Thesis Abstract

				<u>No.</u>
Registration	□ "KOU"		Name [.]	
Number:	No.	*Office use only	Name.	Jianyou Li
Title of Thesis:				
On-demand Digital Customization for Perfect-fit Medical Product				
-Distributed Design Agent Approach				
Summary of Thesis:				
This dissertation addresses the technical and social issues that inhibit the use of digital fabrication, such as 3-D printing, in the medical field and proposes a new sociotechnical collaborative framework that includes the designer (design engineer), user (patients and demanders) and design agent (clinical practitioner) as solutions. In this approach, the designer and clinical practitioner (as design agent) can exchange their professional knowledge to develop a special design tool and related training, and the				
programmable modeling language is applied to develop a semiautomatic modeling sequence of product customization. Such a tool enables the nondesigner clinical practitioner to perform design capability and play the role of distributed design agent to customize medical products for patients or demanders through digital fabrication technology on demand.				
I conducted this approach in two experiments, while playing the role of medical engineer. In the first experiment, through collaboration with an orthopedist, we developed a customization system to help the doctor design a 3-D printed splint for fracture immobilization of an upper limb. In the experiment with a 3-D printed respirator, a customization system was designed to help the Infection Control Practitioner with customization of a personalized respirator for hospital employees to improve the seal between the edges of the respirator and the wearer's face.				
In the results of the two experiments were as follows. (1) A clinical practitioner can operate a digital design tool to customize designs independently after a short training. (2) The design tool can generate qualified models for digital fabrication. (3) Compared to the traditional products, the customized artifacts generated in the experiments have better performance on comfortability and function. (4) The customized products can help the clinical practitioner and users solve the problem or improve the device performance in a medical environment.				
Keyword: digital fabrication, medical product, on-demand, customization, distributed design agent.				