The Key Technologies Research of User Needs by Innovative Design Based on the Cloud Services

LiCheng Zong

ABSTRACT

With the continuous development of the times, the diversity of user needs, variability, uncertainty and other factors, originally led by the designer of innovative product design cannot really meet the needs of users. The rapid development of the Internet brings us into the era of large data, cloud computing as the core technology in the field of information technology, has recently been seen as a new generation of information technology change the model of product design. Through the analysis of the characteristics of large data processing, the characteristics of demand data processing on cloud service platform are put forward, and the demand acquisition is combined with the idea of ZMET metaphor extraction technology. The MUNP model of "user demand-product characteristics" is constructed to map the implicit demand information of user and product characteristics, and then the implicit demand information is displayed and visualized to help innovative design.

INTRODUCTION

In the product innovation design, obtain the needs of user is the premise to ensure that products meet the needs of user, and industrial product design features between the mapping study has gradually become a hot spot for domestic and foreign scholars, the demand for efficiency, demand and design Feature mapping, user needs in different areas of reusability research has gradually become the main research directions and research priorities in future. Wang MeiQing[1] proposes a mapping method consisting of user requirements screening and refinement, product quality feature acquisition and transformation, product quality feature optimization and decision making, and establishes the theoretical model of user demand and product design quality feature mapping. Zhang ZhongQi[2] based on the research of users' needs, proposes a design scheme of recommendation system which makes more effective use of social network resources. Hou Zhi[3] introduce Kano model into the classification of user requirements. The user requirements are divided into basic quality, work quality and surprise quality, and the classification result is used...
in the user importance adjustment process of the QFD product planning matrix. Wang HengChong\(^4\) introduce the character and situation analysis method in interactive design field to construct the bridge between qualitative analysis and quantitative analysis, and put forward a set of methods to analyze the demand, extract the demand problem and find the potential demand. Osgood\(^5\) study the semantic difference method, which reflects the user's needs on the Likert scale through the semantics of learning object such as product and color, and then uses mathematical statistics to analyze. LUO Shijian\(^6\) study the cognitive characteristics of NC machine tool design by the image scale method. Pan YunHei\(^7\) study the types in the process of shape design, and based on the large amount of data is sorted out on the experiment, in order to discuss the similarities and differences between designers' knowledge and design results.

**PRODUCT INNOVATION DESIGN**

**Innovative Design And User Requirements**

The process of product innovation design is the balance of product shape, material and color or many other factors\(^8\), and the user's cognitive process of things is a lot of information to select, analogy, filtering and extraction process. The specific embodiment of metaphorical thinking in product design is to map the subjective feelings of the person to the product characteristics, and to find some emotional resonance on the product based on the experience and background of the person and the environment so as to give the product design new ideas. Figure 1 is the product's cognitive model.

![Figure 1. The model of product cognitive.](image)

User is the main body of product design, the user's needs to meet is the basic requirements of product design, in the design process, the correct and effective way to capture the needs of users of product designers is the necessary knowledge, especially the user's needs, such as the expectations of product modeling, the material of the emotional vocabulary expression, which often cannot be quantified directly to the expression, it will be through some vague emotional vocabulary to convey their intentions. The introduction of metaphor extraction technology can solve this problem, user ambiguous semantic to visualization, so that the needs of users can be transformed into product design of explicit elements, and metaphor to convey is often implied in the product design. The potential cultural attributes, product intention attributes, product value orientation and other higher levels of user needs information, help designers get a new understanding of products and
perspective, greatly enhance the degree of public acceptance of the product to win the support of users.

In recent years, in the field of industrial design, it is an important research direction to realize the mapping of user perception characteristics and design features, that is, to establish a set of user-sensibility image-product design features through some methods. Association mapping, in order to obtain the rich demand data, provides the more comprehensive and the more specific demand for the product design to obtain the help, like figure 2 shows.

![Figure 2. The model of Product Design Mapping.](image)

**The Big Data Approach To User Needs**

The big data have 4V feature, Volume, Variety, Velocity, Value\(^9\). Large data which large amounts of data and data integrity, so that many data can be effectively recorded and stored, but also to avoid the missing data and omissions. The increase in the amount of data exacerbates the diversity of information, we are in these large variety of data found between their internal association, and then we make the right judgments. How to meet the real-time needs of users faster, with the increase in the amount of data for large amounts of intelligence and real-time data requirements increasingly high, which inevitably lead to data latency problem, so the key is how to deal with efficient to meet the needs of users.

![Figure 3. The process of large data.](image)
Therefore, by analyzing the characteristics of industrial design innovation in large data environment and the shortcomings of traditional user research methods, propose the model that presents the following characteristics: strong, low cost, fast and efficient, easy to reuse, etc., and suitable for large quantities of data collection and processing.

THE PROCESSING OF KEY TECHNOLOGIES FOR USER NEEDS

User needs as a user needs information, the need to establish a model to achieve the mapping with the characteristics of the product, which will demand information explicit, and its application to the product, the user needs for the treatment of the "User Needs - Feature Mapping "(MUFM) model, through the demand for information collection, clustering and transformation process to achieve this mapping process. And combine it with the characteristics of cloud services to the background of large data processing methods as the basis, and after processing the data visualization.

