

COMP9414: Artificial Intelligence - Solutions Week 3

Search

1. State space: set of cities on Romania map

Initial state: Arad

Successor function: $s(x)$ is the set of cities adjacent to x on the map

Goal state: Bucharest

Path cost: Sum of the costs of distances between the cities on the path

- (i) (Depth-first) Arad, Sibiu, Fagaras, Bucharest
- (ii) (Breadth-first) Arad, Sibiu, Timisoara, Zerind, Fagaras, Oradea, Rimnicu Vilcea, Lugoj, Bucharest (assuming we don't expand states more than once, e.g. Zerind, which can be reached via Sibiu and Oradea as well as directly from Arad, and more simply, Arad, which can be reached from Sibiu, Timisoara and Zerind)
- (iii) (Uniform-cost) Arad (0), Zerind (75), Timisoara (118), Sibiu (140), Oradea (146), Rimnicu Vilcea (220), Lugoj (229), Fagaras (239), Mehadia (299), Pitesti (317), Craiova (366), Dobreta (374), Bucharest (418) (again assuming we don't expand nodes with the same state more than once, so omit Oradea (291) which would have come from Sibiu, and similarly other nodes)
- (iv) (Iterative deepening) Arad, Arad, Sibiu, Timisoara, Zerind, Arad, Sibiu, Fagaras, Oradea, Rimnicu Vilcea, Timisoara, Lugoj, Zerind, Oradea, Arad, Sibiu, Fagaras, Bucharest (assuming a cycle check for each path, so omit Arad \rightarrow Sibiu \rightarrow Arad)
- (v) (Greedy) Arad (366), Sibiu (253), Fagaras (178), Bucharest (0)
- (vi) (A^*) Arad (366), Sibiu (393), Rimnicu Vilcea (413), Pitesti (415), Fagaras (417), Bucharest (418) (unexpanded states on the frontier are Timisoara (447), Zerind (449), Craiova (526), Oradea (671)) For example, $f(\text{Rimnicu Vilcea}) = g(\text{Rimnicu Vilcea}) + h(\text{Rimnicu Vilcea}) = 140 + 80 + 193 = 413$