A Study on Design of Multi-modal Human-machine Interaction Interface Based on Multi-touch

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Abstract

User experience is a crucial factor influencing users' impression of a certain product and interaction function plays an important role in decision-making of user experience. Compared with traditional single-finger touch operation, interface of multi-touch can better meet requirements of users. This paper, begins with definition of human-computer interaction,and then provides an analysis and study of design of multi-modal human-machine interaction interface based on multi-touch after.

Keywords

Multi-touch; Multi-modal human-machine interaction interface.

1. Introduction

Compared with the past, attention paid to user experience of products has been dramatically increased. In this case, it is necessary to provide the human-machine interaction interface with richer experience for users on the basis of multi-touch. Such interface design shall be commenced with application of relevant theories such as information input mode and aesthetic principles.

2. Multi-touch and Human-computer Interaction

2.1 Definition of human-computer interaction

Human-computer interaction refers to the communication process of two-way information exchange with the target of action and symbol and other contents. In some sense, the process can be regarded as one of the communication activities [1].

2.2 Characteristics of multi-touch

Characteristics of multi-touch mainly involve the following conditions: first, in general, such operation requires the user to use both hands andeyes at the same time during interface processing; second, the light-impacted characteristic, which means that the user fails to make accurate judgment of the information in the interface when the interface is exposed to strong light.

3. Design of Multi-modal Human-machine Interaction Interface Based on Multi-touch

In this section, the analysis and study of multi-modal human-machine interaction interface design is carried out from the following aspects:

3.1 Information input mode design of multi-modal human-machine interaction interface

Given that user experience is directly influenced by reasonability of design of the information input mode, which is a main function of multi-modal human-machine interaction interface and due to complexity of users' gesture, it is necessary to apply effective gesture recognition technologies to meet users' requirements of touch gesture recognition. At present, common gesture recognition technologies include the following types:

3.1.1. Neural network recognition technology

This technology is based on cerebral neural network of human and compared with other recognition technologies, its advantages mainly lie in: first, stronger noise immunity: when users are using the

human-machine interaction interface in noisy environment, it can ensure effectiveness and accuracy of users' gesture recognition; second, it is capable of recognition of all the complete input mode and incomplete input mode by users. Compared with other recognition technologies, such technology can provide better gesture recognition experience for users.

3.1.2. Template matching recognition technology

It refers to matching and recognition of the user raw date captured by the sensor and default template included in the human-machine interaction interface based on multi-touch. When the raw data and the template is highly similar, the data is regarded as data provided by the template. Compared with other user gesture recognition technologies, it is relatively easier to implement such technology that provides poor recognition effects.

3.1.3 Statistical analysis recognition technology

It refers to the technology aiming at accurate recognition of users' gesture by reasonable determination of the classifier with statistical sample eigenvector as the main basis for recognition of users' gesture. Although such technology produces better recognition results, it cannot be used for direct recognition and determination of user raw data produced in the human-machine interaction interface based on multi-touch. Compared with other technologies, such technology takes longer period of time for recognition of users' gesture [3].

3.2 Semiotics design of multi-modal human-machine interaction interface

With the increasing popularity of smart phone, ipad and other mobile terminals, people have developed the habit of judging connotation of the icon listed in the terminals. Under this circumstance, designers shall pay special attention to appropriate application of semiotic principles in design of human-machine interaction interface based on multi-touch. In practical application process, designers shall attach importance to the following problems:

3.2.1. Icon design

During icon design of human-machine interaction interface, the icon design leaving bad impression on users, is mainly caused by deficiency in overall chart layout, arrangement regularity and size. Hence, designers shall abide by the following principles during icon design: first, to ensure that users can obtain the real effect of chart by observation of the icon; second, to unify shapes of all the icons in the interface, for instance, all the icons in a human-machine interaction interface based on multi-touch can be designed as triangle; thirdly, all the icons shall be in the same size. Despite of the quantity and type of icons in the entire human-machine interaction interface, designers shall keep all the icons in the same range of size. Besides, for ease of use, designers shall take into consideration of specific size of the area where users' fingers contact the interface while deciding size of the icons.

The study shows that, when the icon is slightly bigger than the area where users' fingers contact the interface, users can enjoy more smooth usage experience [4].

3.2.2. Text design

Some researches indicate that, compared with graphic information, users tend to spend more time in recognizing text information. Thus, they will spontaneously obtain graphic information if there are both graphic and text information. Currently, there are two frequently-used kinds of text information, namely Chinese information and English information. Because lowercase English letters are more commonly to be seen and used in daily life and work and uppercase English letters usually take longer period of time in recognition and judgment. Therefore, designers shall avoid using all-caps English words in order to ensure practicability of English text information. As for Chinese characters, designers may design the essential characters in the interface as visual elements during design of human-machine interaction interface for the purpose of good user experience. With the text information that is fairly recognizable with low difficulty in memory, users can include such kind of text information into visual area and pleasantly continue to use the human-machine interface.

3.3 Aesthetic design of multi-modal human-machine interaction interface

As far as users are concerned, it is quite necessary for designers to apply aesthetic principles in practical design of human-machine interaction interface. Compared with the tradition design method, designers shall lay emphasis on the following aspects in implementation of aesthetic design:

3.3.1. Symmetric design

Generally speaking, users will be satisfied at the visual balance provided by fairly symmetric human-machine interaction interface based on multi-touch. If the designers fail to provide a fairly symmetric interface, users' visual perception will be in deviation and consequently finial user experience will be impaired. Common symmetric interface design can be divided into the two kinds: first, diagonal symmetric design, referring to the design providing users with symmetric visual perception in the inclined direction with the reference point of the diagonal; second, vertical -axis symmetric design, referring to the design satisfying users' need of visual balance by way of central symmetry with the reference point of the vertical axis in the middle of the interface. Compared with diagonal symmetric design, the latter design is less frequently applied.

3.3.2. Grid division design

During grid division in design of multi-modal human-machine interaction interface based on multi-touch, problems needing special attention mainly involve the two types: first, logic of the program used in the user interface. Under normal conditions, users observe the interface in the order from the left to right and the top to the bottom. When designers carry out the design in accordance with the standard, users will hardly get bad experience in using with regards to visual perception of the interface grid. Second, number of the grids divided. Users tend to get bored if there are too many grids divided, therefore, designers shall apply the rule of simplification in design of grid division of multi-modal human-machine interaction interface [5].

3.4 Chromatology design of multi-modal human=machine interaction interface

Since color is an important of users visual perception, it is of certain practical significance to apply chromatics principles into design of multi-modal human=machine interaction interface. And in the actual application process, designers shall put emphasis on the following aspects:

3.4.1. Symmetric design of change in color of the interface

This design method refers to the application of different colors in several design objects of the interface following a regular pattern that is realized on the basis of balanced application of different colors.

3.4.2. Symmetric design of interface hue

This design method refers to presentation of the icons, texts and other design objects with the same hue in the same shape or identical are by designers. In multi-modal human-machine interaction interface, application of such color design can bring beauty of orderliness to users [6].

4. Conclusion

For users, reasonable design of the multi-modal human-machine interaction interface based on multi-touch directly affects their experience in using and further influences their decision-making purchasing products. For this reason, designers can apply semiotic, chromatics and aesthetic principles in practical design of human-machine interaction interface so as to ensure effective interface design.

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