Research On the Effect of Unconsciousness on Human-Computer Interaction in Web Interfaces

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Abstract. Unconscious interaction design can enhance the readability and learnability of web browsing to a certain extent, and it helps users achieve a natural and smooth interactive experience. At present, more and more researchers are involved in the study of unconscious interaction design. This paper argues that web interface design should focus on understanding the potential needs of users during the design process of human-computer interaction. It proposes researching the unconscious behavior of users while browsing and utilizing this research in combination with the design of the three modules in the interface. This will enhance and improve the conceptual model for human-computer interface design, by considering the impact of unconscious behavior. This paper delves into the shared characteristics and likenesses of the subconscious concepts within the user's psyche in web interfaces. Its objective is to uncover new and creative methods that will empower designers to explore human-centered and deconstructed design principles while navigating technological paradoxes.

Keywords: Unconsciousness, User Interface, Human-computer Interaction, User Experience, Natural Interaction.

1. Introduction

Science and technology have opened up infinite possibilities for our lives. However, the increasing number of machines can make our lives more complicated. Users need to constantly learn how to use different machine interfaces, which can be time-consuming and frustrating. Therefore, incorporating unconscious concepts in interface design can greatly enhance the human-computer interaction experience [1]. In addition, the combination of unconscious concepts and human-computer interaction is also conducive to the development of the field of interaction design in the future. According to psychologist Donald Norman, one of the reasons why the human-computer interaction experience is not smooth is the designer's lack of "understanding of people", our design can not be overly "logical", but should follow the way of life and behavior of people [2]. During the operation of a system, users may not have a complete understanding of the information architecture behind it [3]. Sometimes, users may perform actions that are unexpected or not considered by developers. These actions are often crucial for designing a system that is user-friendly and intuitive, as they reflect the unconscious behavior of users during operation. Therefore, when designing and developing a system, it is important to consider not only the technical aspects but also the needs and behavior of the users. Blacker et al. designed experiments to investigate whether unconscious interactions are related to users' past experiences to explore the efficiency of past experiences with relevant product features for users to utilize these effects in the future [4]. A successful design, especially human-computer interaction design, usually involves the knowledge of different fields, and exploring the interwoven connections between different fields is conducive to helping users get a more smooth and natural operating experience. During experiments on interaction design of products and interfaces, researchers have found that people's prior knowledge has an important impact on unconscious phenomena [1]. Intuitive use of user interfaces (IUUI) research group in Germany studied the source of prior knowledge in the unconscious. It proposed a continuum model of unconscious interactive knowledge involving four different levels of professional knowledge (innate, sensorimotor, cultural, and field-specific) [5]. Therefore, this paper starts with the unconscious phenomenon of users, studies the "hidden needs" of users when browsing the web interface, and explores the impact of the

unconscious phenomenon of users on the design of the web interface combined with the unconscious theory. The hope is to provide designers with more natural and efficient user interface design ideas while countering technological paradoxes.

2. Methods

2.1. Overview of Unconscious Behavior

Unconscious behavior is generally considered to be a series of "subconscious" instinctive actions made without conscious analysis or judgment, also known as intuitive behavior. Freud proposed the division of the human spirit into conscious, subconscious, and unconscious during his psychoanalysis in the 20th century. Our daily actions are heavily influenced by intuition, which is often unconscious, and deliberation. However, intuition, or unconscious dominance, typically plays a larger role than people realize. Donald Norman has categorized the process of human brain information processing into three levels: instinct, behavior, and reflection [2]. The first two levels involve unconscious behavior, where the action trigger is usually rapid and skilled. On the other hand, the reflective level corresponds to conscious behavior that requires reasoning and decision-making, which is relatively slow and controlled. As shown in Fig.1, interaction design is different from the traditional "creation" design. It is more inclined to the design of user experience, which is to "create" behavior " [3]. The relevant design principles in interface design, such as Fitts' law, Schick's law, Miller's Law, etc., summarize the unconscious phenomena of users when browsing the interface. Designing interface interactions based on users' unconscious behavior aims to create a more natural and intuitive user experience by addressing users' potential "hidden needs".

