

For this review I read "SCAIL: An integrated Starcraft AI System"

<http://geneura.ugr.es/cig2012/papers/paper103.pdf>

The paper is describing an AI that was made to handle all aspects of playing a game of the original Starcraft, the classic real time strategy game by Blizzard. The AI focuses on the major issues of macro-management, attack timings, and micro-management.

Macro-management is the high level decisions around how to allocate in game resources between increasing resource collection, research, and building army. To accomplish this the agent uses a goal-driven task architecture where a high level goal is set, and then the next task needed to accomplish the goal is executed, looping until the goal is reached. The agent also scouts the opponent and maintains a belief state of the opponent's units and structures in order to narrow down which builds the opponent is using and set the optimal build to counter as the goal.

Attack timing is another important aspect to starcraft, and revolves around scouting out the opponent in order to determine if an attack at the current point in time will benefit or hurt the agent's chances of winning. The belief state is used here to determine if the agent's army is likely to defeat the opponent's army. The game will attack if it believes the enemy is 10% weaker, which is ramped up to 30% over time to ensure the AI attacks during the early game, and to ensure that scouting data is obtained when uncertainty is high. The agent also divides the map into discrete "places" in order to keep track of where the opponent's units are likely to be, with scouts constantly checking around different "places" on the map.

Finally, the Agent achieves micro management by having units transition between states based on what their goal is, whether it be scouting, attacking, retreating, etc. The units make different decisions based on their own unit type, for instance units with area of effect attacks will seek out clustered groups. The units also make decisions based on nearby units. Units tend to want to retreat the more enemies are in weapons range, but also will be more likely to stand their ground with more friendly units nearby. These counts of units are calculated using DBSCAN clustering.

When actually engaging enemy units, the agent tends to employ ranged units in a surrounding arc around the enemy, to get better unit utilization, as more of the agent's units will be able to attack at a time when compared to the enemy units. To achieve this, particle filters are used to find optimal placing for each unit.

The agent also uses micro to manage Starcraft's notoriously bad pathing. Using a combination of A* search for direction, and particle filters to pick out spaces that are likely to be unoccupied and free for pathing, the agent moves units into traversing the map in a solid group rather than getting strung out in a single file line. This allows units to engage more readily, and provides greater breadth of vision in the fog of war.

The agent was evaluated against both the in game AI and various custom AIs for starcraft. The agent has a winrate between 92-95% depending on opposing race against the default AI, which is to be expected as the default AI is somewhat poor. The AI also has a very broad range of winrates against various other AI's ranging from 22% to 90%.

Future work includes fixing fatal bugs that caused the agent to lose winnable games, and tailoring the agent to play against human opponents as it is currently tailored for AI only tournaments.