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PERFORMANCE ANALYSIS OF IMAGE INPAINTING WITH JOINT FILTERING OF MULTIPLE PATCHES USING SVD AND ALPHA TRIMMED FILTER

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ABSTRACT

Image inpainting is a smart editing tool. The patch-based algorithms inpainted the damaged/missing region patch by patch propagating from the boundary towards the center of the missing region. Several patch-based image inpainting methods relied on single patch selection and few on multiple patch selection-based method. Multiple source patches were used to obtain a more similar source patch for the target patch. Since the single source patch was chosen based on partially known target patch, a large variation resulted in artifacts in the inpainted region. To overcome it, multiple source patches were selected and filtered jointly to capture the core pattern amongst them. The resultant filtered patch was an optimal patch for the corresponding target patch. This paper compared the performance of joint filtering of SVD values of similar patches(KNN-SVD)and filtering of similar patches using alpha trimmed filters(KNN-KV-Alpha).These two algorithms were tested and evaluated for input images and results were compared with standard algorithms. Results showed that the time required for inpainting was drastically reduced while the quality factor was equivalent with the existing techniques. KNN-KV-Alpha gave high quality factor with less time for inpainting as compared to KNN-SVD as the similar patches were selected in the neighbourhood of the missing region.

Keywords: Inpainting; Improvised Data Term, Singular Value Decomposition Refinement Of Similar Patches, Vicinity Patches, Adaptive Patch Size, Sequencing Of Patch Priorities, Standard Deviation As Patch Priority, Multiple Patch Selection**.**

I. INTRODUCTION

Patch-based image inpainting algorithms [1] have been introduced to address image inpainting problems for object removal and region filling. These algorithms inpaint the damaged region patch by patch with structure and texture synthesis. These algorithms had three steps which were iterative, location of the target patch, search of the best candidate patch and alteration of the target patch with the corresponding pixels from the source patch [2]. Many variations had been suggested in formulation of priority function and search of the best candidate patch. Many authors had suggested variations in calculation of priority function and similarity measure for patch selection. Criminisi et al [3] suggested a priority function that was the product of a data term and confidence term. The confidence term determined the confidence values of the pixels in the known region of the image. The data term calculated the dot product of the line of equal intensity and the normal at the point on the boundary. The method did not reconstruct curved structures. In order to search the source patch similar to target patch, patch-based inpainting algorithms applied a similarity measure such as sum of squared distance (SSD) [4], structure similarity (SSIM), mean squared error (MSE), gradient components [6], statistics of patch offsets [5] and perceptually aware mean squared error (PAMSE).The similarity measured was optimised to select the source patches. The target patch was filled in by the source patch. The damaged region was inpainted patch-by-patch in an iterative manner by repeated steps until all the damaged pixels were determined [7, 8].V Sairam et al [9] suggested a modification in patch match criteria with difference in gradient of source patch and target patch along with sum squared distance. The authors also devised an algorithm for inpainting with gradient of image as a data term. Meur et al [10] modified data term with a tensor term that improved the priority function to represent strong structures. The tensor-based data term formed with the Eigen values of the structure tensor helped propagation of the structures.

Gaussian-weighted nonlocal texture similarity measure was suggested in [11] to obtain multiple candidate patches. The refined patch was obtained by α (alpha) trimmed mean filter to inpaint the target region.Deng et al [12] improved Criminisi's priority term with two phases. In the first phase the priority was defined by the data term and in the second phase it was defined by the confidence term. The algorithm propagated geometry of the