Design and Evaluation of UI-Free Interaction Using Audio, Visual, and Haptic Feedback in VR Horror Games to Enhance Realism and Fear Experience

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Abstract

This project aims to design and develop a UI-Free Interaction system for a virtual reality (VR) horror game in order to enhance player immersion and emotional experience. The proposed system minimizes the use of on-screen user interfaces by utilizing sensory-based feedback, including audio cues, visual lighting, and haptic vibration, to communicate game information naturally. A prototype horror game was developed and compared with a traditional UI-based version through user testing. The results indicate that the UI-Free Interaction approach improves immersion, increases fear perception, and enhances player engagement, demonstrating its potential as an effective interaction design approach for VR horror games.

Introduction

Virtual Reality (VR) technology enables highly immersive digital experiences by allowing users to interact with virtual environments in a natural and engaging way. In the context of horror games, immersion and emotional intensity play a crucial role in shaping player experience, particularly in evoking fear and tension.

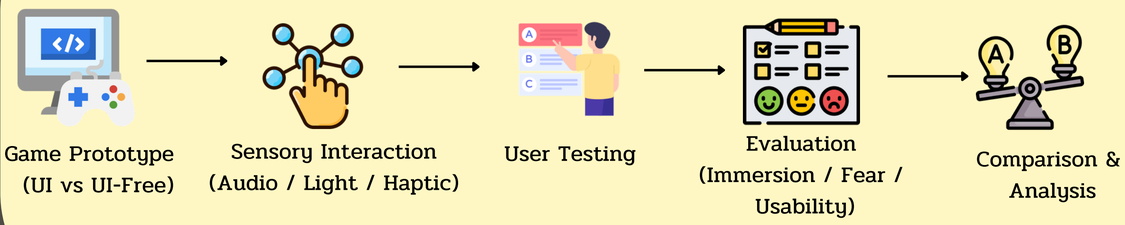
However, traditional on-screen user interfaces (UI), such as icons, text indicators, and status bars, may reduce immersion by distracting players from the virtual environment. These elements can interrupt the sense of presence and remind players that they are interacting with a simulated system rather than experiencing the game world directly.

To address this issue, this project proposes a UI-Free Interaction approach for VR horror games, replacing conventional UI elements with sensory-based feedback, including audio cues, lighting effects, and haptic vibration. This approach aims to enhance immersion, increase emotional engagement, and provide a more natural and seamless interaction experience for players.

Technology

Unity VS code C# Python Pandas

Methodology



A 7-point Likert scale questionnaire was used to evaluate participants' gameplay experience in terms of immersion, fear, and usability after completing both the UI and UI-Free conditions. The collected data were analyzed using descriptive statistics to compare overall trends between the two gameplay modes.

Screenshots





Result

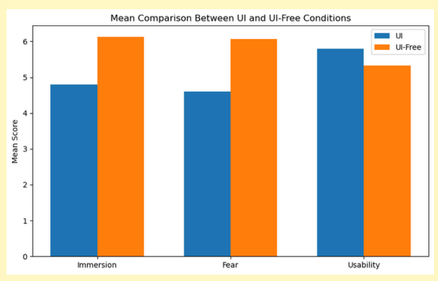


Figure 1: Mean Comparison Between UI and UI-Free Conditions

This figure presents the mean scores of participants under the UI and UI-Free conditions across three dimensions: Immersion, Fear, and Usability. The results indicate that the UI-Free condition achieved higher mean scores in both Immersion and Fear compared to the UI condition. In contrast, the Usability scores of the two conditions were comparable, suggesting that the removal of UI elements did not significantly reduce system usability.

Overall, the combined results from both the mean comparison and paired difference analyses suggest that the UI-Free interaction design enhances emotional engagement, particularly immersion and fear, without substantially compromising usability. These findings support the effectiveness of UI-Free interaction as a design approach for VR horror games.

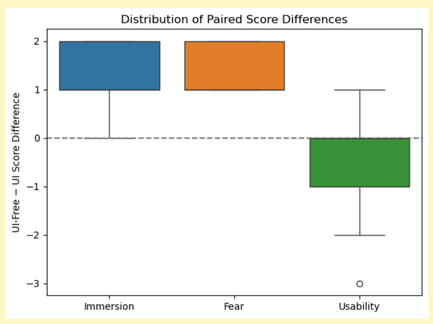


Figure 2: Distribution of Paired Score Differences

Conclusion

This study examined the impact of UI and UI-Free interaction designs on player experience in a virtual reality horror game. The results indicate that the UI-Free condition enhances immersion and fear more effectively than the UI-based design, suggesting that the removal of on-screen interface elements allows for a more natural and emotionally engaging experience. At the same time, usability scores between the two conditions remained comparable, indicating that UI-Free interaction does not negatively affect gameplay control or system understanding. These findings suggest that UI-Free interaction design is a promising approach for enhancing realism and emotional intensity in VR horror games without compromising usability.