

Title	製品設計のためのユーザー要求抽出と文化的属性に関する研究
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# A Study on User Requirements Extraction and Cultural Attributes for Product Design

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## **Research Content**

User requirements play an important role in Product design. The requirements can be used to help designers to determine the product's features for the design process. Besides, it can be considered as the goal for designers in designing products. Current approaches to obtaining user requirements usually use some traditional methods such as surveys, questionnaires, and interviews. These methods can gain some important information about products by interacting with customers. However, the methods have some drawbacks as described as follows: First, it is clear that obtaining the user's information in such a way is expensive. Also, it is difficult to obtain a large number of users' information due to the limitation of accessing a large number of users. Furthermore, sometimes we cannot get their real emotions, and the obtained information could not reflect all aspects of what users need. Meanwhile, the information about products on the internet is available and growing rapidly. The information comes from a very large number of users in different cultures. This information is an essential knowledge for the new users when they would like to purchase the product. Thus, it is essential information for designers in designing attractive products for users. This thesis presents a method for bridging user requirements to designers in Product design. The motivation behind this method is that user requirements are automatically collected by performing an opinion mining method on a set of online product reviews, which is available on the web. The user requirements are then provided to integrate with designers.

In the thesis, we investigate various ways to extract user opinions from customer's opinions for designers in terms of designing products. The main contents of the thesis are sketched as follows.

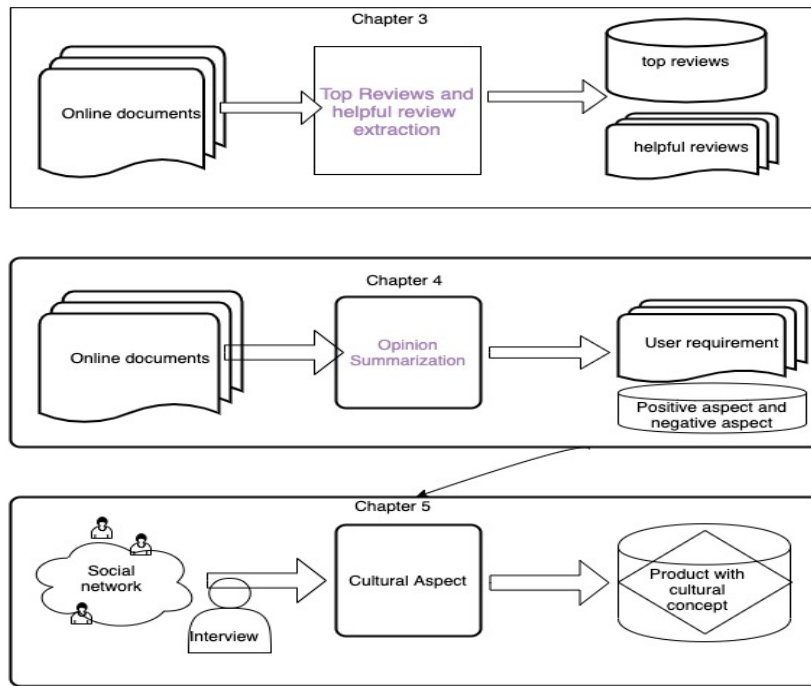


Figure 1. The structure of the thesis

Chapter 3 investigates a study on verifying the contribution of top reviews and helpful reviews on product design. We applied advanced machine learning models to identify helpful reviews automatically and exploit the contribution of helpful reviews on the designing process. From a technical point of view, we compare various machine learning models to select the appropriate one for helpful review identification tasks. We evaluated our results with designers to understand the perspective of designers when they use helpful reviews.

Chapter 4 proposes a user requirements extraction framework that can solve the following issues: (1) extracting aspects of products (2) summarizing reviews opinion corresponding with aspects and (3) classifying them into positive and negative categories. We propose supervised learning and unsupervised models for extracting aspects automatically. Experimental results on the benchmark data showed that the proposed method attains high accuracy compared to strong baseline models. Chapter 4 proposed a novel method using opinion summarization techniques, along with the uses of keyword and aspect extraction, to obtain user requirements. In addition to that, we investigate various machine learning and deep learning models for sentiment classification to classify customer reviews into positive and negative. Some case studies for evaluating the use of user requirements with designers are carried out. The results of the questionnaire by interviewing with designers showed that the proposed framework is sufficient for supporting designers in the early phase of product design.

Chapter 5 shows our third contribution by considering the cultural attributes and their impact on product design in the early process of product design. We also investigate how cultural

attributes can change and effect on selecting design concepts. A case study with designers showed the contribution of cultural attributes and user requirements in product design. The results showed that cultural characteristics and user requirements could help designers create new concepts for culture-oriented product design.

### **Research Purpose**

This research aims at studying the bridge method of utilizing user feedback from online customers for supporting designers in terms of designing products. The research also focuses on answering how cultural attributes can contribute to the design process and design creativity. More precisely, we aim at tackling the problem of utilizing user feedback to support designers in terms of designing products. There are many reviewers available on the internet, but we would like to focus on top reviews and the helpfulness of reviews for product design. For regular reviews, we perform the uses of opinion summarization techniques to get user requirements and form it into an appropriate format for designers to support them in terms of designing products.

On the other important aspect, we aim at studying how cultural attributes can combine with user requirements for supporting designers in the early phase of product design. For this purpose, we would like to interview with designers from various countries to understand the contribution of cultural attributes to product design.

### **Research Accomplishment**

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**Keywords:** Product Design, User requirements extraction, Cultural Attributes, Opinion Mining, Helpful review identification