Search Algorithms

Informed Search Strategies

- Informed search strategies uses **additional knowledge of the problem** in the search algorithm
- The general approach is called **best-first search**.
- a node is selected for expansion based on an evaluation function, ***f(n)*** as a cost estimate.
  - so the node with the lowest evaluation is expanded first.
- The implementation of best-first graph search is identical to that for uniform-cost search except the choice of function ***f***
- The choice of ***f*** determines the search strategy
- Most best-first algorithms include as a component of ***f*** a heuristic function, denoted ***h(n)***:
  - h(n) = estimated cost of the cheapest path from the state at node n to a goal state.

Greedy best-first search

- Greedy best-first search tries to expand the node that is closest to the goal, on the grounds that this is likely to lead to a solution quickly.
- route-finding problems in Romania
  - Heuristic = straight line distance heuristic h_{SLD}.
  - The values of h_{SLD} cannot be computed from the problem description
  - It takes a certain experience to know that h_{SLD} is correlated with actual road distances

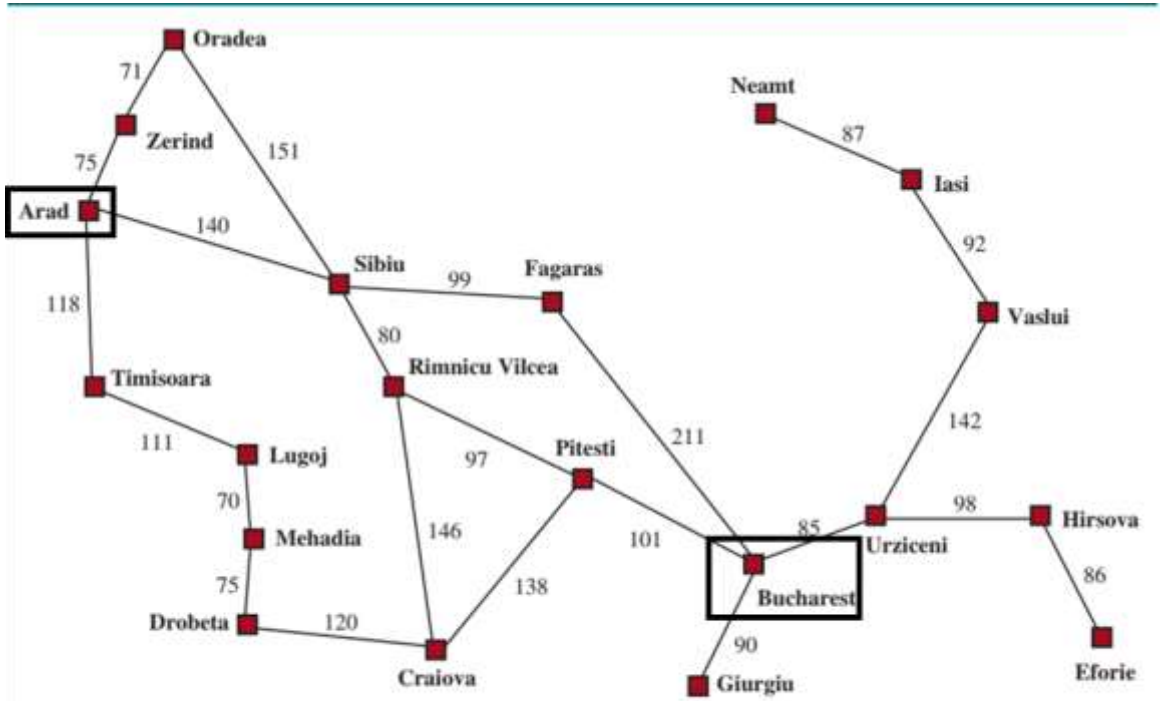


Figure 3.1 A simplified road map of part of Romania, with road distances in miles.

Arad	366	**Mehadia**	241
Bucharest	0	**Neamt**	234
Craiova	160	**Oradea**	380
Drobeta	242	**Pitesti**	100
Eforie	161	**Rimnicu Vilcea**	193
Fagaras	176	**Sibiu**	253
Giurgiu	77	**Timisoara**	329
Hirsova	151	**Urziceni**	80
Iasi	226	**Vaslui**	199
Lugoj	244	**Zerind**	374

Values of h_{SLD}—straight-line distances to Bucharest.

