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Identification of Facial Retouching Using Supervised Deep Learning Algorithm

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ABSTRACT

In the Airport security service, this system is used to restrict the fake and illegal passports is being used for travelling. By using this system we can detect those people who are creating fake passport by providing digitally altered and spoofed facial ID's. By our paper we can easily detect the Facial Retouching, Plastic Surgery, Spoofing, etc.., this processes involves two methods. 1. Supervised Deep Learning 2.Unsupervised Deep Learning. Supervised Deep Learning which only involves scanning of the victims face only. Deep Learning method uses labeled data, which is created by analyzing the individual parts of the input face (i.e. Right Eye, Left Eye, Nose, Mouth). This labeled data is compared with passport photo's labeled data to detect retouching.

Keywords— Deep Learning algorithm, Facial retouching, Plastic Surgery, Spoofing, etc

I. INTRODUCTION

Digital image inpainting refers to the filling of the gaps of arbitrary shapes in an image so that they seem to be parts of the original image. Several applications of digital inpainting have been reported in the last decade e.g. filling occlusions/gaps, removal of objects, image reconstruction by removing scratches or other degradation. Here we propose a specific application of digital inpainting to remove facial wrinkles and imperfections. Traditionally, beautification of skin or facial re-touching in images has been done by professionals using high-end software e.g. Adobe Photoshop TM. Several user friendly smart phone applications which provide minimum user interaction for facial touch ups have also been introduced. However, both professional and user-friendly software have limitations. Professional software require significant user interactions where results are subjective, depending on user's expertise. Whereas user-friendly applications developed for smart phones, while performing an overall beautification or making up of skin with minimum user interaction, do not target specific skin imperfections e.g. deep wrinkles, acne, scars etc. An example is shown Fig. 1, where overall beautification of skin fades wrinkles and moles but does not remove them completely. The reason may be that these applications seem to process all the skin regions equally and do not make distinction between skin vs. skin imperfections. The results can be improved if skin imperfections are detected as a pre-processing step and then processed differently from the surrounding skin.

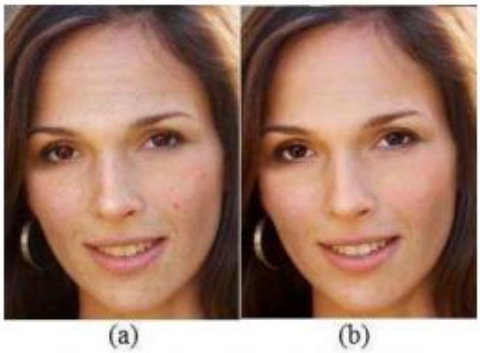

Fig.1. Typical results of facial retouching for a smart phone application. (a) Original Image. (b) Image after retouching. Note that wrinkles on forehead and brown spots on cheeks are deemphasized due to blending but still visible.

The current state-of-the-art approach for the removal of wrinkles is an image painting algorithm proposed by Georgiev. The algorithm is based on the widely used Poisson image editing tool and provides improved seamless image cloning through better handling of lighting variations. The algorithm works behind the Healing Tool in Adobe PhotoshopTM. Image painting is slightly a different application from image inpainting. The former deals with inclusion (painting) of a smaller image region in a larger image where both source and destination image regions are provided by the user. The latter deals with the automatic filling of a gap/occlusion, mostly

provided by the user, in an image based on local and/or global image characteristics and does not require a source image. However, both applications share the requirement of seamless boundaries. Our work is closer to image inpainting than image painting because both source and destination image areas are selected automatically. We make the following observations about the current facial retouching software as a motivation for our proposed work.

II. METHODOLOGY USED

The retouching process includes altering facial features in various ways: "airbrush out" pimples, age spots and wrinkles, make the whites of the eyes whiter, make the Teeth whiter, change shape of nose and eyebrows, remove wrinkles, add texture, adjust skin tone, and make the face slimmer or fuller. If these images are used for auto-tagging, the face recognition algorithm may not yield correct results. Then this retouched image may serve as an enrollment image and be matched with real- time photographs (non-retouched) images. Face recognition is being increasingly used for both personal and security applications. Several of these applications such as controlled user authentication require a human in the loop. However, unattended applications such as surveillance, auto-tagging in media collection, and law enforcement require handling several other covariates such as disguise, aging, plastic surgery, and low resolution. Another covariate, which has received very little attention to date in the biometrics literature, is matching photographic images with retouched (tampered/doctored) face images.

