

# Application and Influence of Conditioned Reflex Theory in Interactive Device

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**Abstract.** This paper discusses the application and influence of conditioned reflex theory in interactive devices from the perspective of cognitive psychology. The focus of this paper is to analyze the role of conditioning theory in interactive devices and its impact on user behavior and experience. Through reviewing previous research, this paper found that conditioning theory can explain users' reactions to associations between stimuli and responses and have an impact on their behavior. At the beginning of this review, the concrete application of the existing reflection theory to the interactive device is introduced. Then this review takes into account the current situation of the rise of the Internet and discusses the application of conditioning in social network design and the influence of current conditioning theory on user behavior and decision making. By utilizing reflective behavior, interactive devices can help users make more informed decisions by providing immediate feedback and directing their attention. This application can be achieved by designing the interface, providing visual data, setting reminders and alerts, etc. Specific impacts include increased user self-awareness, greater transparency in decision-making, reduced decision-making bias, and more conscious choice. To further expand understanding in this field, future research could employ more diverse approaches, focus on specific groups, delve deeper into behavioral motivation and goal setting, and strengthen interdisciplinary collaboration with other disciplines. This review can provide meaningful guidance for the design and improvement of interactive devices to provide better user experience and meet user needs.

**Keywords:** Conditioning theory, cognitive psychology, interactive devices, user experience.

## 1. Introduction

The rapid development and wide application of social networks have changed people's social ways and behaviors. People increasingly rely on interactive devices such as smart computers, ATMs and so on. Social interaction and information acquisition. This dependence and frequency of use provides psychologists with an opportunity to study the application and influence of conditioning theory in interactive devices.

The review question of this paper involves how the theory of conditioning is applied to the study of user experience and user behavior in interactive devices, and the influence of conditioned reflex theory on the design and improvement of interactive devices.

Conditioning theory is a cognitive psychology theory that argues that human behavior is an automatic response to environmental stimuli. In terms of the application and influence of interactive devices, the theory of conditioning can help us understand the user's usage habits and behavior patterns of interactive devices. By studying the application and influence of conditioning theory in interactive devices, people can better design and improve interactive devices and provide better user experience.

This review will summarize the development of reflection theory and the specific application of existing reflection theory on interactive devices. The theme of this review will take into account the current status of the rise of the Internet and the application of conditional reflection in social network design and consider the impact of current conditional reflection theory on user behavior and decision-making. Finally, the article will summarize the views, review the limitations of previous studies and look forward to the future.

## **2. Literature Review on Reflection Theory and Application of Interactive Devices**

### **2.1. An Overview of Conditioned Reflex Theory**

The concept of conditioning was initially introduced by Ivan Pavlov, a Russian physiologist. Pavlov conducted experiments on dogs and discovered a novel type of learning known as conditioned reflex [1]. One of Pavlov's most renowned experiments involved studying the digestive system of dogs [1]. He observed that dogs naturally salivated when they saw food, which is an unconditioned response that occurs instinctively without any prior learning. However, Pavlov noticed that when he repeatedly paired the sound of a bell with the presentation of food, the dogs began to associate the bell with food [1]. As a result, even when the food was no longer presented, the sound of the bell alone triggered salivation in the dogs. This salivation response, in the absence of food, is known as a conditioned response, as it is acquired through the association with the bell. Pavlov formulated the concept of conditioned reflexes based on these experimental findings [1]. According to his theory, through the repeated pairing of stimuli and responses, unconditioned stimuli can elicit unconditioned responses, while conditioned stimuli can elicit conditioned responses [1]. This learning process is referred to as conditioning [1].

Building upon Pavlov's findings, Watson expanded the theory of conditioning to encompass human behavior and proposed the influential theory of behaviorism [2]. Watson argued that all behavior is acquired through learning rather than being innate, and he advocated for psychology to be grounded in observation and experimentation, focusing solely on observable and measurable behavior rather than delving into the internal mental processes of individuals. The theory of conditioned reflexes, originally formulated by Pavlov, had a profound impact on the subsequent development of behaviorism and sparked considerable theoretical debates within the field of psychology. As behaviorist psychology evolved, the theory of conditioning garnered extensive attention and application. Scholars such as Watson and Pavlov applied the principles of conditioning to the study of both animal and human behavior, emphasizing the pivotal role of external environmental stimuli in shaping behavior.

Tolman made significant contributions to the field of animal behavior by developing the theory of operant conditioning. According to Tolman, animals learn through trial and error, associating specific actions with specific outcomes [3]. However, his work in the mid-20th century went beyond the behaviorist perspective by introducing the concept of cognitive maps [4]. Tolman believed that animals acquire behavior not solely through simple associations between stimuli and responses, but through cognitive processes and internal representations of their environment [4]. His experimental research focused on behavioral learning in mice, utilizing maze experiments and careful observation of mouse behavior to propose the theory that animals construct cognitive maps and navigate based on these mental representations [4].

