CS341 Artificial Intelligence and Machine Learning – Fall 2018
Project 1 - Disjoint Pattern Database for the 15-puzzle
50 points
Due: Sept. 27

Overview: For this project you will investigate two strategies for solving the 15-puzzle

1. An informed search using the h_2 heuristic described on page 103 in the text
2. An informed search using a disjoint pattern database described below.

The disjoint pattern database will store the number of moves for five different sets of tiles: the first set contains tiles 1, 2 and 3, the second contains tiles 4, 5, and 6, and so on. The database for each set will store the number of moves involved in moving the tiles in that set to their correct positions just counting the moves of the tiles in the set. The exact format of the database will be described in class.

What I will Provide I will provide the following classes for you which will be discussed in class.

1. `Puzzle.java` – a class used to implement a 15-puzzle.
2. `SearchNode.java` – a class for search nodes.
3. `RandomPuzzle.java` – a class which generates random 15-puzzles.
4. `Solver.java` – an abstract class for 15-puzzle solvers.

What You Must Write You must create the following classes:

1. `BuildDatabase.java` – a standalone class that builds and stores the disjoint pattern database.
2. `TotalDistanceSolver.java` – a subclass of `Solver` that uses the h_2 heuristic.
3. `DisjointPatternSolver.java` – a subclass of `Solver` that uses the disjoint pattern database created by `BuildDatabase`.
4. `MultiRun.java` – a class that uses the two solvers above to solve multiple 15-puzzles with different solution path lengths and outputs the average number of nodes created for each path length and the effect branching factor (similar to Fig 3.29 in the text).

What to Hand In : You will hand in two things for this project:

1. A brief report describing the experiments you ran to compare the two solvers and summarizing their results.
2. Four separate programs implementing the four classes listed above.

You may work in groups of two for this project.