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RESEARCH ON THE INFLUENCE OF VISUAL PERCEPTION AND INTERACTION STIMULATION ON USER EMOTIONAL EXPERIENCE OF INTELLIGENT VEHICLE CENTER CONTROL INTERFACE

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This paper investigates the design elements of intelligent vehicle center control interface that affect the driver's emotional experience from the visual and interaction levels. Based on the factor analysis of perceptual science, it is found that the design elements that enhance the driver's emotional experience and map to the visual perception of the central control interface are the presentation of functions in the form of cards, the presentation of icons in the form of components, and the presentation of color tones in multi-colors. Based on eye-tracking technology, simulated driving behavior experiments are conducted, and the study shows that familiar interaction modes and icons and the operating area within the driver's reach, and the layout structure combining the full screen and functional widgets can improve the driver's emotional experience.

Key words: *Visual perception, interaction stimulation, smart car, center control interface, emotional experience*

INTRODUCTION

With the rapid development of science and technology, smart cars, which are a collection of technologies such as artificial intelligence, communication information, and the Internet, have emerged, and the intelligent central control system has become one of the carriers of the ultimate user experience advocated by new power car companies. In the emerging field of smart cars, Albrecht Schmidt et al. [1] proposed that the key issue in the research of smart car interface is to study the innovative methods of user cognition and user satisfaction evaluation. Along with the arrival of user experience economy, the interaction between driver's emotional experience and in-vehicle information interface is getting more and more attention from enterprises and designers. Intelligent vehicle in-vehicle information interface is a central control interactive digital panel that integrates navigation, entertainment and intelligent driving, and it becomes the main medium of communication between the driver and the vehicle. An efficient and beautiful central control interface can influence the driver's mood, improve the driver's emotional satisfaction and driving comfort, shorten the user's operation time and reduce the error rate, and thus improve driving safety. Previous studies have explored the effects of voice assistance [2], icon clicking [3], and visual perception [4] of automotive interaction interfaces on driver cognitive efficiency and driving safety.



More in-depth investigation is needed in the area of in-vehicle information interface on drivers' emotional affective aspects. Tatjana Zimasa et al. [4] mentioned that drivers' emotions are an important influencing factor in relation to traffic safety. In the experience of in-vehicle information interface, the complexity of the car driving environment affects the driver's emotion in many ways, such as the external driving environment of the car the difficulty of the operation task, and the visual transmission of the interface, which affects the driver's cognition and efficiency. Therefore, it is particularly important to improve the user's emotional experience in the center control interface of smart cars through the study of the influence of visual perception and interaction stimuli on the user's emotional experience.

PURPOSE

This paper investigates the design of center control interfaces for smart vehicles from the perspective of the driver's emotional experience. In this paper, two hypotheses will be proposed for the quantitative aspects of emotional design of the center control interface of smart vehicles:

- (1) Good center control visual effects and interaction modes in smart cars can improve drivers' emotional satisfaction.
- (2) The combination of emotion quantification methods and the three dimensions of emotion can help designers effectively improve the optimized design of the center control interface of smart cars.

RESULTS AND DISCUSSION

(1) Analysis of the Visual Level of the Central Control Interface of Intelligent Vehicles

By extracting interface samples and screening them, inviting five designers to classify them by the affinity diagram (KJ) method, and considering the size of the center screen, three representative samples with similar car screen sizes were finally selected (as in Fig. 1) to launch the questionnaire survey.

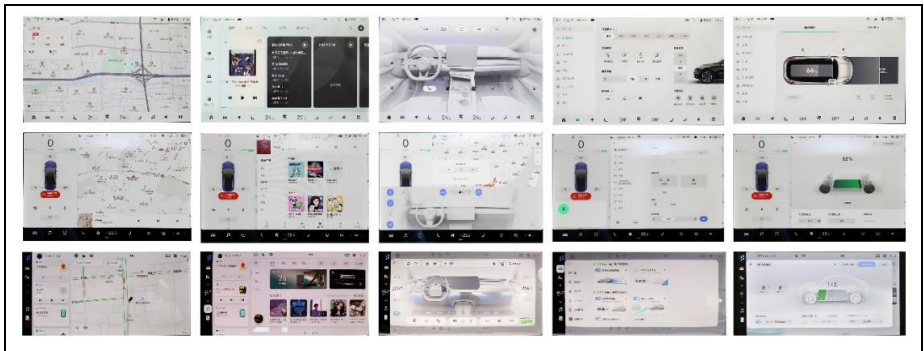


Fig.1. Representative sample of the intelligent automobile center control digital interface



