

AI Assignment-1

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Introduction

N-puzzle is a well-known problem used for a long time by Artificial Intelligence (AI) researchers as a benchmark for comparing the performance of search algorithms. N Puzzle is a sliding blocks game that takes place on a $k \times k$ grid with $((k \times k) - 1)$ tiles each numbered from 1 to N. The task of the game is to reposition the tiles to their proper order. The goal

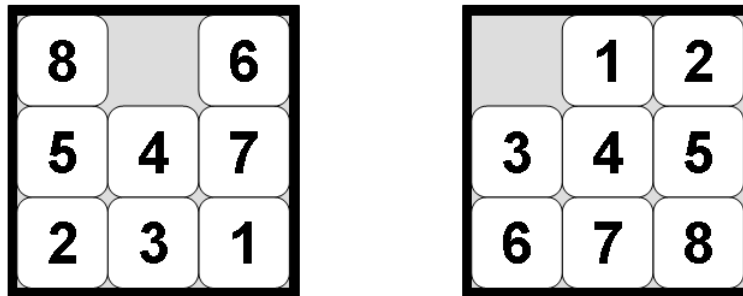


Figure 1: N-Puzzle Problem

of this assignment is to test out different AI algorithms on this problem and analyze their performance and process pattern. Two type of algorithms were tested; Informed Search Algorithms such as Breadth First Search (BFS), Uniform Cost Search (UCS), Depth Limited Search (DLS), Iterative Deep- ening Depth First Search (IDS) and Uninformed Search Algorithms such as Greedy Best
rst search (GBFS), and A* search.

Analysis Of Algorithms Performance

we analyzed the performance of the six algorithms based on same data set. Statistics like time, nodes generated and number of steps were collected based on that data set . The data set was sorted by the length of their optimal solution size. When the statistics about the algorithms are plotted, we got these graphs,

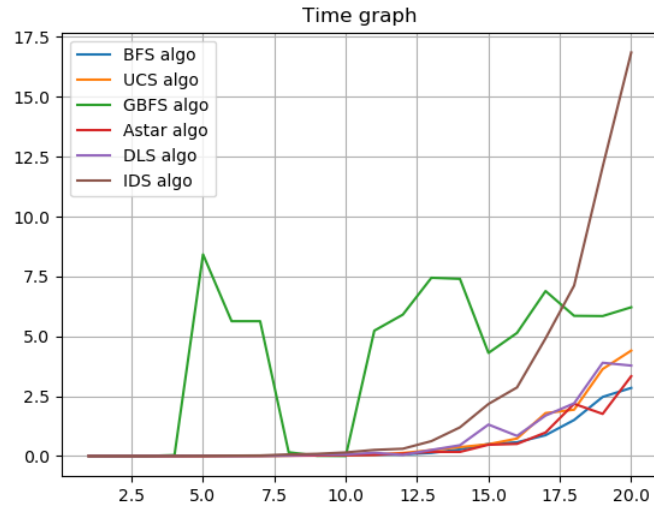


Figure 2: Time Graph

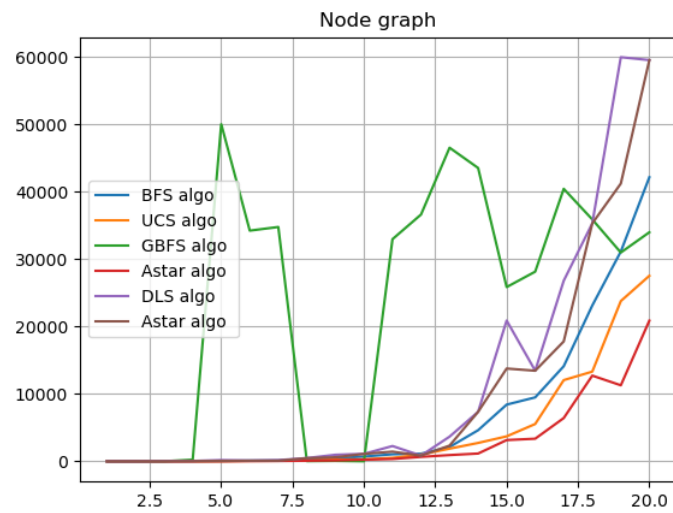


Figure 3: Node Graph

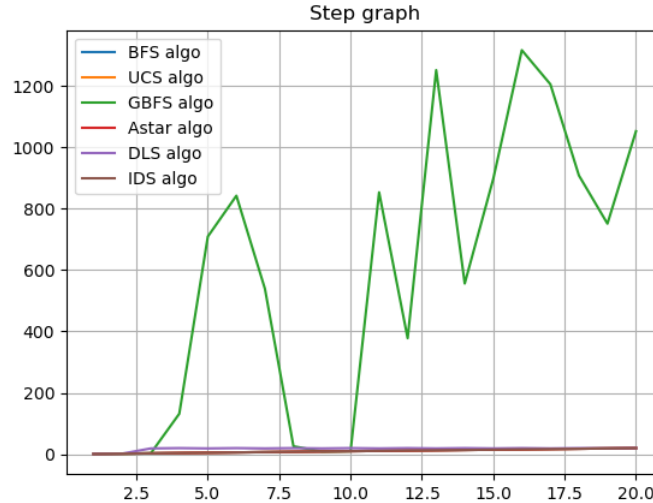


Figure 4: Steps taken graph

we can see from the time analysis and Number of Nodes graph that BFS and UCS have similar growth as for this problem as their process is quite similar. We can also see that IDS requires the most computational effort and DLS is second based on the computation heaviness. we can also see that GBFS and A* require the least computational effort . GBFS needs the least time and node traversal and A* is the second fastest. From these results we can say that heuristic functions are a great help in searching problems. On the other hand if we check the Steps Needed graph, we can see that GBFS needs the most steps.DLS is an algorithm where the exploration happens as deep as possible. For the rest of the algorithms, all of them are optimal, so the follow a steady linear line.

Problems Faced

The most significant problem was to learn the algorithms and to model them. i have completed my assignment in python and as i am new to python language , i have faced a lot of problems to implement different data structures and classes to model the puzzlebox and algorithms