Adversarial Search and Games

ARTIFICIAL INTELLIGENCE

JUCHEOL MOON

1

Games vs. search problems

- "Unpredictable" opponent
  - solution is a strategy specifying a move for every possible opponent reply
- Time limits
  - unlikely to find goal, must approximate
- Tic-Tac-Toe
  - https://www.math10.com/en/math-games/tic-tac-toe/tic-tac-toe.html

2

2

Tic-Tac-Toe

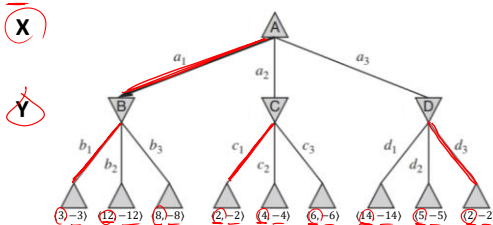- 2-player, deterministic, turns

3

The MinMax game

- The possible moves for MAX at the root node are labeled a_1, a_2, and a_3.
- This particular game ends after one move each by MAX and MIN
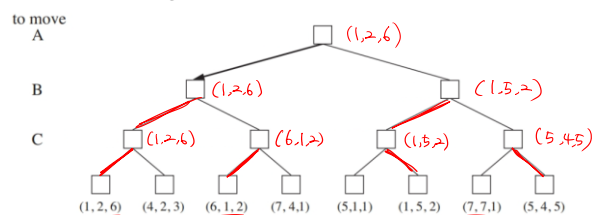

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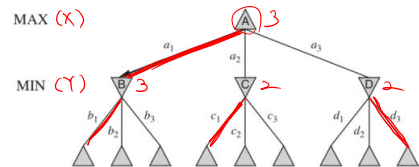
4

The MaxMax game

- In a two-player game with players X and Y, a vector $\langle v_X, v_Y \rangle$ is associated with each node.

5

Multiplayer games (MaxMaxMax game?)

- In a three-player game with players A, B, and C, a vector $\langle v_A, v_B, v_C \rangle$ is associated with each node.
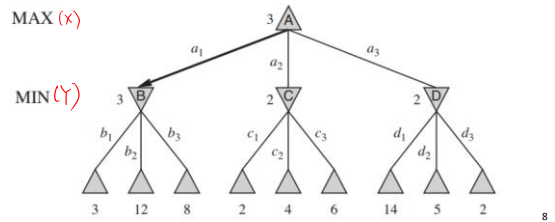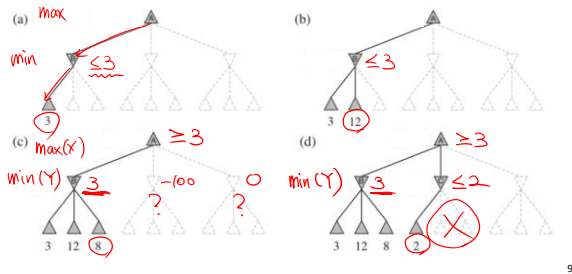

6

IBM DeepBlue

I.B.M. MAN VS. MACHINE

THE NEW YORKER

7

7

Pruning

▪Is it possible to compute the correct minimax decision without looking at every node in the game tree?
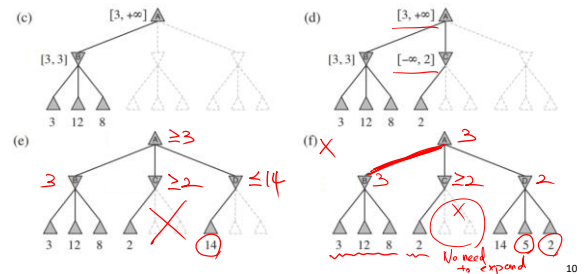

MAX (x)

MIN (Y)
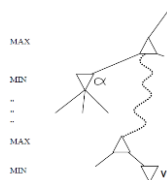
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$\alpha - \beta$ pruning

9

9

$\alpha - \beta$ pruning

10

10

Properties of $\alpha - \beta$?

▪α is the best value (to max) found so far off the current path

  ▪If V is worse than α, max will avoid it

▪Similarly for β and min

▪Pruning (**does / does not**) affect final result

MAX

MIN

MAX

MIN

11

11

2