

Study on Computational Intelligence Approaches for Design of Game Strategies

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論 文 内 容 の 要 旨

We propose a framework for automatic game parameter tuning using a fuzzy logic systems (FS) of a game player model and evolutionary computation (EC) that optimizes the FS and adjusts game parameters through simulations.

Controlling the difficulty levels of games is an important process in a game development. It is a crucial process to make the games attractive for a wider range of game players; too difficult games may discourage novice gamers, and too easy games may bore skilled gamers. Since the game difficulty is controlled by game parameters, game parameter tuning has to find the balance among game parameters that match a variety of gaming abilities.

Since a tuning process of game parameters is time-consuming and resource-intensive, especially on a tight schedule in video game production, it requires automated methodologies under the guiding directions of game developers.

Our proposed framework uses two computational intelligence techniques, FS and EC. A fuzzy rule-based game decision system, as a game player model, generates strategic decisions and game commands. Insights from a game developer can be integrated into the FS. We use an EC algorithm to optimize the parameters of the player model to make the model stronger.

In our evaluation of the proposed framework, we focus on game parameter tuning in a turn-based strategy game and implement the framework into a turn-based strategy text game called *Star Trek*.

We use an FS-based player model as a simulated game player to playtest the game at various game parameter settings. To automate the playtesting, we suggest using a coevolutionary algorithm to evolve both player models and game parameters simultaneously. We expect that both the game and game player models mutually evolve each other until reaching the balance. In this environment, player models with ranges of gaming abilities may play a specific set of games equally well. Therefore, we believe that our framework can fine-tune game parameters computationally for a certain game difficulty that is suitable for game players with diverse skills.