15.4 Games

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Contents

Games

For AI research, researchers attempt to devise computational systems that would exhibit aspects of human intelligence and achieve human-level problem solving or decision making abilities.

The highly formalized, symbolic representation allowed AI to success in many cases.

Naturally, games, especially board games, have been a popular domain for AI researches as they are formal and highly constrained, yet complex, decision making environments.

Games-Applications

There are two main applications of intelligent optimization on games:

- Game playing
- Content generation

Game Playing

For game playing, there are two main ways to use the intelligent optimization:

- Offline optimization: Optimizing the parameters of a pre-defined controller, then using the optimized controller to play the game.
- Online optimization (or evolutionary planning): Optimizing the actions to be deployed while the game is running.

In the offline optimization

The intelligent optimization algorithm can be combined with many other methods. In particular, using EAs to evolve:

- the weights and/or topology of neural networks,
- or programs, typically structured as expression trees (e.g., genetic programming),
- or some other models, such as potential field.

This fitness evaluation consists of using the neural network, program or other models to play the game, and using the result (e.g., score) as a fitness function.

In the online optimization

The basic idea is to optimize the action sequence you want to deploy from now on. Evaluating such an action sequence is done by taking all the actions of the sequence in simulation, and observing the results after taking all those actions.

The online optimization has been applied on several types of games such as:

- arcade game
- turn-based strategy game
- real-time strategy game

Content Generation

Procedural content generation refers to the methods which generate game content either automatically or with only limited human input, such as:

- levels
- maps
- game rules

The search-based methods are widely used in this area because we will eventually get the solution we want if we keep iterating and tweaking solutions by keeping the good changes and discarding the bad changes.

There is a consistent pursuing for our human to obtain the artificial intelligence.