconvolve Poissonian images, Total-variation, frame-based analysis, and frame-based synthesis this problems were attack by ADMM algorithm which is belongs to the family of augmented Lagrangian algorithms. The algorithms developed for linear operators and Gaussian noise cannot be directly applied to Poisson observation models. Poissonian image models are well studied in fields such as astronomical, biomedical and photographic imaging. The standard criterion for deconvolution of Poissonian images consists of a convex constrained optimization problem. To tackle the optimization problem ADMM algorithm which belongs to the family of augmented Lagrangian methods is proposed. So it is called as PIDAL (Poisson image deconvolution by augmented Lagrangian).This paper is an extension of [11]. ADMM is closely related to Douglas-Rachford splitting (DRS) methods [12], [13], so the method proposed in this paper can also be interpreted from a DRS viewpoint.

Reviewing this literature, it is seen that ADM can be efficiently used to image restoration, so a new idea is propose to use ADM for object mapping and Object removal in image inpainting. If we take a snapshot unwanted object may come into picture, so to remove such object from image an automatic system can be developed with the help of ADM algorithm.

III.CONCLUSION

Reviewing this literature, an approach towards a new idea of developing an automatic system for object mapping and removal from image is being proposed. This core idea of implementation with the help of ADM method will give efficient and effective system which requires very less user interaction.

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