

Evaluation Function Assessment for Mancala Players

Part of the CSC 261 Adversarial Search Lab consists of an implementation of an adversarial search agent capable of playing the game of Mancala. Mancala is a game wherein players move one set of marbles at a time around a board containing a series of sets of marbles, with the ultimate aim being to amass a larger quantity of marbles than one's opponent, specifically in a bucket on one's side of the board called the Mancala. Players can also deprive the opponent of their marbles by a capture process.

Developing a function capable of evaluating the state of a Mancala board for its strategic value therefore requires consideration of several parameters. The first and most obvious is the number of stones in the player's Mancala (and, correspondingly, in the opponent's Mancala). Another parameter to consider is the number of 'open' spots (i.e. buckets containing no marbles) on both the player's and the opponent's sides of the board; the theory being that an open spot is a somewhat desirable thing, since it means that the opponent cannot capture marbles in that position and the player in turn has the opportunity to perform marble capture. A final consideration is the ability to capture itself.

In order to consider all of these factors when evaluating states, we wrote an evaluation function that takes each sub-heuristic described above into account. The final evaluation procedure that we developed consists of a weighted sum of helper procedures that adds the number of marbles in the Mancala, the number of open spots, and the maximum number of marbles obtainable by effecting a capture move in the given state, and subtracts the opponent's values of the same. All that remained was to tweak the weights of each heuristic to yield suitably optimized gameplay.

Since we did not have a competent opponent agent against which to test our parameters, we had to assess our agent's performance against itself and against an agent with a simpler evaluation function provided by the instructor. We determined that weighting the number of stones in the mancalas equally with the capture evaluations while placing lesser weight on the number of open spots yielded decent results.