Case-Based Learning by Observation: Preliminary Work

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ABSTRACT

In this paper, we present an agent which uses case-based reasoning to play the real-time strategy game StarCraft. Cases are gathered through observation of human actions in particular situations, which are extracted from game log files. Cases are then used by a domain-independent case-based reasoning framework to make in-game actions based on human actions in similar situations. This work aims to demonstrate a method for more easily creating better agents in real-time strategy games.

Categories and Subject Descriptors

I.2.1 [**Artificial Intelligence**]: Applications and Expert Systems—*Games*

Keywords

Case-Based Reasoning, Learning by Observation, StarCraft

1. MOTIVATION

Despite increasing academic interest in video game Artificial Intelligence (AI) over the past decade, and a rapidly changing games industry which often competes on new technology [3], AI in commercial computer games has not improved as much as graphics, sound, animation or gameplay [4].

Real-time strategy (RTS) is a genre of games which presents some of the toughest challenges for AI agents, making it an interesting area for academic research and a difficult area for developing competent AI. Challenges include reasoning at different levels of granularity, a vast space of possible game states and player actions [1, 4], randomness and hidden information [3]. Facing these challenges, even the best academic agents are still outmatched by experienced humans, while commercial RTS agents tend to exhibit predictable, inflexible behaviour due to the simple AI techniques used, which prevent adaptation to unforeseen situations or events and make them easily exploitable by human players [4]. We aim to improve the quality of these agents.

2. APPROACH

In order to create an AI system which is simple to apply yet able to exhibit appropriate behaviour in a wide range of situations, a learning by observation method was employed in conjunction with a domain-independent case-based reasoning (CBR) framework [2]. This means little development effort is required because behaviour is learned and selected automatically by the framework. Information must simply be adapted to a generic format for the CBR system.

This approach has been applied to the RTS game StarCraft[1]. Examples of correct behaviour were acquired from human actions in game logs (replays) of high-level players and converted into cases for the CBR framework. Each case includes a situation, made up of the map information, buildings and units a player knows about, and an action, such as moving a group of units or constructing a building. The cases are analysed offline to improve retrieval speed and quality. In any situation during a game, the system finds cases containing similar situations in order to choose an appropriate action to take, and may also record the situation to add to its case base. This should allow a player more freedom to try new strategies and tactics which were not anticipated by the game's designers, as the AI system is capable of reacting to a very wide range of situations provided it has observed similar situations previously. The gameplay of a human and AI agent can therefore gain depth through more involved interaction, exploration, and trial and error, instead of simply exploiting known weaknesses.

3. REFERENCES

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