

Research on Semantic Priming Experiment of Interactive Character on the Online Banking Interface

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Abstract: Users cannot truly achieve "harmonious human-machine interaction" and improve the efficiency of interaction until they have correctly understood the semantics of the information on the interface. Taking the interactive characters on the login interface of ICBC's (Industrial and Commercial Bank of China) personal online banking as main experimental material, this paper has drawn the following conclusions after investigating the paradigm of semantic priming experiment. Firstly, users' preference for vocabulary is different in the different prime stimulus; secondly, the semantic distance possesses directivity; moreover, using words of strong semantic relation is more advantageous to the operation of actual interface.

Introduction

With the popularization of graphical human-machine interface, the interactive essence of human-machine interface has become the matching and feedback of human's own knowledge system (semantic system) for the semantic network that consists of interface elements. The human-computer interaction has gradually become the interaction between semantics and knowledge^[1-3]. In terms of the present research, it mainly focuses on the match of interface color, character pitch, interactive operation and function consistency, etc. There are also researches that are related to some certain types of interface semantic, such as, with the survey on the college students who major in computer and industrial design, Zhang Qin et. al found that they seriously misunderstood, mixed up and even didn't understand the characters and figures on the interface of Word2000^[4]; Cheng Shiwei et. al pointed out that the complexity of cognitive interaction makes users confused so that interactive failure rate becomes higher and interaction efficiency drops^[5]. The characters of human-machine interface interaction do not exist in isolation; users usually complete a certain task by use of interface through a set of operation sequence. And the nature of human-machine semantic interaction is the matching results of interface semantic model and psychological semantic model^[6]. The construction of interface semantic model mainly adopts the semantics (concept) expressed by interactive terms and figures. When users' understanding of interface characters' semantics is inconsistent with what to be expressed by interface itself, the interaction will encounter difficulties. While Chinese characters possess their unique characteristics and have differences with English characters and figures of interaction. Due to the interactive function, the Chinese characters on the digital interface beyond the scope of ordinary words in

Chinese and become the interactive terms. Its semantics has become interactive semantics based on human-machine interface, which cannot be perfectly described by the conventional dictionary any longer. When it comes with the same "file", in the dictionary explanation, it may be "official letters and articles on the theory of policy". However, on the commonly used official software interface, it refers to "the basic storage unit of relevant data which can be edited, deleted, and transferred". Compared with the "what it is", Chinese characters on digital interface focused more on "what to do." It is the differences between conventional dictionary and the context of a user's mental lexicon that causes the problem, therefore, it is necessary to study the interaction of the characters on digital human-machine interface. This paper has adopted the method of semantic priming experiment, and take online banking interface of ICBC as a breakthrough point to conduct experimental study on important concepts, such as, user's mental lexicon and semantic distance between hypernym and hyponym, thus it has found that there existing something to be improved.

2. Method and procedures for experimental design

The purpose of experiment. Through semantic priming experiment, this paper is to study the semantic relationship among Chinese characters on the digital human-machine interface, to investigate the reaction time and accuracy, to evaluate efficiency of interaction recognition about Chinese numerical characters on digital human-machine, and then to provide some references and suggestions for the design and evaluation of Chinese digital human-machine interface.

The main purposes of the experiment are as follows:

- (1) Users' preference for various allomorphs of the word "*login name*" in the two different situations (general digital interface, the online banking) .
- (2) Semantic distance between hypernym and hyponym, and the interaction efficiency of original interactive characters on the ICBC's login interface.

Objects of the experiment. The objects of this experiment are postgraduates of Southwest Jiaotong University. The total number of the students is 30, including 18 male students and 12 female students. Their average age is 25.3 years old. Each participant's vision or corrected visual acuity is normal (1.0 or above). The participants received some remuneration after the experiments.

Instruments of the experiment. The experimental equipment is Dell commercial desktop, its screen resolution has been set to 1024 * 768, refresh rate is 120 hz, and the participants are about 50 cm far away from the screen. Experimental procedures has been written and presented by commonly used E-Prime 2.0 software in cognitive behavioral experiments .The experiment has been conducted in a well sound-proof laboratory.

Experimental materials and experimental design. Taking the login interface of ICBC's personal online banking as object, the experiment has conducted research on the interactive (indicating and functioning) characters. To achieve better research effect, this experiment has selected characters on the function sectors are which seldom used by users to reduce the learning effect. Meanwhile, it has adjusted the number of the secondary characters under the premise of not changing the original meaning to make it same with characters of the same level.

Prior to the experiment, a preliminary experiment of vocabulary free association has been conducted among 80 participants, excluding the 30 participants in the experiment. The age of

participants varies from 18 to 30, including senior high school students, college students, people working in different industries. This preliminary experiment managed to obtain experimental material. Besides, to rule out unnecessary cognitive interference, all the fonts of characters are set in black and bold font and the font size is small number two in the experiment.

The experiment has adopted classic startup paradigm, namely, fast represent a stimulus (start a stimulus) first, and represent the second stimulus (target stimulus), then ask participants to quickly respond to the second stimulus (target stimulus), and record the behavior data of the participants. In this paper, the start stimulation and target stimulation are experimental characters, namely the selected interaction term.

One trial in the experiment is shown as the Fig.

