

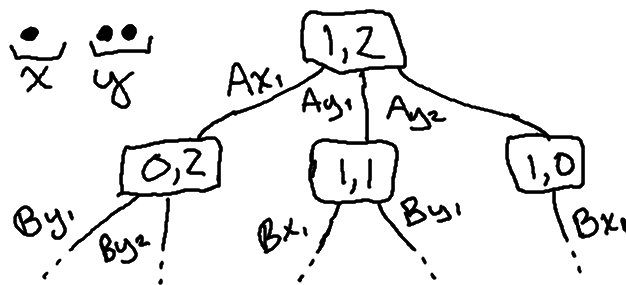
Quiz 3

10 October 2012

This question is about a strategy for an ancient game that is known in modern times as *Nim*. We start with several piles of stones; let's call the piles x , y , z . On each turn, a player can remove *any number* of stones from a *single* pile. The player to take the very last stone wins.

We're going to investigate the search tree, as if we were programming a computer player. This is for an end-game, where only two piles remain, pile x with one stone, and pile y with two stones. So we represent that state as $1, 2$. We can represent moves as Ax_1 (which would mean Alice takes one stone from pile x) or By_2 (which would mean Bob takes two stones from pile y). It is Alice's turn.

Below is a partial tree of moves for each player. Complete the tree to the end of the game, show who wins in each case, and then use those results to determine which is Alice's *best* move for turn #1.



① Alice's turn

② Bob's turn

③ Alice's turn

This question is about a *heuristic* for Tic-Tac-Toe. It assigns a *weight* (a score) for each position on the board. Whoever occupies that position counts that weight toward their score, and we subtract the score of O from that of X. Below is the weight matrix and an example.

Weight matrix		
2	1	2
1	5	1
2	1	2

Sample board		
X	X	O
O		

X's score: $1+5 = 6$
 O's score: $1+2 = 3$
 Combined, $6-3 = 3$

Compute scores for each of the following boards:

a)

	X	
	X	
	O	

b)

	O	
	X	O
	O	X

c)

	O	
X	X	
	O	

d)

	O	
	X	X

e)

	X	
X	O	
	O	

f)

X		O
X	X	
O		O