

Research of Parametric Design System for Mould Head Based on Personalized Brassiere Customization*

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Abstract

The intimate apparel market is changing towards the personalized consumption environment rapidly. On one hand, consumers' behaviour is more selective; On the other hand, brassiere design and development cycle are getting shorter and shorter. Mould head design is a key process in producing brassieres. A master cone which is the prototype of the mould head can be developed by a novel parametric method. The example-based method can easily make a new mould head style from several existing styles of master cones only by adjusting corresponding weights. Through the remeshing and registration algorithm, designer can characterize the outer surfaces of the mould head and scanned bra cups, aligning them each other at a point with same topology for assessing deviation. The results from this paper provide a scientific, practical and effective solution for intimate apparel manufacturers so that they can improve the development process of mould heads.

Keywords: Mould head; Foam; Bra cup; Conformity

1 Introduction

Bra cup moulding is currently a remarkable process in the production of seamless intimate apparel. Mould head design is also a key process in producing brassieres. Among the various types of apparel, brassiere design requires a particularly lengthy process that demands design creativity, precision pattern making skills and a detailed knowledge of fabric [1]. The design process of mould heads is particularly time-consuming and error-prone due to cup styles and sizes, and geometric features etc. Conventionally, the geometric feature and shape modification processes of developing new aluminum mould heads usually involve many "trial and errors". The moulded cup shape is visually inspected through a comparison with a plastic shot. The judgment of the quality and shape depends on the experience of the inspectors as seen in Fig. 1.

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Fig. 1: Foam cup sample is fitted into a corresponding plastic shot

Problems have further increased in the new century due to the complex style of the moulded cups (such as full coverage, demi, triangle, etc.), extreme range of bra cup sizes (from AA to F) introduced into the market. Researchers continue to explore rapid prototyping, body scanning and other innovative product development technologies to improve this development process. Up to now, there has been limited knowledge about the effects of moulding process parameters and bra cup geometric parameters on the design of mould heads. It is crucial to develop a parametric optimization system for the mould head design. The proposed method not only provides useful information for shortening the mould head design time, but also allows a rapid response to the continuous changing needs of the intimate apparel industry.

2 Literature Review

2.1 Rapid Prototyping Technology

Recently, reverse engineering technology has been adopted to assist rapid prototyping, complex geometric measurements, shape evaluation, etc. [2-4]. In this research, by using a non-contact 3D digitizing apparatus, the surface coordinates of mould heads, cup samples and master cones can be accurately and quickly obtained. The resultant shape of the moulded cup is then compared against the shape of the plastic shot devised from the plastic master cone shown below as Fig. 2.



Fig. 2: The shape of a plastic master cone sample

The key features of the surface will be constructed and revised from point clouds [5, 6]. On the basis of a parametric design programme for master cones of bra cups, the 3D shapes of the convex surface of scanned bra cups can be characterized [7]. New styles of mould heads can also be accurately and efficiently designed and/or graded into different sizes.