

Midterm Exam

ARTIFICIAL INTELLIGENCE

Class: KSTN 2007

Questions: 2 – Total mark: 10 – Time: 60 minutes

Open book

Question 1 (5 marks):

Consider the n -queens problem: the problem is to place n chess queens on an $n \times n$ chessboard such that no two queens attack each other. That is no two queens share the same row, column, or diagonal.

Hill Climbing can be applied to solve the n -queens problem as follows. In each step, only one queen can be moved and the queens that have been moved in previous steps will not be moved again. The heuristic function is defined to be the number of pairs of queens that are attacking each other. The goal state thus has value 0.

Illustrate how the method works for the 4-queens problem via search tree expansion. Assume the initial state as in Figure 1, whose heuristic function value is 6.

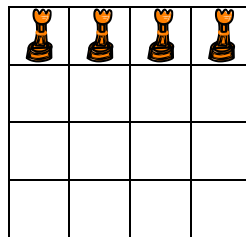


Figure 1

Question 2 (5 marks):

Consider the following situation: a monkey is in a room. The monkey wants some bananas. There are three locations in the room – locations A, B and C. The monkey is at location A. There is a box in location C. There are some bananas in location B, but they are hanging from the ceiling. The monkey needs to climb up the box to be high enough to take the bananas.

Use the following predicates and actions and apply Goal Stack Planning to generate a plan for the monkey to have the bananas.

Predicates:

At(X): the monkey is at location X; **Level(low/high)**: the monkey is at a low/high level;

BoxAt(X): the box is at location X; **BananasAt(X)**: the bananas are at location X;

Have(bananas): the monkey have the bananas.

Actions:

Move(X, Y): the monkey moves from location X to location Y; **ClimbUp(X)**: the monkey climbs up the box at location X; **ClimbDown(X)**: the monkey climbs down the box at location X; **MoveBox(X, Y)**: the monkey moves the box from location X to location Y; **TakeBananas(X)**: the monkey takes the bananas at location X.

- Write down the specifications (i.e., precondition, add list, and delete list) for the monkey actions. (2.5 marks)
- Trace the steps followed to make a plan for the monkey, showing the stack contents in each step. (2.5 marks)

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