ĐẠI HỌC QUỐC GIA THÀNH PHỐ HỒ CHÍ MINH
TRƯỜNG ĐẠI HỌC KHOA HỌC TỰ NHIÊN
KHOA CÔNG NGHỆ THÔNG TIN

BÁO CÁO LAB 1

BỘ MÔN CƠ SỞ TRÍ TUỆ NHÂN TẠO

NGƯỜI THỰC HIỆN
Họ và tên: Đỗ Đạt Thành
MSSV: 20127411
Lớp: 20CLC04

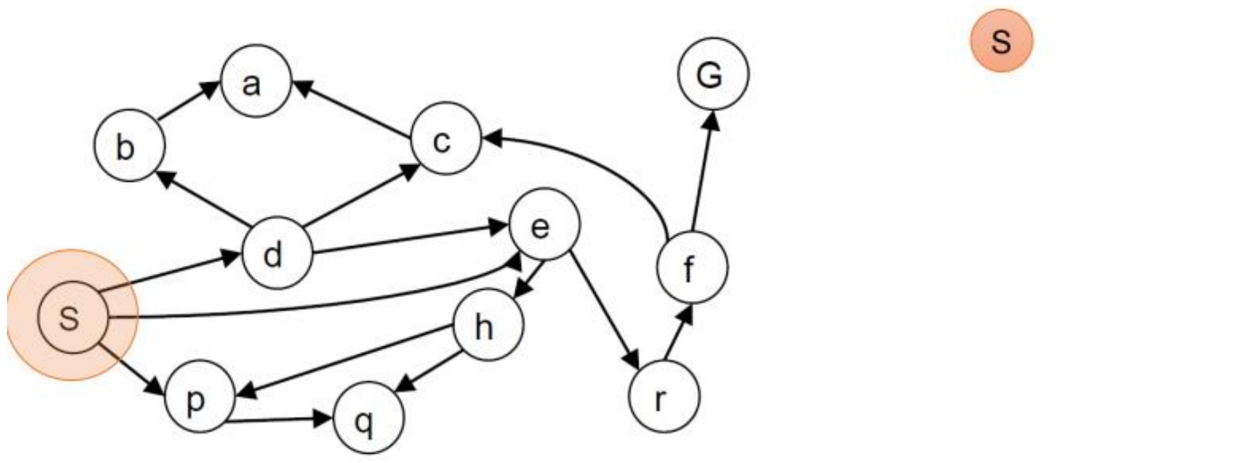
TP. HỒ CHÍ MINH – NĂM 202

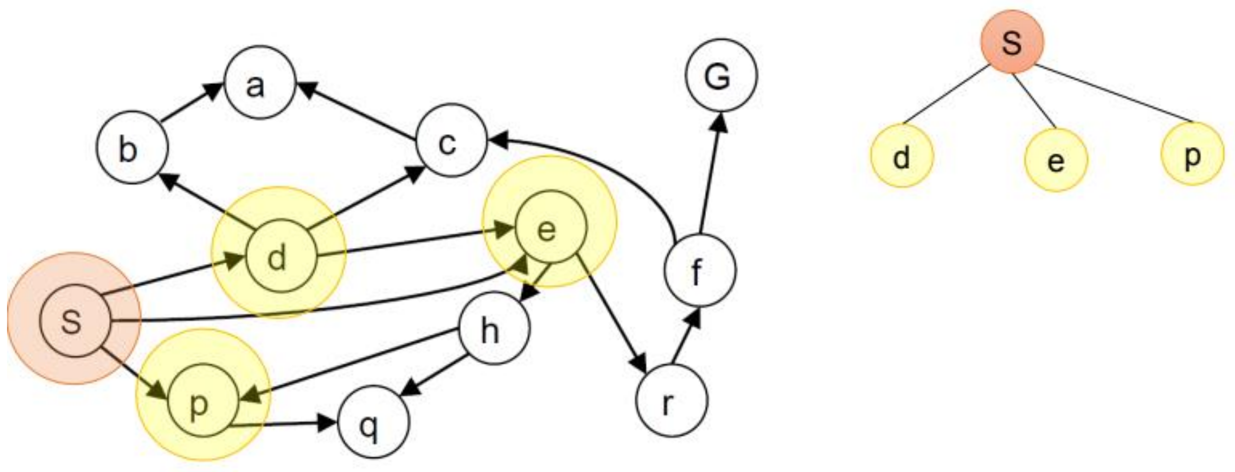
I. Breadth-first search

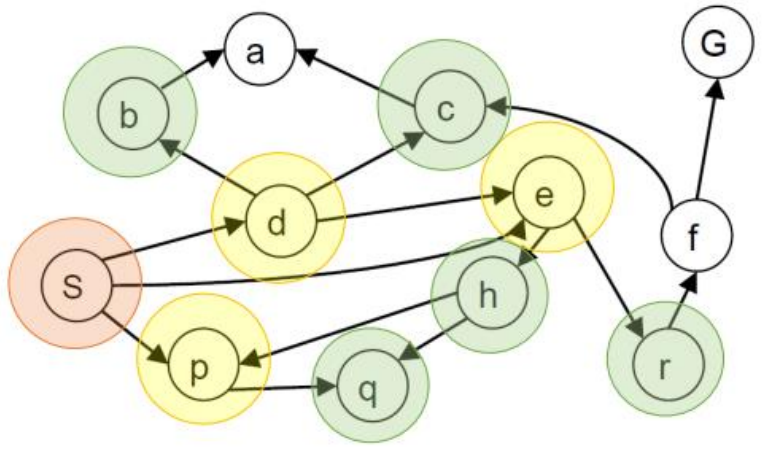
a. Idea

- Create place contain next edge can go and visited
- Perform loop to check edge if it is possible to go, draw it and put it into visited array
- Robot just moves 4 directions so just check 4 times allow 4 directions
- After found the goal, show the final way and compute total of costs

