SwapItUp: A Face Swap Application for Privacy Protection

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***Abstract*—There is a growing concern over the issues related to online privacy due to large availability of high quality images. To tackle the privacy concerns a face swapping application is proposed. There is a library of face images, which is created by downloading images from different sources on Internet. For any given image, first of all facial landmarks are detected. The second image is rotated and scaled so that it can properly fit over the input image. To make sure that the new image looks natural, color balance adjustment is done. After that blending of features from the second image onto the input image is done. It is also shown how this system can be used to creating appealing and funny photographs for entertainment purposes. We conclude with a study that shows the high quality of images produced by this system as compared to existing face swap applications and also limitations of this system.**

***Keywords*—face swap, feature detection, privacy protection.**

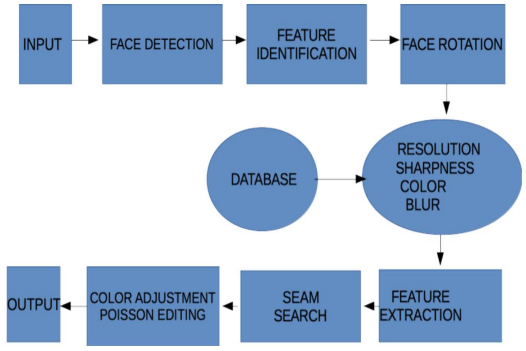

Fig. 1. System Setup for Face Swap

I. Introduction

In the present scenario, it has become very easy to get high quality images through advancement in digital photography and ease of Internet availability. While it has increased the convenience for people, such platforms have raised privacy concerns [1] related to media search. There are online systems like Google Street view and EveryScape , which allow users to navigate through panoramic images of places made by combining thousands of photographs [2]. Lot of these photos contains images of people who have not given their consent to be photographed. Currently what they do is that they obfuscate face regions using blurring and pixelation [3]. This method decreases the visual appeal of the image. One way to solve this problem can be to replace the face in the image with one of the reference images in the database.

There are other applications as well. Most of us have a large collection of images. Such collections often contain photos of the same individual taken with varying expressions and in different circumstances. Novel images can be easily created by replacing face in one image with more appealing face from a different image. The Face Swap algorithm consists of following steps: Extraction of facial landmarks from an image using dlib toolkit. Dlib implements the algorithm described in the paper [4]. Alignment of faces with a procrustes analysis [5], performing color correction using RGB scaling color correction method [6]. The last step involves blending features from the second image onto the first image.

Fig.1 shows the system setup [4]. Initially, the system gets an input image that contains the face to be replaced. The face region from the image is selected, facial landmarks are detected and an estimation of the pose is done. Then the next step involves checking the image database to find the face that would be used for replacement. A face with similar features would be selected in order to make sure that the swap looks natural. A simple process of 2D image composition would be used instead of using any 3D model approach. It is recommended to choose a face with similar quality, color and alignment for best results. But in the next sections it is shown that even if there is difference in color and alignment, still the face swap can be done very precisely. After the selection of the reference page, the color transformation and pose correction is performed. Then the face is blended onto the input image.

II. Related Work

There has been a lot of work done in the fields of computer vision and graphics, which was used for background study. The work done in the paper [7] allows face replacement in photographs. The authors used a 3D model to estimate the shape and pose of the input and the target face. There are different parameters for pose and illumination that are used to reconstruct the 3D face. The loop holes of this approach are that it requires a 3D model. Also it needs manual initialization to get accurate alignment between the input face and the target face. The approach used in my model does not need to use any 3D model and also the alignment is done automatically.

There is another 3D model approach [8] used for face replacement. It uses histogram matching for color and light matching in photographs. But it also needs some pre-processing techniques to improve the quality of the generated output. For face de-identification method, the common and easily approach is to use image blur [9]. But it takes away

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