Managing Massive Multiplayer Online Games
SS 2017
Exercise Sheet 10: Path finding and antagonistic search
Discussion: July 12th, 2017

Exercise 10-1  Path finding

The blue shapes represent obstacles in the field above. In the following we are looking for the shortest path the objects a), b), and c) have to follow to get past the obstacles and to the target.

Hint: To facilitate drawing, vertical and horizontal auxiliary lines are given which have a distance of one unit each.

(a) Draw the visibility graph for the point tagged with a) and determine the shortest path to the target.

(b) Draw the visibility graph for the circle tagged with b), which has a radius $r = 1$, and determine - if possible - the shortest path to the target.

(c) Draw the visibility graph for the triangle tagged with c) and determine - if possible - the shortest path to the target. Assume that the triangle is right and isosceles, with edge length 1.

Exercise 10-2  Antagonistic Search

In the following regard an abstract game in which two players $P_1$ and $P_2$ are on turn alternately and can perform one of two actions a time. At each instant the game situation $GS$ for each player can be rated with a score function $s(GS, P_i)$, where a higher score implies a better game situation.

In the following we want to decide which is the best possible action for player $P_1$, who has a turn. First $s(GS_0, P_1) = 0$ holds. The antagonistic search tree below shows all possible actions of $P_1$ together with all corresponding reactions of $P_2$. 
(a) Which nodes have to be examined if looking for the optimal strategy for $P_1$ with a MinMax-search and alpha-beta pruning?

(b) Does the order in which the nodes are visited make a difference?

Exercise 10-3  

ELO Scores

On a player vs player competition ELO Ranking is used to rate the players. Assume $\alpha = 0.07$ and $\beta = 500$. The following players and their ELO Scores are given:

- Player1: 1000
- Player2: 1200
- Player3: 800

During the competition the following outcomes occur in the given order:

- 1 beats 3
- 2 beats 1
- 3 beats 2

(a) Calculate the ELO Scores at the end of the competition.

(b) Would the ELO Scores differ, if the order of the matches were 2 vs 3, 1 vs 3, 1 vs 2 but with the same results?