



RESTORATION OF MURALS

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Abstract: Murals are an integral part of our heritage and culture. So there is a need to preserve them for coming generations. The major cause for its deterioration can be odd weather conditions, dust, smoke etc. It can be affected as cracks or decolourisation. Due to the irreversibility of chemical restoration of murals, we can go for digital restoration of murals. In this paper, we reviewed about the techniques of digital restoration of murals including crack detection and filling, colour restoration.

Keywords: mural, restoration, crack detection, color restoration.

INTRODUCTION

The motivation behind restoration is based on the idea that the art and artifacts of the past should be respected and preserved. A mural is a piece of artwork painted or applied directly on a wall, ceiling or any other large permanent surface. A particularly distinguishing characteristic of mural painting is that the architectural elements of the given space are harmoniously incorporated into the picture. Those paintings are important as they bring ancient art into the public sphere. Nowadays those are being deteriorated rapidly and so it becomes a necessity to preserve what we have right now and also to restore it digitally so that we may have an idea of possible original appearance. Digitally restoration of archaeological objects is more useful and efficient because permanent change of the art-work from its present form is not allowed. Digital restoration through image processing techniques tries to generate the original look without actually changing the object. Therefore it is always advisable to restore art-works digitally.

LITERATURE REVIEW

[1]. Pooja Bajpai et al., used the method of segmentation and fuzzy clustering. They worked on the segment that needs to be deblurred. Since the amount of blur is scattered they apply image segmentation to extract similar blur regions. Then used fuzzy based clustering mechanism that basically works on membership values. This paper uses fuzzy based clustering applied on PSNR values calculated from segmentation. Image deblurring is next step which is applied on the segment of image that needs to be deblurred. After extracting blurred segment, deconvolution algorithm is applied.

CRITICS: Large number of segments used in small image will increase the time complexity and cause difficulty in visualizing the image.

[2]. Sukhjeet kaur et al. developed an algorithm for detection of cracks named Nearest Neighbour Algorithm, that perform two task- Detection of the cracks and Removal of the detected cracks.

CRITICS: It becomes difficult to find the nearest neighbour in case of large images that increase the complexity.

[3]. Pulak Purkait et al. developed a patch based texture synthesis technique to restore damaged paintings. Uses coherent texture synthesis for restoration of damaged part and a non-linear objective function to complete the missing region H with some new data H^* such that resulting image I has as much as global visual coherence with the original undistorted image region $I \setminus H$. They solve this objective function using iterative Expectation and Maximization. Where H is initialised with some random value and iterations are done till satisfactory result is obtained. After finding the best matching patches in the current resolution level, merging their higher resolution versions at the finer resolution is done.

CRITICS: To apply the method of patch based texture synthesis large portion of textured region must be provided.

[4]. Priyanka Rajesh Gulhane et al. proposed a method for filling technique for missing block of images while transmission, called Inpainting technique. Proposed method was based on correlation between lost pixel and its neighbour pixel.

CRITICS: In Inpainting technique the region needs to be painted must be provided by the user.

[5]. This paper presents a method for colour restoration of paintings using linear approximation and white form transform, and a technique for crack detection of old paintings using Morphological top-hat transform. A digital archiving system for works of arts is also described.

CRITICS: linear approximation creates a mapping between the dirty and corrected portion of images from previously cleaned images. White form transformation uses a dirty image by using brownish light conditions which makes it dependent on lighting conditions.

[6]. In this paper a method is developed for the restoration of cracks on a painting. First, the local minima is detected (they can be either cracks or painting brush strokes), by using a morphological high pass operator, called top-hat transformation. The separation between brush strokes and crack is obtained by classification through the implementation of the MRBF neural network. The primitive geometric shape-matching property of the morphological opening can be used to separate brush strokes, which have a specific shape. Finally, two crack filling methods are proposed, one which is based on order statistics and another one using anisotropic diffusion. Thus, crack filling based on median or trimmed filters and Controlled Anisotropic Diffusion has been extensively used as an efficient nonlinear technique for image smoothing.

CRITICS: Controlled Anisotropic Diffusion insert blur effect in the image after crack filling.

[7]. In the paper impulse noise reduction is based on fuzzy logic and order statistics. Median and MAD (median of absolute deviation from the median) filters are proposed to construct trapezoidal shaped fuzzy membership function which is particularly participated in noise reduction and edge

detail preservation.

MAD is robust estimator and has the capability of accurately estimating distribution variance even if specified window has 50% corrupted pixels in a better way. Fuzzy set constructed using the statistical estimators remove both random valued and mixed impulse noise better than state of the art impulse noise removal techniques.

Two noises are handled in the paper: Salt and pepper noise (min or max intensity value) Random valued impulse noise.

CRITICS: MAD filter will result zero if more than 50% of data is similar. So variants of MAD should be allowed for better performance.

[8]. Digital Image processing techniques can be applied for colour restoration, aiming at obtaining an estimate of the original appearance of a painting, without excessive chemical cleaning treatment of its surface.

In this paper, three methods for colour restoration are proposed i.e. linear approximation: white form transformation, Radial basis neural network.

CRITICS: The methods used little chemical processing on paintings for linear approximation and white form transformation.

CONCLUSION

ALGORITHM	ADVANTAGE	DISADVANTAGE
Segmentation and Fuzzy Clustering	Only the blurred part needs to be restored instead of whole image.	Deblurring function depends on no. of segments.
Nearest Neighbour Algorithm	Good classifier for minimum distance and maximum likelihoodness.	Performance depends on number of dimensions.
Patch Based Texture synthesis	Missing part from the image will be restored easily using the patch from image itself.	For restoration large portion of textured region must be provided.
Inpainting technique	Missing part will be restored using the filling technique.	Region needs to be painted must be provided.
Morphological Top-hat transform	Computationally easy for crack detection.	Dependency on the structural element.
Controlled Anisotropic Diffusion with MRBF neural network	Differentiate between the cracks and the brush strokes that are misunderstood as cracks.	Introduce the blur effect in the image after filling the cracks.
MAD Filter	Better performance than other noise removal median, mean and soft computing methods.	Result zero if more than 50% of data is similar.

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