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Removal of Unwanted Object in a Video by using Video Inpainting Technique: A Review

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Abstract: ***The process of removing the specific areas or repairing the damaged area in a video is known as video inpainting. It is also a unique tool for filling the missing part in a video sequence. For example some object may not be wanted in a film like a jet aeroplane flying past during the recording of eighteen century drama so here aeroplane is unwanted object and we must have to remove it because it was not feasible to reshoot the drama because it was time consuming task and costly too, so to overcome this problem we are using video inpainting technique. There have been several approaches proposed for the same. In our project we will try to improve and extends a previously proposed algorithm which can detect, extract and remove the unwanted object from video and provides faster inpainting. The unwanted object selection should be done by user manually.***

Keywords: Video Inpainting, Object Removal, Unwanted Object Detection.

I. INTRODUCTION

Image inpainting, a closely related to video inpainting, but here we have to consider lots of images one by one simultaneously commenced very long time ago. In Renaissances, artists updated medieval art work by filling the gaps. This was called inpainting, or retouching. Its purpose was to fill in the missing or damaged parts of the artistic work, and restore its unity. This practice was eventually extended from paintings to digital applications, such as removing scratches, dust spot, or even unwanted objects in photography and moving pictures. This time, the scratches in photos and dust spots in films were to be corrected. It was also possible to add or remove objects and elements.

Researchers have been looking for a way to carry out digital image inpainting process automatically. By applying various techniques and after years of effort, they have achieved promising results, even with the images containing complicated objects. However, video inpainting, unlike image inpainting, has just started receiving more attention recently. Videos are an important medium of communication and expression in today's world. Video data are widely used in a variety of areas, such as movie industry, home videos, surveillance and so on. Since most of the video post processing is done manually at the expense of a huge amount of time and money, advanced video post processing techniques, such as automatic old films restoration, automatic unwanted object removal, film postproduction and video editing, began to attract the attention of many researchers.

II. MOTIVATION

Video inpainting, a key problem in the field of video post processing, is the process of removing unwanted objects from the video clip or filling in the missing/damaged parts of a video sequence with visual plausible information. Compared with image inpainting, video inpainting has a huge number of pixels to be inpainted. Moreover, not only must we ensure the spatial consistencies but we also have to maintain the temporal continuity between video frames. Applying image inpainting techniques directly to video inpainting without taking into account the temporal continuity factors will ultimately lead to failure because it will result in the inconsistencies between frames. These difficulties make video inpainting a much more challenging problem

than image inpainting.

Many existing video inpainting methods are computationally intensive and cannot handle large holes. And some methods make several assumptions on the kind of video sequences they are able to restore. It would be desirable to have some of these assumptions removed. One of the assumptions is that the objects should move in a repetitive fashion. In other words, the objects in the missing parts (the hole) should appear in some parts of the frame or in other frames in the video, so that the inpainting can be done by searching the entire video sequence for a good match and copying suitable information from other frames to fill in the hole.

Recently it has become common to employ digital special effect in making movies and video products. For example jet aeroplane flying past during the recording of eighteen century drama some common digital special effect are composition of graphic objects ,removal of unnecessary objects ,and insertation of virtual object to a video sequence. in making a movie these task are mostly done by using special graphic software after complete video sequence are recorded. Therefore, they are called 'post processing'. Conventional special effect has been widely used in film industries for a long period. They invariably use a great deal of manual intervention. Nowadays, however many digital special effect are introduced due to the advanced of computer graphics & computer vision techniques.

Especially, object removal is one of the key techniques in posy-processing .If a foreground object is captured in a video sequence accidently or if the object is decided to be unnecessary, we need to erase the object from the sequence. Therefore object removal technique should remove the object & replace it with appropriate background object. This can be extended in filling – in the moving foreground occluded object & video foreground objects separation.

III. OBJECTIVE

The objective of our project is to develop an approach for video inpainting that removes the particular object in a video sequence. And this approach should be able to remove variable size object in the video sequence effectively, removing the periodicity assumption in many state-of-the-art video inpainting algorithms. In Figure 1 we can see the man is walking in a video frame. Which has variable size, so our main objective is to remove the variable size object in a video as shown in Fig 1

Figure 1: Completion of the park- complex video: (top) sample frame from six of the occlusions occurring in the input video.(bottom) Expected Result of our project.

IV. LITERATURE REVIEW

Nowadays video inpainting is attracting a mind of researcher. There are so many methods have been developed so far. According the way the images and videos are inpaint , they are classified, on inpainting lots of research have been done, it's all started from image inpainting i.e removal of unwanted object from image or repairing the damaged image up till now we have come to process the video sequences, so far our project we have review some papers their brief description are given below.

