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FACULTY OF EGINEERING

ARTIFICIAL INTELLIGENCE
LECTURE-11

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OUTLINE

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Informed Search Algorithms

o far we have talked about the uninformed search algorithms which looked through search space for all possible solutions of the problem without having any additional knowledge about search space. But informed search algorithm contains an array of knowledge such as how far we are from the goal, path cost, how to reach to goal node, etc. This knowledge help agents to explore less to the search space and find more efficiently the goal node. The informed search algorithm is more useful for large search space. Informed search algorithm uses the idea of heuristic, so it is also called Heuristic search.

Heuristics function

Heuristic is a function which is used in Informed Search, and it finds the most promising path. It takes the current state of the agent as its input and produces the estimation of how close agent is from the goal. The heuristic method, however, might not always give the best solution, but it guaranteed to find a good solution in reasonable time. Heuristic function estimates how close a state is to the goal. It is represented by h(n), and it calculates the cost of an optimal path between the pair of states. The value of the heuristic function is always positive.

Admissibility of the heuristic function is given as:

$$h(n) <= h^*(n)$$

Here h(n) is heuristic cost, and h*(n) is the estimated cost. Hence heuristic cost should be less than or equal to the estimated cost.

Pure Heuristic Search

Pure heuristic search is the simplest form of heuristic search algorithms. It expands nodes based on their heuristic value h(n). It maintains two lists, OPEN and CLOSED list. In the CLOSED list, it places those nodes which have already expanded and in the OPEN list, it places nodes which have yet not been expanded.

On each iteration, each node n with the lowest heuristic value is expanded and generates all its successors and n is placed to the closed list. The algorithm continues unit a goal state is found.

In the informed search we will discuss two main algorithms which are given below:

- Best First Search Algorithm(Greedy search)
- A* Search Algorithm

Best-first Search Algorithm (Greedy Search)

•Greedy best-first search algorithm always selects the path which appears best at that moment. It is the combination of depth-first search and breadth-first search algorithms. It uses the heuristic function and search. Best-first search allows us to take the advantages of both algorithms. With the help of best-first search, at each step, we can choose the most promising node. In the best first search algorithm, we expand the node which is closest to the goal node and the closest cost is estimated by heuristic function, i.e.

f(n)= g(n).

Were, h(n)= estimated cost from node n to the goal.

The greedy best first algorithm is implemented by the priority queue.

Best first search algorithm

•Step 1: Place the starting node into the OPEN list.

•Step 2: If the OPEN list is empty, Stop and return failure.

•Step 3: Remove the node n, from the OPEN list which has the lowest value of h(n), and places it in the CLOSED list.

•Step 4: Expand the node n, and generate the successors of node n.

•Step 5: Check each successor of node n, and find whether any node is a goal node or not. If any successor node is goal node, then return success and terminate the search, else proceed to Step 6.

•Step 6: For each successor node, algorithm checks for evaluation function f(n), and then check if the node has been in either OPEN or CLOSED list. If the node has not been in both list, then add it to the OPEN list.

•Step 7: Return to Step 2.

Advantages and Disadvantage

•Advantages

•Best first search can switch between BFS and DFS by gaining the advantages of both the algorithms.

•This algorithm is more efficient than BFS and DFS algorithms.

•Disadvantages:

•It can behave as an unguided depth-first search in the worst case scenario.

•It can get stuck in a loop as DFS.

•This algorithm is not optimal.

MCQ

1. Which particular generation of computers is associated with artificial intelligence?

a) Second

b) Fourth

c) Fifth

d) Third

2. Shaping teaching techniques to fit the learning patterns of individual students is the goal of _____

a) decision support

b) automatic programming

c) intelligent computer-assisted instruction

d) expert systems

3. Which of the following function returns t If the object is a symbol m LISP?

a) (* <object>)

b) (symbolp <object>)

c) (nonnumeric <object>)

d) (constantp <object>)

MCQ

4. The symbols used in describing the syntax of a programming language are _____

a) 0

b) {}

c) “”

d) <>

5. Which stage of the manufacturing process has been described as “the mapping of function onto form”?

a) Design

b) Distribution

c) Project management

d) Field service

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