Further advancements in the theory of conditioned reflex were made by Liddell developed the theory of conditioned reflex and proposed a comprehensive view of conditioned reflex and behavior theory [5]. Liddell argued that conditioned reflex serves as the foundation for animal and human behavior, with behavior being controlled and adjusted through the formation and modification of conditioned reflexes [5].

Rescorla and Solomon conducted additional research on the theory of conditioning and introduced the concept of the development and regulation of conditioning [6]. They proposed that conditioning is not solely under the control of a single stimulus, but is also influenced by environmental factors and individual differences [6]. Sotres-Bayon and LeDoux proposed that Pavlovian fear conditioning is an important form of emotion regulation that is directly relevant to the treatment of fear and anxiety disorders in humans [7].

Overall, the collective contributions of these scholars have significantly enhanced the understanding of conditioning and its intricate relationship with behavior, cognition, and neural processes. It is important to acknowledge that the theory of conditioning has not been without its

challenges and has been complemented by other theories in the field of psychology, such as cognitive psychology and social learning theory. These relative theories have contributed to the enrichment and refinement of the overall understanding of conditioned reflexes through their own development and research.

## 2.2. Application of Conditioning Theory in Interactive Devices

In recent years, the application of interactive devices has seen the utilization of conditioning theory to design and optimize user experiences. By establishing associations between stimuli and responses, the behavior and emotional responses of users can be influenced. For instance, providing positive feedback for a specific action or event (conditional stimulus) can enhance the user's preference for and reuse of that action (conditional response). This plays a significant role in areas such as user interface design, game design, and virtual reality.

Conditioning theory can also help address issues that may arise when using a role description system to interact with external agents in use case modeling. Understanding the user's conditioning mechanism enables designers to guide user behavior and decisions through positive feedback and reward mechanisms, thus improving user engagement and learning outcomes. Additionally, utilizing the "role" or "user role" to describe the relationship between the user and the system provides a clearer understanding of the user's needs and expectations. This, in turn, helps designers create interface designs that are more responsive to the user's requirements. By combining conditioning theory with the use of the term "role" or "user role," designers can effectively comprehend user behavior and needs, ultimately enhancing the user experience and functionality of interactive devices [8].

Furthermore, conditioned reflex theory can be applied to facilitate user learning and skill development [9]. By associating specific stimuli with the appropriate actions or knowledge, users can be assisted in quickly acquiring and mastering new skills. For example, in educational applications, conditioning theory can be used to design interactive learning activities that strengthen students' motivation and memory through positive feedback on correct answers.

The criteria for store selection decisions influenced by store environmental cues suggest that human behavior is influenced by environmental stimuli, which in turn shape behavior through perception and interpretation [10].

Applying the conditional theory to the iDREAMS project, it aims to evaluate game design as an effective tool for attracting K-12 students to learn computer science and computational thinking [11]. The project's objective is to achieve functional design by creating a course that integrates increasingly complex game design, computational thinking patterns, and creative tools. The project is implemented in various settings, including urban schools, remote rural areas, and Native American communities. To ensure the course's effectiveness, the project has developed a list of requirements for computational thinking tools and tested them with thousands of students. Additionally, middle school teachers and community college students have participated in the project, with teachers receiving training and implementing the Frogger unit in the classroom, while community college students serve as classroom support liaisons. By combining game design with educational content, the iDREAMS project aims to create effective and scalable courses for public schools. In terms of enhancing the project, the following aspects can be considered.

Utilizing game design as a tool can arouse interest and motivation in K-12 students, engaging them in computer science and computational thinking. By utilizing game design as a tool to engage K-12 students in computer science and computational thinking, the project can provide a fun and stimulating learning environment that captures students' interest and motivation. Game design provides appropriate challenges that encourage K-12 students to apply computational thinking and problem-solving skills.

Providing feedback and rewards in game design fosters a supportive learning environment for K-12 students, encouraging their progress and engagement in computational thinking and computer science. The game design provides timely feedback and rewards that can help students assess their

progress and increase their motivation to learn. This feedback and reward can come from the game system itself, or it can come from teacher and classmate evaluation and recognition.

The iDREAMS project recognizes and accommodates individual differences in students' learning styles, abilities, and needs. The curriculum and teaching strategies are designed to be adaptable and flexible, allowing for personalized approaches to support each student's learning journey in computer science and computational thinking. According to the individual differences and learning needs of students, teachers can adjust the curriculum according to the feedback and observation of students to ensure that each student can obtain an effective learning experience.