Usually, car drivers will perceive the overall effect of the interface through the visual perception before driving, and have a preliminary emotional experience of this, good interface visual representation design is likely to trigger a strong interaction stimulation and psychological implication of the driver. Users are more inclined to richness in the color style of the intelligent car center control interface. The application of color in the central control interface is mainly divided into brand color, background color, state color and split color. In the field of intelligent automobile, the application of color in the function is mainly easy to identify and in line with the positioning of the automobile brand needs to be presented to the user. According to the previous research on the intelligent automobile central control interface and the extraction of sensual imagery vocabulary, technological, elegant, intelligent, high-end and environmental protection are the most commonly used in the intelligent automobile industry.

The simplicity of the intelligent automobile center control digital interface in terms of layout structure. The layout structure of all information in accordance with the use scene and functional partition can reduce the cognitive load of people. Card-type presentation and the combination of similar icons can be presented in the same interface for functional partitioning. Reducing the driver's cognitive load is mainly through the realization of interface lightweight, interface lightweight is to display as little information as possible on the interface to avoid the interference of excessive information, reasonable partitioning, modular layout can realize the simplicity of the interface. In addition, the location of the menu bar should be designed as far as possible in the driver's reach, to shorten the operating distance, but taking into account the principle of balance of the UI design, too much functional information is presented on the left side of the interface will be overloaded with information, which is contrary to the principle of the lightweight of the central digital interface, so the menu bar is arranged at the bottom of the interface after the functional partition, and the commonly used functions are presented on the left side of the interface to improve the user's emotional Experience. The brightness of the menu bar can distinguish the main operation area and the main sight area. It helps the driver to quickly capture the function area and operate it during the driving process.

From Figure 2, it can be seen that the distribution of the user's line of sight on each interface presents a general direction, and in the process of driving, the interaction of their line of sight is mainly concentrated in the left side of the region, so it can be judged that the left side of the region closer to the driver is the best interaction area for the user in the process of driving.

At the interaction level, drivers use task instructions to distinguish the overall interface layout and find the location of icons, and form impressions and subjective feelings about the nine interface groups. The driving experience is more immersive and delicate than the previous visual experience. In the form of interface layout after users simulate driving, users prefer the overall presentation of the navigation interface, but based on the analysis of eye-tracking hotspot map and trajectory map, the left side is defined as the best interaction area, and setting up the function area and operation area in this area can improve the efficiency of the driver's operation. In terms of the interaction mode of operation on the interface, the results of the user



behavior observation and interviews in Chapter 3, Subsection 2 show that drivers are interested in the "Back button", "x" symbol, "Home button", etc. These distinctive interaction symbols can evoke the general user's previous interaction habits of using smart devices, and quickly find the positioning to perform the return task in order to improve interaction efficiency. Second, users appear to repeatedly click the icon to close the current function, so the changing presentation of the icon will stimulate users to perform the interaction action again. Moreover, when users cannot find the interaction target, most of them will choose to return to the main interface with one click and start searching again, which according to the interview results will make them feel relaxed to improve efficiency and enhance user experience.

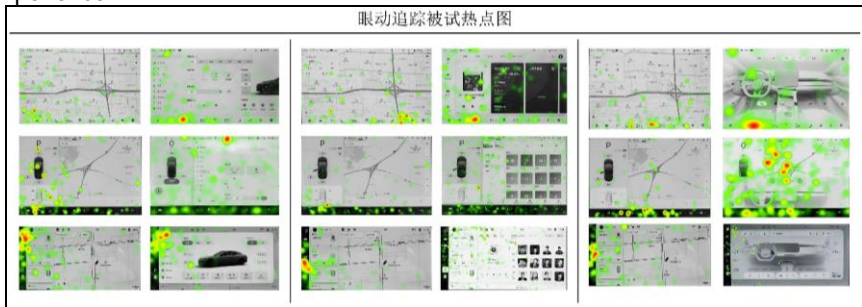


Fig. 2 Hotspot map of eye tracking subjects

CONCLUSIONS

The conclusions of the study are as follows: firstly, in terms of visual perception, the richness of color and simplicity of the layout of the central control interface of intelligent vehicles can enhance the driver's emotional experience. Secondly, in terms of interaction stimulation, retaining the traditional user interaction mode and arranging the functions in the area within the driver's reach will enhance the driver's emotional experience to a greater extent.

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