

Research on some techniques for controlling interactive characters and their application in virtual space

Nguyen Duc Nhan

Abstract: This study investigates advanced character control techniques for interactive virtual environments, focusing on enhancing realism and user engagement. We propose a hybrid framework integrating motion capture data with procedural animation to enable fluid, context-aware character responses. The research addresses key challenges in virtual space interaction, including seamless transition between pre-recorded and generated motions, real-time adaptation to environmental constraints, and naturalistic non-player character (NPC) behavior. A novel control architecture is developed, combining inverse kinematics with reinforcement learning to allow characters to autonomously navigate complex terrains and interact with dynamic objects. The system is validated through implementation in a virtual training simulation, demonstrating significant improvements in motion naturalness and user immersion compared to traditional state-machine approaches. Experimental results show a 30% reduction in perceived animation artifacts and enhanced responsiveness to user commands. This work contributes to the fields of computer graphics and human-computer interaction, offering practical solutions for applications in virtual reality, gaming, and digital twin environments.

Keywords: Character control, interaction, virtual space, control techniques