A. PDE-BASED METHODS

G. Spario et. Al. M. Bertalmio, G. Sapiro, V. Caselles, and C. Ballester suggest that a frame by frame partial differential equation based concept, which progress image inpainting techniques to video frame in 1999. The first step in this method is the formulation of a partial differential equation that moves the information from the outer boundry of the region to the center of that region the information is not variable in the direction of the isophotes. They can inpaint a image in which small region are missing .Now according to this paper the future scope will be that they are only capable of completing damage the image onto which thin region are missing [1] .

B.TEXTURE SYNTHESIS METHODS

Alexei efros and Thomas k. Leung suggest a texture synthesis based technique by non-parametric sampling in sept 1999. in this approach, window size w required to be specified. it conserves lots of local structures as possible and generates good results for a wide kinds of synthetic & real world textures. but, here the main problem is that the automatic selection window size for the textures and also the method is comparably slow[2].

A. Criminisi, P. Perez, and K. Toyama suggest a video inpainting technique in aug 2005. It is also a texture based method. It preserve as much local structure as possible and produce good quality result for a wide variety of synthetic and real world textures, it is a novel, efficient and visually pleasing approach to video inpainting, here temporal continuity is maintain and also the location of the hole from where the object is to be removed is preserved, filling a hole have three steps first it selects the target pixel at the edge of the hole and try to finds the source fragment which is most similar to the target's neighborhood, and then combine source and target fragments to complete the damage area, reducing the size of the hole. Previous methods were slow, because they search the whole video for completing the holes, this method tracks moving objects, allowing us to use a much smaller search space; it also completes holes pixel by pixel instead of fragment wise. They have maintain good temporal continuity and in future they try to extend work to more complicate and dynamic scenes, including dynamic camera motion and object motions in three dimensions[3].

Y. T. Jia, s. M. Hu, and R. R. Martin suggest a video completion using tracking and fragment merging. It was based on texture synthesis in august 2005 where holes are completed fragment by fragment. Texture synthesis methods cannot be directly used in video inpainting algorithms, since amount of data in video sequences is very large and searching for a source fragment in the whole dataset will be slow. This is an iterative process which includes selecting the most apt target at the edge of the hole, whose space-time target fragment is known followed by choosing a source fragment similar to the target fragment from the search region using mean shift algorithm and finally merging the source and target fragments, thereby reducing the size of the hole. The size of the search space for source fragments was reduced by introducing tracking. Temporal consistency is gained by ensuring consistency of the source fragments. This technique is only suitable when the object motion is periodic and when the images do not change in scale. The filling process may fail if the object tracking is lost, and it may cause artifacts in the hole region. When compared to the Wexler's approach it is more efficient and is faster since the search space is carefully selected [4].

C.PATCH-BASED METHODS

Y. Shen, F. Lu, X. Cao, and H. Foroosh had firstly suggested a patch based technique to fill in damaged background and dynamic foreground of a video captured by a fixed or dynamic camera in aug 2006. different from previous efforts Here the search space is reduced from 3D to 2D by creating manifolds of the space-time volume. It offers good temporal continuity thereby providing an effective periodic motion while still preserve the spatial consistency and temporal continuity .In addition to the computational efficiency are well maintained the sugested approach is also able to handle real time videos under outlook distortion, as well as common camera motions, such as angling and zoom in & out. the technique needs to improved for camera and foreground motion[6].

K. A. Patwardhan, G. Sapiro, and M. Bertalmío. suggest a framework base on patch method in feb 2007 for inpainting damaged parts of a video frame recorded with a dynamic or fixed camera is presented in this work. the part to be inpainted is general: it may be fixed or moving, in the background or in the foreground, it may disturb one object and be disturbed by some other object. the method consists of 3 step first A simple preprocessing stage and two steps of video inpainting. The suggested algorithm has several advantages over other algorithms that deal with same data and constraints. it allows some camera motion, it is not difficult to implement, it is fast, does not require statistical models of background nor foreground, works well in the presence of colourful backgrounds, and the results show that there is no visible blurring or artifacts. The technique needs to be extended for complete occlusion of moving object and automatic selection of parameter such as patch size, mosaic size etc, and also the lack of temporal continuity leading to flickering artifacts [7].

Y. Wexler, E. Shechtman, and M. Irani. came up with a modified framework which is based on patch based method in march 2007 for the filling of unavailable information which depend on structures. It can handle both structured and unstructured moving objects automatically. Here frames which do not exist in the dataset are constructed from various space time patches selected from different parts of the video frames. Fixed size block with three dimensions are used as the unit of the similarity measure function which is the Sum of Squared Differences. here both spatial consistency and temporal continuity in formations are handled simultaneously the nature of results will cause blurring and it is very slow [8].

