

MEMORY
BOUNDED
HEURISTIC
SEARCH



ITERATIVE-DEEPENING A* (IDA*)

- Cutoff = $f = \text{cost}(g+h)$

RECURSIVE BEST-FIRST SEARCH (RBFS)

function RECURSIVE-BEST-FIRST-SEARCH(*problem*) **returns** a solution or *failure*
 solution, fvalue \leftarrow RBFS(*problem*, NODE(*problem*.INITIAL), ∞)
return *solution*

function RBFS(*problem, node, f_limit*) **returns** a solution or *failure*, and a new *f*-cost limit
 if *problem*.IS-GOAL(*node*.STATE) **then return** *node*
 successors \leftarrow LIST(EXPAND(*node*))
 if *successors* is empty **then return** *failure, ∞*
 for each *s* **in** *successors* **do** // update *f* with value from previous search
 s.f \leftarrow max(*s*.PATH-COST + *h*(*s*), *node.f*)
 while true do
 best \leftarrow the node in *successors* with lowest *f*-value
 if *best.f* > *f_limit* **then return** *failure, best.f*
 alternative \leftarrow the second-lowest *f*-value among *successors*
 result, best.f \leftarrow RBFS(*problem, best, min(f_limit, alternative)*)
 if *result* \neq *failure* **then return** *result, best.f*

