

A* search

- Idea: avoid expanding paths that are already expensive
- Evaluation function $f(n) = g(n) + h(n)$
- $g(n)$ = cost so far to reach n
- $h(n)$ = estimated cost from n to goal
- $f(n)$ = estimated total cost of path through n to goal
-
-
-

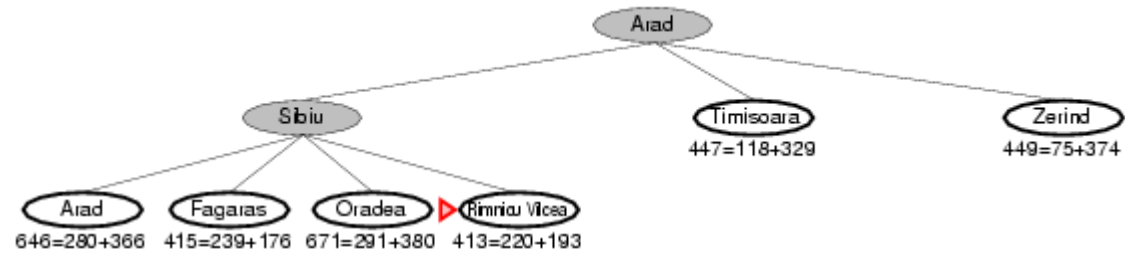
A* search example

▶ Arad
366=0+366

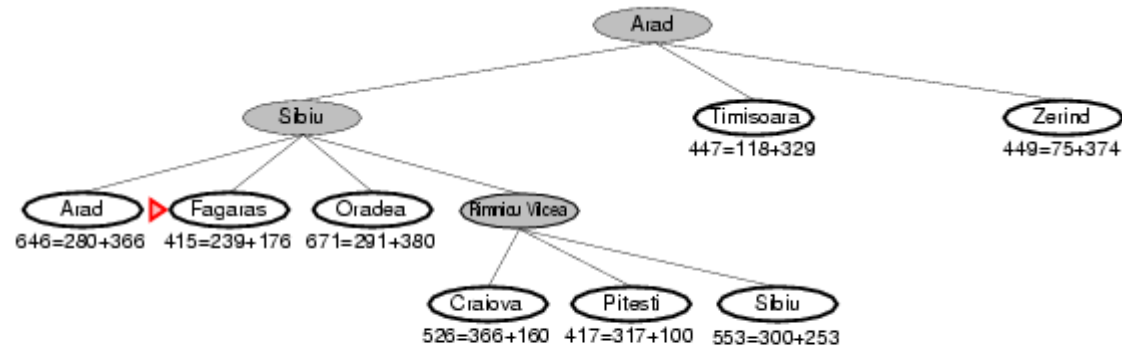
A* search example



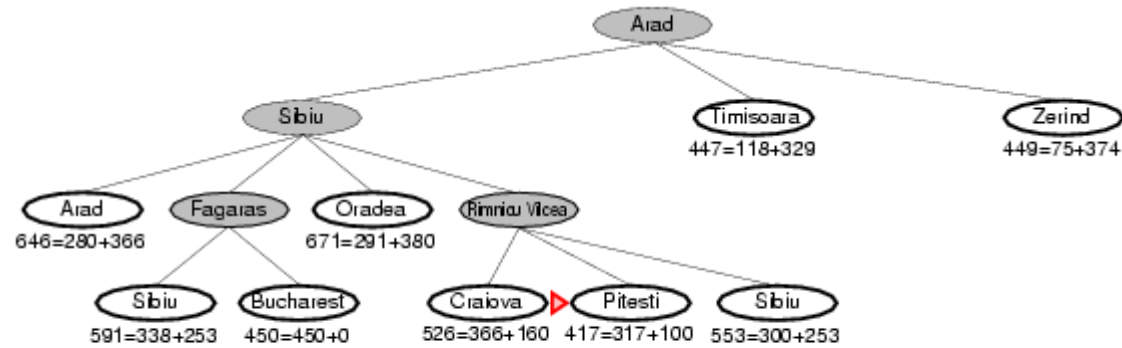
A* search example



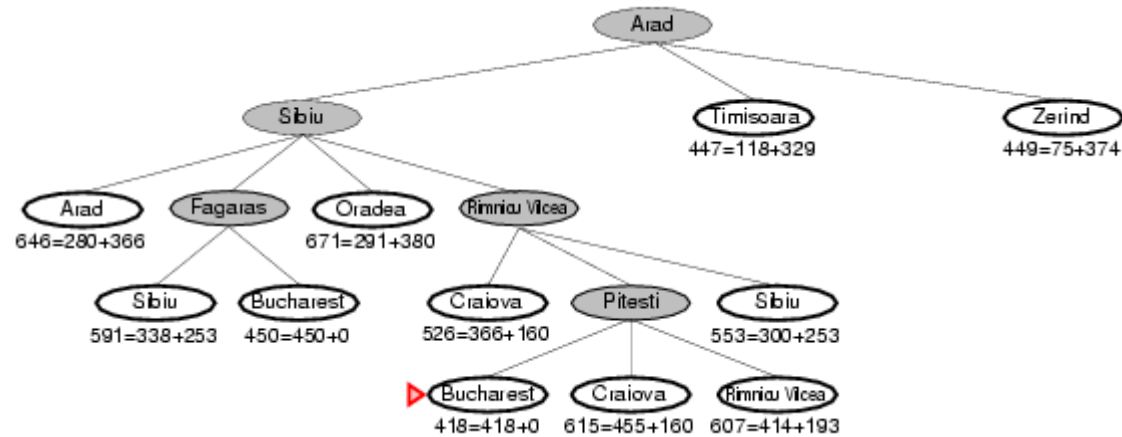
A* search example



A* search example



A* search example

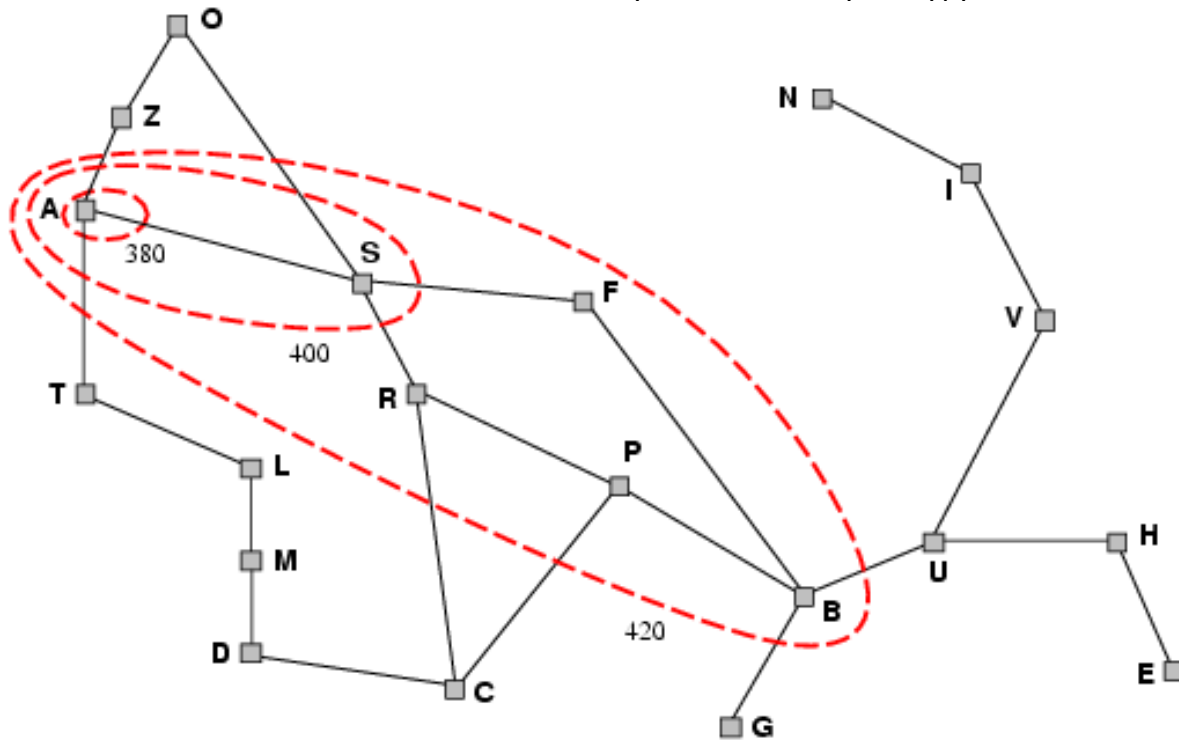


Admissible heuristics

- A heuristic $h(n)$ is **admissible** if for every node n , $h(n) \leq h^*(n)$, where $h^*(n)$ is the **true** cost to reach the goal state from n .
- An admissible heuristic **never overestimates** the cost to reach the goal, i.e., it is **optimistic**
- Example: $h_{SLD}(n)$ (never overestimates the actual road distance)
- **Theorem:** If $h(n)$ is admissible, A^* using TREE-SEARCH is optimal
-
-

Optimality of A*

- A* expands nodes in order of increasing f value
- Gradually adds " f -contours" of nodes
- Contour i has all nodes with $f=f_i$, where $f_i < f_{i+1}$



Properties of A^*

- Complete? Yes (unless there are infinitely many nodes with $f \leq f(G)$)
- Time? Exponential
- Space? Keeps all nodes in memory
- Optimal? Yes
-
-
-
-