Tutorial: Computational Intelligence and Games

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Abstract

In recent years, the field of Computational Intelligence and Games (CIG) has enjoyed rapid progress and a sharp rise in popularity. In this field, algorithms from across the computational intelligence spectrum are tested on benchmarks based on classic board games and video games, and new CI-based solutions are developed for problems in game development and game design.

This tutorial will give an overview of key research challenges and methods of choice in CIG. It will include videos of examples of CI in games, live demonstrations and concrete tips on how to get your own CIG-related research started.

The first part of the tutorial covers learning to play games, which is arguably the core challenge in CIG research. A variety of learning algorithms have been applied to games as diverse as Chess, Go, car racing, Pac-Man and Unreal Tournament. We discuss how evolutionary algorithms and temporal difference learning can be used to learn game strategies and generate NPC behaviours, and give several examples from the literature. A key design choice that strongly affects the performance of the learning algorithm is how to represent the strategies: we introduce and compare several strategy representations, and also discuss emerging techniques for CI-based game playing, such as Monte Carlo tree search.

The second part of the tutorial covers some applications of CIG methods to problems beyond learning. This includes modelling players and their preferences, and using these models and other techniques to automatically generate content for games and to adapt the player experience depending on their inferred preferences.