Mass Customization Design of Cosmetic Mask based on Depth Sensing Technology

Customized design is a major trend in consumer products nowadays. The idea is to enhance the values added by a product or service by satisfying individual customer needs. Cosmetic mask is a popular beauty item of an enormous demand. However, there are only one or very few sizes/shapes to be chosen in the current market, which fails to fulfill the requirements of various consumer sectors. Current designs of the cosmetic pattern do not follow any rigorous theories. The product quality is not satisfactory because the designs do not consider the degree of fit between a mask and the wearing face. This research attempts to develop a novel technology of mass customization design for cosmetic mask by integrating various techniques in face anthropometry, depth sensing, 3D geometry reconstruction, and computer graphics. The first step is to establish database for the female Chinese. Various mask designs are constructed based on the results classified/clustered by face shape or feature parameters. In addition, a commercial depth sensor, Microsoft Kinect^{TM}, captures the facial geometry and image of a user with which the most fit mask is selected from the existing designs. A realistic 3D face model of the user is generated by merging the data acquired from multiple view angles. Enabled by a haptic device, the model serves as an interactive medium for the user to perform the mask design. Finally, the technology of 3D geometry flattening is applied to finish the pattern design and improve the material utilization in the pattern arrangement. This work realizes the concept of human centric mass customization design. The results offer beauty products a new design method and open up practical applications of real-time depth sensing in product design.

Keywords: *depth sensing, customized design, 3D face model, clustering, 3D geometry flattening*