Battling AI bots in StarCraft

Lance Mudryk, Gateway Staff, Sep 14, 2011
(via https://thegatewayonline.ca/archives/2013/index.php/article/view/starcraft)

StarCraft is generally known for its multiplayer aspects, pitting players against each other in real-time strategy combat. But in order to test the limits in strategic ingenuity, the Computing Science department at the University of Alberta recently hosted the second annual AIIDE StarCraft AI Competition, an international competition in which competitors write state of the art artificial intelligence programs to control *StarCraft: Broodwar*.

With 13 teams participating from universities across the globe, the university's competitor UAlbertaBot managed a second-place finish in the competition, winning 80 per cent of its matches played.

For those unfamiliar with the game, *StarCraft* is real time strategy (RTS) game released for PC in 1998. The goal of the game is to destroy all of the opposing players structures in a real time war setting. Unlike Chess or Go, RTS games also have the added challenges of dealing with imperfect (or hidden) information, including far more possible game scenarios (somewhere around 10^1000), as well as requiring decisions to be made on the fly. The game has been played as a professional spectator sport in South Korea for the past decade, and has shown to have a extremely high skill ceiling, in which no dominant strategy has formed.

Lead researcher Dave Churchill is the main programmer on the UAlbertaBot team and contributed the most to the bot's good showing at the competition. While he's happy with second place, there is a lot to improve upon for next year's event. Even with a very intelligent strategy and real-time build-order planning techniques, UAlbertaBot made mistakes that no human would ever make.

"RTS AI is still at a stage where hard-coded human knowledge is more powerful, as 12 years of intense human competition and analysis is very difficult to overcome using existing AI techniques."

Although the future is hard to predict, Churchill expects that it'll likely be 10 years or more before computers could beat human opponents at the highest level.

"Humans are really good at broad game understanding, computers are really good at being fast, so our goal is to somehow combine a human's ability in finding good game situations and a computer's ability to perform billions of operations per second. That would be ideal," he said.

Last year's tournament was a random pairing double elimination style tournament, so bots could have bad luck with opponent pairings or a unusual bot crash during the game could lead to bad results. This year, a round robin style format was implemented, with each bot playing each other bot 30 times. This tournament style, combined with brand new automatic tournament managing software written by the U of A allowed for thousands of games to be played, minimizing the affects of bad luck in the results. This allowed researchers to make statistically significant claims about the overall outcome of the tournament.

Another big improvement was a new restriction to the competition's entry process. To participate, every bot's code needed to be made open to public. "It takes months just to get these kind of projects off the ground. If people like our bot's AI, they can now take our code, make some changes where they thought we were weak, and then have an entry for next year's competition. I think we're going to have double the entries next year from this alone," Churchill said.

Churchill also stressed the benefits of the competition as a way for measuring improvements in AI design. With every new solution and technique discovered through competitive play, the boundaries of what is possible to do with computers becomes larger, and potential payoffs in applications extend far beyond the game.

"It's a great testbed for research techniques, you never know what could be applied to something. It really does mimic at lot of things in real life, like spatial awareness and planned decision making … Some military commander might want this kind of stuff. That's probably not where I want my research to head towards, but all of these different sub-problems that we're trying to solve are definitely applicable to other fields."