b. Example



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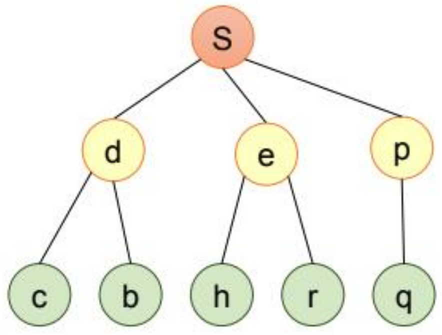
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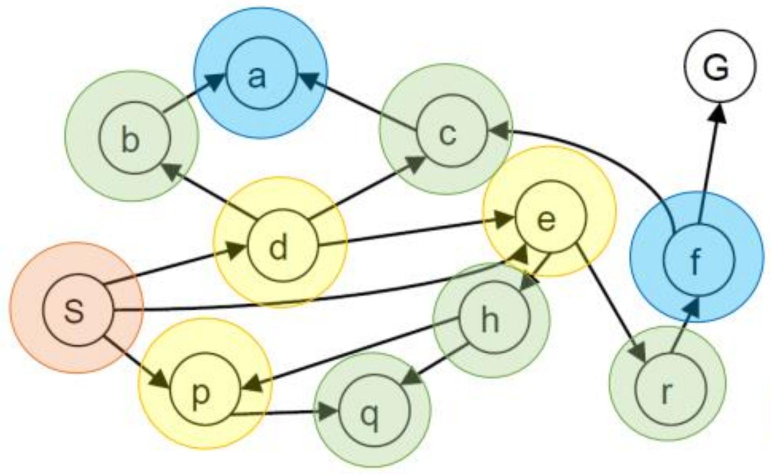
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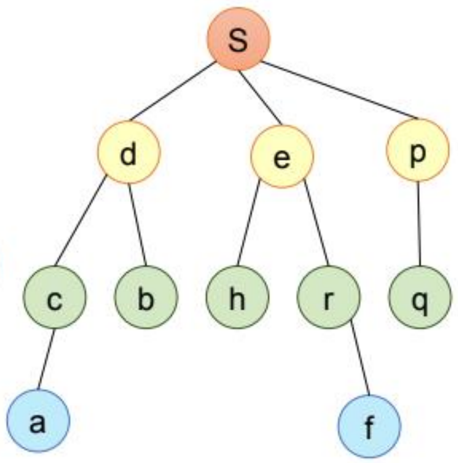
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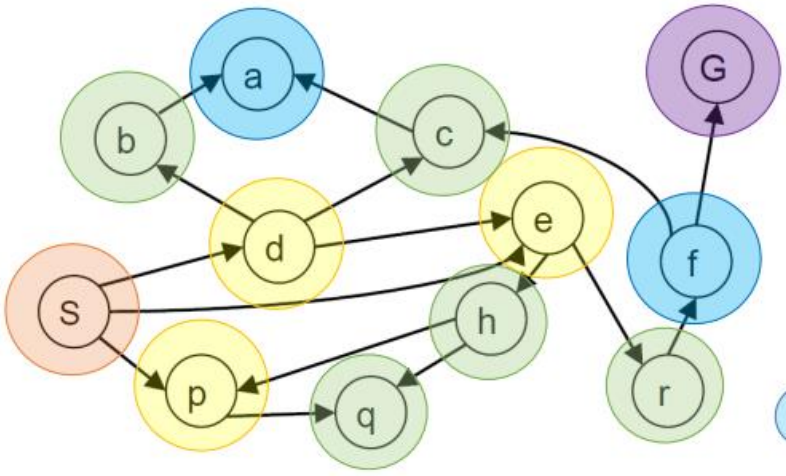
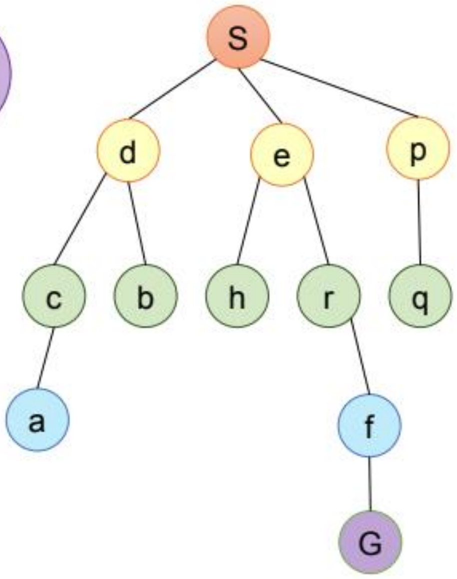
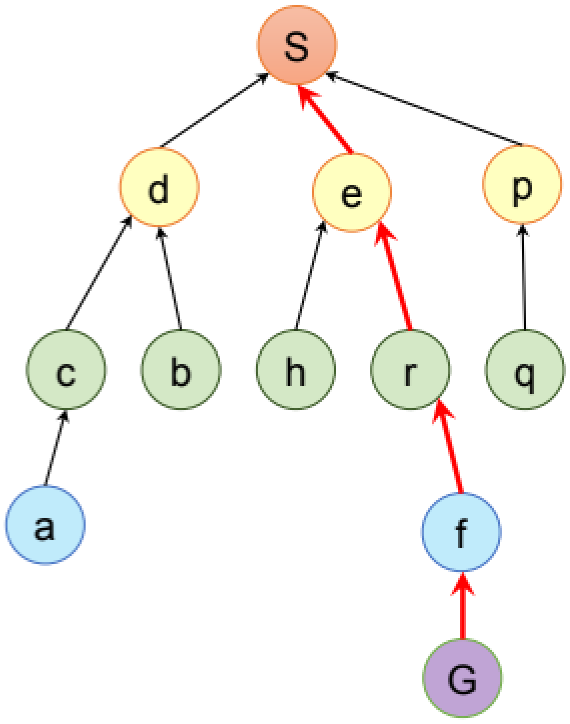




d = 4



[illegible]

c. Conclusion

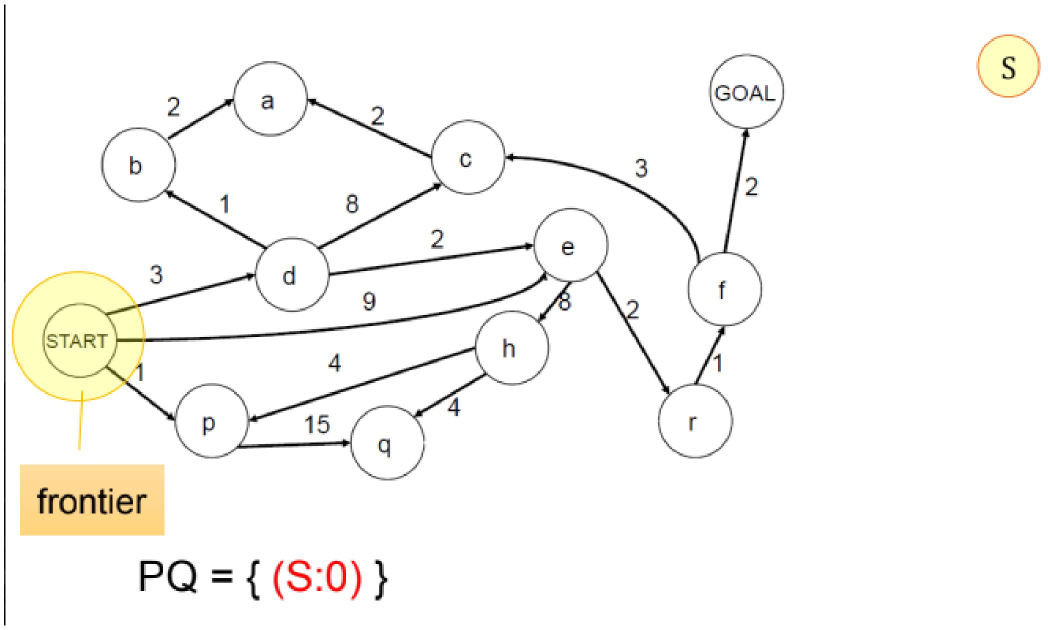
- It can use to find a way on map which doesn't have number about the distance between place to place but it still found the shortest way to go to the goal.
- Can't find the cheapest path

