International Journal of Scientific Research in Engineering and Management (IJSREM)
Volume: 04 Issue: 07 | July -2020 ISSN: 2582-3930

Real Time Person Removal from Video

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***Abstract*— The process of removing special areas in a video or repairing the damaged parts in a video segment is known as video painting. In this work the proposed in painting algorithm can in real time remove unwanted human objects from the video. On a canvas, the algorithm makes the video frame by frame and then performs segmentation to assign binary values to the frame's segmented pixels. A value of 1 is given to the human objects, and 0 is given to all other objects. Now we can distinguish the (1) values from the rest using a simple formula and the algorithm will fill those values with (0) pixels. Later we will provide the conclusion and future scope of our work.**

Keywords—Video-inpainting, BodyPIX, Tensorflow.js, Human Segmentation

I. Introduction

The process of removing specific areas such as a human object or any unwanted object in a video is known as video painting. The unwanted object is removed from the video in video painting, and it is filled by the same video background pixels. In ancient times artist used inpainting techniques to fix or repair the images. In general, painting is the way to automatically fill in holes and gaps in image or video using information from the surrounding area or background in such a way that the observer finds the modified region within the image or video in a difficult way. Therefore, inpainting techniques are also named image / video completion. In this work we have used the Tensorflow framework to render our BodyPIX model of human segmentation. It segments the video into pixels and returns an array of binary values 0 and 1 with 0 representing all non-human objects and 1 representing human objects.

II. Objective

The objective of this work is to provide a web based approach for video inpainting that can remove human objects from video. With a static background and a mobile human object this approach should be able to remove human objects from the video. This work should provide the approach of using Google's Tensorflow.js to use the tensorflow framework on the web. There the user can select any video, and use the BodyPIX segmentation model to remove the human object from the video.

III. Proposed Method

Segmentation: Segmentation refers to the segregation of objects from a collection. In this work segmentation assigns binary values of 0 and 1 to the segmented video pixels. The segmentation model we have used is bodyPIX. It is pre-trained human segmentation machine learning model and is highly efficient.

Given a video, we first render the video frame by frame on a temporary canvas where we process the frame image using our ML model. Next is segmentation configuration. BodyPIX provides methods to increase the segmentation accuracy at the cost of processing speed.

Sample Segmentation result from the model:

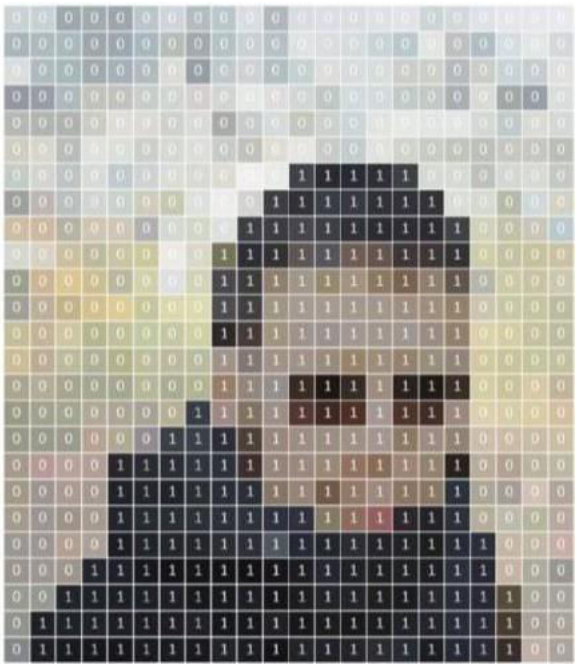

Fig. 1. A sample segmentation output on the canvas.

IV. Algorithm

The step for our algorithm is summarized below:

I. Convert the video into frames on the temporary canvas.

II. Load the bodyPIX model using the segmentation configuration to obtain maximum accuracy.

III. Get the segmented pixel data of the frame on the canvas.

IV. The segmentation result is single dimension array of binary values. All non-human objects have values of 0.

V. Create a loop to iterate through every pixel of the frame image.

VI. If the pixel value is 0 then copy the pixel data from the video to the output canvas. If its 1 then skip the updating process.

V. Result

After removing the human pixels:

Fig. 2. The output result showing no human object in video.

VI. Concllusion

From the results obtained we can conclude that the segmentation model performed well and the accuracy is good. It only segments the human and non-human pixels, thus the shadows are also considered as non-human pixels and therefore we as of now cannot remove the shadows using this model.

The proposed method fails when there is a mobile background or a static foreground. This is because the model fails to inpaint the videos due to the lack of pixel data. Also, we might have to adjust the configuration of the segmentation model for each video as per need.

VII. Future scope

Future purpose of this paper is to deal with moving background & foreground video sequence and also deal with random camera movement (including zooming), moving object size shifts, and dynamic backgrounds. This algorithm does not currently tackle the complete analysis of the moving object and work is underway to adapt the methodology to such scenario. Dealing with shifts in lighting in the series is a problem, too. Recently results for adapting to changes in lighting have appeared as an extension.

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