2) A* Search Algorithm

→ To find the Shortest path through the search space using the heuristic function.

→ It uses heuristic function h(n), & cost to reach the node 'n' from the start state g(n).

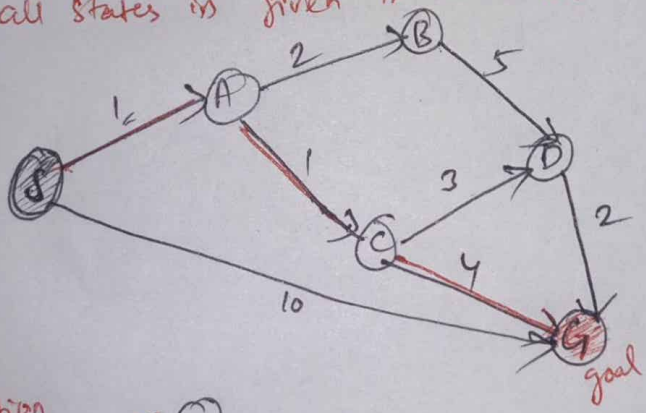
→ It solve the problem efficiently.

Fitness number: $f(n) = g(n) + h(n)$

- $f(n)$ → Cost to reach from node(n) to goal node
- $g(n)$ → Cost to reach node(n) from start state
- $h(n)$ → Estimated cost of the cheapest solution

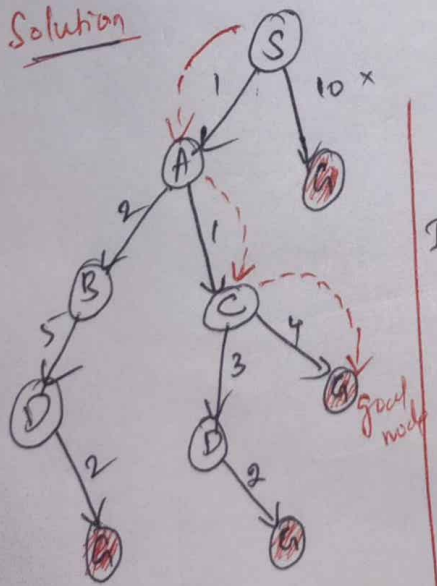
* Open list & Closed list to select the node

Example given graph using A* algorithm. The heuristic value of all states is given in the table.



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

Solution



Initialization: {(S,5)}

Iteration 1: ⓐ S → A ⇒ f(n) = g(n) + h(n)
= 1 + 3
= 4 ✓ (best)

ⓑ S → G ⇒ f(n) = g(n) + h(n)
= 10 + 0 (hold) ×

Iteration 2: ⓐ S → A → B ⇒ (1+2) 3 + 4 = 7 // (hold) ×

ⓑ S → A → C ⇒ 2 + 2 = 4 (best) ✓

Iteration 3: ⓐ S → A → C → G ⇒ f(n) = g(n) + h(n)
⇒ 6 + 0 ⇒ 6 (best) ✓ (Shortest path & cost minimum)

ⓑ S → A → C → D ⇒ 5 + 6 ⇒ 11 (hold) ×

A* Search Algorithm

Advantages

- A* Search algo is the best algorithm than other Search algorithms
- A* Search algorithm is Optimal and Complete.
- To Solve very Complex problems.

Time Complexity

→ A* Search algorithm depends on heuristic function no. of nodes expended depth of solution d.

$O(b^d)$ → b → branching factor

Space Complexity ⇒ $O(b^d)$