CSCI-630 Homework 2

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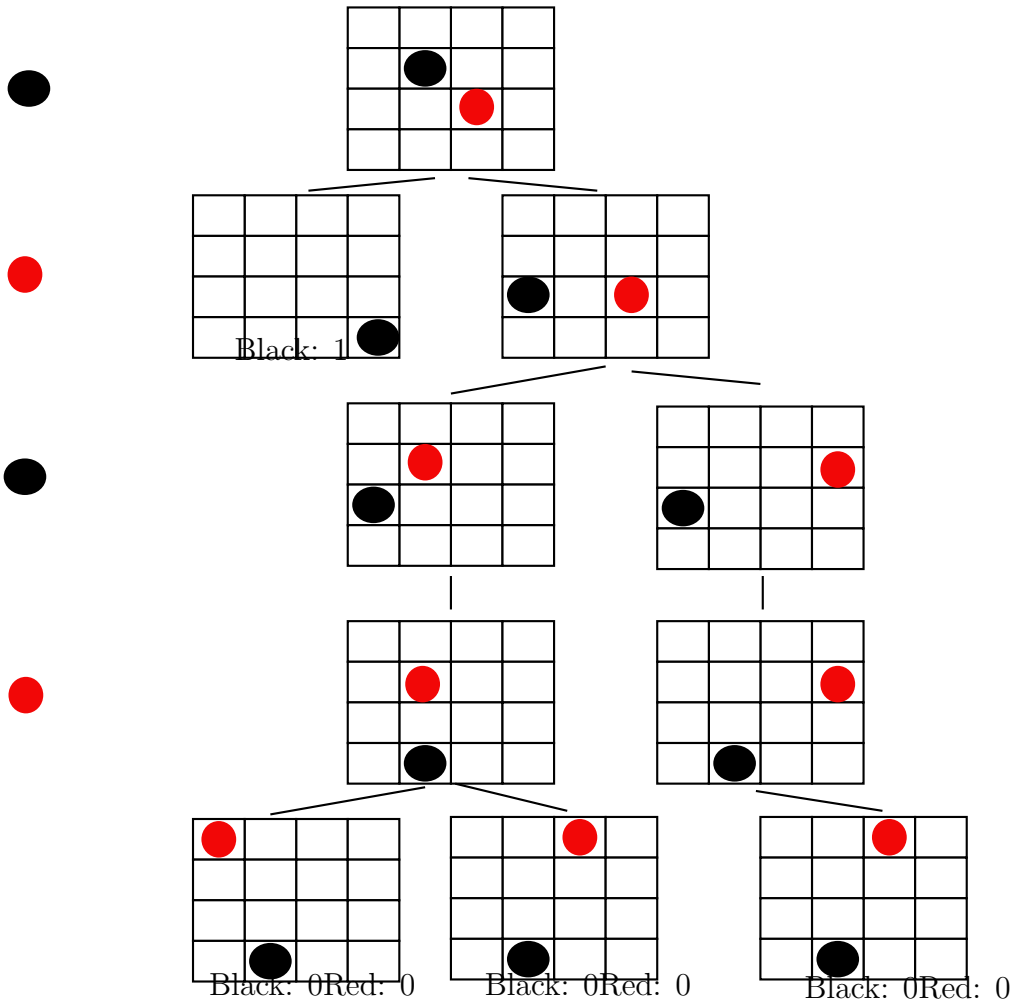
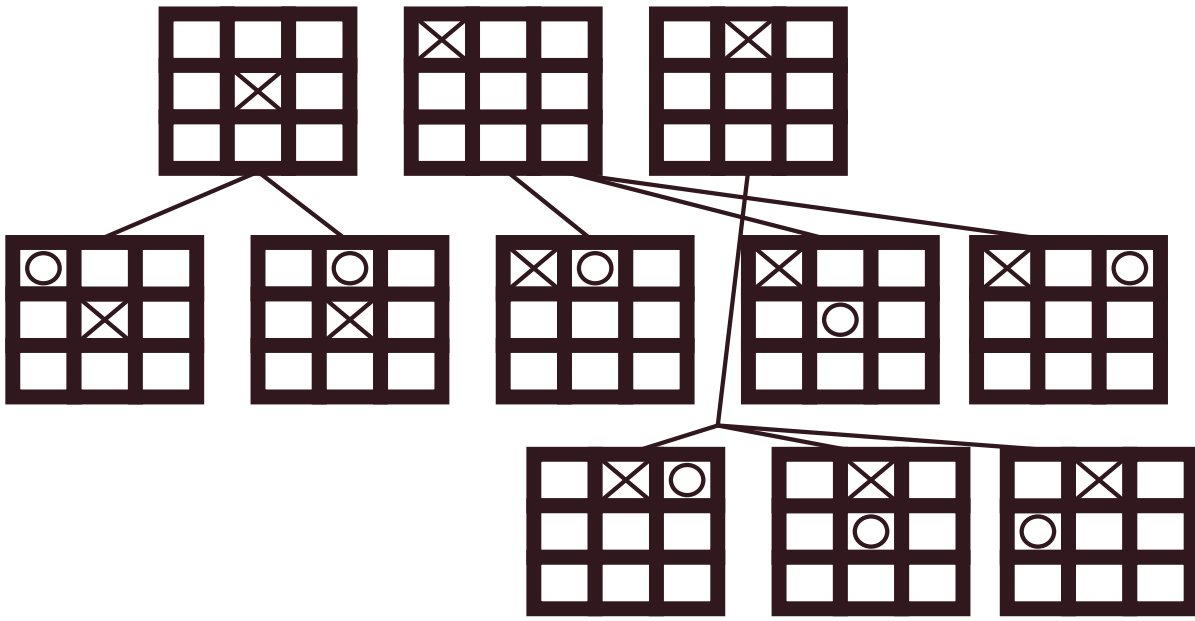
1 If you consider the problem of aligning railway pieces, assume that there is some beginning point α and some ending point Ω, where $\alpha = \Omega$ and some set of pieces $x \in X$ that have rotation ω, head h, tail t such that $x_{i-1}[t] = x_i[h]$ and $x_i[t] = x_{i+1}[h]$ and the solution $S \in \{X \times \omega\}^*$.
The problem then can be put into terms of a search which can use Simulated Annealing by creating a search tree where all the available piece choices are placed into a level, and from there the annealing portion will run with the rotation ω, choosing to rotate the piece by some degree (+- 10 °). The exact temperature function will have to be experimented with, but after choosing the main piece to use; the annealing portion of the function will allow for perfect alignment assuming that alignment is measured as a rotation of the piece, and $sum(\omega_{x_i}, \omega_{x_i+1}) = 0$ is considered perfect alignment.


