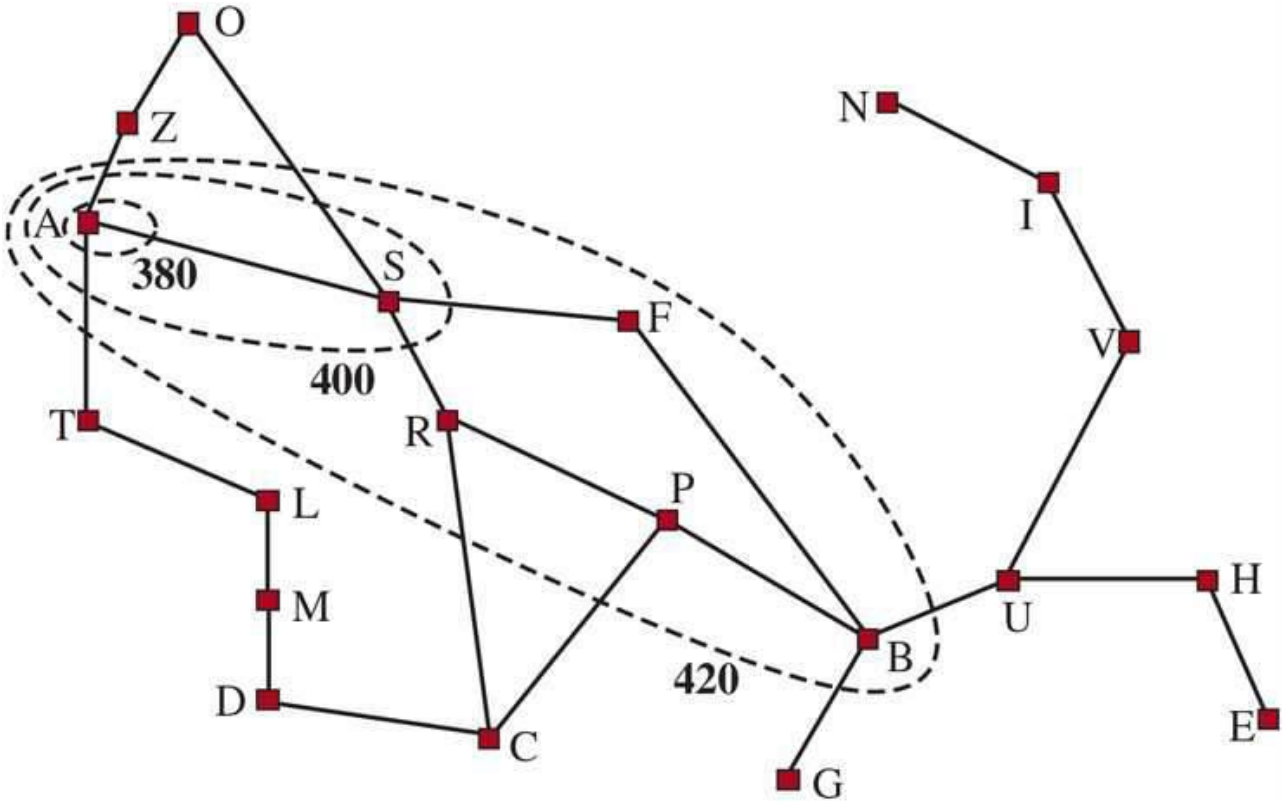
INFORMED SEARCH

Weighted A search*

SEARCH CONTOURS

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



SEARCH CONTOURS

- Uniform-cost search: Circular Contours (looks only at g(n)
- A* search: Narrowly focused around an optimal path (looks at g(n) + h(n)

- g cost is monotonic as path cost always increases as you go along a path.

