

Study of Design Method for Tangible User Interface

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Abstract: The third industrial revolution facilitated the rapid development of Tangible User Interface (TUI) in Internet of Things (IOT). The concept of TUI broke through the limitation of traditional Graphical User Interface (GUI). By giving objects digital information, the objects in our daily life can be transformed to the tangible interfaces between human and the digital world. Fully using daily life experience, the atoms and the bits can be combined perfectly, which gave the human-computer interaction (HCI) a new meaning. This paper involved the development of HCI, principles and evaluation criteria of human-computer interface design, the characteristics of TUI and in end proposed the method for TUI design.

1 Introduction

In the third industrial revolution, the cyber space realized the object transformation from physical to digital form, which promoted the social transformation from industrial to information. The fuse of physical and digital world made the bits exceed the physical boundaries and brought the atom revolution in the world of bits. This fuse and transformation led to TUI generation, which let us return our “global village” interweaving the reality and the digital. The concept of TUI broke through the limitation of traditional GUI. By giving the objects digital information, the objects in our daily life can be transformed to the tangible interfaces between human and the digital world. Fully using daily life experience, the atoms and the bits can be combined perfectly, which gave the HCI a new meaning. The fuse of digital and physical world provided wide space for the development of TUI.

2 Principles and evaluation criteria of human-computer interface design

According to the Human Interface by Jef Raskin [Ra00], the human-computer interface design should include two basic principles: 1) the computer cannot destroy the users' jobs, and 2) the computer cannot waste users' time or require users to do more jobs than necessary. Under the prerequisite of the two principles, seven specific criteria were proposed including visibility, feedback, affordance, simplicity, structure, consistency and tolerance to evaluate and guide the human-computer interface design. GUI, precisely, is the action part of visual experience and interaction of screen productions, and it emphasizes that human, computer and environment should be regarded as one system when designing the overall design [GRR06]. Additionally, GUI design gradually transforms from the task-centered to the user-centered design, and in the user-centered interaction design there are two phased objectives: 1) usability and 2) user experience.

3 Characteristics and method for TUI

TUI covers four main characteristics: 1) the objects and the bottom digital information are overlapped; 2) the objects themselves take the interactive control mechanism; 3) the objects can reflect the continuous changes of information carriers, and 4) the physical features of the objects can express the key features of digital systems. The analysis and design process is regarded as a reasonable and gradual refinement process from the context fitting the design to the design fitting the context. This process can be divided into five steps, i.e. context analysis, behavior analysis, mapping analysis, meaning analysis and rationality analysis, in which the mapping analysis is the most important. The implicit knowledge and the user cognition are the cores of the process. The objects, the information, the information carriers and the characteristics of user cognitive behavior should be considered comprehensively for the study on method for TUI. Besides, with the empathy the mental model of users, data structure and five senses of interface can achieve the same sentiment and assimilation, and in the end the interactive behavior.

References

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- [GRR06] Giudice, F.; Rosa G.L.; Risitano A.: Product Design for the Environment: A Life Cycle Approach, Taylor & Francis, 2006.