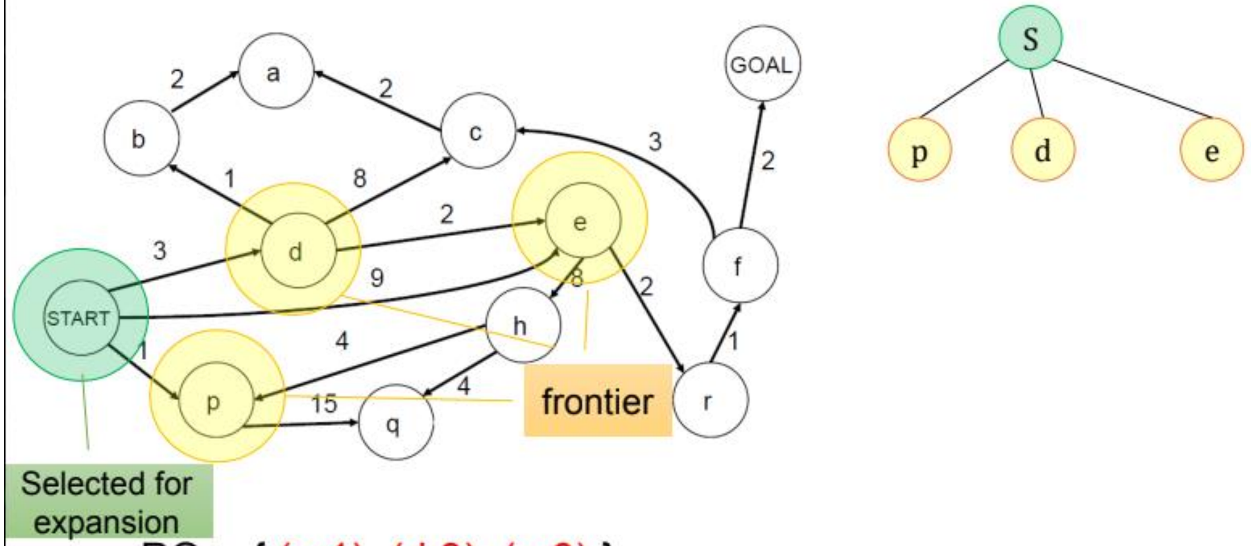
II. Uniform-cost search

a. Idea

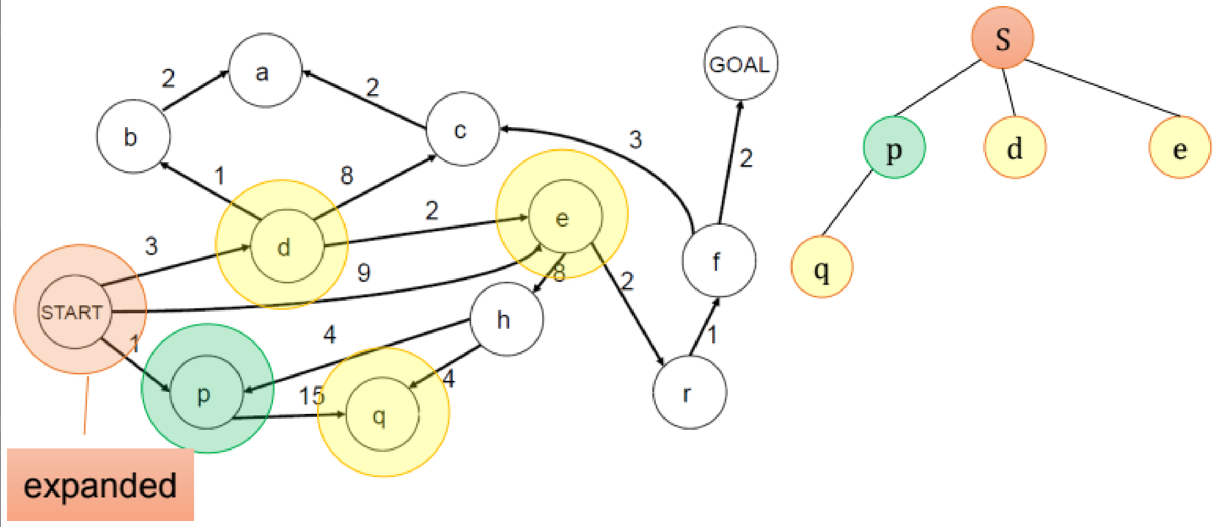
- At the same with breadth-first search but have value of the cost
- Update path cost
- Compare distance to find a next way need to go