The iDREAMS project takes into consideration the environmental impact by conducting its activities in various settings, including urban schools, remote rural areas, and Indigenous communities in the Americas. Given the diverse Settings of the iDREAMS program [11], including inner-city schools, remote rural areas, and Native American communities, teachers and curriculum designers need to adapt to different environmental factors to ensure the effectiveness of the curriculum in a variety of Settings.

By combining the conditional theory and the design and implementation of iDREAMS project, students' behavior and learning needs can be better understood, and an interesting and stimulating learning environment can be provided for them, and adaptive adjustments can be made according to individual differences and environmental needs, so as to improve students' learning results.

The application of conditioning theory to interactive devices can influence user behavior and emotional responses by establishing associations between stimuli and responses, optimize user experience, and promote user learning and skill development.

### **3. Application of Conditioned Reflex Theory to Interactive Devices in Contemporary**

#### **3.1. The Application of Conditioning Theory in Recommendation Algorithms**

Applying conditioning theory in recommendation algorithms is by utilizing recommendations based on user behavior. According to conditioned reflex theory, behavior is formed through association with stimuli. In recommendation algorithms, the user's behavioral data (such as clicks, purchases, ratings, etc.) can be utilized to establish the association between user behavior and stimuli. By analyzing the user's behavioral history [12], the recommendation algorithm can predict the user's interests and preferences, enabling the recommendation of relevant content.

Another application of conditioning theory in recommendation algorithms is through social relationship-based recommendations. Social relationships have a significant impact on an individual's behavior. In recommendation algorithms, the conditioning theory can be applied to analyze the social relationship between users. By examining the user's social network, the recommendation algorithm can suggest content from the user's friends, family, or common interest groups. Such recommendations can enhance user engagement and interaction, ultimately improving the accuracy of the recommendation system.

Recommendations based on operant conditioning is another approach used in recommendation algorithms. Operant conditioning, as described in conditioned reflex theory, can be employed to design stimulus mechanisms in recommender systems. By providing users with rewards or punishments, recommendation algorithms can guide users towards specific behaviors. For instance, rewards such as points, coupons, or discounts can be offered based on a user's behavior, encouraging users to utilize the platform more frequently or make relevant purchases.

Recommendations based on conditioned stimuli involve using previously established associations between stimuli and responses to make personalized recommendations. This approach utilizes patterns and preferences in user behavior to suggest relevant items or content, leveraging the conditioned stimulus of the user's past behavior and preferences. According to conditioned reflex theory, the association between stimuli and behavior can be established through conditioned stimuli. In recommendation algorithms, specific stimuli can be designed to influence the user's behavior based

on their preferences and previous actions. For example, after a user purchases a particular item, the recommendation algorithm can suggest other related items, prompting the user to engage in cross-purchasing.

In summary, the application of conditioned reflex theory in recommendation algorithms mainly includes recommendation based on user behavior and social relationship, recommendation based on operational conditioning, and recommendation based on conditioned stimulus. These applications can improve the accuracy of recommendation algorithms and user satisfaction, thereby increasing the activity and revenue of the platform.

### **3.2. The Specific Application of Reflex Theory in Consumption Behavior**

Behavior formation and learning through association are explained by conditioning theory. According to this theory, when users continuously receive and associate with a particular stimulus, they gradually learn and remember the association. This learning and memory process can influence a user's cognition, giving them a cognitive preference for a particular stimulus and making it easier for them to respond to similar stimuli.

The theory of conditioning holds that there is a conditioned association between stimuli and emotions. When a user has a positive emotion for a stimulus, that emotion can act on other related stimuli through conditional associations. In the recommendation algorithm, if the system can give positive stimuli according to the user's preferences and feedback, the user's emotional enthusiasm and satisfaction with the recommended content can be increased. Conversely, if a user has negative feelings about a stimulus, that emotion may also act on other related stimuli through conditioned associations.

Conditioned reflex theory states that decisions are made through associations with stimuli. In recommendation algorithms, users make decisions based on previous associations with stimuli when faced with multiple options. If users have previously had a positive association with a stimulus, they are more likely to choose the option associated with it. This conditional association can influence the user's decision-making process and have an impact on their behavior.

Conditioning theory suggests that giving positive feedback strengthens the association between a stimulus and behavior. In the recommendation algorithm, if the system can give positive feedback based on the user's behavior and feedback, such as giving rewards or recognition, it can increase the user's satisfaction with the recommendation results and encourage them to use the platform more frequently or engage in related behaviors.

