Human-Computer Interaction: The Construction of Design Implementation Model and Design Countermeasure of Human-Computer Interface Design

GONG Chao

Abstract—This paper briefly sums up the overall goal and requirements of implementation stage of human-computer interface design and illuminates the main contents in this stage, and then analyzing on four sections’ contents of implementation stage in detail. It puts forward the problems in each stage which should pay much attention to and how to take actual operation solving the problem. Combining with the overall goals and requirements in the implementation stage, we make related design countermeasures and finally build the feasible design model for the implementation stage of HCI interface design, providing an important reference for the effective implementation of human-computer interface design.

Keywords—Human-Computer Interaction, Interface Design, Design Mode, Design Countermeasure.

I. INTRODUCTION

NOWADAYS, harmonious information interactions are people’s good wishes for information acquisition and recognition. The scientific, efficient, and systematic human-computer interface design have become the final goals for designers to pursuit. It has already become the essential requirement of information society’ development to meet the all users’ needs of physiological, psychological and behavior abilities, and make them acquire and identify information by human-computer interface more rapidly, accurately, efficiently and comfortably. After fully analyzing user requirements, the implementation phase in the process of human-computer interface design seems to be extremely important. Whether the designer can create a satisfying human-computer interface which fully meets the user’s needs, it depends on whether the implementation phase is reliable and effective. The implementation phase of human-computer interface design mainly includes four parts: conceptual design, structural design, expression design and iterative design.

II. THE CONCEPTUAL DESIGN OF HUMAN-COMPUTER INTERFACE DESIGN

In implementation phase of human-computer interface design, the design team is required to create a variety of feasible implementing schemes. Designers ought to sort out and make analysis on the collected users’ information before carrying on specific designs, and establish certain structures in the interface information spaces. They should make the feasible solving schemes and then determine which one should put into implement. Conceptual design phase mainly includes three contents: the setting of user’s role, the establishment of user’s role, and target tasks analysis.

A. The Setting of User’s Role in Conceptual Design

Conceptual design is to explain and define user need analysis more in detail. In order to achieve this goal, designers should set a “role” concept and let users really participate in the whole process of interface design. Role comes from interviews and observations towards product customers and potential customers (sometimes are consumers)[1]. It is a virtual description of interface users in the process of human-computer interaction design and the actual user prototype defined by user need analysis. In the conceptual design phase, creating a user role can help designer to determine interface’s contents, interactive ways; the establishment of user role can make clear about user’s goals and tasks, providing designers with interface design basis.

B. The Establishment of User’s Goal in Conceptual Design

User’s goal is the terminative condition of human-computer interface design, which can stimulate the user to perform the interactive behaviors. It is driven by user’s motivation and demand and is difficult to change with time, or even not change at all. User’s goal can be used to eliminate unrelated interactive factors in interface design. Designers should clear about user’s intention of interface design, and create a more suitable and satisfying design for users with interface design basis.

GONG Chao is with the Beijing Institute of Technology, Beijing, 100081 CHINA (phone: +86-15901285651; e-mail: gonge_0@126.com ).
which is the foundation of interface functions realization. In the human-computer interaction design, these three goals should be combined together and none is dispensable. The ultimate goal is the principal part, the experience goal is the key point, and the life goal is the basis.

C. The User’s Target Tasks Analysis in Conceptual Design

The user’s target tasks’ setting and analysis are facing to the final user. Here the task is based on the establishment of user’s goal, referring to the specific interactive works which are to accomplish by interface as well as the specific methods[2]. Designers should analysis on the all the tasks based on user’s goal, including user information acquisition and interactive behavior related to the tasks, and make full consideration on the user’s perception, cognition and behavioral abilities, etc. They carry on reasonable establishment and distribution of user’s tasks according to logical structures, and determine the interface contents and interactive ways.

III. STRUCTURAL DESIGN OF HUMAN-COMPUTER INTERFACE DESIGN

The establishment of information structural design in human-computer interface design process is after accomplishing conceptual design, which is the basis for designers to do specific interface design. It is a real description of the user information interaction requirement in interface. The establishment of the interface information structure contains three layers of contents: information classification of the user target tasks, the establishment of user information interaction elements, and the establishment of user information interaction structure (interface prototype).

A. Information Classification in Structural Design

Before building interface functional structure, designers also need to classify information transmitted by interface, and in this phase, they should begin to consider how to organize all kinds of information acquired in user requirement phrase. Information classification is the basis of information structure’s establishment. In real life, the user often classify and organize information according to certain logic relationship, therefore it need to sort out the user requirement information, so that the information functional structure of human-computer interface meets most users’ habits and expectations and convenient for them to use. The rationality of the information classification will directly affect the user’s efficiency in using human-computer interface.

