

Real-Time Design Customization of Freeform Soft Products

Due to global competition in economics, the traditional thought that the core competence of a company is focused on production, manufacturing, and cost has gradually transformed into the niche based on product design and service innovation. In addition to functional requirements, modern products emphasize even more on manifestation of the taste and styling of the end users. Especially soft products such as glasses, ornaments, apparels, and wigs are characterized with high design customization that matches between product styling and the appearance of people wearing the products. The current practice of virtual product evaluation is mostly based on either CAD or VR/AR technologies. The former cannot offer good interaction with the end users and support integration of the data of heterogeneous formats. The latter is lack of geometric modeling functions and thus cannot allow real-time design modifications. To overcome these problems, with a focus on freeform soft products, this research will develop innovative technologies of real-time design customization by integrating multiple disciplines. Virtual product models will be merged into realistic video stream of the product user in a light-weighted augmented environment. Using 3D glasses frame as an example, the prototyping system proposed by this work aims at facilitating assessment of the match between product design and the end-user itself. A new marker-less tracking function will be developed to identify the eyes in a human face. This helps dynamically simulate the wearing process of the glasses frame. In addition, this work will propose a new method for parametric design of 3D freeform products. The design customization based on this method allows the user to change the appearance, color, and texture of the product in a real-time manner. This work will realize advanced mass customization services for human-centric product design. It opens a new design approach for soft products. The technical merits include novelty in parametric design of freeform geometry and improvement of human-product interaction by complementing CAD and VR/AR. It is expected that a series of new research topics will be generated by the stimulus offered by this work.

Keywords: Product customization, freeform geometry, parametric design, soft product, augmented reality