

Using Markov Chains to Manage Resource Gathering, Base Building & Unit Building in StarCraft

Giovanni Campo, Patrick O'Halloran & Jeremiah Dunn

This paper will discuss an implementation the implementation of certain aspects of an AI controller which could be used in the Student StarCraft AI Tournament (SSCAI).[1] The implementation will focus on the use of Markov Chains to manage resource gathering.

1 Introduction

StarCraft is a *real time strategy* game developed by *Blizzard* and released in 1998. In the game, the player gathers and manages resources, constructs a base, builds an army and attempts to destroy all enemy players.

In the game's multiplayer and single-match skirmish modes, the player can be controlled by a computer agent using the *Brood War API (BWAPI)*. A yearly AI competition for the game, the SSCAI, has been running since 2011 where students submit their own bots to compete in a tournament.

Many academic papers have been written exploring the use of different AI techniques for different components of the game. Our AI will use Markov chains to manage the resource gathering, base construction and unit building.

- Student StarCraftAI tournament.
- overview of our proposal, what we hope to achieve

2 Markov Chains

Markov chains are weighted finite state machines.

- what are markov chains
- how have they been used with starcraft before
- what is our motivation for using them with our bot

3 Implementation

3.1 SCV Units

The *Terran* race uses SCV units to harvest resources and build structures. At the start of a game there are four SCVs available to the player.

Figure 3.1 shows the Markov Chain which dictates the behaviour of the SCV units. The transition from Building to Idle has no probability assigned to it. Building is taken to be a distinct state but exiting the state is controlled by the game, not the agent. The probabilities P_{IB} and P_{IH} refer to the probability that an idle agent will chose to start harvesting or to start building. P_{HB} refers to the probability of a harvesting agent stopping and begining building.

3.2 Structures

3.3 Unit Construction Structures

- talk about a generic unit building structure
 - building mode has seperate actions for each type of troop with an assigned probability
 - update this image using the existing scv powerpoint as a template

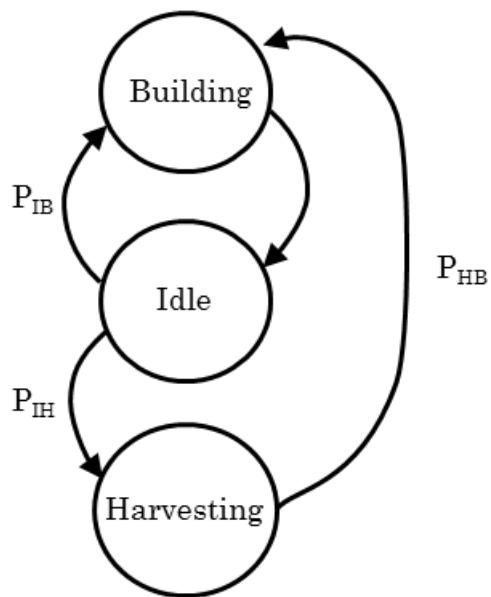


Figure 1: Markov Chain for SCV agent.

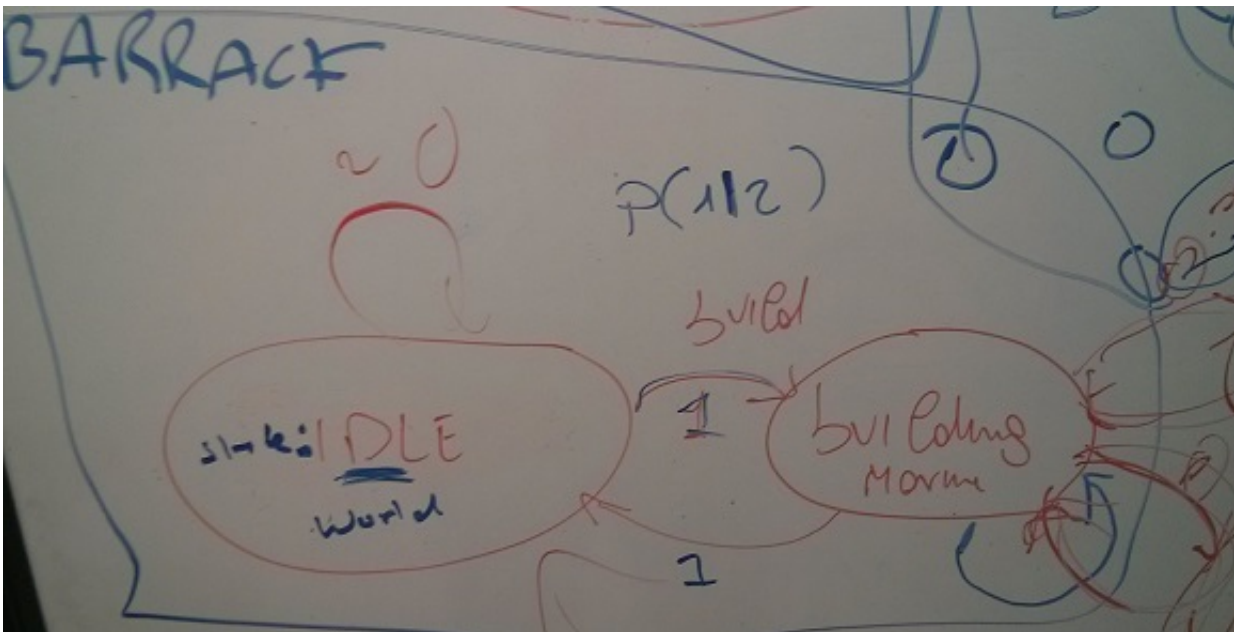


Figure 2: Markov Chain for unit building structures.

3.4 Research Orientated Structures

- create a similar generic diagram for research structures
 - indicate using states how certain options are cut off

4 Results

- what did we achieve?
 - have we any way of evaluating our performance?

5 Conclusion

- what do we think about the results?
 - patrick might write about future work using genentic algorithms?
 - other forms of learning algorithms?

References

- [1] Sscai student starcraft ai tournament 2014. <http://www.sscaitournament.com/>,
December 2014.