B. The Establishment of User Information Interactive Information

The establishment of user information interaction is based on information classification of user’s requirement goals. Designers make use of general and simple languages to describe the target tasks which the user’s roles are about to accomplish in interface design, and define information expression elements of user’s goal requirement based on the classification of user requirement information, determining grouping and hierarchical relationships of function implementation elements. User information interactive elements include function elements and the data element, and they are the visible expressions of interactive behavior and information stimulation, and manifestation of user requirements in user requirement stage[3]. In this phase, the designer should use objects and actions of the real world and adopt human-computer interface expressive way to describe these requirements, such as the interface’ pane, frame, the interactive control buttons and groupings, information stimulation includes: characters, indexes, charts, graphics, images and so on.

C. The Establishment of User Information Interactive Structure

In this phase, designers ought to devote themselves in structural presentation of interface interactive elements in the actual interface and draw a interface structural draft according to the definition of information elements and the division of information elements’ functional levels. Interface structural draft should be as simple as possible and take rectangular picture frames, text name, and the brief description of functional region’s relationship as principle thing. This process does not involve detailed designs. That requires designers firstly grasp the interface’s general interactive design framework on unities and consistency of its interactive style, instead of not too much emphasizing detailed processing the framework, which is the basic guarantee for the whole interface visual realization. The establishment of user information interaction presentation structure should put its logic and reasonable into consider and design the composition and layout of actual interface’s information elements on the basis of the concept design, which makes the actual interface structure more clearly.

IV. THE INFORMATION EXPRESSION OF HUMAN-COMPUTER INTERFACE DESIGN

After taking human-computer interface’s information conceptual and structural designs, designers are about to consider how to present information contents in interactive interface using information expressive ways. The contents of the information expression design is that how to present information contents, information functions, visual, hearing, and tactile elements of information structure by means of effective and reasonable interface layout in the process of information interaction.

A. Visual Design

In the process of human-computer interface design, the designers’ concern is to find the most suitable expressive ways to exchange some special information [4]. It is better for designers to look for the most appropriate interactive expressive way to express information interactive behaviors, which make users acquire information and accomplish requirement tasks conveniently and effectively, and accurately through the human-computer interface. In the following part, we put forward some design countermeasures of visual design:

1) The visual elements design in the process of human-computer interaction must be clearly visible to guide
design through the user's information requirement goal and a series of design principles, which enables users to identify, understand and apply the information expressed by visual elements.

2) The visual layout designs should avoid the appearance of redundant and unnecessary visual information in case that they may disrupt effective information layout. In each divided visual area or hierarchy, there should be a clear visual information structure expression for users to distinguish and understand easily. Visual elements used in the interface must be compact, consistent and in accordance with the information contents and functions. The layout of areas and information hierarchies in interface area should keep consistent and make the function’s setting more purposely.

3) It is better to combine the visual color design with other visual elements in the process of human-computer interaction design. The applications of different colors are to highlight the important information contents and attract users’ attentions. Combining with the user’s psychological reaction towards colors, it benefits a lot in auxiliary expressing effective information contents. The consistent use of color plays the function in enhancing the classifications of information functions, and increasing interface information’s navigational ability and enhancing the user's information search and browsing speed. It can use colors to help divide information areas and levels effectively and reasonable.

B. Metaphor Design

Metaphor in human-computer interface design is not a language phenomenon, but a cognitive phenomenon, which makes the interpretations of the most abstract information in the interface become possible. The information cognitive metaphor in human-computer interface design is the most important definition mapping from relatively familiar and easily understanding information content domain to unfamiliar and difficult target content [5]. The metaphor designs in human-computer interface rely on the intuitive connections which are established by users between visual information expressions and the contents and functions of information. User’s identification of metaphor information is realized by means of understanding information contents’ denotation. Metaphor designs must choose the appropriate and reasonable metaphor objects and keep metaphor form’s inconsistency in the interface. It needs to fully consider metaphor objects’ internationalization, etc. The designer should reasonable use metaphor design in interface combining with information contents and functions as well as the visual expression effects.

V. THE ITERATIVE DESIGN OF HUMAN-COMPUTER INTERFACE DESIGN

The whole design process of human-computer interface design consists of many dynamic iterative ways rather than static linear ways which continuously develop during the whole process of design development. Iterative design is a design methodology that redesigning or improving the original products when designers find there exists some problems in the original design process through phased evaluation or the appearance of new requirements, after accomplishing certain design phase. Sometimes it need to return back to the former design phase, sometimes even goes back further. The timely iteration plays an essential role in the human-computer interface design, while the human-computer interaction design should develop constantly in an iterative design framework during different design phases.

VI. CONCLUSION

In the implementation phase of human-computer interface design, designers should set different user’s role goals and confirm goal-based task contents according to their respective requirements, adopting reasonable and effective methods to integrate and classify users’ requirement information of different task contents. It is required to select the interactive ways which is based on the user goal tasks and establish integrated, systematized and reasonable interface information structures as well as draft the interface prototype. What’s more, they ought to carry on expression designs and layout designs of interface contents and application of colors clearly, accurately, reasonable and effectively. As the principal part in human-computer interface design, implementation model design is the key point for realizing design, in another word, establishing implementation model is to reach the purpose of design realization smoothly and effectively. The following figure is the design implementation model we put forward in the process of human-computer interface design.

Fig. 1 The design implementation model of human-computer interface design
REFERENCES