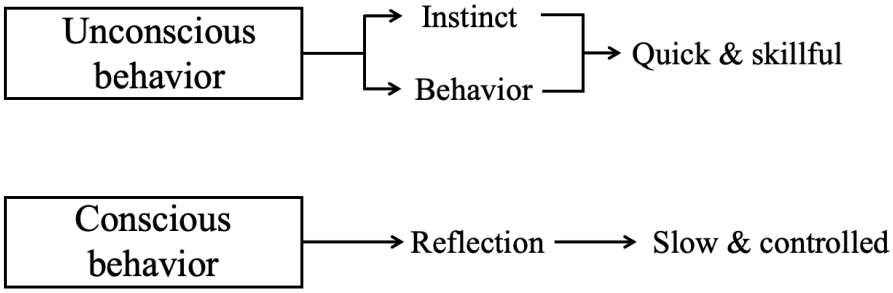


Fig. 1. Characteristics of unconscious behavior and conscious behavior
(Photo/Picture credit: Original)

2.2. Research Objects

The concept of unconscious interaction design is to uncover the needs of users in human-machine interface interaction. By tailoring information input to align with human factors engineering cognition, this approach aims to enhance website usability and readability [6]. By reducing the cognitive load of users and streamlining interaction, the goal is to improve the overall user experience. Donald Norman proposed a design method called action-centered design, which emphasizes the importance of understanding the user's situation and behavior before designing [2]. However, he did not explicitly mention that the designer should also consider the purpose of the user's behavior. This is a crucial aspect to consider in unconscious design, as the user's unconscious behavior may be difficult to detect but can be traced back to its root cause. In everyday life, users may unintentionally interact with products, and designers need to be aware of these interactions to ensure that the user's goals are met. In the website design, it can affect the design of the three modules of web page style, layout, and interaction from the user's visual sense, cognitive decision, and operation behavior. Based on Fig.2, designers can improve the integration of information input and interface functions by analyzing the influence of users' unconscious on the three levels of interface design. This can lead to a more

effective design process, shortening the learning time for users and improving their efficiency when interacting with a new interface system. By comprehensively applying these principles, designers can design interface elements that cater to both information visualization and emotional interaction touch points, and integrate them into a system to enhance the overall user experience of a website. This, in turn, can increase user retention rate and improve follow-up promotion efforts.

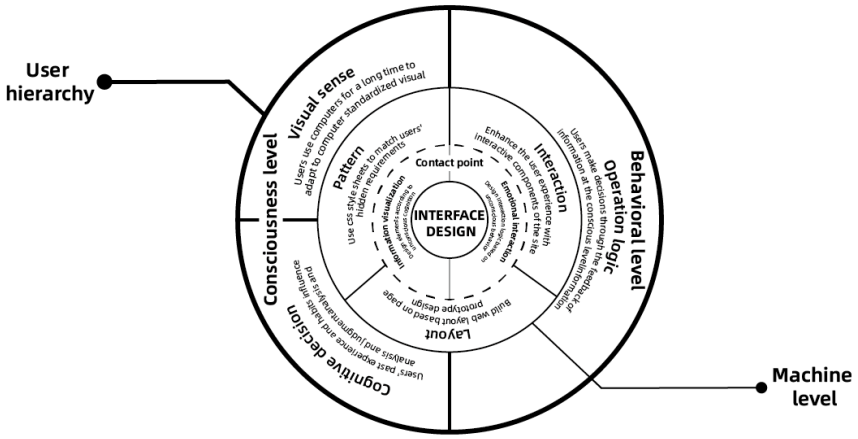


Fig. 2. Unconscious user influence on interface design
(Photo/Picture credit: Original)

2.3. Experimental Environment

The technologies used for front-end web development in this project are HTML5, which employs a variety of markup symbols to create the structure of the web page, CSS3, which incorporates multiple cascading style sheets to achieve different page styles, and JavaScript, which enhances the interactivity of web pages through web browsers. To summarize, the technology used for web front-end development is relatively easy to learn. With minimal effort, one can achieve an overall website style and interactive behavior that's user-friendly and intuitive. This simplicity makes it easier to demonstrate the impact of users' unconscious behavior on web design in practice.

2.4. Design of Unconscious human-machine interface conceptual model

When it comes to designing websites, it can be challenging for users to articulate their behavioral goals. Therefore, designers need to analyze the "hidden needs" of users and understand their behavioral patterns [7]. This knowledge can be used to create a conceptual model of interface interaction design that features low input and high feedback. Achieving this requires the use of web front-end development technology. In the context of human-computer interaction, the user initiates communication with the machine using a "conversation". The user tends to develop certain habitual patterns and operational logic based on their previous computer usage [8]. These unconscious principles can be utilized in interface design to create a "mapping" symbol that guides user behavior. This symbol corresponds to the style and layout of the web page, and the design process can be broken down into two steps. Finally, it is necessary to provide immediate "feedback" information to the user after the corresponding "mapping" of the user's unconscious behavior operation, which is conducive to matching the user's instinctive "hidden needs". This step corresponds to the layout and interactive components of the web page. Fig.3 illustrates how creating a conceptual model for human-machine interface interaction design can provide theoretical support for front-end website development.

