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Multi Exemplar Texture Synthesis Based On Image Quilting Algorithm

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Abstract: ***Texture synthesis is process of constructing large digital texture image from small sample texture without affecting quality of image. Single texture cannot meet the need of variety of texture .This paper Proposed the concept of Multi-exemplar Texture Synthesis based on Image Quilting algorithm. Number of traditional techniques such as sample based texture synthesis, multi-scale texture synthesis, exemplar graph texture synthesis, patch based texture synthesis, neighbor searching texture synthesis. To improve the efficiency and quality of image we proposed quilting method and fusing technique. We compared our approach result to different approaches. The experimental results shows that there is significant improvement in PSNR, MSE, RMSE, image quality index of images. Various experiments showed that this proposed can which can overcome the less smooth boundary problem of the conventional synthesis methods. Experimental result shows that our algorithm take less time for synthesized image. It gives quick response to user. Our algorithm can easily control the synthesis result to design a texture visual with user interactions. Our algorithm generates natural result, maintaining a reasonable time to keep interactivity with user.***

Keywords: Multi-exemplar synthesis, Texture synthesis, Peak signal to noise ratio (PSNR).

I. INTRODUCTION

Traditional texture synthesis takes one single picture as input, which cannot meet the needs of more information. Thus multi-exemplars texture synthesis becomes a hot research topic. Main problems in multi-exemplars texture synthesis is the lack in user-control and bad quality of result, such as overlapped area and blur. the algorithm should preferably be able to handle multiple exemplars. Use of multiple input exemplars will have advantages over one inhomogeneous input because the user can supply a variety of texture features more easily via multiple exemplars. Even if synthesizing with one inhomogeneous input is the most straightforward approach, it can be difficult to obtain a single inhomogeneous exemplar that contains all the features that the user may want.

We investigate the Main problem in texture synthesis is Single Texture synthesis because it is straight forward approach. It cannot meet the need of user. So we extend our approach for multi exemplar texture synthesis. We address the problem of exemplar relation graph [1].It is difficult for average user to understand. So Problem is lack of user control. The Problem of bad quality of result such as overlapped area and blur [1] in image. [2] Cannot work well for highly structure texture.[3] If we synthesizing complex texture than it should wastage of time.

In this multi exemplar texture synthesis process we deal with image quilting algorithm [3] to produce high quality synthesized texture very quickly. We deal with fusion [4] process to combining the relevant information from a set of images into a single image.

The main contributions of this paper include:

User-control: Because texture synthesis can be applied in many fields, user-control in its process synthesis is highly required. So how to appropriately arrange the texture data under users' control becomes a problem to be solved. In this paper, we present a method for users to arrange data in the form of fusion thus enhancing the controllability.

Efficiency: we propose improvement on the algorithm to improve the efficiency, using patching method instead of pixel matching method. We propose quilting method for improve the efficiency. We consider time complexity based on proposed method.

Quality: we observe our synthesis result with different parameter. Image quality quantitative parameter like, PSNR, MSE, RMSE, INDEX QUAITY (Q).from the experimental result our algorithm work well. It produces good quality result.

II. Related Work

Exampler-based texture synthesis approach is popular in the fields of image processing, computer graphics and computer vision in recent years. Current methods can be classified into pixel-based texture synthesis and patch-based texture synthesis. Exemplar-based[2] techniques can generate a synthesis result with a natural look that resembles the given input exemplar. Most previous work on exemplar-based techniques has mainly focused on producing a homogeneous output texture. Use of multiple input inhomogeneous because the user can supply a variety of texture features more easily via multiple exemplars. using single-inhomogeneous input approaches, difficult to obtain a suitable exemplar containing all the features that the user may want. Texture mixture[2] algorithms focus on how two or more textures will naturally blend with each other. Zhang [5] and Ruiters [6] methods to generate a texture-mixture from a pair of exemplars. But cared about one to one transition.[6] produces high-quality mixing result, but algorithms could not produce complex mixture of three or more input textures. Han [7] works on produce an inhomogeneous result but never addressed any issue about multiway transition. Many single-input algorithms have used statistics [8], patch-based optimization [9], or neighbor-hood matching [3].Exemplar graph is used to handle several exemplars. But it is very difficult to handle for average user.

Single texture synthesis have limited feature. So we motivate for Multi exemplar Texture approach. It is very important idea in the field of Texture synthesis. Multiple exemplar texture synthesis is very challenging task. If this process is not work proper then we can not meet the variety of texture feature. Texture synthesis is useful in every fields such as in image editing for alter the image, gaming, post production films. We can also used in industry like ceramic, military, agriculture. Pixel[10] based method take one pixel at a time. So if we synthesizing more complex texture then it is wastage of time. Based on this we inspire to work on multi exemplar texture synthesis based on image quilting algorithm. Because it improve the efficiency as well as quality of synthesize texture.

III. Proposed Work

In this paper, our method of multi-exemplars texture synthesis is based on the patch based image quilting algorithm. The traditional method of getting information from one single image to compose result image cannot meet the needs of texture applications, so multi-exemplars texture synthesis becomes a interesting topic currently. Here we proposed Multi-Exemplar Texture Synthesis based on Image Quilting algorithm. We want various feature of texture according to user choice. It should difficult to get an image that contains all relevant objects features. To get an image with every object feature image fusion process is required. We propose joint fusion technique for mixture of texture. Joint fusion technique combines relevant information of multiple exemplars into single exemplar. Image will be more informative and complete than any of the input

images. In fusion technique we get variety of texture mixture from pair of exemplar. It focuses on how two or more texture blend with each other. Image fusion performs mainly three steps. first is the registration image second step is resampling image and third is fused image. Image fusion techniques can improve the quality. Fusing images giving a better view of images .The simple requirements of an image fusing process are that it should contain all valid and useful pattern information from the source images.

We want quick feedback response from system so we use patch based algorithm. We propose patch based Image Quilting algorithm for texture synthesis. The methods in this genre vary in the way they handle the overlap region. Image quilting algorithm works well for stochastic textures. Image quilting is more effective and faster than pixel based algorithms.

The flow chart of the whole process is shown in Fig. 1.

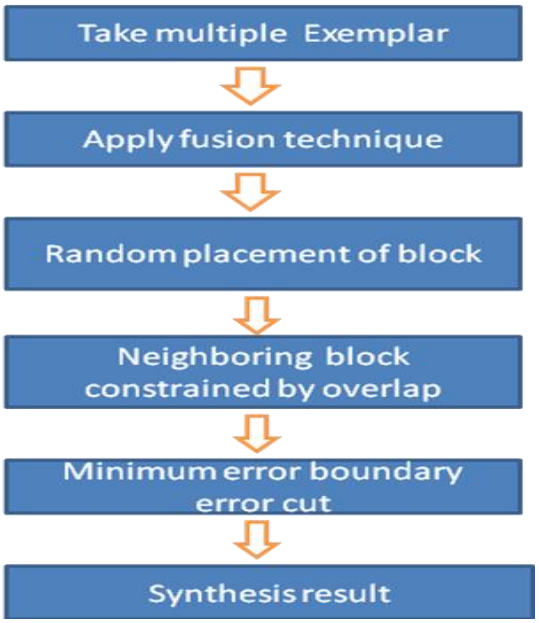


Fig 1.Flow chart of proposed method

We propose framework for synthesizing multi exemplar texture synthesis based on Image Quilting algorithm.

Step 1: Take multiple exemplar which according to user want.

Step 2: Applying joint fusion technique for combining multiple exemplar into single one.

Step 3: Image is synthesized in raster scan order in step of one block.

Step 4: We use distance based method SSD. SSD is used for find best patch from input texture.

Step 5: SSD select best patch and put into the neighborhood block.

Step 6: Neighbourhood block should be overlap .So here we use min error boundary cut method.

Step 7: We make the cut between two overlapping blocks where the two textures match best , where the overlap error is low.

