This book covers the content on using geometric approaches to design the freeform shape of products that are worn by human bodies. The recent trend about user-customized product design requires that the shape of such products be automatically adjusted according to the human bodies’ shape, so that people will feel more comfortable when wearing them.

The motivation of this book is to introduce readers to the newly developed geometric solution for the design automation of customized freeform objects, which can greatly improve the efficiency of design processes in various industries involving customized products (e.g., garment design, toy design, jewel design, shoe design, and design of medial devices, etc.). The products in the above industries are usually composed of very complex geometry shape (represented by free-form surfaces), and are not driven by a parameter table but a digital human model with freeform shapes or part of human bodies (e.g., wrist, foot, and head models). After carefully designing a product around one particular human model, it is desirable to have an automated tool for “grading” this product to other shape-changed human bodies while retaining the original spatial relationship between the product and human models.

The techniques introduced in this book are based on my research conducted in this area in the past decade, which cover the algorithms of human body reconstruction, freeform product modeling, constraining and reconstructing freeform products, and shape optimization for improving the manufacturability of freeform products. Based on these techniques, the design automation problem for human-centered freeform products can be fundamentally solved. This book can be used as a reference book for researchers and developers working on problems of automatic designing of products customized for individuals, and it can also be used as a reference book for courses in computer-aided product design at the graduate level.

My research conducted in this area was initiated during my graduate study. I would like to thank Prof. Matthew M. F. Yuen, Prof. Kai Tang, Prof. Shana Smith, Prof. Qifu Wang, Dr. Jin Fan, Dr. Zhuang Wu and Prof. Jiansong Deng for their encouragement and valuable advice at the early stage of my work. Acknowledgments also go to my collaborators, students, and research staff, in
particular, my collaborators—Prof. Kin-Chuen Hui, Prof. Xiaogang Jin, Prof. Chih-Hsing Chu, Prof. Alexandre Kung and Dr. Terry Chang, my students and research staff—Yunbo Zhang, Tsz-Ho Kwok, Siu-Ping Mok, Shengjun Liu, Yuwei Meng, Kwan-Chung Chan, Alan Yeung, Samuel Li, Hoi Sheung, Yuen-Shan Leung, and Ya-Tien Tsai, and all staff at the Department of Mechanical and Automation Engineering, The Chinese University of Hong Kong (CUHK).

The bulk of this research was supported by the Hong Kong Research Grants Council under grants CUHK/412405, CUHK/416307, and CUHK/417109, the Innovation and Technology Commission under the grant of Innovation Technology Fund ITS/026/07, the Shun Hing Institute of Advanced Engineering (SHIAE) under grant CUHK/8115022, the industrial sponsors—TPC (HK) Limited and Tak Wai Model Clothes Rack Co., and the direct research grants of CUHK.

Shatin, Hong Kong, May 2012

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Geometric Modeling and Reasoning of Human-Centered Freeform Products
Wang, C.C.L.
2013, XII, 228 p., Hardcover
ISBN: 978-1-4471-4359-8