# Theory Problems 7

Graph Algorithms

Problem 1: A* Search Algorithm

A simple road map of Romania is shown in the graph below. Every node represents a city and the distance in km between cities is shown on the edges in the graph. The straight-line distance from each city to Bucharest is provided in the table to the right. Using A* search algorithm, find the shortest distance from Arad to Bucharest.
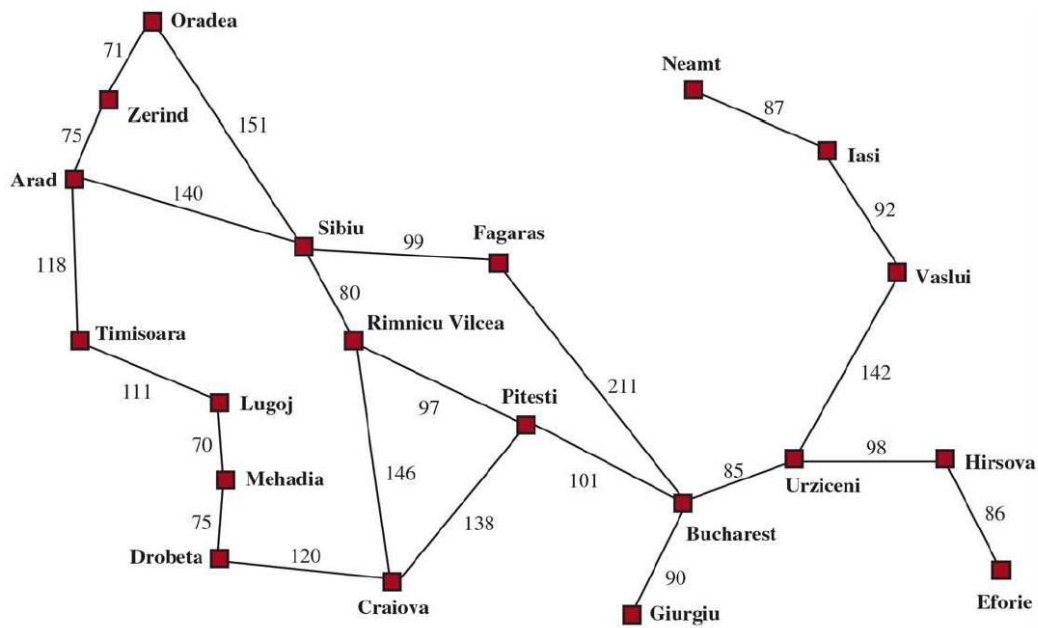
Node	Visited	Distance from A (g)	Heuristic (h)	Total distance f = g + h	Previous Node
Arad			366		
Bucharest			0		
Craiova			160		
Drobeta			242		
Eforic			161		
Fagaras			176		
Giurgiu			77		
Hirsova			151		
Iasi			226		
Lugoj			244		
Mehadia			241		
Neamt			234		
Oradea			380		
Pitesti			100		
Rimnicu V.			193		
Sibiu			253		
Timisoara			329		
Urziceni			80		
Vaslui			199		
Zerind			374		

Problem 2: Floyd-Warshall Algorithm

If we are not only interested in finding the shortest path from one specific vertex to all the others, but the shortest paths between every pair of vertices, we could, of course, apply Dijkstra's algorithm to every starting vertex. But there is a simpler way of doing this, known as Floyd's algorithm. Using the Floyd-Warshall's algorithm, compute the shortest path between all vertices in the following directed weighted graph: