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Survey on: Different Methods of Occlusion Removal

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***Abstract*—This work aims at the study and implementation of occlusion removal. Occlusion is a block which disturbs eyesight. In order to get a better clarity we remove the block. It involves removing the block and filling the gap left behind within the image. There are so many varieties of algorithms. First, segment the image into structure and texture image. The sparse technique is used for decomposition of the image and reconstruction of the structure image. Texture image is reconstructed based on anisotropic diffusion. Finally, the structure and texture image is recombined and we get an image where occlusion is filled. This paper includes texture synthesis, exemplar based method and hybrid method for occlusion removal, sparse method, PDE method. The results are found better since the patches selected are from the source region, and also regularization is carried out during diffusion.**
This paper aims at the study of various types of inpainting techniques, and how efficiently they work

***Index Terms*— Texture synthesis, Exemplar based method, Inpainting, Occlusion.**

I. INTRODUCTION

The main aim of inpainting is removal of the unwanted portion and recreate the original one. We are removing the occluded part and recreate it in a plausible way. In this paper we are going to compare 3 methods. In first method, Texture synthesis, it helps to fill the holes by sampling and copying neighbouring pixels. This method works only for selected number of images, not with all. Yamauchi et.al presented algorithm which generate texture under different brightness condition and work for multi resolution [11]. If we compare with the capacity to generate texture with different color, intensity, gradient and statistical characteristics, all methods are different. Texture synthesis based inpainting method do not perform well for natural images. This method do not handle edges and boundaries well. In some cases user need to enter desirable texture to replace with the original texture. These methods are used for small area of inpainting. Exemplar method removes large objects without disturbing the image. Removal of block is filled with the gap left behind the image. It is an iterative process. The hybrid occlusion removal method decomposes the image texture and structure the image worked separately. Final process joins the structure and texture image to get a perfect occlusion filled image. Bertalmio et al. in [1] proposed an algorithm on the base of PDE. The region of occlusion is selected by user. It fills the gap left behind by using surrounding pixels. The fill is completed on the base of isophote line .The algorithm works only for structure inpainting not for large texture regions. If we apply PDE for texture regions, it introduces some blur easily.TV inpainting method works based on euler larange equation.

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II. EASE OF USE

A. Texture Synthesis

Here, the images are decomposed and its texture is changed. It works only in approximating textures. This method performs in a slow basis i.e. pixel by pixel[3]. This method is not suitable for real images. Texture synthesis can be used to fill in holes in images, create large non-repetitive background images and expand small pictures.

B. Exemplar based Method

Here, the algorithm removes large objects and replaces it in a visually pleasant way. A. Criminsi et al. [2] proposed an algorithm based on combining texture synthesis and inpainting together. Algorithm defines confidence term and data term. The algorithm finds the best confident value and based on the confident value, algorithm fills the gap left behind the occlusion region. Propagation takes through this confidence and data term. It fills holes in the image by searching patches in a nearby source region and copying the similar portion to the respected target region.

There are 2 basic steps

1. Priority assignment
2. The selection of the best matching

The algorithm finds the best confident value and based on the confident value, algorithm fills the gap left behind the occlusion region. Propagation takes through this confidence and data term patch.

C. PDE Inpainting

Total variational inpainting method is used to remove the occlusion.TV inpainting works based on euler larange equation. Here curve driven diffusion (CDD) is an extended version of TV model[1]. We may not get satisfied output if large image is used to process. This method works well for smaller regions.

D. Removing Occlusion in Images using Sparse Process and Texture Synthesis

In this paper[11] image is decomposed into structure and texture image. The term sparsity is used for decomposition and inpainting for retaining the lost structure followed by a patch based texture synthesis on texture image. The lost structures are retained by using patches. These patches are always from the known area of the texture image. Repeat this procedure from known area to unknown area.

E. A Hybrid Method for Occlusion Removal

The method which decomposes the image into 2

1. Structure image
2. Texture image

An image mainly consists of two parts, structure and texture. We decompose the image into structure and texture by morphological component analysis (MCA) decomposition method. They are processed separately. Structure image is processed using sparse inpainting method. Texture image is processed using anisotropic diffusion. Anisotropic diffusion is an edge enhancing function. The output of the anisotropic diffusion is regularized using regularization method to get an improved texture result. Inpainting retains the lost structure in various iterations. Anisotropic diffusion and regularization reconstructs the lost contour. Further we will reconstruct by recombining the results. We are also applying Texture synthesis over the combined image.

Abbreviations and Acronyms

PDE: Partial Differential Equation
CDD :Curvature Differential Equation

III. COMPARISON OF EXPERIMENTAL RESULTS

In this paper we are comparing 5 methods. Figure 1 shows the original bungee jumping image and its mask. Figure 2 is the comparison output of various methods .Here by visual analysis itself we can find out the better output .The last two methods gave better output than other.

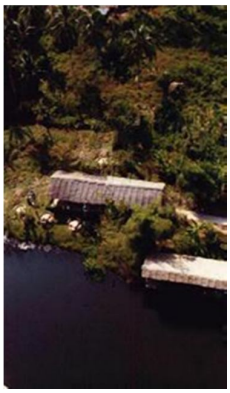
Fig 1. Original Image

Fig 2. Mask

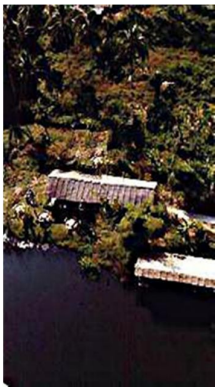
a PDE inpainting

b. Exemplar Metho

c.Texure synthesis



d.sparse method



e. hybrid method

Fig 3 .Comparison of various results [1,2,3,11,17]

IV. Conclusion

By our experiments with the various methods and by our proposed method, we see that it works well for reconstructing contour in texture images and sparse reconstruction in structure images. The proposed method is similar to the previous work[10] and it decomposes the image into following two types; i.e., structure image is the apparent outlook of an image and texture is the repetitive patterns. The texture image is processed with anisotropic diffusion which supported by local gradient and surface normal information. From this the values are interpolated along the path generated. We then recombine the structure and texture together and reconstruct to produce an occlusion removed image, and visually better or compare with various previous inpainting results. A very faint ghost image boundary is the shortcoming of our method. However the results are visually better than previous methods. Our aim now is to extend the algorithm in videos for removing occlusions. The conclusion is based on the visual clarity of the image. Each method has its own benefits and problems. The scatter graph shows 5 values and this is on the base of output image.

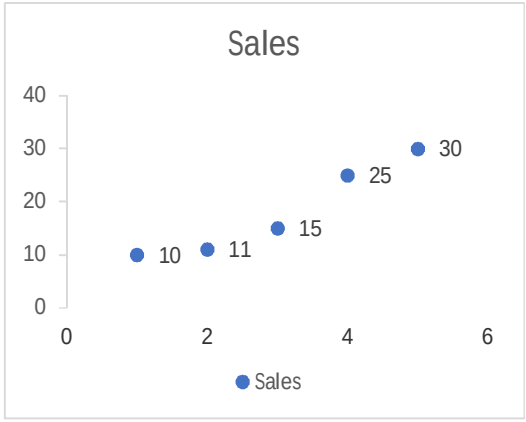


Fig 4 .Subjective Evaluation

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