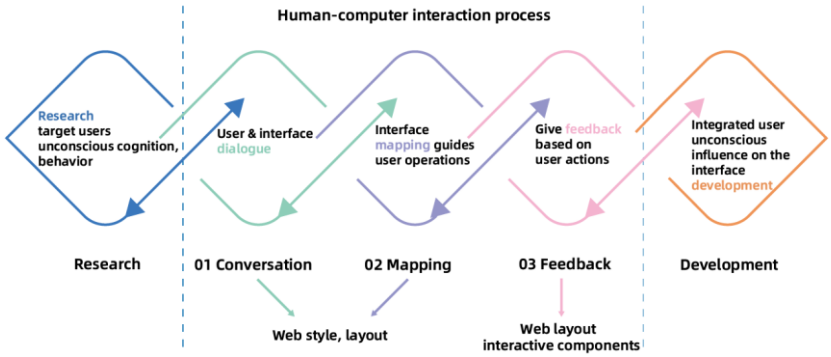


Fig. 3. Conceptual model of unconscious human-machine interface design
(Photo/Picture credit: Original)

3. Result

For the website development of this project, the front-end design should follow the unconscious human-machine interface design model. This model suggests that the web page style, layout, and interaction components are the main user-interface design parts. By focusing on the touch points of information visualization and emotional interaction, an intuitive interface can be created that enhances user readability and efficiency.

3.1. Analysis of Effect Drawing

3.1.1 Establish an easily recognizable visual style.

Simplify. When designing an interface, it is important to simplify the visual elements as much as possible. The human brain automatically processes and simplifies information when browsing the interface, but too much information can cause cognitive overload for users. Therefore, the colors, buttons, logos, and other design elements should be simple and consistent, which will help improve the cognitive efficiency of users.

The principle of proximity. When designing the layout of interface elements, the spacing between different elements can impact the user's ability to distinguish between different modules. Additionally, the relative distance between objects can affect our perception of whether they are related or not. For instance, in Fig.4, the legend and text in the website information introduction page, when compared to other content information, the icons and text that are closer to each other appear to belong to a group.

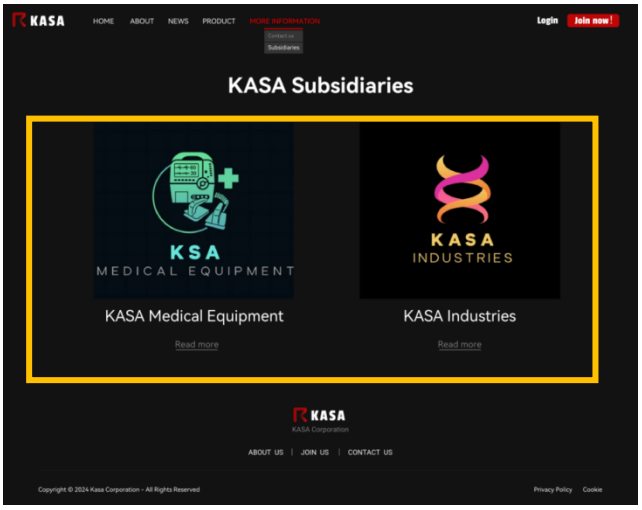


Fig. 4. Website information page
(Photo/Picture credit: Original)

The principle of graphics. Compared to text, graphics, and icons, interfaces are better at stimulating the visual senses for recognition. They allow users to quickly receive information and react accordingly. According to Fitts' Law, the user's focus of attention and the size of the target are positively correlated with the efficiency of mouse movement. Therefore, incorporating more graphics and icons can improve the efficiency of interface information transmission, leading to better readability of the interface. For example, the landing page on the left of Fig.5 and the button icon on the registration page on the right of Fig.5 can efficiently convey information and guide the user to action.