b. Example

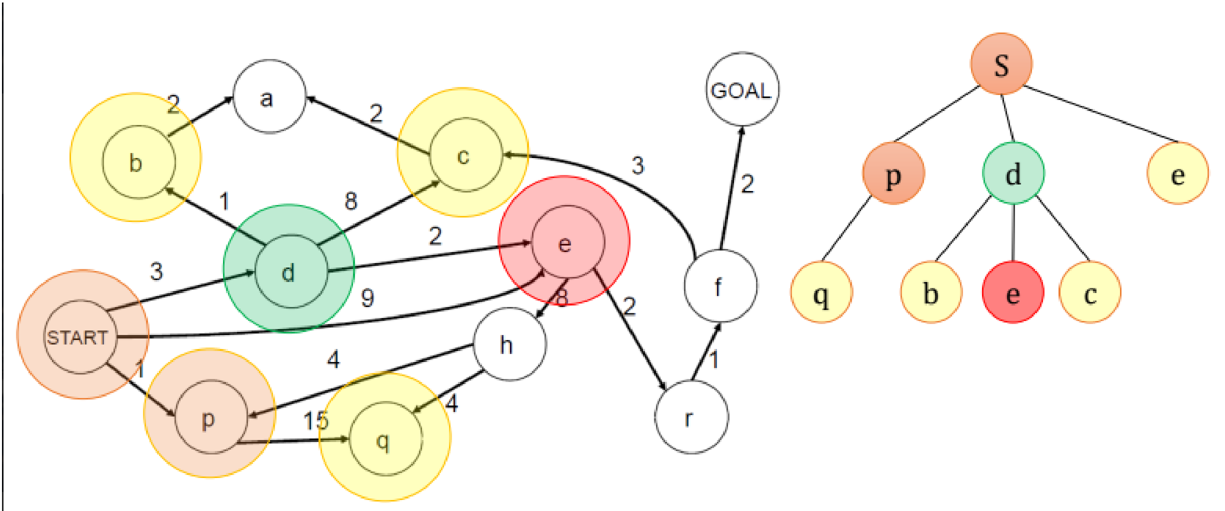




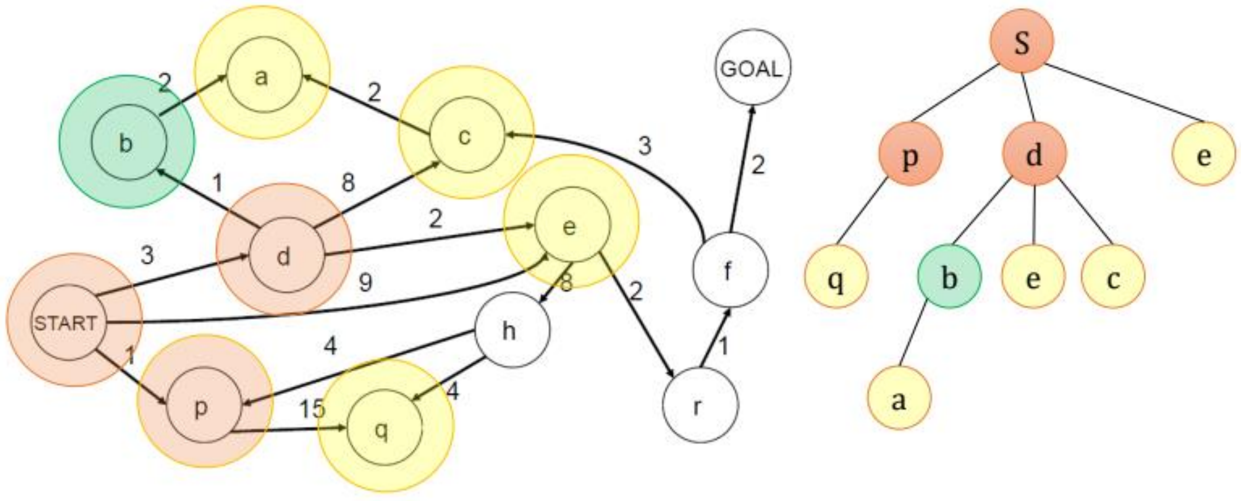
PQ = { (p:1), (d:3), (e:9) }



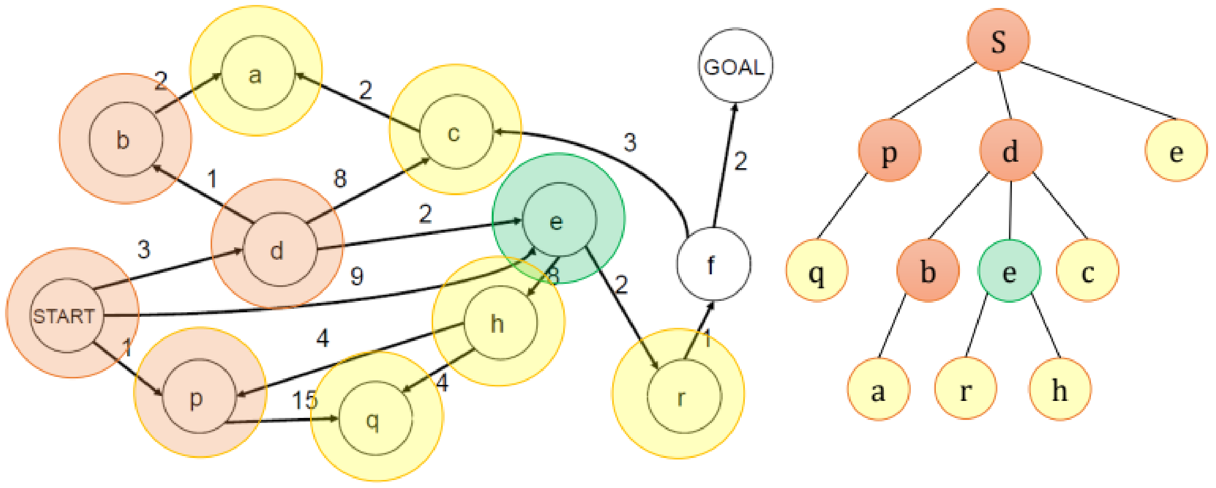
PQ = { (d:3), (e:9), (q:16) }



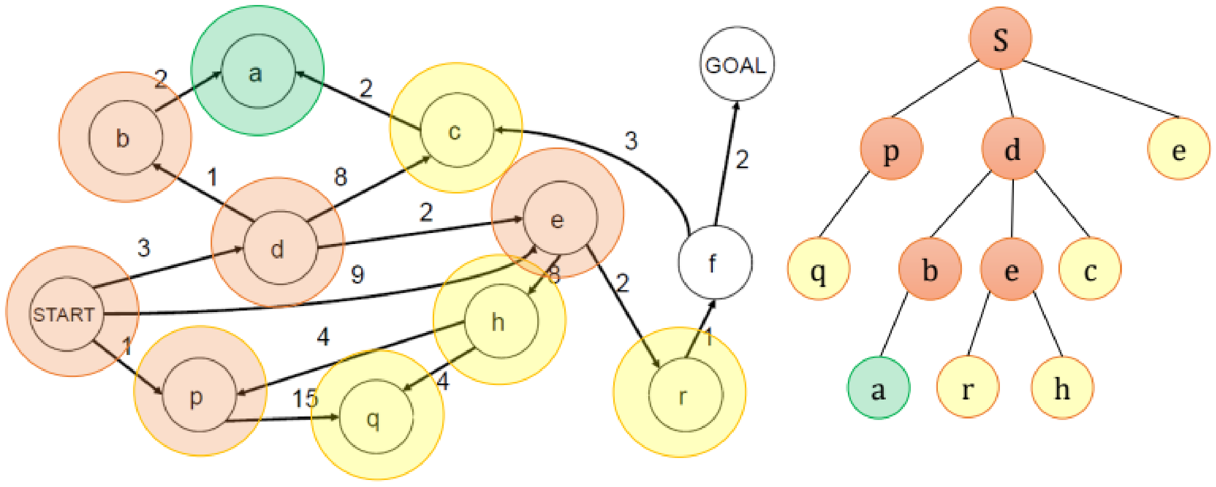
PQ = { (b:4), (e:5), (c:11), (q:16) }



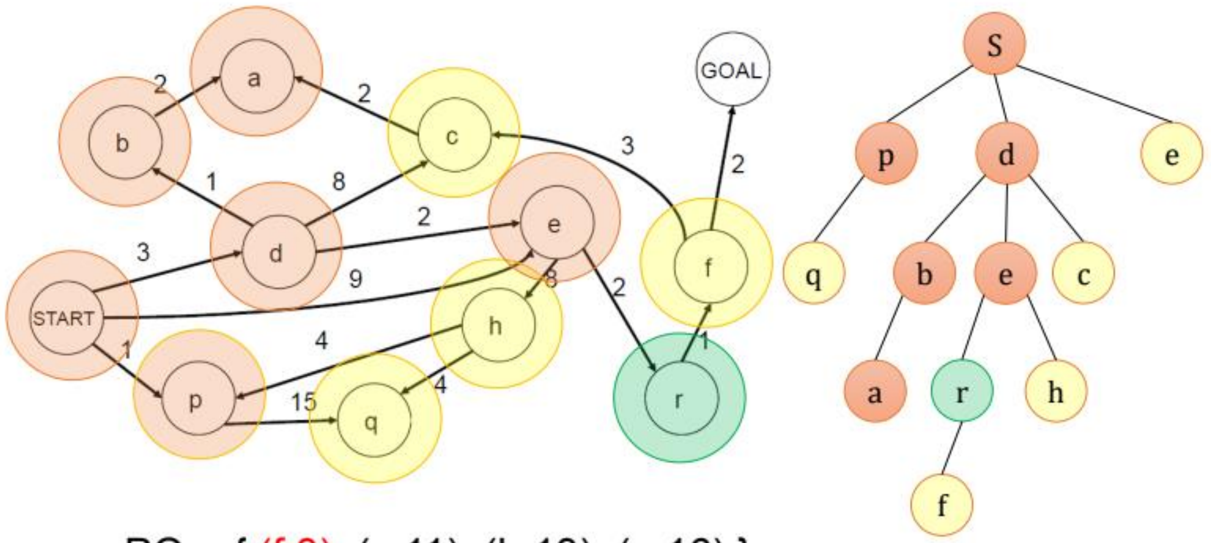
PQ = { (e:5), (a:6), (c:11), (q:16) }



PQ = { (a:6), (r:7), (c:11), (h:13), (q:16) }