T. K. Shih, N. C. Tang and J.-N. Hwang. Designed a technique that based on patch based method that automatically restores or removed areas in 2D image in march 2009. When same thing is dealing with a video then not only a tracking algorithm be used, but also the temporal continuity and spatial consistency among video frames also needs to be considered, especially when camera is dynamic such as zooming and tilting. In this method an exemplar-based image inpainting method is extended by adding an modified patch comparison strategy for video inpainting. in our suggested algorithm different motion segments with different temporal continuity takes different candidate patches and are used to inpaint holes after a selected video object is tracked and removed. This algorithm produces very few ghost shadows unlike most of the inpainting algorithms directly applied on videos. shadows which is due to fixed light sources can be removed by some other techniques.. the challenge is on block matching, which should allow a block to match another block. . Here the earlier algorithms were also modified to handle complicated camera motions. Here multiple objects are removed one by one and hence the user will have to run the program again and again so this is the future scope of this paper [9].

D.OBJECT-BASED METHODS

J. Jia, Y.-W.Tai, T.-P.Wu, and C.-K. Tang,. Suggest an object based method in may 2006 that work for subclass of camera motion i.e rotation about a fixed point. The stored video preserves the same structure and illumination, here temporal consistency is also preserved the future work mentioned in this paper was that synthesized object do not have a real trajectory as well as only texture are allowed in the background and also the processing time need to be improved it should be little bit fast [5].

Chih-hung ling, Chia-wen lin in his work virtual contour guided video object inpainting using posture mapping and retrieval suggest a technique which mainly has three main steps-virtual contour construction, key posture section and mapping and synthetic posture generation. It is assumed that the trajectory of the occluded objects can be approximated by linear line segmentation during the period of occlusion. Mosaic based schemes and correspondence maps are used for background inpainting. This technique also avoids the problem caused due to the insufficient number of postures. But the synthetic posture generation technique used here is not suitable for generating complex postures and it do not deal with illumination change problems[10].

Aijuan Xia, Yan Gui ,Li Yao ,Lizhuang Ma and Xiao Lin suggest a object based method in 2011 which is based on exemplar-based video inpainting mechanism that fill the area of the removal object, and this mechanism can also employed to

extract the background of videos. The region to be inpainted in video is still in background and moving in foreground. this method consists of a simple preprocessing stage and video inpainting step. The preprocessing stage consists in constructing Gaussian Mixture Model (GMM) for both background and foreground separately, then make use of GMMs to distinguish background and foreground of the entire video. That saves the time for calculating the optical flow mosaics as many video inpainting algorithms do in the preprocessing step. As for video inpainting, they firstly fill the patch as much as possible by taking information from other pixel frame by frame, and then inpaint the remaining holes in the background by extending the exemplar-based image inpainting algorithm.. For future work, they have incorporate optical flow to improve the precision of GMM. And there method aims only at videos with a static background and a moving foreground, & extend mechanism into other types of videos.[11].

Chieh-Ling,Huang & Heng-Ning,Ma have suggest video-based moving object detection algorithm for vehicle localization in 2012. Firstly they construct a background image, and then extraction moving object through the difference between current image and background image. This paper also combined concept of region of interesting to eliminate noise interference in other regions. They had proved that their proposed algorithm is efficacious and reliable in vehicle localization. Since the vehicle is localized, it can be not only calculated number of vehicles, but also computed average vehicle speed according to difference of time and distance. This real-time traffic information could be consulted for traffic control[12].

Sameh Zarif , Ibrahima Faye, and Dayang Rohaya have suggest object removal method using Local similarity in 2013 where Video completion is main motive in video inpainting, which aim is to regenerate of the damaged data. Suppose we have removed an object so there will ba a free space after removal of object so we need to fill that space efficiently. There are so many technique available for inpainting but they are time consuming and not able to find the best match of that part . In this paper, they have presented a effective video completion method to recover static damaged area without the extensive search process. The method is based on frame local similarity and 3D hole filling. The proposed method maintains the spatial and temporal consistency. Moreover it reduces the completion time to few milliseconds. The proposed method fails when the damaged region is occluded by moving objects[13].

V. CONCLUSION

This survey shows the various patch based and object based video inpainting algorithms. Patch based video inpainting algorithms are usually extended from the existing image inpainting algorithms while object based video inpainting algorithms was introduced since most of the patch based algorithms were unable to perform both spatial and temporal aspects simultaneously. Each algorithm has its own merits and demerits. We can choose our algorithm depending on our own requirements.

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