Video Completion by Using Colour Inpainting and Optical Flow

Meghana. R. Patil, Sumit Y. Waghmare, Tejas D. Wadbudhe, Amruta G. Raghushe

Assistant Professor/ HOD, Dept. of ECE, Dr.Babasaheb Ambedkar College of Engineering and Research, Nagpur,

Maharashtra, India

UG Student, Dept. of ECE, Dr.BabasahebAmbedkar College of Engineering and Research, Nagpur, Maharashtra, India

UG Student, Dept. of ECE, Dr.BabasahebAmbedkar College of Engineering and Research, Nagpur, Maharashtra, India

UG Student, Dept. of ECE, Dr.BabasahebAmbedkar College of Engineering and Research, Nagpur, Maharashtra, India

ABSTRACT: Video Inpainting is a process of reconstructing or modifying the object present in the video that the observer is unable to see the changes when the video is played. In this paper a technique is introduced for video completion which is used for temporal consistent background images. Firstly colour inpainting is applied on object and then using optical flow technique it continuously removes object from the needed frames. Optical flow technique is used to estimate the motion between various frames present in a video to remove or restore object in selected frames. By the use of histogram tracking algorithm it tracks the object from various frames. Combining colour inpainting and optical flow video inpainting is performed with minimum error.

KEYWORDS: Image inpainting, object detection, optical flow, temporal consistency, video completion

I. INTRODUCTION

Videos of natural scenes sometimes include disturbing objects or artifacts. Artifacts are nothing but the undesired objects such as walking people, flickering, blurring of object etc. There is a lot of research in the field of image processing for replacing the objects using various techniques. In this more emphasis is given on optical flow and colour inpainting. Video inpainting refers to the field of image processing that aims to restore or replace missing or defective part in video sequence by utilizing the temporal and spatial consistency. This paper depicts an interactive video completion method which involves two innovations. Firstly, it replaces the tedious hand labelling of inapinting and this method also assures temporal consistency of complex motion of object. The main objective is to generate an inpainted area that will be merged smoothly into the video so that while playing the video flickering or ghost images will not be observed. In contrast to the above reasons, inpainting algorithm focuses more on the filling of object from neighbouring pixel's information. The inpainting problems can be expressed more efficiently by introducing an image or video file 'u' with a masked region 'Ω' and 'Ω^c' be the complimented region from where the pixel information is to be taken. Inpainting has more practical importance for restoring and modifying the image or video. The reconstruction of motion object has been proposed in the field of video completion. For large holes the background should be consistent for more accuracy or better results.

II. RELATED WORK

In the recent few years many video Inpainting methods have been developed for variety of applications. When compared with video inpainting there has been much research going on in the field of image inpainting. Because while considering video inpainting we need to cover significantly large number of pixels, and also the search space to be considered is very large. In video inpainting we must ensure that temporal consistencies between the frames are maintained rather than considering the spatial consistencies within a frame. Video inpainting is often considered as a much more challenging problem when considered to image inpainting. Still in most of the cases image inpainting algorithms are successfully applied directly to the video inpainting algorithms.

The main challenge in video inpainting is the temporal dimension. The inpainted region has to be consistent with the structure and colour around the object. While doing this we need to maintain temporal continuity. This is because while applying image inpainting method to frame by frame the inpainted video shows artifacts like ghost shadows or flickering. In order to ensure temporal consistency, we proposed to inpaint the optical flow and in addition ckecks the found patch to be similar to its origin. The inpainted flow should be approximately same as the flow of the inpainted video sequence.

Partial Differential Equation (PDE) based technique uses iteration method. According to this algorithm lines at the border of the region should be smoothly inpainted. It Produce good results if missed portion are small one and target portion is non-textured, but take long time if target portion is large. Resultant video sequence consists of some blurring effect. Texture Synthesis technique of inpainting is used to fill the damaged or missed regions using similar neighbourhood of the missed pixels. This algorithm is generally used to inpaint small region and cannot inpaint natural scenes effectively.