Data Collection and Clustering

The cloud server contains a database, a data warehouse, a World Wide Web and other information repositories. It stores a large number of relevant vocabularies, and composes the original data on the cloud service platform through the user demand structure collected by the demand. Through the database with the cloud service The data similarity degree is calculated based on the word similarity calculation method of "Hownet", and then the semantic similarity of the concept is calculated, and then the semantic similarity of the data is calculated. Clustering, clustering after the concept of the definition of characteristics, through continuous training, so that the computer according to the requirements of the categories in the library category. Figure 4 shows the requirements information clustering process for the cloud service platform:

![Figure 4. The process of clustering requirements information on cloud platform.](image)

The Mapping Of Demand Data

The mapping process of the requirements based on metaphor extraction technology as follows:

- By allowing users to use free association method to collect user needs, after clustering processing, access to the corresponding image visualization, in order to tap the needs of users.

- The product features technical characteristics of free association, mining features technical metaphor.

- Gestalt theory is used to establish the mapping relationship between user requirements and product characteristics. Thus, the mapping of the customer's unstructured requirements to the technical characteristics of the products is realized
Visualization of Demand Data

In the past ten years, the rapid development of data acquisition, storage and data analysis technology has greatly reduced the cost of data storage and processing, so that a large data age is gradually appearing in front of us. Cloud computing, the development of Internet of things technology and a variety of sensor technology applications are a large number of data sources or bearer. Large data technology is not the core of the vast amount of data through the network to master information, but rather to the intelligence of these data and effectively deal with.

![Figure 5. The concept and operational mechanism of visual analysis](image)

Traditional visualization methods have been unable to satisfy the processing of large data. When it comes to the problem of large-scale data visualization, many researchers use feature extraction and geometric modeling to significantly reduce the actual rendering size of the data, thus understanding the data more closely and intuitively. Through the visualization of user needs data, so that we understand these data can be more intuitive and in-depth, but also allows designers to analyze user needs more accurate, in the process, the user's demand data becomes more plastic, More humane. If there is sufficient knowledge of the potential of information charts, the information diagram is no longer just a new form of expression, it also contains a new understanding of the world, revealing the reality of a new perspective, new thinking. Informative graphics not only have a very attractive visual impact, can easily lead to resonance, so that users interested in the same time, through the summary, concise interface allows the platform to all users clearly and intuitively transfer a large number of needs Information, with the information in the form of a variety of forms, personalized enhancements to make it easier for the audience to participate, rather than just passively accept the information, the audience can be based on their own needs than to make personalized selection and judgments.

In order to visualize the transformation of demand information and mapping relationship, ZMET's idea of constructing consensus map is introduced. More than one-fourth of the constructs mentioned in this paper will be included in this paper, which has high universality and accuracy. The constructs in the consensus diagram are the potential needs of the users of the target research products, and the higher the coverage, the higher the instructional significance of the construct.

![Figure 6. The model of data visualization](image)
REQUIREMENTS PROCESSING SYSTEM CONSTRUCTION

In the initial stage of product design, designers need to combine experience, background and other cognitive elements to their own ideas to sketches, renderings and other graphical way to express it. Graphical information can not only serve as a communication medium between designers and users, but also can be regarded as the most intuitive tool for users to choose and evaluate the design. It is the explicit expression of designer's design knowledge and design ability. Designers' knowledge is hidden in the mind, some cannot be easily described, such as observation, inspiration, visual experience and experience, especially in product modeling aesthetics creativity, but also need to tap the designer's deep knowledge. Therefore, the designer can express the latent knowledge only through the visual symbols such as point, line, face and color, so that the knowledge can be perceived by the users. This process can be expressed by the knowledge transfer explicit model, as shown in Figure 7.

![Figure 7. The transfer model of explicit Knowledge.](image)

After submitting the design work, the designer will express the design idea through the corresponding visual illustrations, and describe the design work for the design work, extract the product design elements that affect the product image feeling, and further decompose into various technical features, and establish the initial design work Metamodel database. The designer needs to extract the design elements that affect the product image feeling according to the initial idea, such as outline shape, surface treatment, color and other elements, and further decompose them into various technical characteristics, such as: contour outline can be decomposed into rounded corners, Edge, streamline, etc., and the technical characteristics of free association, upload and these technical characteristics corresponding to the legend, given the relevant keyword description.

![Figure 8. The model of Product characteristics.](image)

CONCLUSIONS

Based on the idea of ZMET metaphor extraction technology and combined with the advantages of cloud service platform, we summarizes the technical characteristics of user requirement processing from the perspective of large data processing, and applies the requirement technology to the process of product design. The MUNP model (user requirement - product characteristic mapping) is
established on the platform of industrial design cloud service, and a demand processing system is constructed based on the model. The realization and application of the system are verified by concrete design process.

REFERENCES