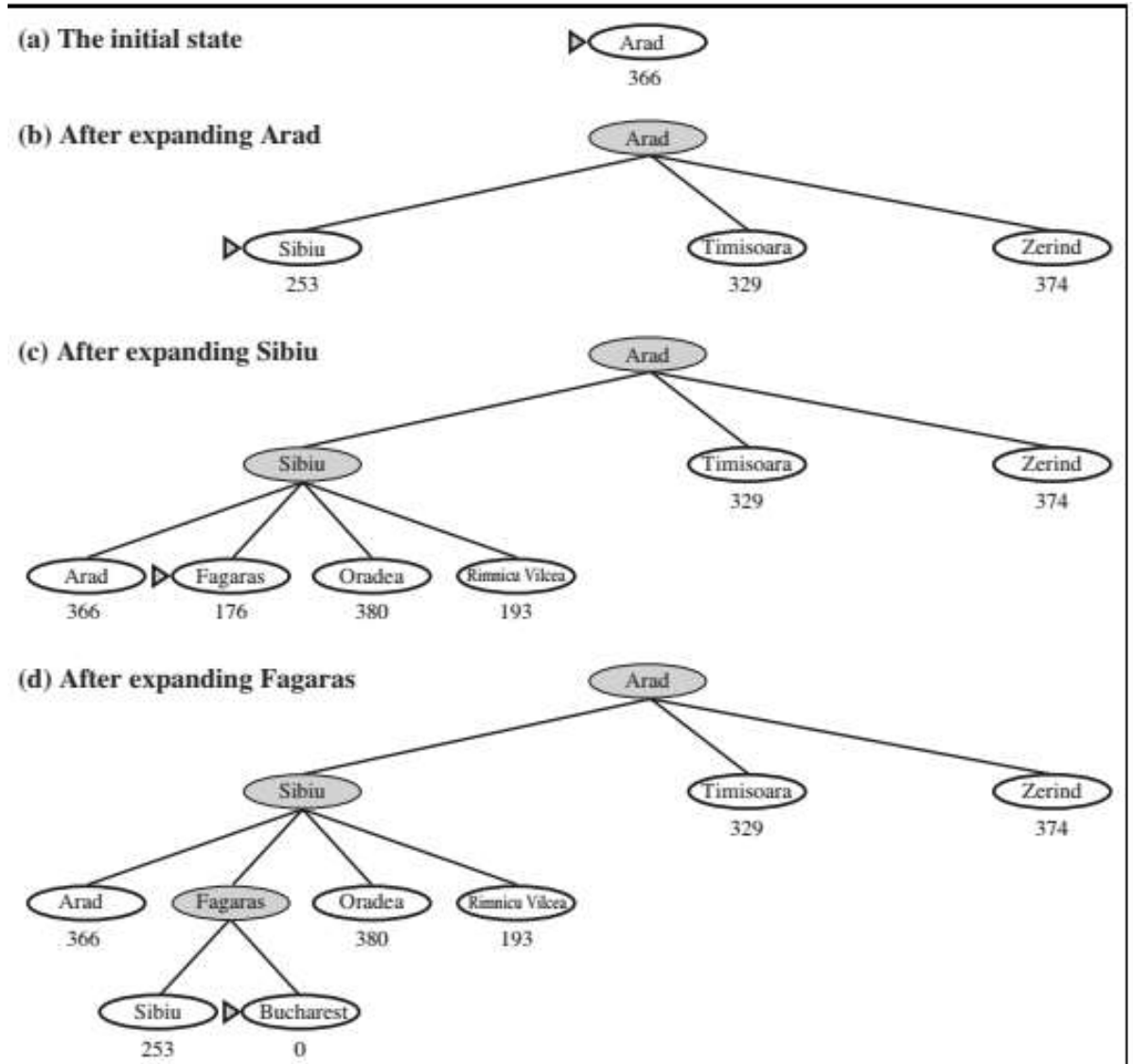
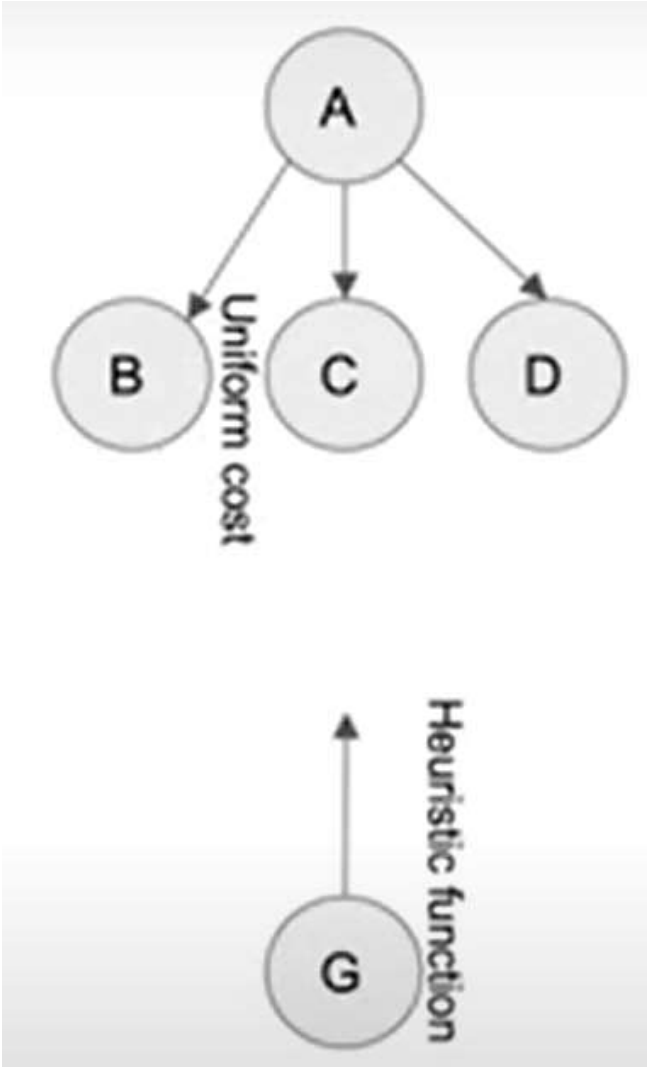


