ISSN: 2424-8460(O)
2251-2608(P)

Original Research Article

Research on the Influence of Robot Operation Interface Design on User Experience

Zheyuan Xu

INSPYR Solutions 94087

Abstract: With the continuous development of technology, robots are increasingly widely used in various fields. As a key link in the interaction between users and robots, the design quality of the robot operation interface directly affects the user experience. This paper analyzes the elements of robot operation interface design, discusses the impact of different design factors on user experience, and proposes strategies to optimize robot operation interface design to improve user experience.

Keywords: Robot; Operation interface design; User experience

1. Introduction

In today's era of rapid technological development, robots have gradually entered people's lives and work. From automated robots in industrial production to home service robots, and then to professional robots in fields such as healthcare and education, their application scope is continuously expanding. The robot operation interface, as a bridge for users to interact with robots, its rationality and degree of humanization in design directly relate to the user's acceptance and usage experience of robots. A good robot operation interface design can improve user operation efficiency, reduce operation difficulty, and enhance user satisfaction and loyalty. Therefore, researching the impact of robot operation interface design on user experience has important practical significance.

2. Elements of Robot Operation Interface Design

2.1. Interface layout

Interface layout is an important part of robot operation interface design. A reasonable interface layout can make information presentation clearer and more orderly, facilitating users to quickly find the required operation options. When designing the interface layout, the following aspects should be considered[1]:

Clear functional zoning: Divide different functional modules into zones, such as control zone, display zone, setting zone, etc., so that users can quickly locate the required functions.

Simple operation process: Layout according to the user's operation habits and logical sequence to make the operation process more concise and smooth.

Distinct visual hierarchy: Through reasonable design elements such as color, size, and shape, make important information more prominent and secondary information does not interfere with the user's attention.

2.2. Interaction method

Interaction method is the way users communicate with robots. Different interaction methods will bring different experiences to users. Currently, the following common robot interaction methods are available[2]:

Touch screen interaction: Operate by touching the screen, which is intuitive and convenient and suitable for most users.

Voice interaction: Operate by voice commands, without manual operation, which is more convenient and efficient.

Gesture interaction: Operate by gesture recognition, which has natural and intuitive characteristics.

2.3. Feedback mechanism

The feedback mechanism is an indispensable part of robot operation interface design. Timely and accurate feedback can let users understand the state and operation results of the robot, enhancing the user's sense of trust and security. The feedback mechanism can include the following forms:

Visual feedback: Provide visual feedback to users through screen display, indicator lights, etc.

Auditory feedback: Provide auditory feedback to users through sound prompts, voice feedback, etc.

Tactile feedback: Provide tactile feedback to users through vibration, pressure, etc.

2.4. Color and graphic design

Color and graphic design can affect users' emotions and cognition. In robot operation interface design, appropriate colors and graphics should be selected to create a comfortable and friendly user experience.

Color selection: Select colors that meet users' psychological needs and usage scenarios. For example, bright colors can bring vitality and pleasure, while soft colors can bring comfort and relaxation.

Graphic design: Adopt simple and intuitive graphic design, avoiding overly complex patterns and decorations to improve the readability and recognizability of information.

3. The Impact of Robot Operation Interface Design on User Experience

3.1. Operation efficiency

A well-designed robot operation interface can improve user operation efficiency. Reasonable interface layout, simple operation process, and convenient interaction methods can enable users to complete operation tasks quickly, reducing operation time and error rate. For example, by combining touch screen interaction and voice interaction, users can easily operate robots even when their hands are busy; through reasonable functional zoning and shortcut key settings, users can quickly find the required functions and improve operation efficiency[3].

3.2. Learnability

For ordinary users, the learnability of the robot operation interface is one of the important factors affecting user experience. An operation interface that is easy to learn and understand can reduce the user's learning cost and increase the user's willingness to use. When designing the robot operation interface, a intuitive and simple design style should be adopted as much as possible, and overly professional terms and complex operation processes should be avoided. At the same time, detailed operation guides and tutorials can be provided to help users quickly master the operation methods of robots.