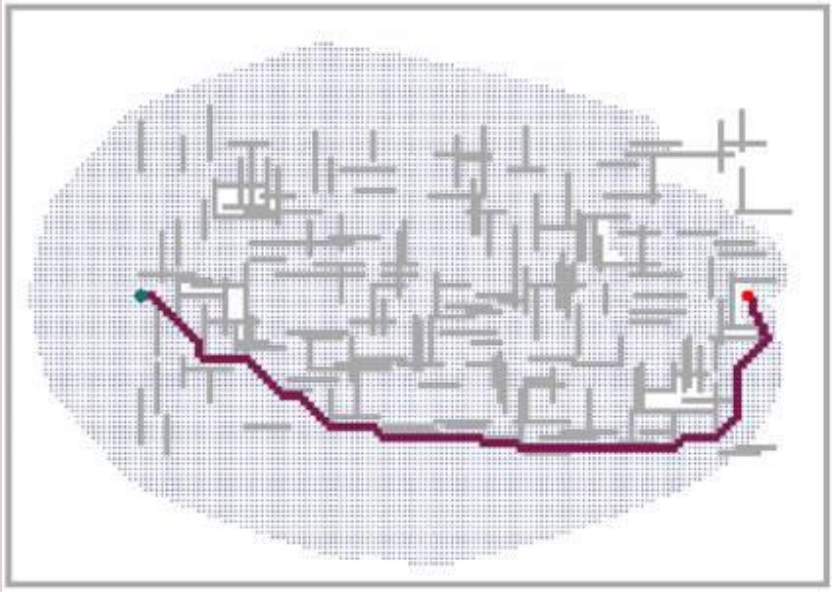
- f = g + h, f will increase monotonically?

- Node n cost = g(n) + h(n)
- n -> n'
- Node n' cost = g(n) + c(n, a, n') + h(n')

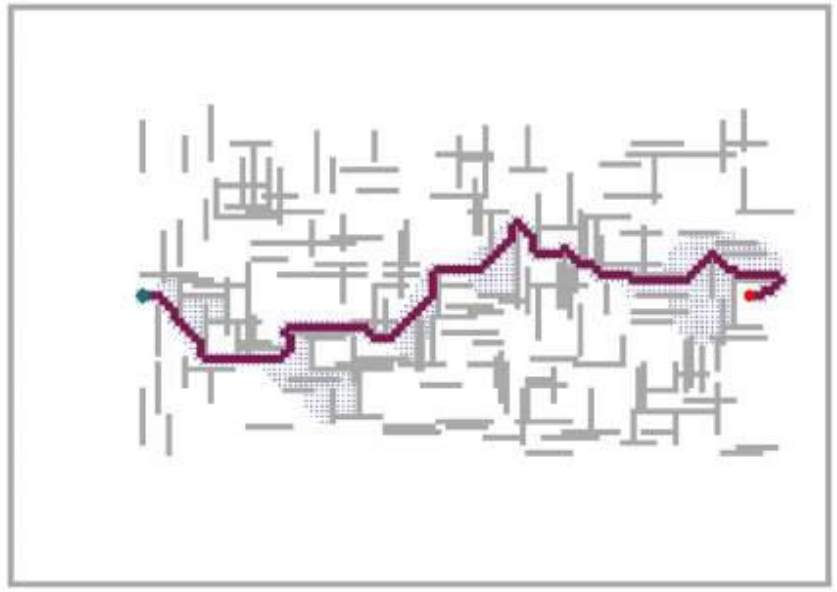
SEARCH CONTOURS

- A* expands all nodes that can be reached from the initial state on a path where every node on the path has $f(n) < C^*$.
- A* might then expand some of the nodes right on the "goal contour" (where $f(n) = C^*$) before selecting a goal node.
- A* expands no nodes with $f(n) > C^*$

SATISFYING SEARCH (WEIGHTED A*)



(a)



(b)

- Good enough solution
- Inadmissible heuristic

WEIGHTED A* SEARCH

- $f(n) = g(n) + W \times h(n)$; $W>1$

$C^* \leq$ Solution cost $\leq W \times C^*$

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

Figure 3.22 Values of h_{SLD}—straight-line distances to Bucharest.

