Review

Chapter 5   Adversarial Search

1. Games
2. Optimal Decisions in Games
3. Alpha-Beta Pruning

Chapter 5   Adversarial Search

4. Imperfect Real-Time Decisions
5. Stochastic Games
6. Partially Observable Games
7. State-of-the-Art Game Programs
8. Alternative Approaches
9. Summary

Recommended videos

1. Game Theory

   (https://www.bilibili.com/video/av28477392/)

2. Games

   (https://haokan.baidu.com/v?vid=9684107665572441532&pd=bjh&fr=bjhauthor&type=video)

Homework

5.8 Consider the two-player game described in Figure 5.17.

a. Draw the complete game tree, using the following conventions:

- Write each state as (s_A, s_B), where s_A and s_B denote the token locations.
- Put each terminal state in a square box and write its game value in a circle.
- Put *loop states* (states that already appear on the path to the root) in double square boxes. Since their value is unclear, annotate each with a "?" in a circle.

b. Now mark each node with its backed-up minimax value (also in a circle). Explain how you handled the "?" values and why.

c. Explain why the standard minimax algorithm would fail on this game tree and briefly sketch how you might fix it, drawing on your answer to (b). Does your modified algorithm give optimal decisions for all games with loops?

d. This 4-square game can be generalized to n squares for any $n > 2$. Prove that A wins if n is even and loses if n is odd.
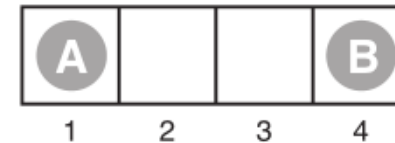

Figure 5.17 The starting position of a simple game. Player A moves first. The two players take turns moving, and each player must move his token to an open adjacent space in either direction. If the opponent occupies an adjacent space, then a player may jump over the opponent to the next open space if any. (For example, if A is on 3 and B is on 2, then A may move back to 1.) The game ends when one player reaches the opposite end of the board. If player A reaches space 4 first, then the value of the game to A is $+1$; if player B reaches space 1 first, then the value of the game to A is -1.