

Informed Search Strategies



School of Electronic and Computer Engineering
Peking University

Wang Wenmin



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A* Search A*搜索

□ Search Strategy 搜索策略

- avoid expanding expensive paths, minimizing the total estimated solution cost.
避免扩展代价高的路径，使总的估计求解代价最小化。

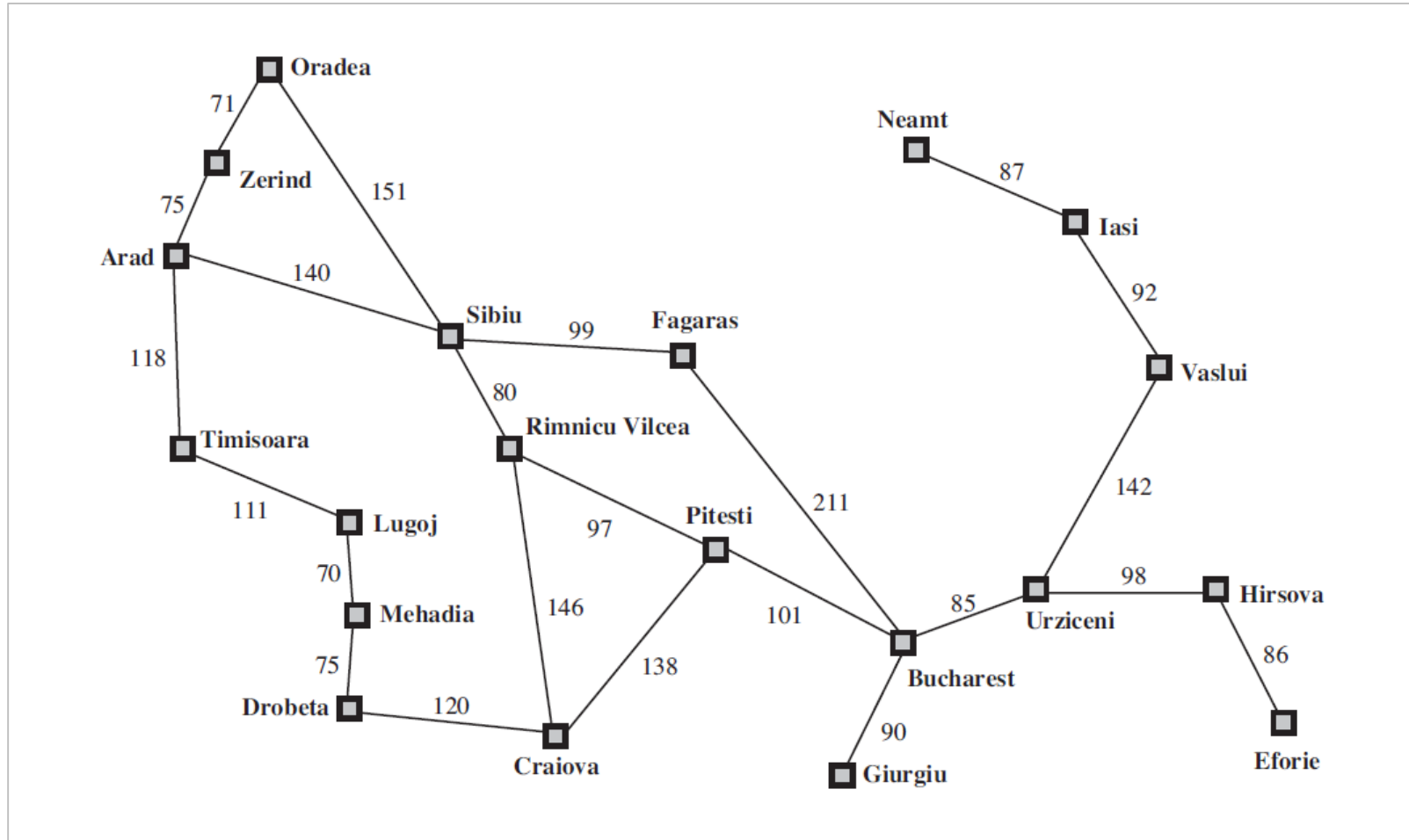
□ Evaluation function 评价函数

- $g(n)$ -- cost to reach the node
到达该节点的代价
 - $h(n)$ -- estimated cost to get from the node to the goal
从该节点到目标的估计代价
- $$f(n) = g(n) + h(n)$$

