Detailed Comparison of Search Strategies

Department of Computer Science **FAST-NUCES** **Lahore Campus**

CS401 Artificial Intelligence

Programming Assignment No 1 (Sections E, F) Spring 2019
Assigned on 31/1/2017 Deadline 10/2/2019 before 1:00 p.m.
Submission: Online on Piazza Weight 3%

Instructions:

Following rules will be enforced for this assignment

- You might work in a group of at most two students and cross-section group formation is allowed
- You will be required to explain your approach and implementation in detail in the report and also during the detailed evaluation.

Please remember that PLAGIARISM is INTOLERABLE and anyone found involved in it will get -3 marks (i.e. 100% penalty) in this assignment.

Introduction

In this assignment we are going to compare **Iterative-Deepening** and **A*** Algorithms for the famous Rubik's cube puzzle. Comparison will be in terms of number of nodes expanded and optimality of solution found by these search schemes.

Following are the major grading rubrics for this assignment

- Correctly working code (40%)
- Clearly described state representation and successor function implementation (20%).
- A well-researched heuristic function and its correct implementation (30%)
- Detailed experiments (20%)
- Well documented code (10%)

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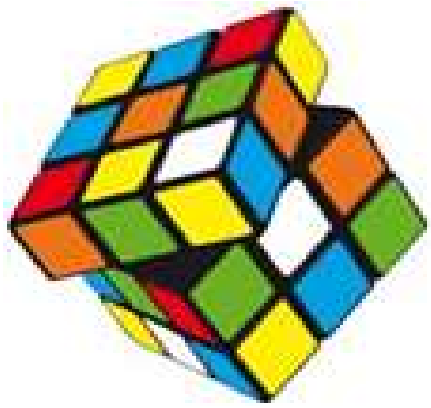
Puzzle Description

- The Rubik's Cube is an important test domain for heuristic search that has 10^{19} possible states, making it impossible to store in memory.
- A single move on a Rubik's Cube can be defined as a quarter turn (90') of any face either clockwise or anticlockwise.



In this part of the assignment you are going to write a **C++** program that will take the **initial** and **final** configurations of the cube and will find a sequence of moves that will transform the initial state into the final state. The solutions will be found by using one uninformed search strategy i.e. iterative-deepening and one informed search strategy named A*

For this assignment you must assume that turning a face of the Rubik's cube by 90^o either in clockwise or counter clockwise direction is considered one move each

Your program will take as input a file containing the **initial** and **final configuration pair** and will output the set of moves needed to solve the puzzle.

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File Format

The first line of the file will contains the initial configuration (a space separated list of 54 digit code of the colors) the second line contains the final configuration.

A complete configuration of a puzzle consists of 54 space separated digits which give the color information on each of the six sides of the cube. A color on each of the nine cubes on a given side is a digit from the set {1, 2, 3, 4, 5, 6}. The first 9 digits of these 54 digits specifying the colors of the 9 cubes faces on the front side (left-right and top-bottom), the next 9 numbers specifying the color information on the back side and then comes the color information of top, bottom, left and right sides.