Informatics 2D s1813674

Coursework 1 Search and Games

3.4 Uninformed Search – Questions

Manual breadth first search on provided graph (cost omitted)

Une image contenant ciel, stationnaire, périphérique, enveloppe

Description générée automatiquement1. c. I chose this graph because if we use depth first search, it is going to be stuck in an infinite loop and never reach the goal destination. It will first expand 1, than 2, then 5 and then get stuck in a loop after that. If we use breadth first search, we will expand 1 first, then 2, then 3, then 5, then 6 and then reach the destination (which is 4)

1. d. I chose this graph because using depth first search is quicker as it expands less nodes then breadth first search (in fact we can notice the tree is symmetric, there are no optimal solutions so breadth first is in this case doing too much work).

Une image contenant table, ciel

Description générée automatiquement

1. e. Main differences between Breadth first search (BFS) and Depth first search (DFS):

* Frontier is a LIFO queue for DFS and a FIFO queue for BFS
* DFS has a better space complexity because it is linear
* BFS has a better time complexity
* DFS is better if the solution is dense and space is important
* BFS is better if we want to find the optimal solution (DFS is not optimal)
* DFS is not complete whereas BFS is complete (if b is finite)

2. a. If we are assuming that the start node is A and the end node is I (as there are no arrows leaving I). Then the optimal depth would be three as it is the shortest path from A to I (A -> E -> G -> I).

2.b Iterative Deepening Search combines Depth First search with Breadth first search. It allows to do a depth first search but with levels. Overall it has the same space complexity but has an improved time complexity. It solves the problem of depth first search being stuck in a loop. Because it gradually increments the depth limit, it gives us a complete an optimal result which is not the case of depth-first. So, if the solution is closer to the root, doing an Iterative Deepening Search is much more effective. So is it if there’s a loop in the tree.

4.3 Informed Search -- Questions (10%)

1. a An admissible heuristic never overestimates the true cost to reach the goal, it is optimistic. Since straight line distance is the shortest distance between two points then straight line distance is a valid heuristic.
2. b Number of different bits in strings (Hamming distance)
3. a The main difference between Best First Search and A\* Search is the function it uses to evaluate. Best First search explores nodes that appear closer to the goal whereas A\* search avoids paths that are already costing too much (by considering the cost so far as well). If the heuristic is well chosen, A\* search is complete and optimal whereas Best First isn’t.

2. b DON’T KNOW

* 1. Connect Four – Questions

2. Player has 16 ways to put the token ????????