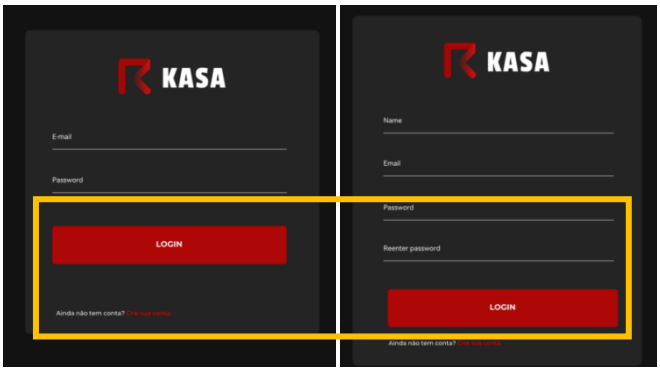


Fig. 5. Login and registration page
(Photo/Picture credit: Original)

Establish an information hierarchy that matches users' cognitive habits. The unconscious behavior and cognition of users are affected by the accumulation of experience [9], so designers should fit the cognitive habits of users in the design of interface layouts. According to the research on unconscious learning, changing the user's external cognition will increase the user's cognitive load [10], so the interface layout should follow the standardized module layout of computer browsers and the logical framework familiar to users as much as possible. The homepage navigation bar layout shown in Fig.6 follows the natural reading pattern of the human eye, from left to right. According to research conducted by the Nielsen Norman Group, website users are more likely to recall the logo placed in the upper left corner of the page.

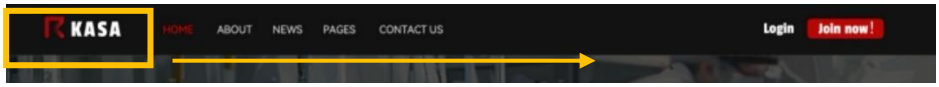


Fig. 6. Main navigation bar layout
(Photo/Picture credit: Original)

Establish a predictive feedback mechanism. In the design of web user experience, one of the most important points is "not to waste the patience of users". Based on the research on unconscious learning, users may experience cognitive overload and tend to get lost while browsing the web [11]. When navigating through an application with multiple levels, users may subconsciously look for a way to return to the upper or main level. In such cases, anticipating the user's behavior and giving immediate feedback can boost the user's trust in the application. In Fig.7, the path entry is displayed on the details page, while Fig.8 prompts the user to register with an information entry action.



Fig. 7. Path entry returned in the details page
(Photo/Picture credit: Original)

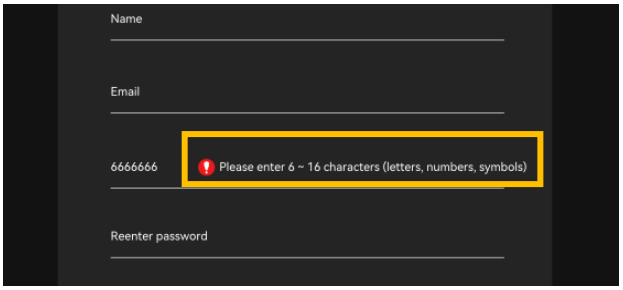


Fig. 8. Registration page information input operation prompts
(Photo/Picture credit: Original)

4. Conclusion

Taking the web interface as an example, this paper explores the impact of users' unconscious ideas on natural human-computer interaction. It also integrates these ideas into the design process to improve user experience and efficiency. In interface design, the readability and usability of the interface depend on the integration of the user's behavior, cognitive habits, and abilities. Studying the unconscious theory in human factor engineering and psychology can help us understand the common physiological and psychological characteristics of users while they browse interfaces. This understanding can then be used to design interfaces that improve the human-computer interaction system and enhance the user experience and efficiency. The application of the unconscious concept in the web interface is also conducive to improving the readability and learnability of human-computer interaction in the interface and can bring users a more natural and smooth interactive experience. This paper delves into the "hidden needs" of users that are impacted by unconscious ideas when interacting with web interfaces. It proposes a conceptual model of human-machine interface design that accounts for these unconscious influences, helping designers create more natural interaction schemes that align with users' needs and habits. This can offer valuable guidance for improving user experience in web interface design. The design process involves identifying problems, comprehending contradictions, and finding solutions. Additionally, exploring unconscious phenomena in interface design can facilitate the study of human unconscious behavior at a psychological level. This has immense potential for the study of unconscious behavior in both human-computer interaction and psychology. Currently, there is a shortage of evaluation techniques and well-established theoretical guidelines for designing interactions that occur unconsciously. However, it is expected that future research in this area, in combination with various disciplines, will result in more sophisticated evaluation methods and guidance. This progress will occur alongside the advancement of science and technology.

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