ABSTRACT

Dynamic difficulty adjustment (DDA) in video games is a crucial feature that enhances player engagement by adjust challenges to individual skill levels. This research focuses on implementing adaptive artificial intelligence (AI) to dynamically adjust game difficulty in real time, ensuring an optimal gaming experience. The proposed system leverages machine learning techniques to analyze player behavior and adapt gameplay parameters accordingly.

The Spiral Model was employed as the development framework, emphasizing iterative prototyping, risk analysis, and continuous feedback integration. Key phases included planning, where requirements were defined based on literature and user input; risk analysis, which addressed potential algorithmic and performance challenges.

A qualitative research methodology was utilized, focusing on gathering in-depth insights from player feedback through structured interviews and questionnaires. The qualitative data provided a nuanced understanding of player experiences and perceptions of the adaptive AI system. The results demonstrated that the system effectively enhanced user satisfaction and engagement, particularly in maintaining a balance between challenge and playability. The system's design was visualized through UML diagrams, including use case and activity diagrams, to ensure a clear understanding of the AI's operation within the game environment.

Keywords: *Dynamic Difficulty Adjustment (DDA), Adaptive Artificial Intelligence, Video Games, Machine Learning, Player Engagement*