□ Theorem: A* search is optimal

定理：A*搜索是最优的

Example: Form Arad to Bucharest 举例：从Arad到Bucharest



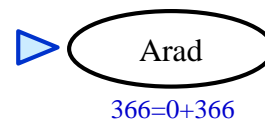
h_{SLD} Values

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

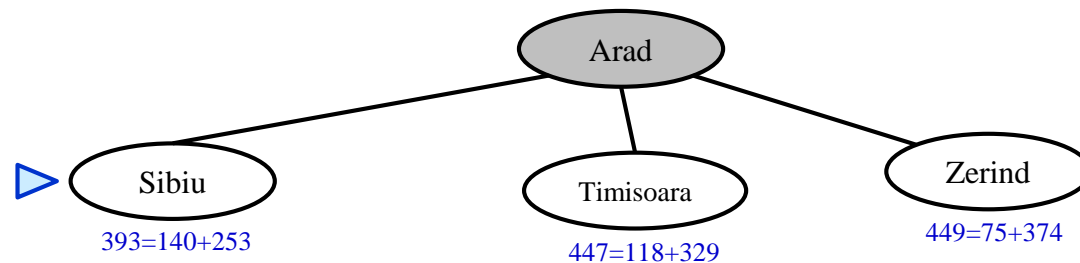
$$f(n) = g(n) + h(n), \text{ which } g(n) = \text{path cost}, h(n) = h_{SLD}$$