PQ = { (r:7), (c:11), (h:13), (q:16) }



PQ = { (f:8), (c:11), (h:13), (q:16) }

Search path: S → d → e → r → f → G, cost = 10

c. Conclusion

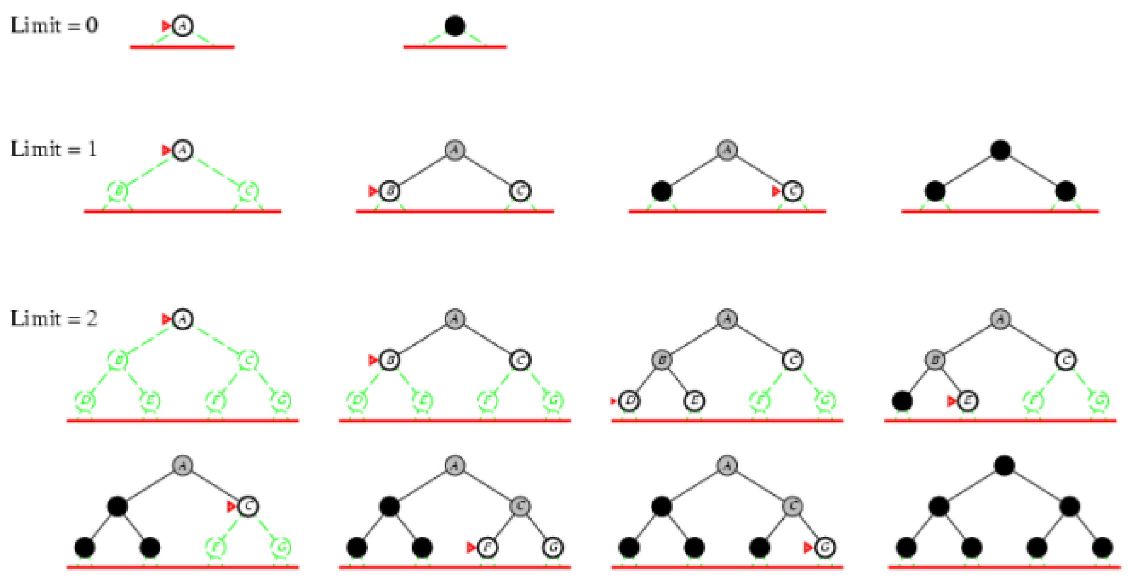
- It is optimal
- Find the cheapest path

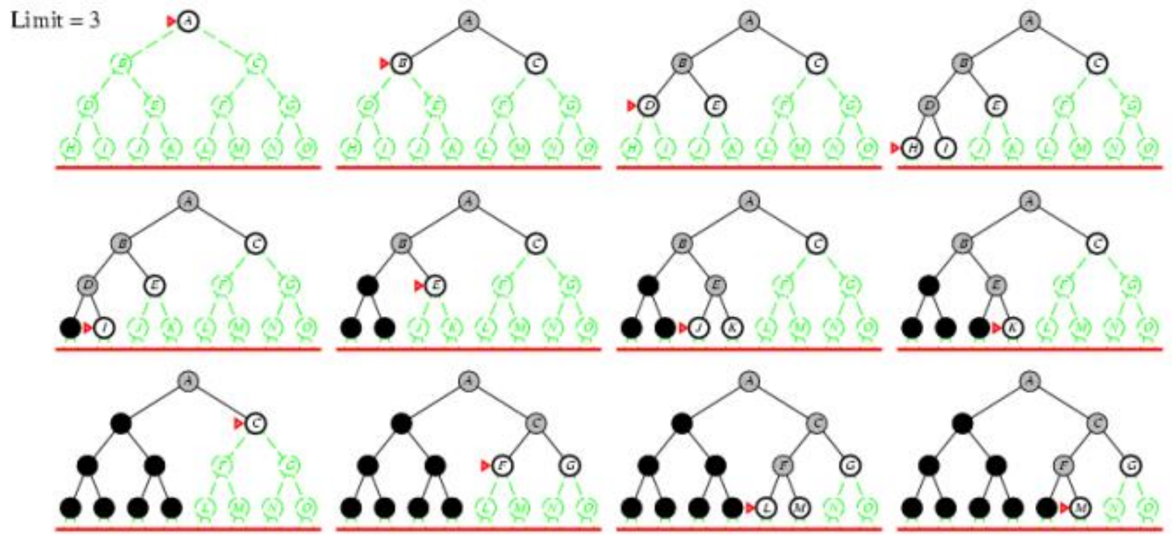
III. Iterative deepening search

a. Idea

- Movement same algorithm before
- Create the value contain the limit and depth
- Create function check that the depth is reach the limit or not

