Leveraging Digital Technology and AI Application in Eyebrow Design and Cosmetic Treatments

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Abstract

Achieving the ideal results through eyebrow cosmetic treatments such as microblading or eyebrow transplant can be challenging. The challenges in these procedures are selecting the ideal form to suit the clients' face and satisfy their needs, implementing the chosen form on the clients' face, and stating the eyebrows' symmetry.
This paper highlights two newly developed methods that increase the accuracy of eyebrow cosmetic treatments. These two methods indicate how the combination of 3D technologies, artificial intelligence, image processing, and computer vision can help achieve the ideal results through such treatments. Moreover, in this paper, the newly designed software AIbrow is introduced.

Keywords: eyebrow treatment, digital technology, 3D scanning, 3D printing, artificial intelligence

1. Introduction

The industry of beauty and cosmetics was one of the most rapidly developing markets. In 2017, the beauty industry revenue was worth $474,179 million, and experts from Statista predicted the beauty industry to reach a market value of $571,696 in 2023. But then, the coronavirus pandemic came. As for 2020, the beauty industry revenue is estimated at $483,338 million, compared with $504,501 million in income received in 2019. There are co-dependent reasons for the beauty market fall, including Global lockdown, Face masks, and Less income. Artificial Intelligence can potentially confront new virus-caused disruptions. Over the past years, AI algorithms have penetrated the beauty and cosmetics industry. Experts predict spending for AI in the beauty industry will grow to $7.3 billion by 2022 [1].
One of the major beauty AI applications is Augmented reality for virtual try-on. Augmented reality is a technology stack that enables adding virtual images to real-life photos. We use this feature for virtually try-on eyebrows before eyebrow cosmetic procedures.

2. Virtual Eyebrow try-on

Using Ai major application, virtual try-on, for eyebrow cosmetic procedures enhances the online consultation experience, with the ability to see the result of beauty treatment. We invented two methods for virtual eyebrows try-on.

2.1. Method one

In the first method, after face 3D scanning by an RGB camera, specific pattern stickers that are detectable by computer vision are placed on the client's head, and by generating a new point cloud of the client's face with the pattern sticker and aligning it with initial point cloud which 3D model is produced by, we can determine the exact location and rotation of pattern sticker points on the client's 3D model. Next, some dots showing the margin of patterns are generated on the face 3D model and camera live each frame by our developed software. Then, the generated dots on the 3D model and camera 2D image are aligned. Therefore, the 3d model is moving along with the moving of the client's face in each frame, and by projecting the ideal eyebrow on the 3D model and just showing the texture, it is possible to virtually try on different eyebrow models imbedded in the software on the camera live 2D image. Also, the software allows performing measurements and symmetry assessments. By virtually trying different eyebrow models on the face, applicants can select models that suit their face best. The 3D model of stamp and stencil of the selected eyebrow is generated automatically for 3D printing. Using real-time virtual eyebrows on the client's face by computer vision, the ideal printing on the client's face is possible.

2.2. Method two

This method does not require special cameras or 3D scanners. Only a few photos are taken by mobile cameras. These photos are opened in the newly -designed AIbrow software. The software can generate a face 3D model based on each photo individually using artificial intelligence. The 3D model generated in this method is not accurate at all, but we have been able to detect differences between the result of eyebrow projection on the generated 3D model and the shape of the eyebrow in real.

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Indeed, by running some specific algorithms to modulate the projecting system on each generated 3D model, a realistic eyebrow shape on the client's face without any errors is achievable. Therefore, it is possible to correctly project different eyebrow models on the 2D images taken. After selecting the eyebrow model that suits the face, pre-prepared stencil and stamps are used to correctly print the eyebrow desired design on the applicant's face. The stamps and stencils are designed based on the models embedded in the software.

3. Intelligently implement eyebrow treatment

After the virtual eyebrow try-on, the selected model should be implemented on the client's face accurately. For this purpose, according to the desired eyebrow model, some custom guides are used that may be pre-prepared or produced after by 3D printers based on the selected method.

3.1. Microblading

Microblading is a semi-permanent treatment through which, using specific needles, it is possible to finely implant featherweight strokes with a medical grade pigment on the epidermis layer of the skin, creating fine, realistic, and natural hair strokes. To intelligently perform eyebrow microblading, based on the 3D model of the selected eyebrow, custom stamps with some bulges indicating hair strokes are produced. The bulges print the eyebrow pattern on the applicant's face, and the operator can perform microblading based on the printed pattern.

3.2. Transplantation

Transplantation is a permanent method for eyebrow beauty procedures. Through this procedure, hair follicles are planted in the eyebrow predetermined location. Before this procedure to be started, the surgeon specifies the eyebrow margin. To intelligently determine the eyebrow margin, custom stencils are produced by a 3D printer based on the selected eyebrow 3D model. The positioning of the stencils on the face is assessed by the technology described for the microblading.

4. Advantages

In the traditional way of performing eyebrow treatments, basic tools such as thread, ruler, and divider are used for drawing eyebrow shapes before treatments. In most cases, the procedure is not performed accurately, and the final eyebrows are not symmetric or based on the client's desire. Indeed, the procedure is mostly based on the operator's taste. This described process and method allow the smart performing of eyebrow treatments leading to symmetric and suitable eyebrow form.

References

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