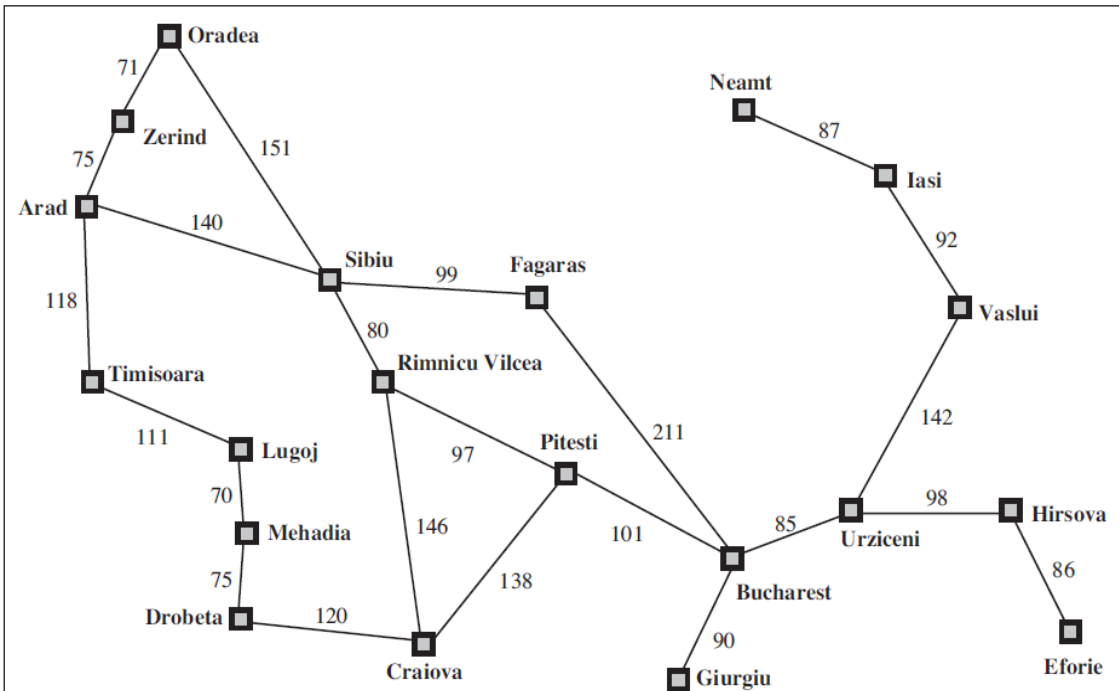
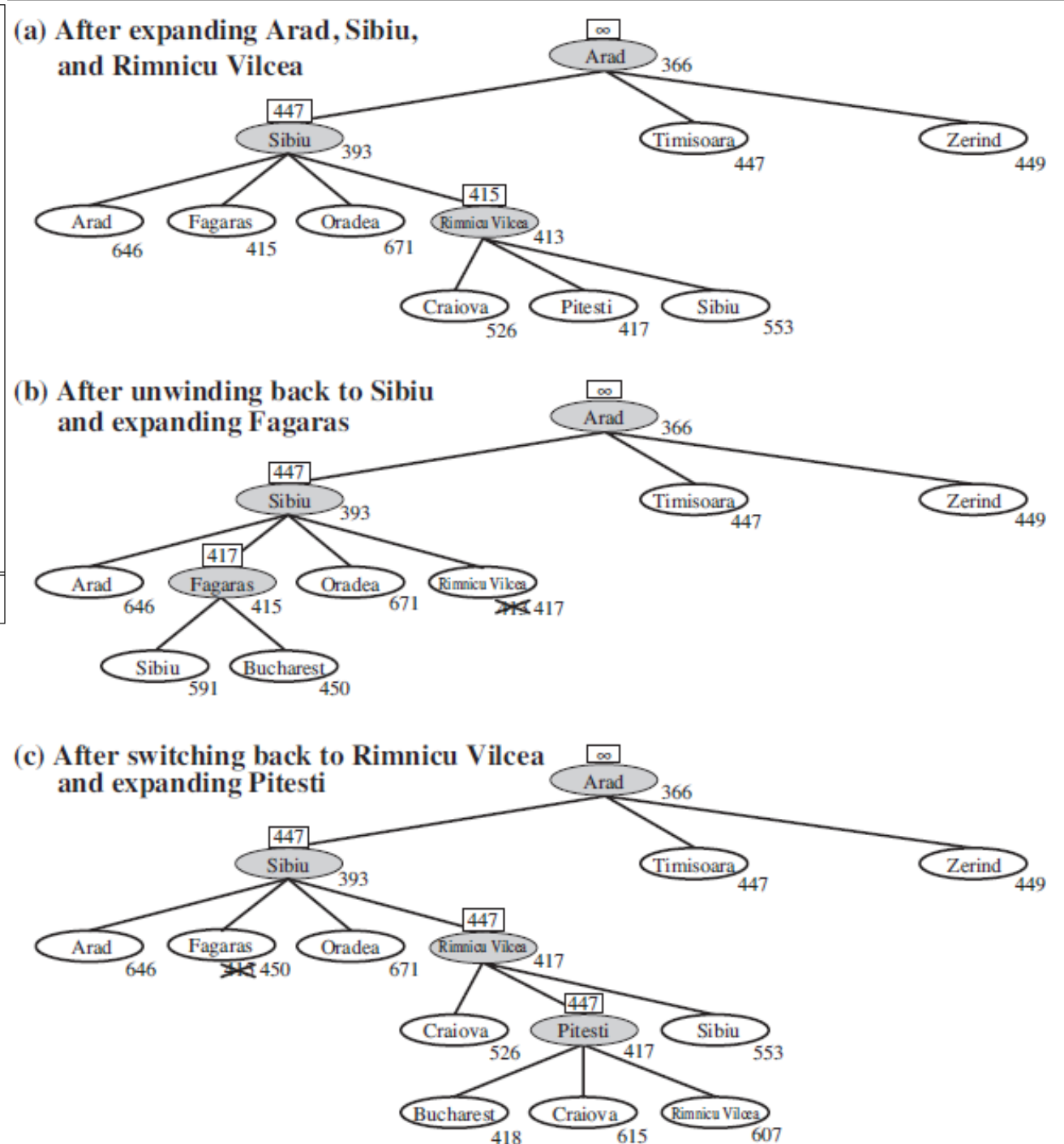


Figure 3.2 A simplified road map of part of Romania.

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.



IDA* AND RBFS: CHALLENGES

- Low amount of memory utilization
 - Forgets all previously expanded paths
 - Exponential increase in complexity associated with redundant paths
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- Solutions:
 1. Memory-bounded A*
 2. Simplified MA*