The theory of conditioning can influence users' cognition, emotions, decision-making processes, and feedback in recommendation algorithms. It impacts a user's learning and memory processes, as well as their emotional and mental states. These effects can be applied in recommendation algorithms to improve user satisfaction and engagement. To sum up, the theory of conditioning can be effectively used in recommendation algorithms to enhance the user experience.

### **3.3. Influence of Conditioned Reflex Theory on User Behavior and Decision Making**

In addition to its application to consumer behavior, conditioning theory also has an impact on user decisions and habits, such as in the use of bank ATMs. According to this theory, users form a conditioned reflex to the operation and feedback of ATM machines, so that users can make decisions and perform corresponding operations faster when using ATMs. Users' habits are also shaped by specific actions and feedback on ATMs, making them more convenient and skilled in daily banking [13]. Therefore, the application of conditioning theory in user decision-making and user habits is of great significance to improve the efficiency and user experience of banking services [13].

Combining with the principle of conditioned reflex theory, the design of bank withdrawal interface can help users form habitual operational responses and improve operational efficiency and satisfaction.

When the user clicks the withdrawal button, the interface should display the effect of the button press, such as a color change or an animation of the button. This visual feedback helps the user establish a conditioned connection between the action and the outcome.

To improve user experience in the bank withdrawal interface, it is essential to maintain consistency in the layout and operation. This includes placing the withdrawal button in a specific location, such as the lower right corner, and ensuring its consistent position across different interfaces. By doing so, users can develop a conditioned reflex and easily locate and click the withdrawal button with speed and accuracy. In the bank withdrawal interface, the design should maintain a consistent layout and mode of operation. For example, place the withdrawal button in the lower right corner of the interface and keep it in the same position across different interfaces. In this way, the user will form a conditioned reflex after repeated use and can quickly and accurately find and click the withdrawal button.

To enhance user experience, it is crucial to simplify and minimize cognitive load in the design of the bank withdrawal interface. This can be achieved by displaying only essential options and information, avoiding excessive choices and lengthy instructions. By enabling users to form simple conditioned reflexes, their operational efficiency and satisfaction can be significantly improved.

Providing guidance and prompts in the bank's withdrawal interface helps users form a conditioned reflex, such as displaying a confirmation dialog box after entering the withdrawal amount to prompt users to verify the correctness of the amount and develop a habit of double-checking.

The bank's withdrawal interface should also be customizable and adaptive to cater to individual user preferences and needs. The design of bank withdrawal interface should consider the user's personalized and adaptive needs. For example, according to the user's preferences, different withdrawal methods, such as buttons or touch screens can be provided to meet the operating habits and preferences of different users.

#### **4. Limitations and Future Direction**

At present, there are not many research papers on the reflection theory in the interactive device in the existing articles. The current research mainly focuses on the laboratory environment, and lacks empirical research on the application of interactive devices in the real world. It is hoped that future research can focus more on practical application scenarios, such as virtual reality devices, to verify the applicability of the theory of conditional reflection in practical situations.

The application of conditional reflection theory in existing research mainly focuses on the automation and prediction of user behavior, and lacks in-depth research on user subjective experience and emotional response [14]. The future of marketing: artificial intelligence, virtual reality, and neuromarketing [14]. Future research can explore the relationship between conditioned reflex theory and user emotion and subjective experience, for example, through emotion recognition technology and user feedback data to deeply understand the user's emotion and experience in interactive devices.

At the same time, the application of conditional reflex theory in existing research mainly focuses on simple stimulus-response relationships, and lacks the study of conditional reflex in complex interaction processes [15]. Future research can explore the application of the theory of conditional reflection in complex interaction processes, such as the mechanism of conditional reflection in the context of multi-step operation and multi-modal input.

From the perspective of social level, most of the existing research focuses on the study of conditional reflex at the individual level, and lacks the study of conditional reflex at the level of social factors and group. It is hoped that future research can further promote the combination of cognitive psychology, interactive devices and reflection theory, so as to achieve a more intelligent, personalized and efficient interactive experience. Through in-depth understanding of the user's cognitive and emotional processes, it can better meet the needs of users and promote the innovation and development of interactive devices.

## 5. Conclusion

By applying reflection theory to interactive devices, the study found that users can make more informed decisions through instant feedback and guiding users' attention. This application can be achieved by designing the interface, providing visual data, setting reminders and warnings, thereby enhancing the user's self-awareness, improving the transparency of decision-making, reducing decision-making bias and promoting more conscious choices. This paper fills the gap in the academic circle and is of great significance to the decision-making rationality of readers and consumers. However, further research is still needed to explore the application effects of reflection theory in different fields and situations, and continue to improve the design of interactive devices to improve user experience and decision-making quality.

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