NAME :- DIVYANG BAGLA
PANEL-C
PC-33
AI

PAGE NO.:

LAB ASSIGNMENT-1

AIM :- To solve 8 puzzle problem using A* algorithm

OBJECTIVE :- To study and implement A* algorithm for 8 puzzle problem.

THEORY :-

1.) BFS and OR graph :-

- BFS concept of priority queue & heuristic search.
- BFS method uses two list of tracking the traversal as 'open'.

2.) 8 - puzzle problem :-

- It is played on 8 by 8 grid with 8 square blocks labelled through 8 & 9 block.
- Eg →

1 3	1 3	1 2 3	1 2 3	1 2 3
4 2 5 →	4 2 5 →	4 5 →	4 5 →	4 5 6
7 8 6	7 8 6	7 8 6	7 8 6	7 8
initial				goal state

- Data structure and other details :

- Most commonly known for BFS uses heuristic function $h(n)$ and costs to reach node n from start $g(n)$.
- It finds shortest path through search space using heuristic fun.

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

INPUT :- Initial and final state
OUTPUT :- Sol^{n} state with optimal path.
ALGORITHM :- A*
PROGRAMMING LANGUAGE :- Python.

FAQ's

Q1. What is heuristic function? What is advantage of using heuristic function?

→ It is a function that rank alternatives in search algorithm at each branching step based on available information to decide which branch to follow.

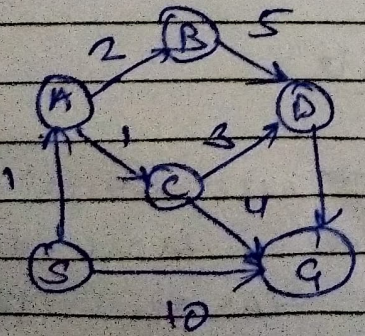
$h(n) < h^*(n)$

- Advantages of heuristic function :-

1) Can provide some quick relatively inexpensive feedback
2) You can obtain feedback easy in design process.

Q2 Explain A* algorithm with examples?

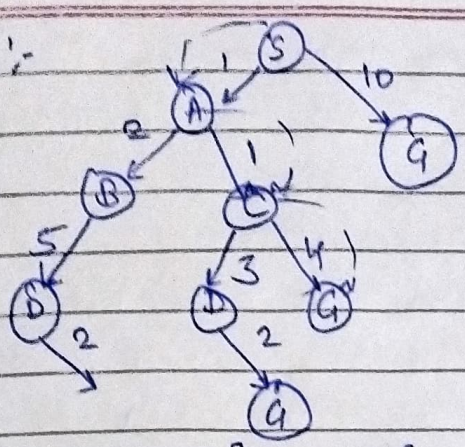
- A* algorithm is an informed algorithm or best first search meaning it is formulated in terms of weighted graph starting from specific node of graph it aims to find a path to given goal node having smallest cost.



State	h(n)
S	5
A	3
B	4
C	2
D	6
G	0

PAGE NO.:

Solution:-



- Initialization = {(S, S)}
1. {(S → A, 4), (S → G, 10)}
2. {(S → A → C, 4), (S → A → B, 7), (S → G, 12)}
3. {(S → A, C → G, 6), (S → A → C → D, 11), (S → A → B, 7), (S → G, 10)}
4. S → A → C → G if provided.

optimal path with cost 6.

Q.3 list different heuristic function used in 8 puzzle problem?

→ Admissible heuristic
i) n-max swap
ii) n-max sequence swap.

→ Non-Admissible heuristics
i) Nilsson's sequence score.