# AI201
# Programming Assignment 1
# Implementing the A* Algorithm

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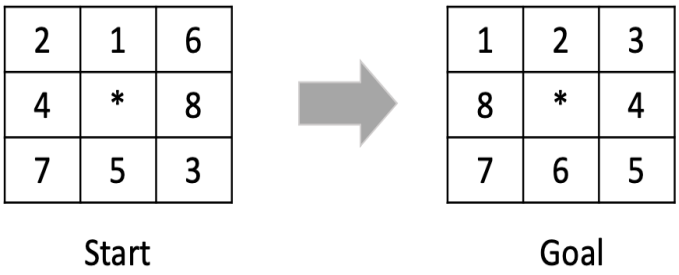
Due: 12:00 noon of February 26, 2025

In this Programming Assignment, you will implement the A* Algorithm and use it to solve the 8-Puzzle Problem. Your code should be able to read an input file named "astar_in.txt" that decribes the configurations for the start and goal states.

Suppose you want to solve the problem below.




The input file should be in this format:

start
2 1 6
4 * 8
7 5 3
goal
1 2 3
8 * 4
7 6 5

**Instructions**

Using Jupyter notebook write Python code to implement the A* Algorithm following the pseudocode described in slide 21 of Lecture 3B. **Other implementations of A* that do not follow the pseudocode will not be accepted.**

1. Your code should output the sequence of states from start to goal for the following heuristic functions:
a) Number of Tiles in the Wrong Position
b) Manhattan Distance
c) Nilsson's Sequence Score defined as: h(n) = P(n) + 3 S(n) where P(n) is the Manhattan distance of each tile from its goal position and S(n) is a sequence score

obtained by checking around the non-central squares in turn, allotting 2 for every tile not followed by its proper successor and 0 for every other tile, except that a piece in the center scores 1. It is easier to understand this if you know that the goal state that Nilsson uses is {1 2 3 8 * 4 7 6 5} where * is the blank or empty "tile". For more detailed explanation, see the following:
https://stackoverflow.com/questions/10584788/can-anyone-explain-nilssons-sequence-score-in-8-puzzle-more-clearly/10607141#10607141

2. Try out your code on the sample puzzle above. For each step, your program should output the values of f(n), g(n), h(n), and, if applicable P(n), S(n). The search cost (in number of nodes generated) for each heuristic function should be outputted as well.

Submit your code in Jupyter notebook to submit2pcnaval@gmail.com and rsgabud@up.edu.ph with "[AI201 PA1 (A*) Submission] <Your_Name>" on the subject line by 12:00 noon of February 26, 2025.