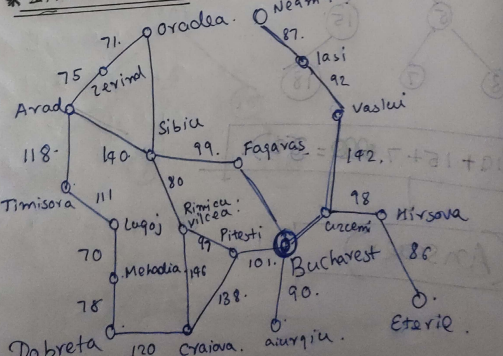
Expt 5:- Best First Search & A*Alg for Real World Problems

* **Problem formulation:-** A Romanian map is given we have to find the shortest path with least path cost using A* and Best First Search Problem.

* **Path cost:-** The sum of the cost from the initial to the final node.

* **Operators:-** The node ~~costs~~ and the paths (costs) are the operators in this problem

* **Initial State:-**



Romanian Map

Nodes.

Straight line Distance to Bucharest

Arad	366
Bucharest [Goal]	0
Craiova	160
Dobreta	242
Eforie	161
Fagaras	178
Giurgiu	77
Hirsova	151
Iasi	226
Lugoj	244
Mehadia	241
Neamt	234
Oradea	380
Pitesti	98
Rimnicu Vilcea	193
Sibiu	253
Timisoara	329
Urziceni	80
Vaslui	199
Zerind	374

* Algorithm:-

(:) Best First Search:-

* Create a priority queue. pqueue.
* Insert 'start' in pqueue: pqueue. insert (search)
* Delete all elements of pqueue one by one
* If the element is goal. Exit.
* Else, traverse neighbours. and mark the node examined.

(:) A* Star:-

* Create two lists - Open and Closed.
* Initialize the open list
* Initialize the closed list.
* Put the starting node on the open list. (you can leave its f at zero).
* When the open list is not empty:-
(:) Find the node with the least f on the open list; call it 'q'.
(:) pop q off the open list.
(:) Generate q's 8 successors. and set their parents to q.

(c) for each successor.

(i). if successor is the goal, stop search.

(ii) else, compute both g & h for successor.

successor.g = q.g + distance between successor and q.

successor.h = distance from goal to successor.

successor.f = successor.g + successor.h.

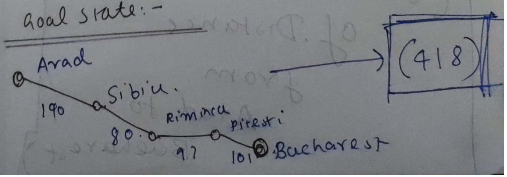
(iii). if a node with the same position as successor is in the open list which has a lower f than successor, skip this successor, skip this successor

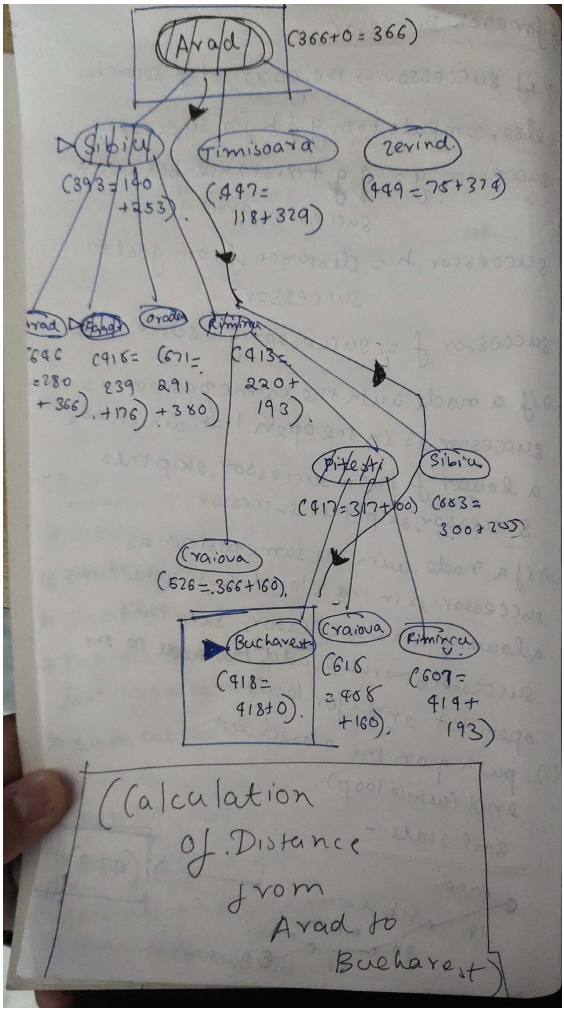
(iv) if a node with the same position as successor is in the closed list which has a lower f than successor, skip this successor otherwise, add the node to the open list. end (for loop).

(v). push q on the closed list.

end (while loop).

goal state:-




Arad
(366+0=366)
Sibiu
Timisoara
Zerind
(393=140+253)
(447=118+329)
(449=75+374)
Arad
Fagaras
Oradea
Rimnicu
(646=280+366)
(415=239+176)
(671=291+380)
(413=220+193)
Pitesti
Sibiu
(417=317+100)
(553=300+253)
Craiova
(526=366+160)
Bucharest
Craiova
Rimnicu
(418=418+0)
(615=455+160)
(607=414+193)
(Calculation of Distance from Arad to Bucharest)