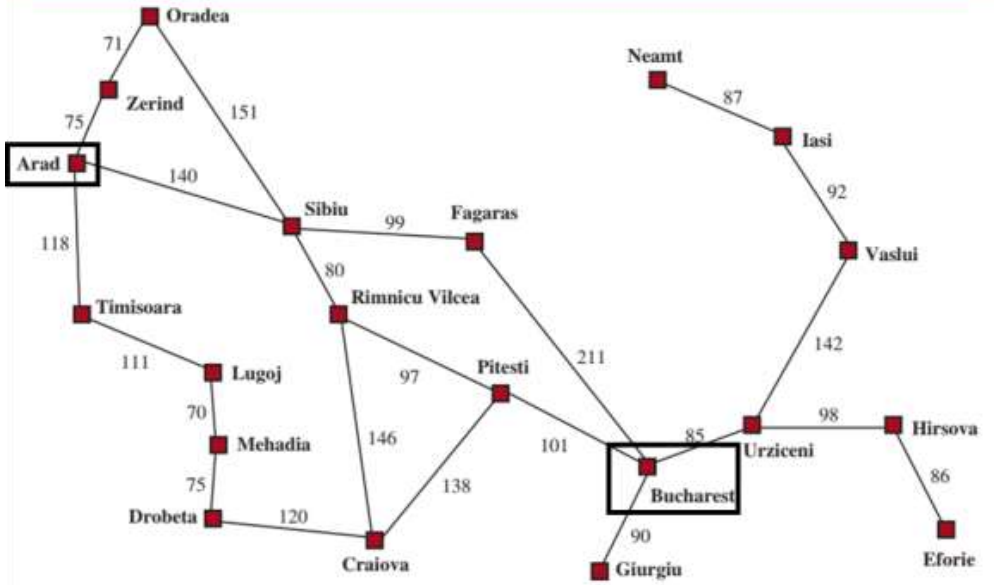
Figure 3.23 Stages in a greedy best-first tree search for Bucharest with the straight-line distance heuristic h_{SLD}. Nodes are labeled with their h-values.

A* Search

- The most widely known form of best first search
- It evaluates nodes by combining
  - ***g(n)***, the cost to reach the node from start state, and
  - ***h(n)***, the cost to get from the node to the goal
  - ***f(n) = g(n) + h(n)***
  - ***f(n) = estimated cost of the cheapest solution through n***



Working of A* Search



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