b. Example





c. Conclusion

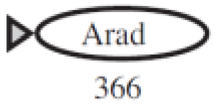
- Optimality
- Time complexity: $(d+1)b^0 + db^1 + (d-1)b^d = O(b^d)$
- Space complexity: $O(bd)$, similar to DFS
- Preferred when the search space is large and the depth of the solution is not known

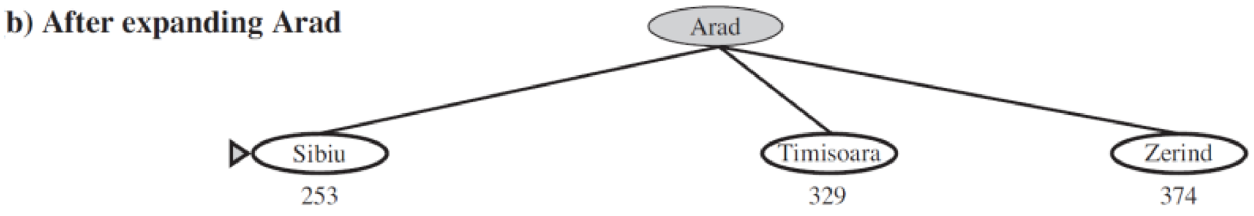
IV. Greedy best-first search

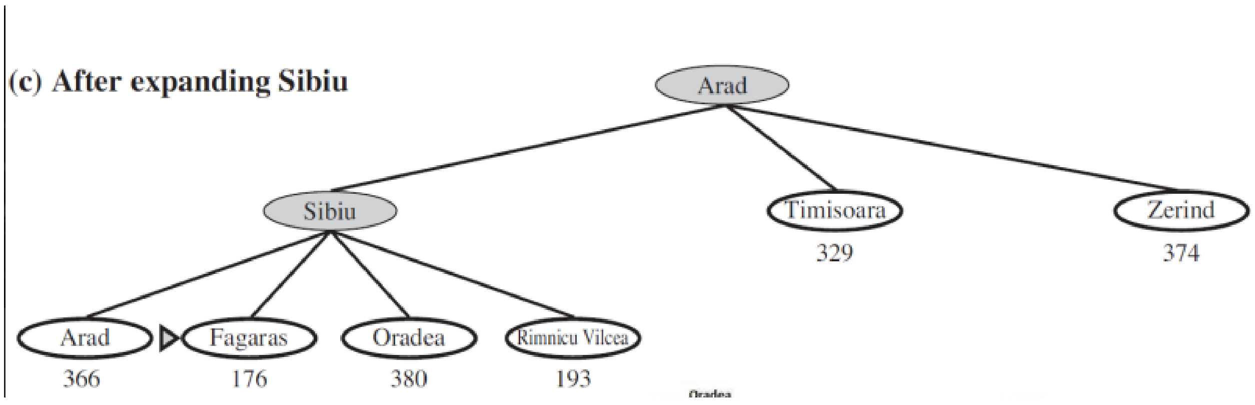
a. Idea

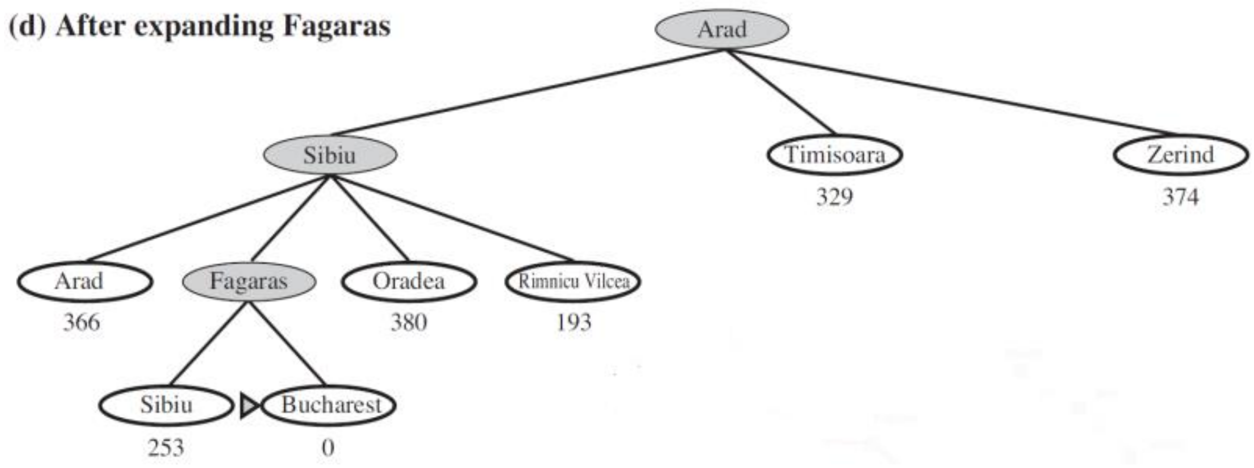
- Movement same another algorithm
- Bonus function to compute Manhattan
- Compare the distance and choose a the lowest

b. Example









c. Conclusion

- Time reduced substantially with a good heuristic
- Space complexity: $O(b^m)$ – keeps all nodes in memory
- No optimality

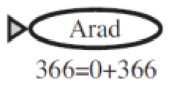
V. <u>Graph-search A*</u>

a. Idea

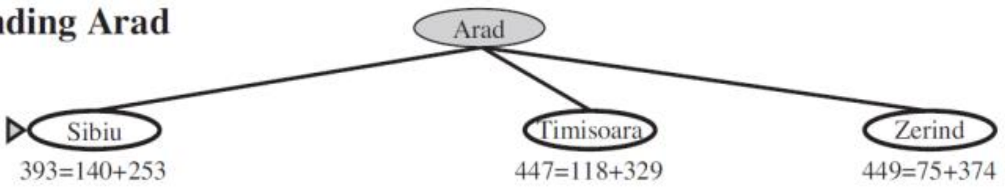
- Same Greedy best-first search
- More the value to contain cost
- Distance sum by Manhattan and the cost and compare it