Example: Form Arad to Bucharest 举例：从Arad到Bucharest

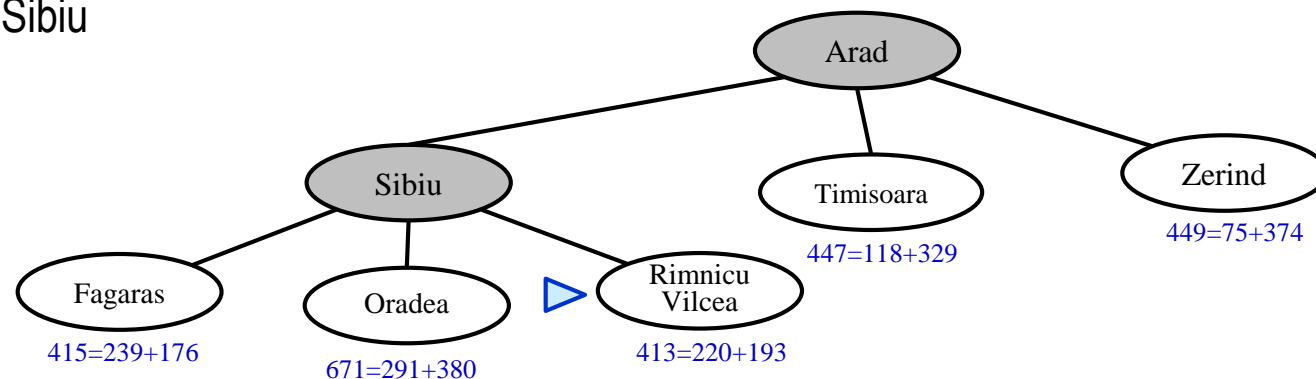
(a) The initial state



(b) After expanding Arad

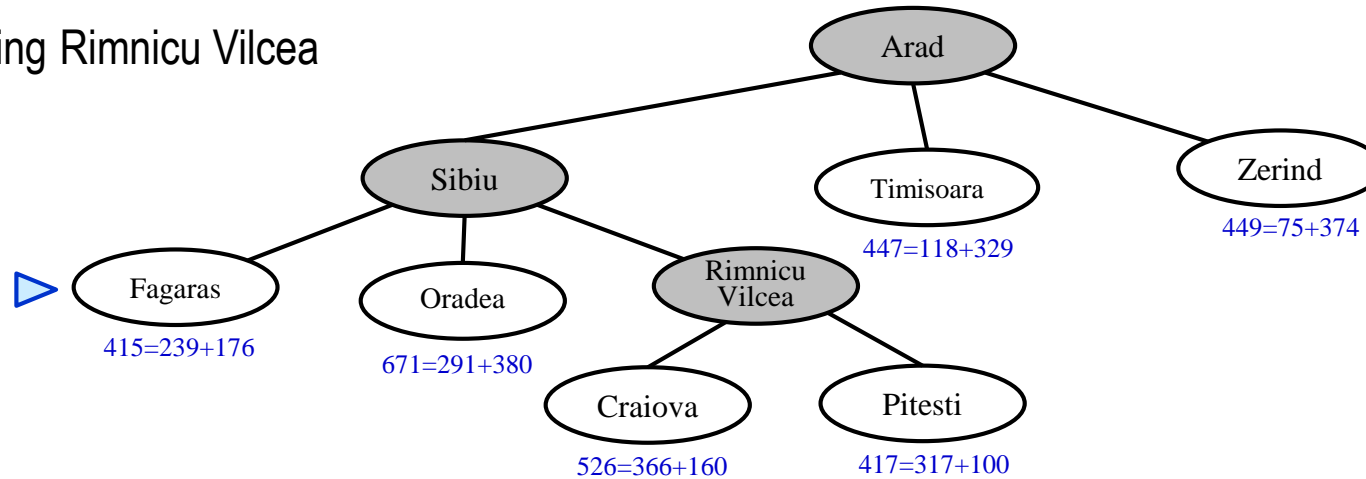


(c) After expanding Sibiu

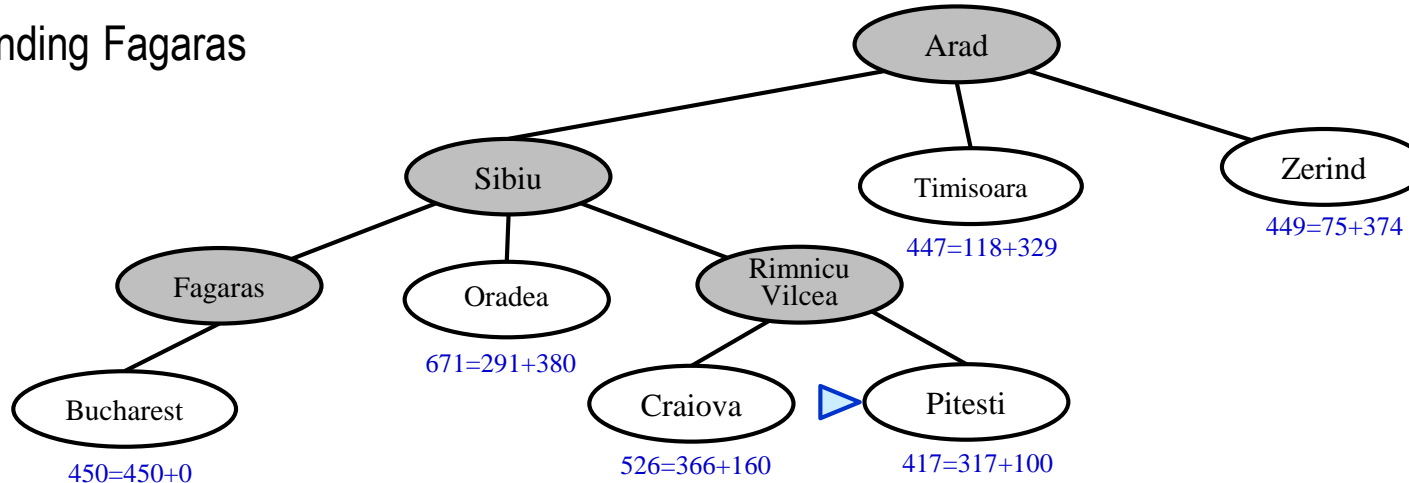


Example: Form Arad to Bucharest 举例：从Arad到Bucharest

(d) After expanding Rimnicu Vilcea

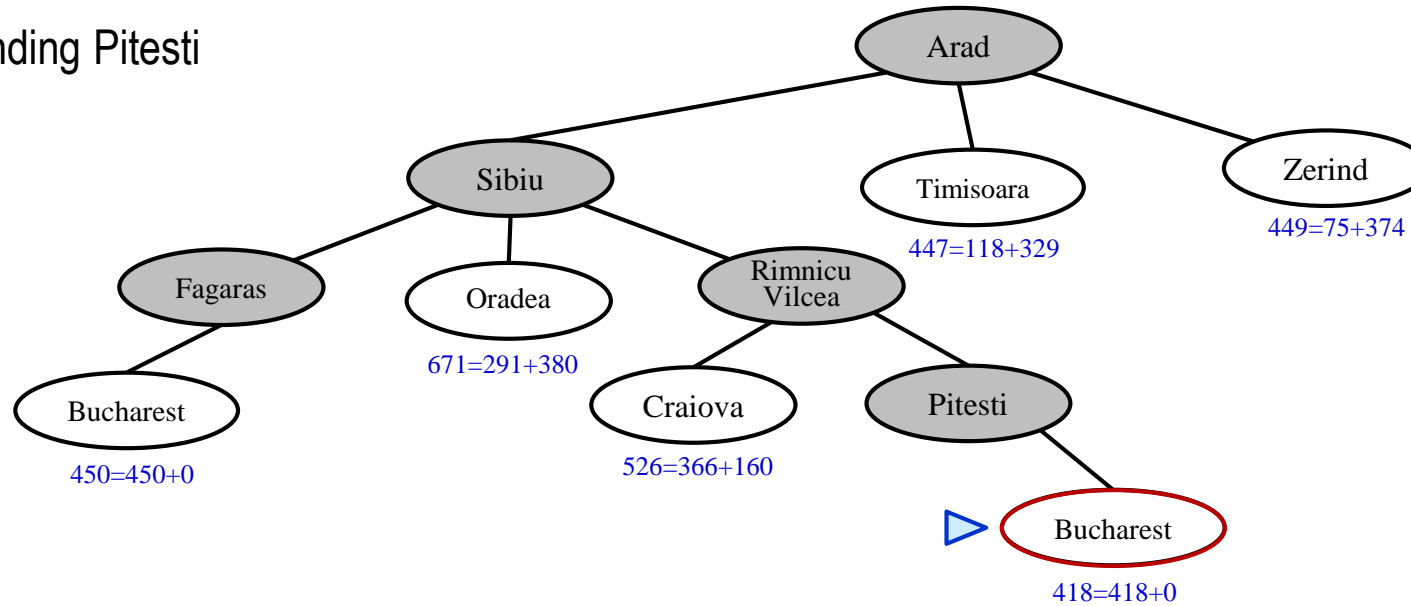


(e) After expanding Fagaras



Example: Form Arad to Bucharest 举例：从Arad到Bucharest

(f) After expanding Pitesti



Iterative Deepening A* Search 迭代加深A*搜索

- It is a variant of iterative deepening depth-first search

它是迭代加深深度优先搜索的变种

- that borrows the idea to use a heuristic function to evaluate the remaining cost to get to the goal from the A* search algorithm.

从A*搜索算法借鉴了这一思想，即使用启发式函数来评价到达目标的剩余代价。

- Since it is a depth-first search algorithm, its memory usage is lower than in A*

因为它是一种深度优先搜索算法，内存使用率低于A*算法

- but unlike standard iterative deepening search, it concentrates on exploring the most promising nodes and thus doesn't go to the same depth everywhere in the search tree.

但是，不同于标准的迭代加深搜索，它集中于探索最有希望的节点，因此不会去搜索树任何处的同样深度。

Comparing Iterative Deepening Search 迭代加深搜索之比较

□ Iterative deepening depth-first search

- uses search depth as the cutoff for each iteration.

迭代加深深度优先搜索：使用搜索深度作为每次迭代的截止值。

□ Iterative Deepening A* Search

- uses the more informative evaluation function, i.e.

迭代加深A*搜索：使用信息更丰富的评价函数，即

$$f(n) = g(n) + h(n)$$

where

- $g(n)$ -- cost to reach the node

到达该节点的代价。

- $h(n)$ -- estimated cost to get from the node to the goal

该节点到目标的估计代价

Thank you for your attention!

