Value Iteration Report

Question 1 – Write a value iteration agent in ValueIterationAgent.java which has been partially specified for you. Here you need to implement the iterate() & extractPolicy() methods. The former should perform value iteration for several steps (k steps – this is one of the fields of the class) and the latter should extract the policy from the computed values. **(6 points)**

Answer 1 –

Summary for Value Iteration Agent Implementation

1. **Functions Modified:**
   a. **iterate()**

   b. **extractPolicy()**

2. **Detailed Implementation Analysis:**
   a. **iterate() Method**

      Function:

      i. Perform value iteration to estimate state values
      ii. Runs for a fixed number of iterations (k)
      iii. Computes the maximum expected value for each state
      iv. Updates the value function based on the Bellman optimality equation

3. **extractPolicy() Method**

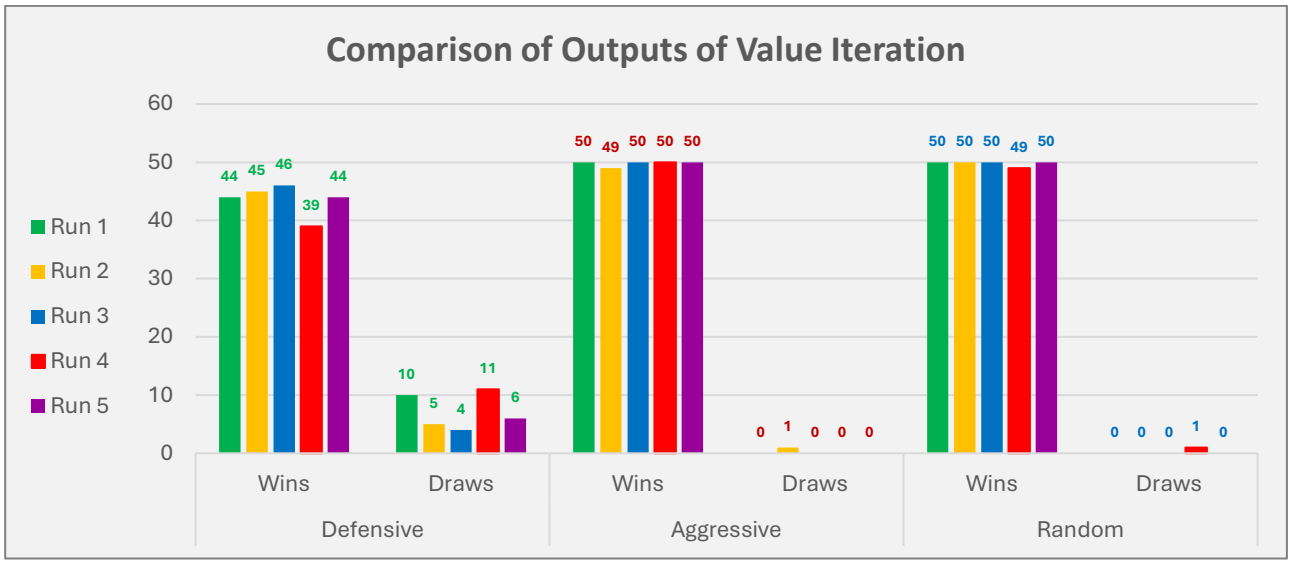
      Function:

      i. Extract the optimal policy based on the computed value function
      ii. Uses one-step look-ahead to determine the best move for each state
      iii. Creates a policy map with the best move for each non-terminal state

Question 2 – **Test your Value Iteration Agent against each of the provided agents 50 times and report on the results – how many games they won, lost & drew against each of the other rule-based agents. The rule-based agents are random, aggressive, defensive. (1 point)**

Answer 2 –

Iteration/ Agent	Defensive			Aggressive			Random		
	Wins	Losses	Draws	Wins	Losses	Draws	Wins	Losses	Draws
Run 1	44	0	10	50	0	0	50	0	0
Run 2	45	0	5	49	0	1	50	0	0
Run 3	46	0	4	50	0	0	50	0	0
Run 4	39	0	11	50	0	0	49	0	1
Run 5	44	0	6	50	0	0	50	0	0



The program was run for a total of 250 iterations split into 5 runs of 50 iterations each. As we can see from the tabular column, we obtain the best result during iteration 3 of the Value-Iteration Agent.