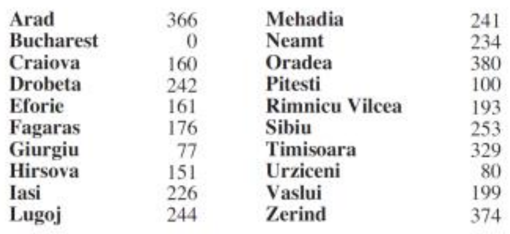
b. Example

(a) The initial state



(b) After expanding Arad





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

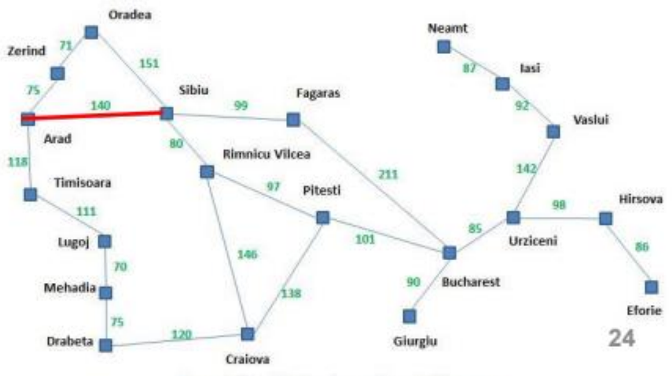
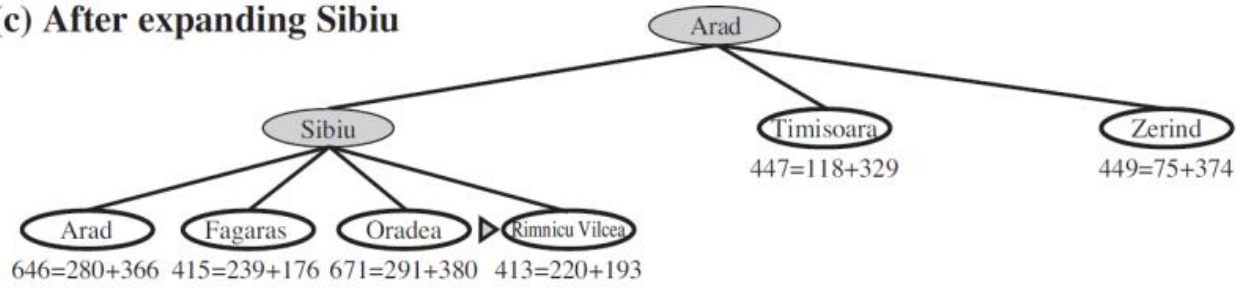


Figure A simplified road map of part of Romania.

(c) After expanding Sibiu



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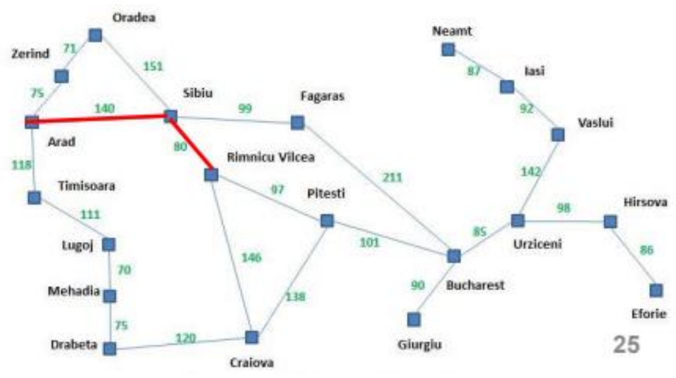
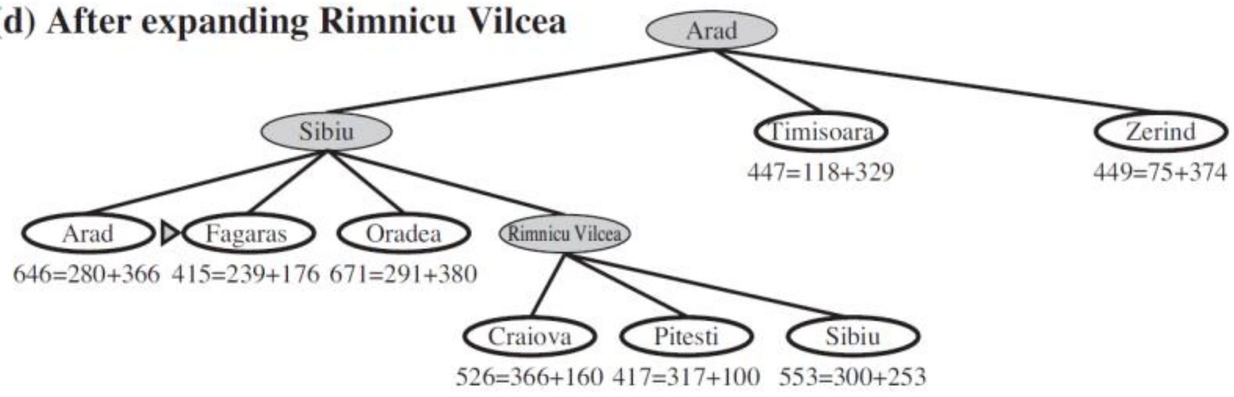