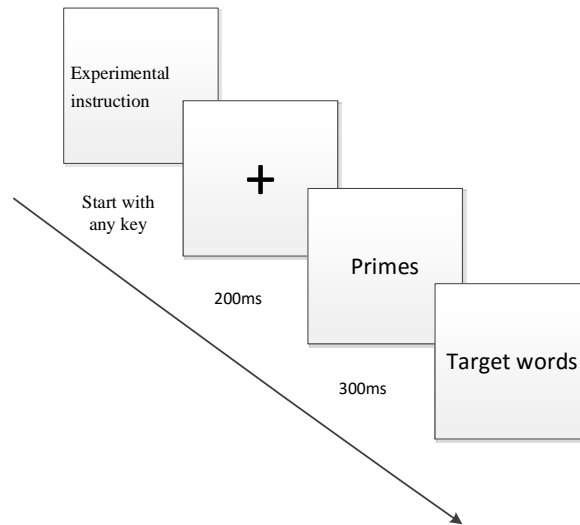


Figure 1. A single Trial presentation

Present experimental instruction to the participants at the beginning of experiment, introduce the specific experimental procedures, and remind the participants to be ready to press any key to start the experiment. Experiment begins with a gaze '+', which is to help participants focus on the center of the screen, then present the primes. The primes disappear after brief appearance on the screen, and then the target words appear. The participants are required to make relevant response to the target words according to the requirement of the experiment instruction, and then Trial ends. The next cycle begins.

The first part of the experiment has selected a few common login characters. The participants are required to conduct semantic priming experiment in the two different situations (general web pages, online banking). The experiment is to investigate whether the users' preference for various allomorphs of "login name" on the different types of sites are different through the index of participants' reaction time.

All the characters randomly appear as primes, target words, and in cross combinations. The experiment has taken the task of lexical decision as paradigm. Firstly, it appears start stimulus, and then it appears target stimulus. The participants are required to tell whether the target stimulus is relevant with the start of stimulus. If so, press the key of F, if not, press the key of J, then it goes to the next cycle, with the total 90 cycles. The reaction time of the participants, together with their response to key-press has been recorded by E-Prime automatically.

The selected characters are shown in the Fig.

Review words	Disturbance words
Login name	Password
Users' name	Modify
Account name	Set
Mail address	Bind
Name of member	Logoff

Figure 2. Start the experimental character in different situations

Before the experiment, the participants were required with simple questions, such as, “do you have online banking account?” And they were led to different situations. The interval between experiments of different situations is three weeks. The participants have undergone two situational experiments in a random sequence.

The second part of the experiment has taken the personal online banking account of ICBC as an example, selected the interactive characters on the login interface as a start-up stimulation and target stimulation, and investigated whether there existing deficiencies in the structuring and selecting of interactive characters on the login interface.

Finally, the selected characters are shown in figure 2-3. Before the experiment, the participants are shown with the original organizational structure of the experimental characters and expected to memorize them (as shown in Fig.3), in 30 seconds.

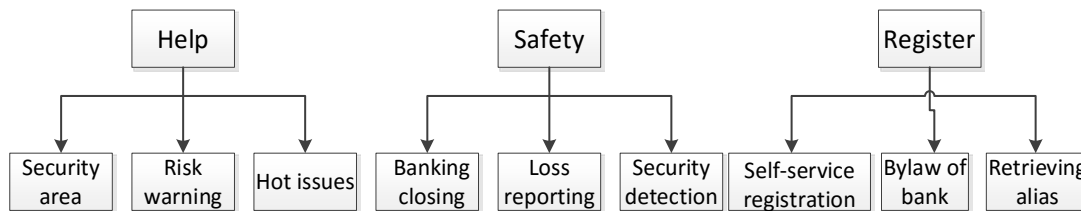


Figure 3. Structuring of ICBC's interactive terms

Experiment has adopted the category to judge task paradigm, it appears prime stimulus first, and then target stimulus. The participants are required to determine whether a target stimulus belongs to the hyponym of prime stimulus. If so, press the key of “F”, press J if it is not, and then go to the next cycle, with total 90 cycles. The reaction time of the participants and key-press have been recorded by E-Prime automatically.

Results of the experiment and its analysis

First of all, in order to investigate whether the users' preference for different allomorphs of "login name" on the different types of sites are different, the experiment has made single factor analysis of variance on the data when the prime word is "login name" in two kinds of situations, respectively.

In the situation of general web, when prime word is “login name”, the target words, “user name” and “email” belong to a group with shorter reaction time, “account name” and “member name” belong to another group with longer reaction time, which are significantly different from the

shorter one.

In the situation of the online banking, when prime word is “login name” and the target word is “account name”, the reaction time is the shortest, which is significantly different from the other 3.

From the above experimental result, in the situation of general web, the users think “user name,” “email address” and “login name” are close in their meaning; and in the situation of online banking, the users think that account name and login name are the closest in their meaning. In addition, to a pair of interactive terms, when the starting order is not the same, the reaction time may be different. Therefore, the semantic distance of interactive terms on the human-machine interface may also have direction, it is also the scalar results calculated by semantic distance, and it cannot be described by conventional dictionary.

Conclusions and Prospect

By introducing semantic priming experimental paradigm, this paper has conducted research on the interactive characters on the typical online banking interface and reached the following conclusions.

Firstly, even though the words of the same meaning or similar meaning may have different semantic distance in the different interface situations, and the semantic distance of the two words may have direction. The calculation of semantic distance in the conventional dictionary can't describe semantic features of the interactive terms.

Secondly, to the words of strong semantic relations, the accuracy rate of participants is higher in judging the category. The participants can learn better, memorize the function organization and structure of the interface when they interact with the interface. And when words of shorter semantic distance are classified to different system, the users will have difficulties to distinguish, which will lead to a decline in the interaction efficiency. Therefore, interface designers should try to classify words with shorter semantic distance together when structuring the interactive characters, and increase the semantic differences of words from different systems as many as possible.

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