PROJECT SPECIFICATION

Build a Game Playing Agent

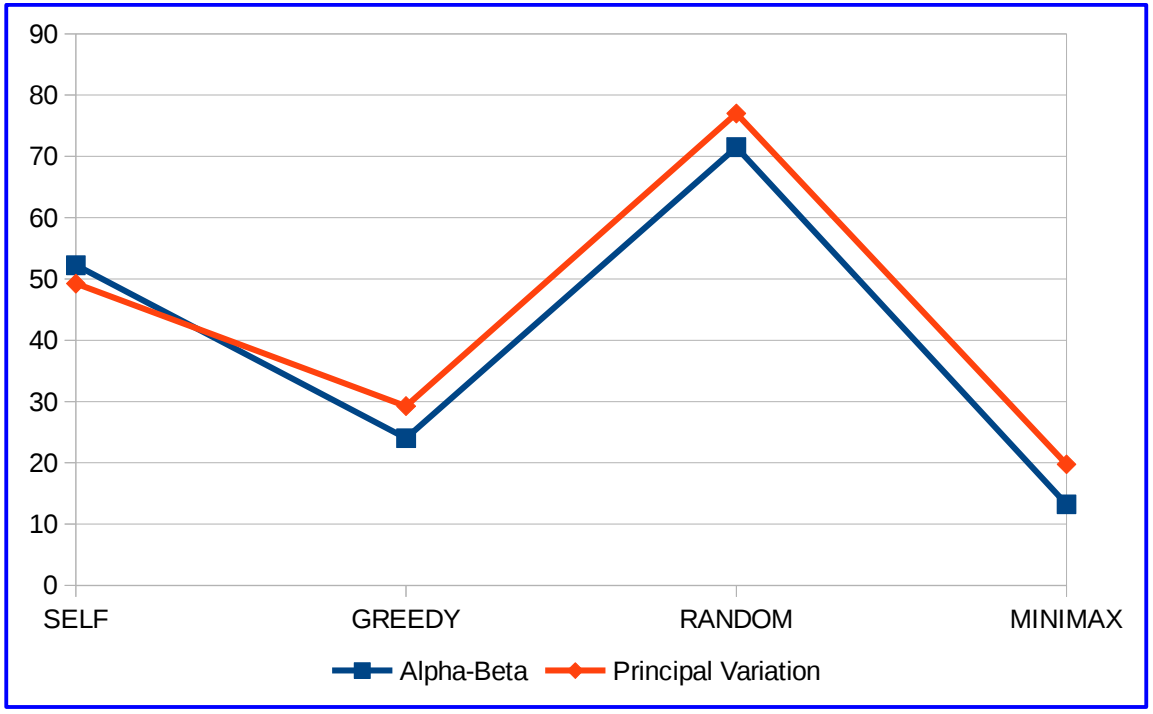
Game Agent Implementation

CRITERIA	MEETS SPECIFICATIONS	STUDENT COMMENTS
`.get_action()` method calls `self.queue.put()` at least once before the time limit expires	(AUTOGRADED) Game playing agent can return an action. • `.get_action()` method calls `self.queue.put()` at least once before the time limit expires	Implemented in my_custom_player.py (lines 53-54) (Note: Commenting the line depending on whether im running alpha-beta or principal variation)
`CustomPlayer` successfully plays as both player 1 and player 2 in a full game to a terminal state (i.e., the agent does not deadlock during search, return an invalid action, or raise an exception during a game)	(AUTOGRADED) Game playing agent can play a full game. • `CustomPlayer` successfully plays as both player 1 and player 2 in a full game to a terminal state (i.e., the agent does not deadlock during search, return an invalid action, or raise an exception during a game)	Implemented in my_custom_player.py All unit tests passing.

Experimental Results

Test Agent	Algotirhm	Run1	Run2	Run3	Run4	Run5	Average	#Games	Fair
SELF	Alpha-Beta	55	47.5	55	57.5	46.2	52.24	40	Yes
SELF	Principal Variation	45	55	46.2	48.8	51.2	49.24	40	Yes
GREEDY	Alpha-Beta	13.8	30	27.5	25	23.8	24.02	40	Yes
GREEDY	Principal Variation	32.5	45	25	28.8	15	29.26	40	Yes
RANDOM	Alpha-Beta	67.5	67.5	77.5	73.8	71.2	71.5	40	Yes
RANDOM	Principal Variation	81.2	77.5	75	72.5	78.8	77	40	Yes
MINIMAX	Alpha-Beta	10	15	17.5	12.5	11.2	13.24	40	Yes
MINIMAX	Principal Variation	15	23.8	20	20	20	19.76	40	Yes

Test Agent	Alpha-Beta	Principal Variation	%Improved
SELF	52.24	49.24	-3.00%
GREEDY	24.02	29.26	5.24%
RANDOM	71.5	77	5.50%
MINIMAX	13.24	19.76	6.52%



Report

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CustomAgent search function uses an advanced search technique	`CustomAgent` class implements **at least one** of the following: • Custom heuristic (must **not** be one of the heuristics from lectures, and cannot *only* be a combination of the number of liberties available to each agent) • Opening book (must be at least 4 plies deep) • Implements an advanced technique not covered in lecture (e.g., killer heuristic, principle variation search, Monte Carlo tree search, etc.)	I have decided to implement the principle variation search with minimax Implemented in my_custom_player.py I have referred the following pages for implementation along with the lectures and AIMA book https://en.wikipedia.org/wiki/Alpha%E2%80%93beta_pruning https://en.wikipedia.org/wiki/Principal_variation_search
Report includes a table or chart documenting an experiment to evaluate the performance of their agent	Submission includes a table or chart with data from an experiment to evaluate the performance of their agent. The experiment should include an appropriate performance baseline. (Suggested baselines shown below.) **Advanced Search Techniques**	The results are provided in page 2 of this report and also a chart comparing the baseline (alpha-beta) and the implementation algorithm(principal component search with minimax) is provided. As we can see in the chart, the the agent plays with itself, the results are around 50% and in all the remaining

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	• Baseline: student must specify an appropriate baseline for comparison (student must decide whether or not `fair_matches` flag should be used)	scenarios, the principal variation search works better.
Report answers all required questions	Submission includes a short answer to the applicable questions below. (A short answer should be at least 1-2 sentences at most a small paragraph.) **Advanced Search Techniques** • Choose a baseline search algorithm for comparison (for example, alpha-beta search with iterative deepening, etc.). How much performance difference does your agent show compared to the baseline? • Why do you think the technique you chose was more (or less) effective than the baseline?	• I observe 5.24%, 5.5% and 6.52% improvement with principal variation search for GREEDY, RANDOM and MINIMAX respectively. Please take a look at the table in page 2 of this report. • From https://en.wikipedia.org/wiki/Principal_variation_search, we know that principal variation search dominates alpha-beta pruning in the sense that it will never examine a node that

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		can be pruned by alpha-beta; however, it relies on accurate node ordering to capitalize on this advantage