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CSC 44800 Artificial Intelligence

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**Project 1 Report: Sprouts strategy**

As was pointed out in the reading materials attached for this project, Sprouts is a finite game of perfect information. This means that for any game of Sprouts, no matter how large or small the initial number of vertices, a winning strategy is available for one player. For this program, a minimax algorithm is employed for the AI player(s). In a two vertex game of sprouts, regardless of the initial move of the first (max) player—creating an edge from one vertex to itself, or connecting the two initial vertices—a winning strategy exists for the second (min) player. Therefore the second player (or min player) is guaranteed a victory if he plays the correct strategy. Furthermore, in the machine vs. machine mode of this program, the AI controlling the second (min) player will always win.

In the other mode available for this program—human vs. machine—the human may take the role of the max player and the AI as the min player, or vice versa. In the case of the former, although the human player may feel he is making meaningful choices, he is destined for failure, as the AI player employing the minimax algorithm is certain to win. Perhaps you can make a few bucks off some poor sod who claims he can win in this mode. To test your own prowess at the game, you can play as the min player while the AI employs the minimax algorithm as the max player. If you play correctly, you should win every time. The strategy as a min player is to “close” the board as much as possible. This is because in a two node game of sprouts, the game must end in exactly four turns for the min player to win. Whenever possible, a move should be made that isolates a vertex of a playable degree (1 or 2). This removes that vertex from being used for the rest of the game. Employing this strategy whenever possible will result in a win for the min player.

Macintosh HD       :Users:James:Desktop:SproutsNodes:sprouts1.jpgExample: If it is min player’s turn, and this is the current game state:

Macintosh HD       :Users:James:Desktop:SproutsNodes:sprouts5.jpgMacintosh HD       :Users:James:Desktop:SproutsNodes:sprouts4.jpgMacintosh HD       :Users:James:Desktop:SproutsNodes:sprouts3.jpg

3

2

1

Then the correct play is 3. This closes off the newly created vertex of degree two from being used for the remainder of the game. There is now only one playable node.