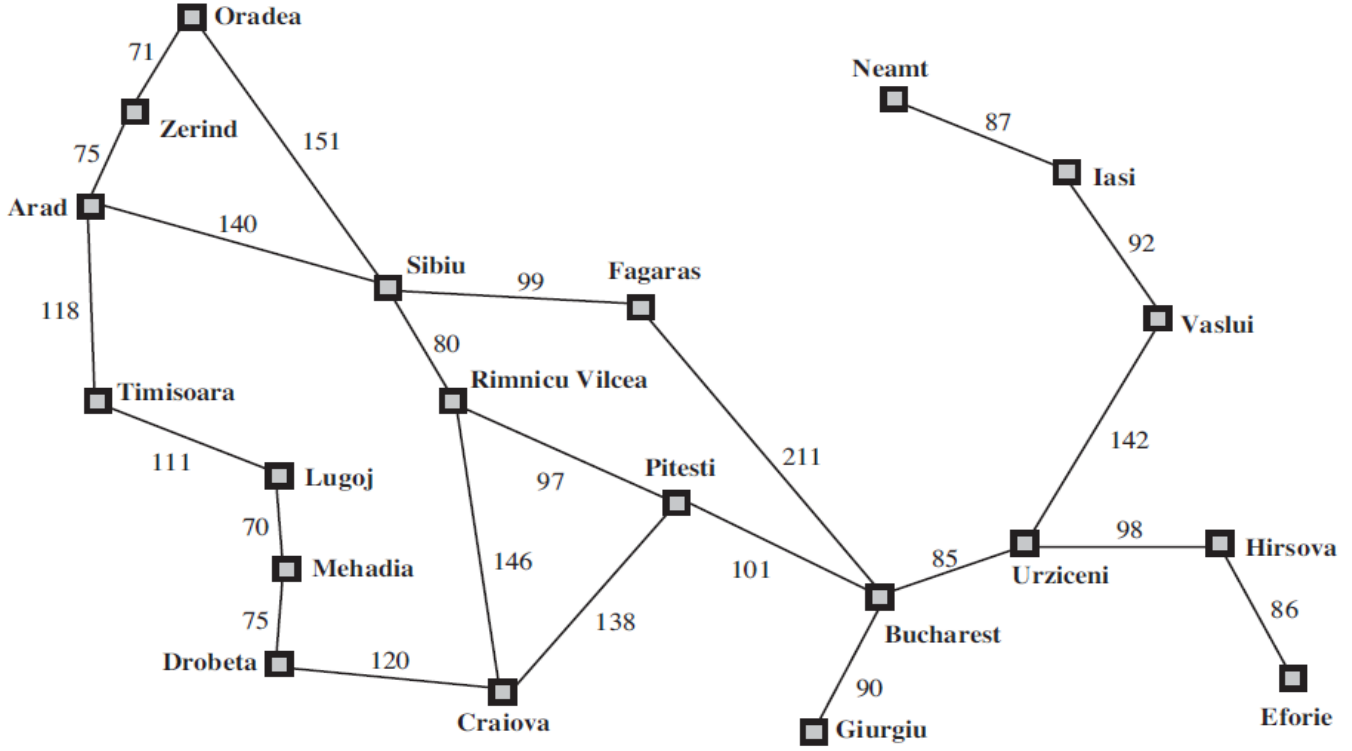


Figure 3.2 A simplified road map of part of Romania.

A* search:	$g(n) + h(n)$	$(W = 1)$
Uniform-cost search:	$g(n)$	$(W = 0)$
Greedy best-first search:	$h(n)$	$(W = \infty)$
Weighted A* search:	$g(n) + W \times h(n)$	$(1 < W < \infty)$

SEARCH IDEAS

- **Bounded suboptimal search**: Looks for a solution that is guaranteed to be within a constant factor W of the optimal cost.
- **Bounded-cost search**: Looks for a solution whose cost is less than some Constant C.
- **Unbounded-cost search**: Accepts a solution of any cost, as long as we can find it quickly.