(d) After expanding Rimnicu Vilcea



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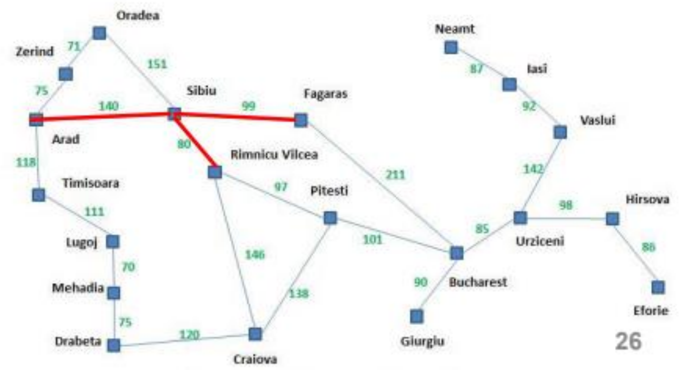
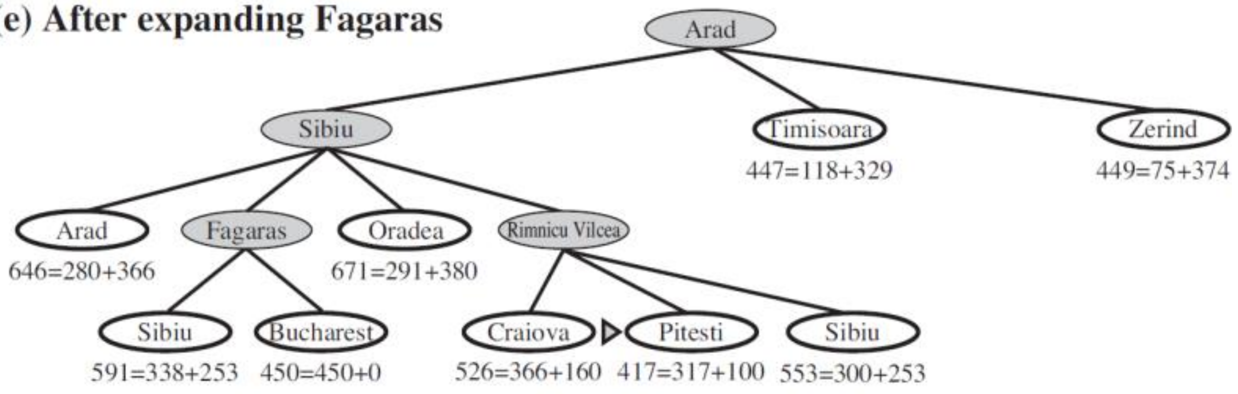
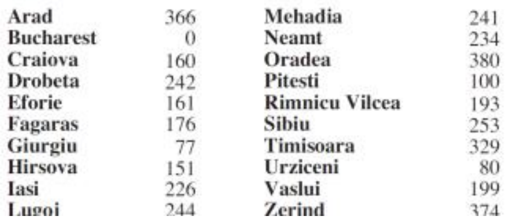


(e) After expanding Fagaras





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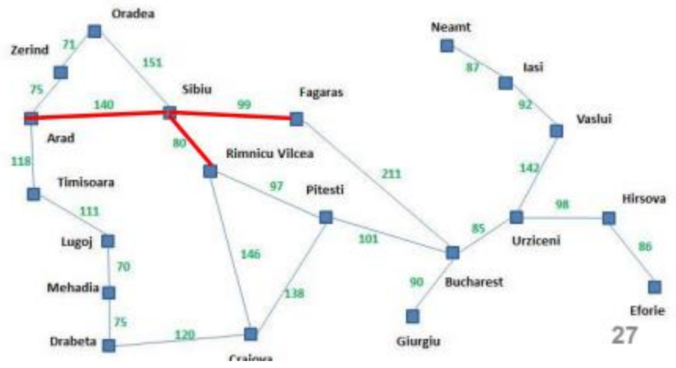
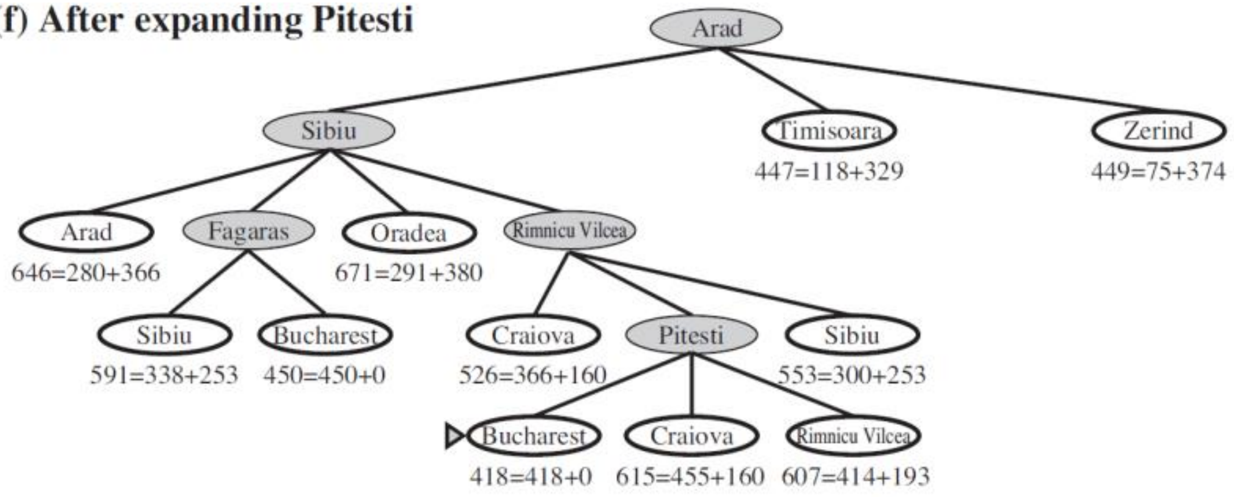
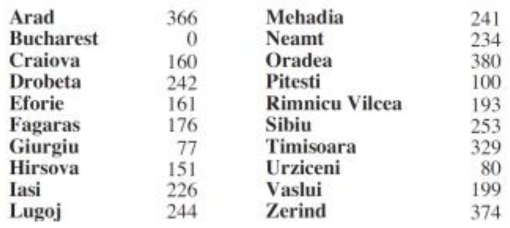


(f) After expanding Pitesti





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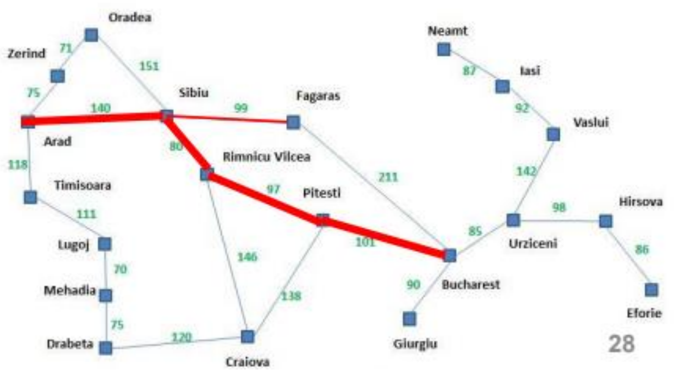

c. Conclusion

- Not always optimality
- Time complexity: exponential
- Space complexity: exponential

VI. References

- The document in the Computer Science Department at the University of Science, Vietnam National University, Ho Chi Minh City
- GeeksforGeeks
- StackOverflow