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Parametric Modeling Method for Inner Surface of Functional Bra Mold Cup in Personalized Customization ⋆

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Abstract

In order to meet the needs of consumers for the fit of bra and solve the problems in the production process of mold cup, this paper proposed a forward grading design method based on the idea of personalized customization. This paper analyzes the feature points of the human body and the mold cup to find the relationship between the human body characteristics and the mold cup control parameters, and establishes a quantitative formula for the constraint relationship between the basic mold cup and the functional mold cup based on the human body, and passes UG OPEN GRIP programs the generation process of the inner surface of the mold cup in UG, and realizes the automatic generation of the functional mold cup by controlling the design parameters in the UG environment. And discuss the application of the parameterized design model of the inner surface of the personalized custom middle mold cup, including: the application for individuals with different human body data and the application of selecting different functional parameter values for the same human body data. This method provides a method reference for the digital design method of mold cups in the future.

Keywords: Bra mold cup; personalized customization; parameterization; Hierarchical design

1 Introduction

In recent years, with the rapid development of science and technology, people's living standards are constantly improving, and consumers' demand for material life level is getting higher and higher, and the pursuit of personalized and unique consumption attitude is increasing day by day. The underwear industry is also the same. As is known to all, bra products should be highly fit and individual, and the mismatch of mold cup bra products will affect the physical and mental health of consumers.Therefore, how to greatly meet customers' demand for cup bra while reducing unnecessary repetitive design labor has become the primary problem of underwear enterprises.This topic is put forward by combining the production status of underwear enterprises and the consumer psychology and consumer demand of these two aspects to comprehensive discussion.

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In the design of bra mold cups, Pan Sichen [1] proposed the design idea of "one person and one cup". The detailed dimensions of human body are extracted based on three-dimensional anthropometry technology, and the feature points, feature lines and feature surfaces required for mold cup modeling design are analyzed and extracted Combined with the design principle of mold cup, the three-level mold cup model design is realized in UG modeling environment. Establish the mold cup model completely based on the human body of consumers, and realize the relationship model from the human body to the mold cup. Cui Xue [2] analyzed the characteristics of women's breasts and cups, divided them into three relationship levels in the modeling design process of the formwork cups, obtained the relationship model among the geometric attributes of the bra cups, and developed the user-defined mold cup modeling design module by using UG secondary development tool.Lv Feifei [3] analyzed the characteristics of chest morphology, and expressed the relevant characteristic points and characteristic curves by parameterization. According to the parameterized representation, the parameterized constraint relationship between the mold cup and human body was established, and the UG OPEN GRIP secondary development technology was used to realize it. Li Mingju [4] combined the Bezier curve and parameterization concept to analyze the difference of human body shape in different regions, established a mathematical model suitable for underwear design on the Visual C++ 6.0 and OpenGL platform, and applied it to the tight-fitting prototype and the basic version of the bra cup. Interactive design method. Han Jing [5] Han Jing studied the shape of female breast, established a digital mold cup model based on this, proposed a digital mold cup modeling design method, and summarized the digital mold cup modeling technology. Xing Chao [6] scanned the bra mold cup into a digital model by 3d scanning technology, extracted and analyzed the internal and external features of the mold cup for similarity classification, and parameterized the characteristic curves of the internal and external surfaces. Finally, the mold cup model library was established according to the feature classification.Wang Shuanghu [7] and Ding Yaru analyzed the breast shape of middle-aged women, used several main parameters describing breast shape, and adopted the method of forward design to construct the characteristic curve required by the mold cup prototype in the UG environment and establish the mold cup model.Peng Hui [8] studied the four design factors of the unrimmed molded cup bra, including the thickness of the cup, the Angle of the center of the heart, the height of the side ratio and the material of the bottom, and explored the relationship and influence between the design factors of the unrimmed molded cup bra and the bra shaping effect, the size of the pressure and the fit of the wearing. Xu Yaoyao [9] obtained the point cloud data of the mould cup through a 3D scanner, and obtained the function relationship between the arc length of the characteristic curve and the depth of the mould cup through analysis. The morphological structure of the curved surface could be controlled by changing the geometric parameters on the morphological characteristic curve.Heh Soon Jung and Mi Hyang Na [10] aims to develop no-wire mold cups in order to commercialize bras that make the breast appear beautiful by keeping the shape without wire supporting them.Okkyung Lee, Kyunghi Hong and Yejin Lee [11] analyzes the shape change of the breast according to the replica combination method of the lower cup and suggest a pattern construction for the end use purpose. Lee C W [12] Independent variables of breast size, underband length, cup material modulus, shoulder strap and underband material modulus, underwire and gait speed were regarded as important variables in the prediction of vertical breast displacement. The soft manikin showed a satisfactory result validated by a subject wear trial, thus providing a reliable and objective approach for future bra studies. Tian Y, Ball R. [13] develops a parametric personalized bra design algo-rithm that can generate personalized bra by using self-measurements of women users. Hyun-Y oung Lee [14] proposes the suitable sensation for cup volume and the natural wearing silhouette could be accomplished by removing