Optical flow is the pattern of noticeable motion of objects, edges, and surfaces in a visual scene caused by the relative motion between the scene and an observer. Optical flow techniques such as motion detection, object segmentation, and focus of expansion calculations, motion compensated encoding, and stereo inconsistency measurement makes use of this motion of the objects, edges and surfaces. Optical flow fields are used to detect corrupted regions and to restore them.

III. COLOUR INPAINTING AND OPTICAL FLOW

The most challenging part in a video completion is to maintain the temporal consistency. The inpainted area has to be consistent with the structure and colour around the object. While doing this we need to maintain temporal continuity. This is because while applying image inpainting method to frame by frame the inpainted video shows artifacts like ghost shadows or flickering. In colour Inpainting after cropping the object, it searches for the best matching patch which can be seamlessly merged in the cropped object. Optical flow can be defined as relative motion of the object, edges and surfaces present in the video. Optical flow field are used to detect damaged or blurred region present in the video and restore that information. By using optical flow all objects which are present in a region of interest are colour inpainted simultaneously rather than using state of the art hand labelling technique.

IV. BLOCK DIAGRAM

Combining the colour inpainting and Optical flow technique, video completion can be achieved with minimum error. Optical flow is the relative motion of the object, edges and surfaces present in the video. Colour Inpainting is the method in which the surrounding pixels are matched and then their information is merged into the object.
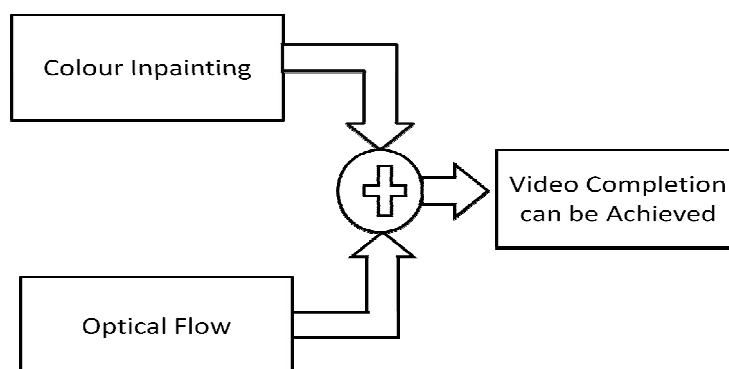

Fig. 1 Combining two techniques

V. IMPLEMENTATION

Firstly It need to select an image or a video file which have to be inpainted. After selecting the file, MATLAB will read that file and if it is an image it will show the normal view of the image and in case of video file it will play the video and shows the total number of frames present in that video. After reading the file and showing the normal view, MATLAB request the user to select the object to be inpainted. Then we need to select the rectangular object to be cropped or inapainted. Region of Interest is a region from which the object is needed to be inpainted. It is used only in case of video file. In region of Interest we need to specify the starting and the ending frame. For object tracking purpose we have used histogram object tracking algorithm. Histogram tracking algorithm basically consists of rectangular diagram in which area is proportional to the frequency of variable and width is equal to the class interval. In this technique histogram tracks the object which is present in a region of interest of a video. After tracking the object, black box appears in all the frames in which the object is tracked by the histogram technique.
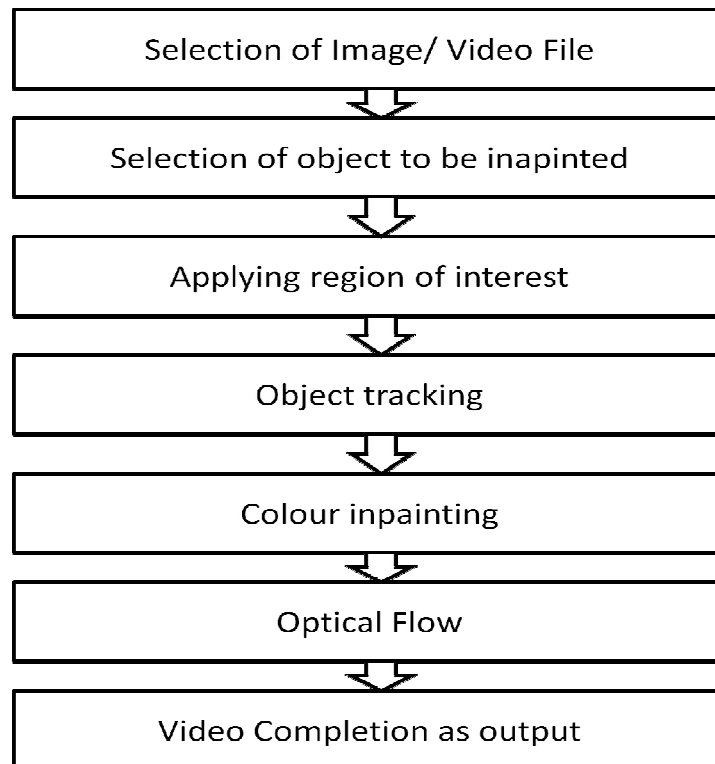
Selection of Image/ Video File