3.3. Usability

Usability refers to the convenience and comfort degree of users when using the robot operation interface. An easy-to-use operation interface should have the following characteristics:

Simple operation: The operation process is simple and clear, without complex operation steps and professional knowledge.

Timely feedback: Be able to provide feedback information to users in a timely manner, so that users can understand the state and operation results of the robot.

High fault tolerance: Be able to tolerate users' wrong operations and provide corresponding error prompts and correction methods.

3.4. Satisfaction

User satisfaction with the robot operation interface directly affects the user's overall evaluation of the robot. A well-designed operation interface can bring users a pleasant usage experience and improve user satisfaction. When designing the robot operation interface, attention should be paid to users' emotional needs, adopt a humanized design concept, and create a comfortable and friendly user experience. For example, some personalized settings and decorations can be added to let users feel the uniqueness and personalized service of the robot.

4. Strategies to Optimize Robot Operation Interface Design to Improve User Experience

4.1. User-centered design concept

When designing the robot operation interface, we should always adhere to the user-centered design concept and fully consider the user's needs, expectations, and usage habits. User research and user testing can be used to understand the user's real needs and feedback opinions and continuously optimize the operation interface design.

4.2 Simple and clear interface design

Keep the interface layout simple and clear, avoiding excessive information and complex operation processes. Use intuitive icons and text descriptions so that users can quickly understand and operate. At the same time, pay attention to the combination of colors and graphics to create a comfortable and friendly visual effect.

4.3. Diversified interaction methods

Provide multiple interaction methods to meet the needs and usage habits of different users. For example, multiple methods such as touch screen interaction, voice interaction, and gesture interaction can be supported simultaneously, so that users can choose the appropriate interaction method according to their own preferences and actual situations.

4.4. Timely and accurate feedback mechanism

Establish a perfect feedback mechanism and provide feedback information to users in a timely manner. Whether the operation is successful or not, users should clearly understand the state and operation results of the robot. At the same time, different feedback methods such as visual feedback, auditory feedback, and tactile feedback can be used to enhance the user's experience.

4.5. Personalized user experience

According to the user's needs and preferences, provide personalized operation interfaces and services. For

example, users can customize the interface layout, color theme, shortcuts, etc. to meet their personalized needs. At the same time, by learning the user's operation habits and preferences, more intelligent services can be provided for users.

5. Conclusion

Robot operation interface design is one of the key factors affecting user experience. A good operation interface design can improve user operation efficiency, reduce operation difficulty, and enhance user satisfaction and loyalty. When designing the robot operation interface, we should fully consider the user's needs, expectations, and usage habits, adopt a user-centered design concept, and pay attention to the optimization of aspects such as interface layout, interaction method, feedback mechanism, color and graphic design, to provide users with a simple, clear, convenient, efficient, comfortable, and friendly user experience. With the continuous progress of technology and the continuous change of user needs, robot operation interface design will also continue to innovate and develop, bringing users more high-quality services and experiences.

About the Author

Zheyuan Xu(1996–)Male, Han, Jiangsu, Senior Software Engineer, Research Interests: Robotics, Autonomous Driving, Reinforcement Learning

References

[1] Human Machine Interface Design for a 3 DoF Robot Manipulator [J]. Universal Journal of Mechanical Engineering, 2018, 6 (3):

[2] Marion P ,Fallon M ,Deits R , et al. Director: A User Interface Designed for Robot Operation with Shared Autonomy [J]. Journal of Field Robotics, 2017, 34 (2): 262-280.

[3] Neupert C ,Matich S ,Klug F , et al. Haptic User Interface for a Telerobotic System–Design based on a Network Model [J]. IFAC PapersOnLine, 2015, 48 (20): 201-206.