

Assignment 01

Write a program to solve the 8-Puzzle problem using heuristic functions.

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Abstract: A heuristic function $h(n)$, takes a node n and returns a non-negative real number that is an estimate of the cost of the least-cost path from node n to a goal node. The function $h(n)$ is an admissible heuristic if $h(n)$ is always less than or equal to the actual cost of a lowest-cost path from node n to a goal.

1. Introduction

A heuristic, or a heuristic technique, is any approach to problem-solving that uses a practical method or various shortcuts in order to produce solutions that may not be optimal but are sufficient given a limited timeframe or deadline. Heuristics methods are intended to be flexible and are used for quick decisions, especially when finding an optimal solution is either impossible or impractical and when working with complex data.

2. Methodology

Heuristics are methods for solving problems in a quick way that delivers a result that is sufficient enough to be useful given time constraints. Investors and financial professionals use a heuristic approach to speed up analysis and investment decisions. Current state $[[7,2,3],[4,6,5],[1,8,0]]$ and the goal state is $[[1,2,3],[4,5,6],[7,8,9]]$

3. Advantages and Disadvantages

Heuristics facilitate timely decisions. Analysts in every industry use rules of thumb such as intelligent guesswork, trial and error, the process of elimination, past formulas, and the analysis of historical data to solve a problem. Heuristic methods make decision-making simpler and faster through shortcuts and good-enough calculations.

Heuristic algorithms are practical, serving as fast and feasible short-term solutions to planning and scheduling problems. The main downside of the heuristic approach is that it is – in the vast majority of cases – unable to deliver an optimal solution to a planning and scheduling problem.

4. Explanation

This program is based on Heuristic search. 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. It does so by ranking

alternatives. The Heuristic is any device that is often effective but will not guarantee work in every case. Here the task is we have to take 0 to 8 numbers randomly as input then we will get that numbers sorted ascending order.

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Assignment 02

Write a program about BFS implementation.

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Abstract: This paper introduced for Breadth-First Search (BFS) problem solved using C++ language.

Index Terms- Here I mostly used in My report C++ language and Code-Blocks code editor.

1. Introduction

Breadth first search is a general technique of traversing a graph. Breadth first search may use more memory but will always find the shortest path first. In this type of search the state space is represented in form of a tree. The solution is obtained by traversing through the tree. The nodes of the tree represent the start value or starting state, various intermediate states and the final state. In this search a queue data structure is used and it is level by level traversal. Breadth first search expands nodes in order of their distance from the root. It is a path finding algorithm that is capable of always finding the solution if one exists. The solution which is found is always the optional solution. This task is completed in a very memory intensive manner. Each node in the search tree is expanded in a breadth wise at each level.

2. Methodology

Here I Discuss BFS Algorithm: In the breadth-first traversal technique, the graph or tree is traversed breadth-wise. This technique uses the queue data structure to store the vertices or nodes and also to determine which vertex/node should be taken up next.

Consider G as a graph which we are going to traverse using the BFS algorithm.

Let S be the root/starting node of the graph.

Step 1: Start with node S and enqueue it to the queue.

Step 2: Repeat the following steps for all the nodes in the queue.

Step 3: Dequeue S and process it.

Step 4: Enqueue all the adjacent nodes of S and process them.

END OF LOOP

Step 6: EXIT

3. Advantages and Disadvantages

Advantages: In this procedure at any way it will find the goal. It does not follow a single unfruitful path for a long time. It finds the minimal solution in case of multiple paths.

Disadvantages: BFS consumes large memory space. Its time complexity is more. It has long pathways, when all paths to a destination are on approximately the same search depth.

4. Explanation

Breadth-

rst search starts at a given vertex s, which is at level 0.

In the first stage, we visit all the vertices that are at the distance of

one edge away. When we visit there, we paint as "visited," the vertices adjacent to the start vertex s - these vertices are placed into level 1.

- In the second stage, we visit all the new vertices we can reach at the distance of two edges away from the source vertex s . These new vertices, which are adjacent to level 1 vertices and not previously assigned to a level are placed into level 2, and so on.
- The BFS traversal terminates when every vertex has been visited.

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