↓

Selection of object to be inapinted

↓

Applying region of interest

↓

Object tracking

↓

Colour inpainting

↓

Optical Flow

↓

Video Completion as output

Fig. 2 Flowchart of the system

VI. RESULTS

By the use of Histogram tracking algorithm we tracked the object and inpainted that object using colour inpainting in which patch based method is used. All the selected frames are inpainted smoothly via optical flow which overcomes tedious hand labelling technique along with no artifacts are shown while playing the video.
Following figure shows the result of video completion.

Fig. 3 Original Frame

In the fig 3, it shows the original input frame of a video. The frame consists of a consistent background which can be smoothly merged into the object. In this we have to select the object which has to be removed in the next step.

Fig. 4 Pixel removed Frame

In the fig 4, it shows the object removed frame. I.e. the pixels of the object are made equal to zero. The black box shown in the figure shows the object cropped area.

Fig. 5 Patch Inpainted output Frame

In Fig 5, It shows the patch inpainted frame of a output video. The selected object is inpainted using the colour inpainting, i.e. the best matched pixels from the surrounding of the object are smoothly merged into the selected object.

Video completion is done by using colour inpainting in which patch based method is used and optical flow which overcomes tedious hand labelling technique along with no artifacts are shown while playing the video.

VII. CONCLUSION

We proposed a method which combines two techniques and results in video completion. Firstly we colour inpainted the object present in several frames.Secondly, by using optical flow technique we removed tedious hand labelling of inpainting region present in all video frames.

REFERENCES

[1]   Michael Strobel, , Julia Diebold, Daniel Cremers , " Flow and Color Inpainting for Video Completion" 36th   German Conference, GCPR 2014, Münster, Germany, September 2-5, 2014, Proceedings **DOI** 10.1007/978-3-319-11752-2_23 Print ISBN 978-3-319-11751-5 Online ISBN 978-3-319-11752-2
[2]   A. Criminisi*, P. P´erez and K. Toyama, "Region Filling and Object Removal by Exemplar-Based Image Inpainting" IEEE TRANSACTIONS ON IMAGE PROCESSING, VOL. 13, NO. 9   SEP 2004
[3]   Sean Moran, "Video Inpainting", April, 2009 vol 1 pp 12-25. sean.moran@edu.ac.in
[4]   Anu Rachel Abraham, Kethsy A Prabhavathy and Devi J Shree, "A Survey on Video Inpainting", *International Journal of Computer Applications* 56(9):43-47, October 2012
[5]   P.Ramya, A.Sriram, Dr. N. R Chenthil Kumar, Dr.Elango, Pazhani, "INPAINTING OF VIDEO USING TEXTURE SYNTHESIS AND OPTICAL FLOW TECHNIQUE", International Journal of Innovations in Engineering and Technology (IJIET): ISSN: 2319 – 1058, Vol. 1 Issue 4 Dec 2012

BIOGRAPHY

Mrs. M. R. Patil is a Assistant Professor, Head of Dept. of Electronics and Communication, Dr. Babasaheb Ambedkar College of Engineering, Nagpur Univercity. She received Master of Technology (M.Tech.) degree in Electronics   from YCCE, Nagpur, Maharashtra, India. Her area of interest is Image Processing.