III. SYSTEM ARCHITECTURE

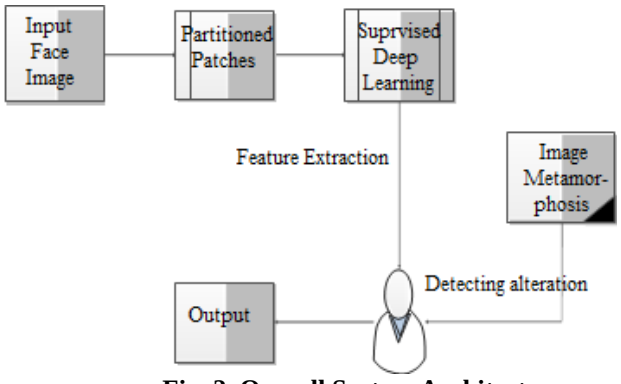

Fig. 2. Overall System Architecture

The important block in the overall system architecture

1. Input face
2. Face patches
3. Supervised Deep Learning Algorithm
4. Image Metamorphosis
5. Detecting Face Alteration
6. Output

A. INPUT FACE

In this module, the test image is used for automatic extraction of the region of interest by calculating the mean of each row (column) and compared to the threshold as follows. Image acquisition in image processing can be broadly defined as the action of retrieving an image from some source, usually a hardware-based source, so it can be passed through whatever processes need to occur afterward. Performing image acquisition in image processing is always the first step in the workflow order because, without an image, no processing is possible. The input images are taken from file. These images are different format like jpg, tiff, gif mostly we are using jpg format because it will accept black image and color image.

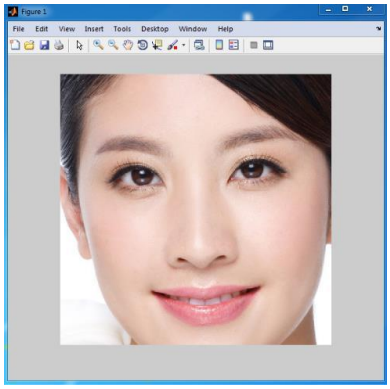

Fig 3. Input Face

B.FACE PATCHES

In this module, the input face image is partitioned into four local facial patches. These partitioned patches are used for detecting retouching. The partitioned patches are the right and left periocular, nose and mouth regions are extracted from a full face (face and eye, nose, mouth detector).

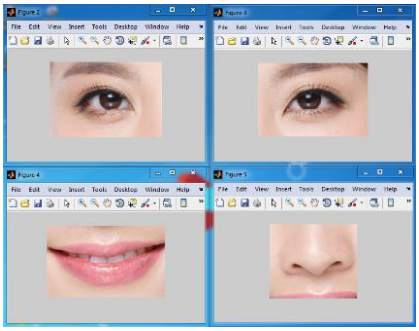

Fig. 4. Face patches

C. *SUPERVISED DEEP LEARNING ALGORITHM*

The proposed algorithm focuses on four facial patches and supervised features are learnt via deep

learning framework to discriminate between original/unaltered and retouched variations. This helps in classifying the test images accurately. The novel supervised deep learning based algorithm to solve the problem of classifying face images as original or retouched is proposed. The proposed algorithm shows a significant improvement compared to state-of-the-art algorithm for retouching detection. To detect retouching in face images, a novel supervised deep Boltzmann machine algorithm is proposed. It uses facial parts to learn discriminative features to classify face images as original or retouched.

