ARTIFICIAL INTELLIGENCE ASSIGNMENT-3

Ques1. Prove that the following breadth first search is a special case of uniform-cost search

Ans. Uniform-Cost Search

Edges have different costs

Instead of expanding nodes in order of their depth from root expand in order of cost from root

. At each step, expand a node whose cost g(n) is lowest where g(n) is sum of costs of edges from root to node n

• Nodes are stored in a priority queue

Worst case time complexity:

O (bc/m) where

c is the cost of an optimal solution and m is the minimum edge cost

Problem: Memory- similar to breadth first

Ques2. Discuss and solve the 8 puzzle problem

Problem:

We also know the eight puzzle problem by the name of N puzzle problem or sliding puzzle problem.

N-puzzle that consists of N tiles (N+1 titles with an empty tile) where N can be 8, 15, 24 and so on.

In our example N = 8. (that is square root of (8+1) = 3 rows and 3 columns).

In the same way, if we have N = 15, 24 in this way, then they have Row and columns as follow (square root of (N+1) rows and square root of (N+1) columns).

That is if N=15 than number of rows and columns= 4, and if N= 24 number of rows and columns= 5.

So, basically in these types of problems we have given a initial state or initial configuration (Start state) and a Goal state or Goal Configuration.

Here We are solving a problem of 8 puzzle that is a 3x3 matrix.

Initial state

1	2	3
	4	6
7	5	8

Goal state

1	2	3
4	5	6
7	8	

Solution:

The puzzle can be solved by moving the tiles one by one in the single empty space and thus achieving the Goal state.

Rules of solving puzzle

Instead of moving the tiles in the empty space we can visualize moving the empty space in place of the tile.

The empty space can only move in four directions (Movement of empty space)

Up

Down

Right or

Left

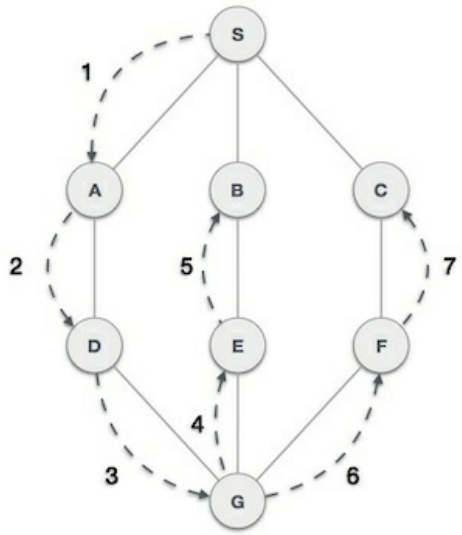
The empty space cannot move diagonally and can take only one step at a time.

Ques3. Explain with example

(a) Depth first search

(b) Breadth first search

Ans. (a) Depth First Search (DFS) algorithm traverses a graph in a depthward motion and uses a stack to remember to get the next vertex to start a search, when a dead end occurs in any iteration.



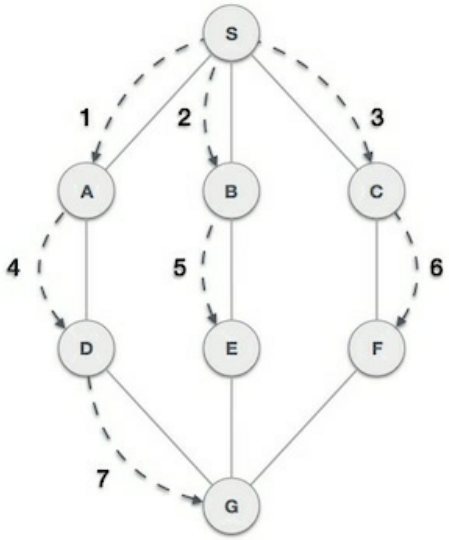
As in the example given above, DFS algorithm traverses from S to A to D to G to E to B first, then to F and lastly to C. It employs the following rules.

Rule 1 – Visit the adjacent unvisited vertex. Mark it as visited. Display it. Push it in a stack.

Rule 2 – If no adjacent vertex is found, pop up a vertex from the stack. (It will pop up all the vertices from the stack, which do not have adjacent vertices.)

Rule 3 – Repeat Rule 1 and Rule 2 until the stack is empty.

(b) Breadth First Search (BFS) algorithm traverses a graph in a breadthward motion and uses a queue to remember to get the next vertex to start a search, when a dead end occurs in any iteration.



As in the example given above, BFS algorithm traverses from A to B to E to F first then to C and G lastly to D. It employs the following rules.

Rule 1 – Visit the adjacent unvisited vertex. Mark it as visited. Display it. Insert it in a queue.

Rule 2 – If no adjacent vertex is found, remove the first vertex from the queue.

Rule 3 – Repeat Rule 1 and Rule 2 until the queue is empty.

Ques4. What are the heuristics and what is their impotence? give example?

Ans. A Heuristic is a technique to solve a problem faster than classic methods, or to find an approximate solution when classic methods cannot. This is a kind of a shortcut as we often trade one of optimality, completeness, accuracy, or precision for speed.

A Heuristic (or a heuristic function) takes a look at search algorithms. At each branching step, it evaluates the available information and makes a decision on which branch to follow.

Importantance:
One reason is to produce, in a reasonable amount of time, a solution that is good enough for the problem in question. It doesn't have to be the best- an approximate solution will do since this is fast enough.

Most problems are exponential. Heuristic Search let us reduce this to a rather polynomial number. We use this in AI because we can put it to use in situations where we can't find known algorithms.

We can say Heuristic Techniques are weak methods because they are vulnerable to combinatorial explosion.

Ques5. Distinguish between heuristics and algorithm. Support your answer with the help of

example

Ans. Heuristics:

A heuristic is an educated guess which serves as a guide for subsequent explorations.

heuristic is a mental shortcut that allows people to quickly make judgments and solve problems. ... If complete accuracy is required, it is best to use an algorithm

Algorithm:

An algorithm is a step-wise procedure for solving a specific problem in a finite number of steps. The result (output) of an algorithm is predictable and reproducible given the same parameters (input).

algorithms are frequently contrasted with heuristics.