Black: 1
Black: 0Red: 0
Black: 0Red: 0
Black: 0Red: 0

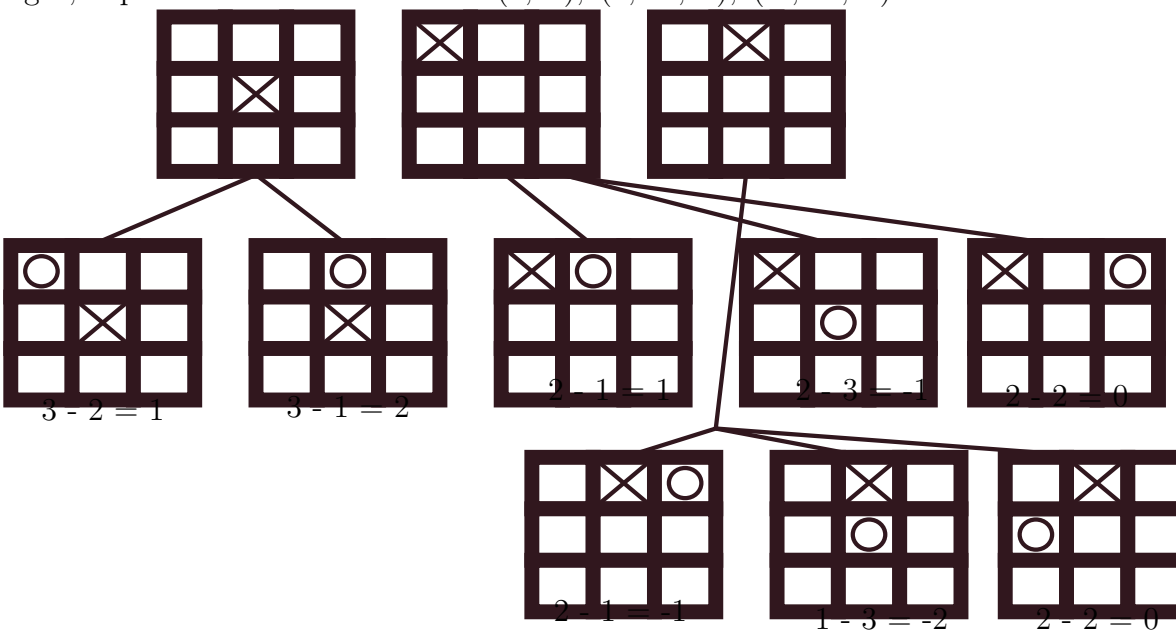
3 RN 5.9

a $9! + 7! + 5! + 3! + 1$ games of tic-tac-toe are possible

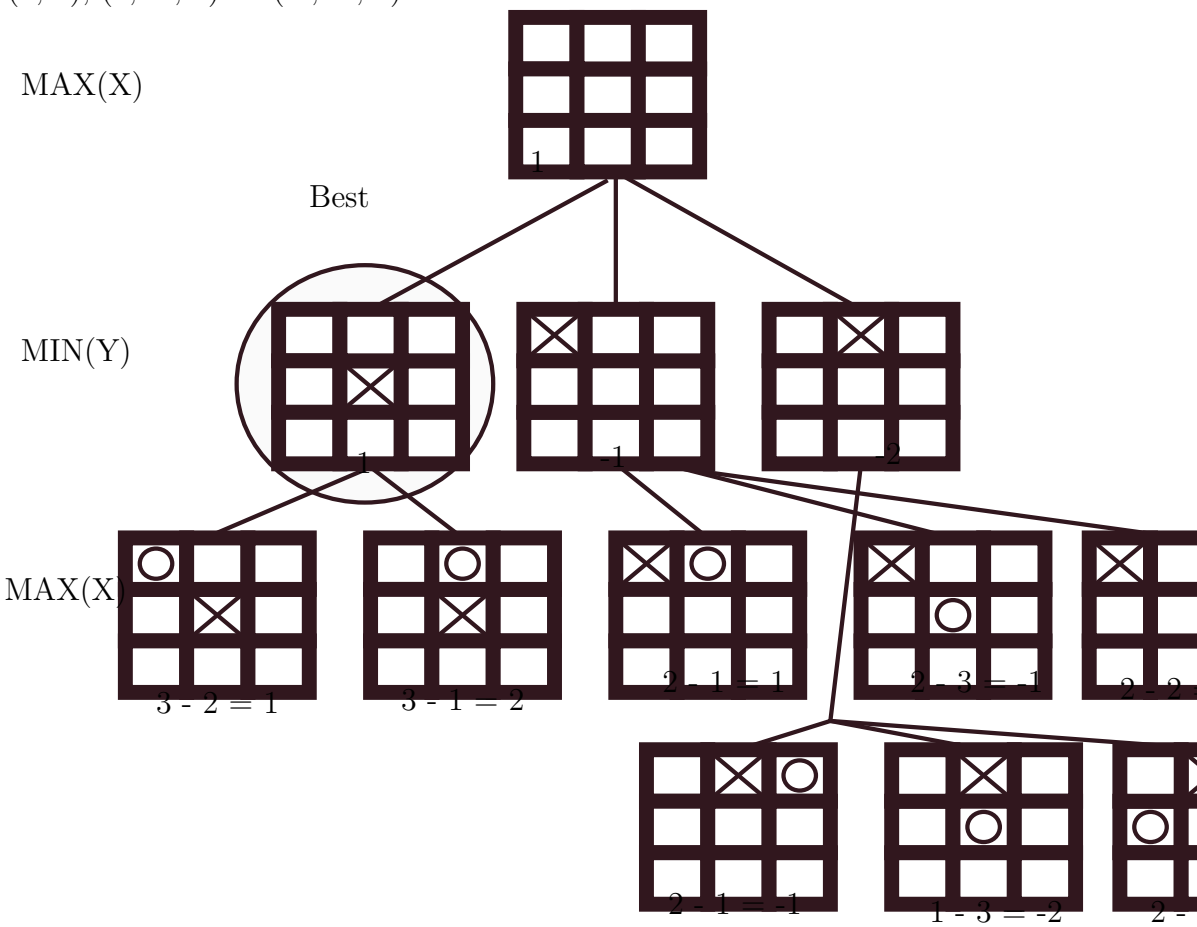


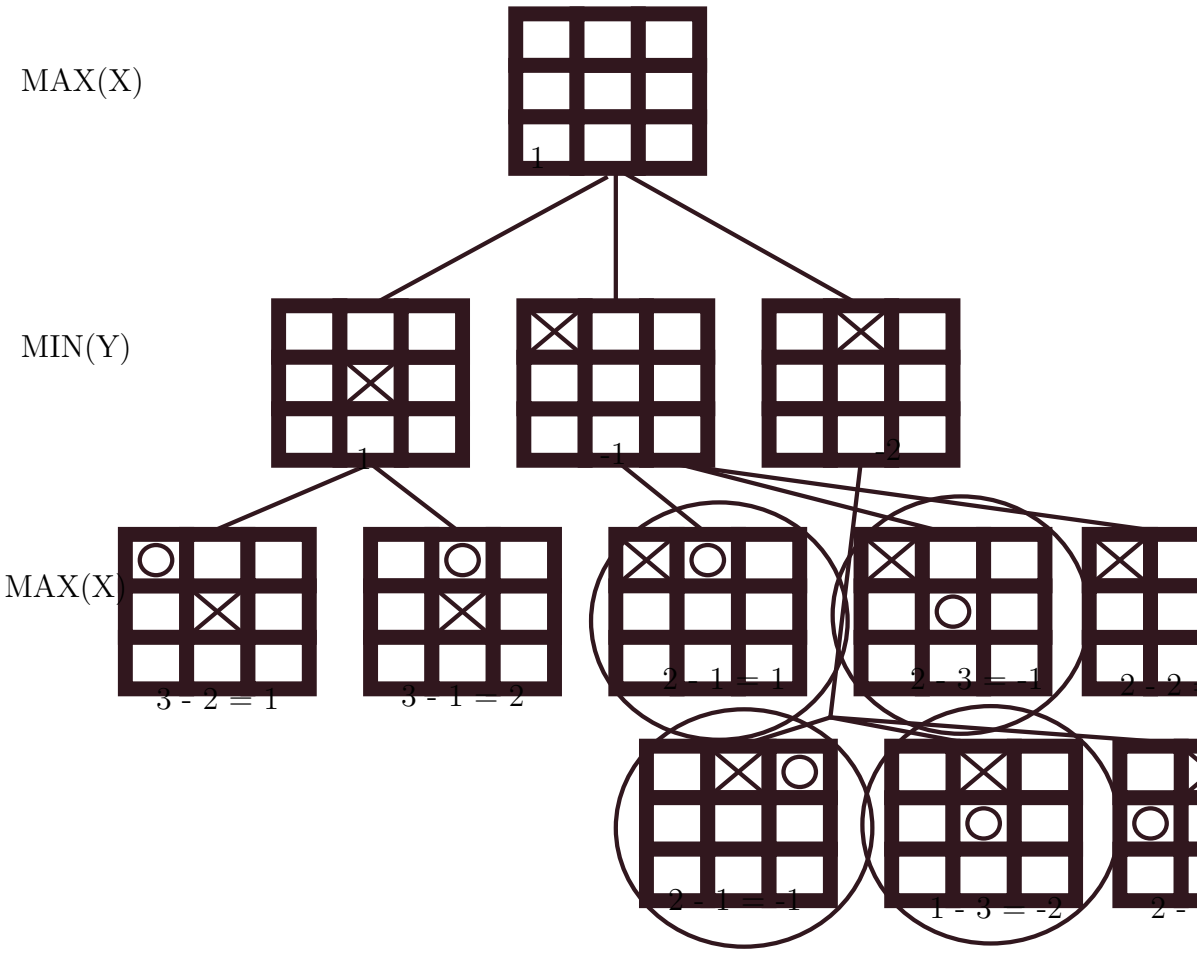
b

c The SVG editor messed up the text labels. The values, left to right, top row then bottom are... (1, 2), (1, -1, 0), (-1, -2, 0)



d The SVG editor messed up the text labels. The values, left to right, top row then middle, then bottom are... (1) — (1, -1, -2)— (1, 2), (1, -1, 0) — (-1, -2, 0)





e

4 RN 6.2

a Variables The variables X are the size of the board s, the individual knights $K[i]$, and the x_i and y_i coordinates of each knight.

b Domains The domains D are $s \in Z^+$, $i <= s$, $x <= s$, $y <= s$

c Constrains Assume that knights attack in the 'L' formation in any direction, this means that from their initial position of (x_i, y_i) they can attack in one of any 8 directions: North West $(x_i - 1, y_i + 2)$, North East $(x_i + 1, y_i + 2)$, South West $(x_i - 1, y_i - 2)$, South East $(x_i + 1, y_i - 2)$, West North$(x_i - 2, y_i + 1)$, West South$(x_i - 2, y_i - 1)$, East North$(x_i + 2, y_i + 1)$, East South$(x_i + 2, y_i - 1)$ The constraints C are that $(K[i], k[j]), [(x_i + -(1, 2), y_i + -(1, 2)) \neq (x_j, y_j)]$ for any $i, j \in s$ and $i \neq j$.

d The local search can solve this problem by starting in a corner $(0, 0)$ and placing a knight, checking the constraints (checking for conflicts), picking a new grid position (ACTION) and checking the constraints for it (RESULT) then placing the knight down (if there are none) and continuing down that path until all boxes are filled with either knights or conflicts.