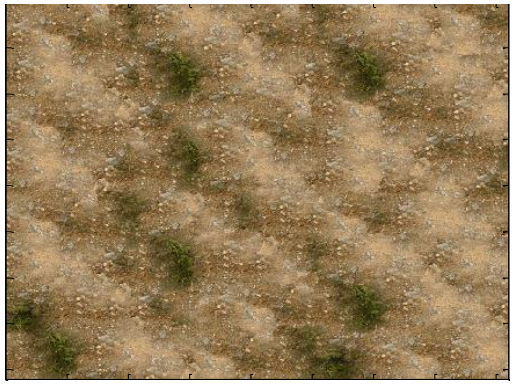
Step 8: The final outcome of the algorithm can be clearly removed most of the edges, and produced a quite acceptable lager texture.

Step 9: We measure the performance of the resultant output based on calculation of peak signal noise ratio and mean square error.

IV. EXPERIMENTAL RESULTS

We compare our proposed approach with pixel based multi exemplar texture synthesis. We have measured the performance by PSNR, MSE. Proposed method multi exemplar texture synthesis based on image quilting algorithm implementation shown in figure. We have taken different type of three exemplar texture as input.

(a) (b) (c)



(d)

Fig 2. (a) input texture (b) input texture (c) input texture (d) synthesis result size

Fig 2 shows that we take three textures as input whose size is 103*104. (d) shows synthesis texture whose size is 820*820. Synthesis texture Result show that we get good quality result. Resultant image is generated without blur in texture. Resultant image is naturally generated.

TABLE I. Comparison of Time Complexity with Different Approach

Index	No. of Texture	Input Size	Output Size	Total Time(sec)	
				Existing approach	Propose approach
1	Four texture	120*120	410*410	1655	107
2	Four texture	114*114	410*410	1434	88
3	Three texture	85*85	510*510	805	95
4	Three texture	72*72	820*820	743	227
5	Three texture	103*104	820*820	813	119
6	Two texture	80*80	281*281	840	4
7	Two texture	120*120	620*620	1288	21
8	Two texture	106*103	620*620	1180	61
9	Single texture	192*192	415*415	1811	18
10	Single texture	192*192	415*415	1325	16
11	Single texture	192*192	415*415	1568	18

From Table I existing approach (pixel based method) and proposed approach(patch based method) clearly saw that propsed method contain less time value. we conclude that systeem give quick response to user. User does not wastage of time. So we say our method is efficient.

TABLE II. Comparison of Texture Quality with Different Approach

Index	Number of texture	Input size	Existing approach		Proposed approach	
			PSNR(DB)	MSE	PSNR(DB)	MSE
1	Four texture	120*120	16.1746	1581.31882	18.20478	990.83663
2	Four texture	114*114	16.18360	1213.61967	18.19260	993.61967
3	Three texture	85*85	16.40357	1500.119	18.61730	901.05279
4	Three texture	72*72	15.13054	1207.92123	18.13054	1007.92023
5	Three texture	103*104	16.45177	1483.55244	18.54501	916.17661
6	Two texture	80*80	16.21749	1180.30134	18.71849	880.30134
7	Two texture	120*120	16.41789	1495.170	18.08004	1019.70820
8	Two texture	106*103	15.32543	1557.52425	18.35543	957.05425
9	Single texture	192*192	16.68818	1404.95415	18.61065	902.43321
10	Single texture	192*192	15.92415	1499.26825	18.62615	899.21825
11	Single texture	192*192	16.37055	1321.53630	18.38055	951.53630

From Table II existing approach(pixel based method) and proposed approach (patch based method) clearly saw that propsed method contain higher PSNR and, lower MSE value.we conclude that significant improvement in quality of our result.

V. CONCLUSION

In this paper, we present a Multi Exemplar Texture Synthesis based on image quilting algorithm. We compare our approach results with existing pixel based multi exemplar texture synthesis method; we show result of proposed work. Based on the Experimental results we conclude that higher PSNR and Quality index lower MSE and RMSE of image that improvement quality of Result. Experimental results show that our algorithm take less time for synthesis image. It gives quick response to user. So we say that our algorithm is efficient.

This paper highlights the concept of multiple exemplar texture. It is possible to work on video texture synthesis. So video texture synthesis leave for future work.

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