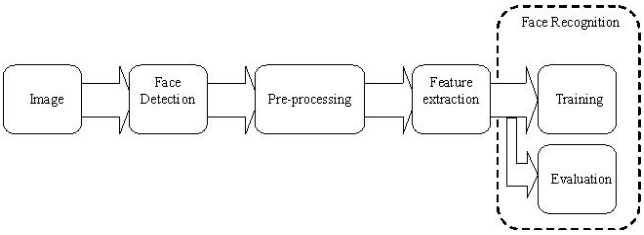

Fig. 4. Algorithm process

IMAGE: This is the subjects photograph.

FACE DETECTION: Face detection or Face Priority AF is a function that automatically detects the human faces in the provided input image.

PRE PROCESSING: This process involves the elimination of noise as well as improvement of the input image.

FEATURE EXTRACTON: This process used for obtaining the most relevant information from the original data and represent in lower dimensional space.

TRAINING: This process is used for classifying pixels from the digitized image in order to segment different objects.

EVALUATION: Here in this process we evaluate the performance of the entire system.

D. ***IMAGE METAMORPHOSIS***

Morphing is a special effect in motion pictures, animations that changes (or morphs) one image or shape into another through a seamless transition. Most often it is used to depict one person turning into another through technological means or as part of fantasy or surreal sequence.

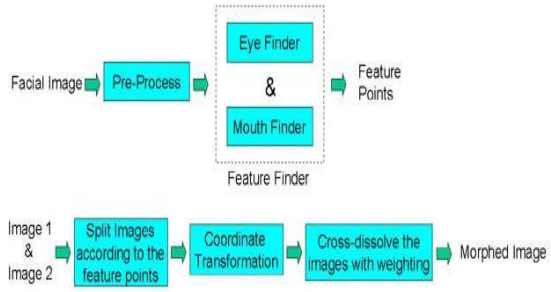

Fig 5. Image Metamorphosis process

EYE-FINDING - We assume that the eyes are more complicated than other parts of the face. The weighting function specifies how likely we can find eyes on the face if we don't have any prior information about it.

MOUTH-FINDING - After finding the eyes, we can specify the mouth as the red-most region below the eyes. Note that the mouth has relatively high red-ness and low green-ness comparing to the surrounding skin.

IMAGE PARTITIONING - The image is partitioned into feature points since the feature points are, at different positions, when doing morphing between images, the images have to be warped such that their feature points are matched.

COORDINATE TRANSFORMATIONS - There exist many coordinate transformations for the mapping between two triangles or between two quadrangles.

CROSS-DISSOLVING - After performing coordinate transformations facial image, the feature points of these images are matched. i.e., the left eye in one image will be at the same position as the left eye in the other image. Finally the morphed images are detected using feature based image metamorphosis.

E. DETECTING FACE ALTERATION

Digital alterations of face images can be broadly organized in two categories: geometric and appearance-based. The first category includes transformations that are typically introduced by either the acquisition or the printing device (e.g. barrel distortion or change in the image aspect ratio). These kinds of alterations are usually unintentional. The second kind of transformation includes all the alterations that can usually be performed by some image processing software. Such alterations are usually intentionally introduced to make the image more attractive; moreover several software applications that allow simulating plastic surgery interventions are now available.

IV. OUTPUT

Fig. 6. Application UI

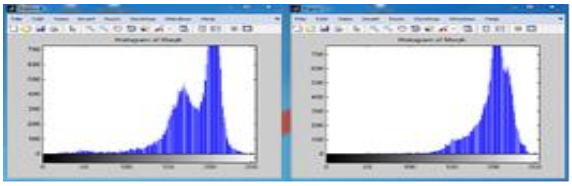

Fig. 7. Histogram

V. CONCLUSION

The novel supervised deep learning based algorithm to solve the problem of classifying face images as original or retouched is presented. The proposed algorithm shows a significant improvement compared to state-of- the-art algorithm for retouching detection. Additional experiments show that the improvement in classification accuracy can be attributed to the supervised DBM and to the form of the SVM used for classification. It uses facial parts to learn discriminative features to classify face images as original or retouched. Metamorphosis between two or more images over time is a useful visual technique, often used for educational or entertainment purposes. A new technique is presented for the metamorphosis of one digital image into another to detect image forensics.

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