A* Search Algorithm

- A* Search is the one of the best and popular technique used in Path-finding.
- It has combined features of Uniform Cost Search and greedy best-first Search by which it solve the problem efficiently.
- A* Search algorithm finds the Shortest path through the search space using the heuristic function.
- It uses heuristic function h(n) and cost to reach the node 'n' from start state.

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

- $f(n)$: estimated cost
- $g(n)$: Cost to reach the node
- $h(n)$: heuristic value (child node).

Advantages

→ Best Searching Algorithm.

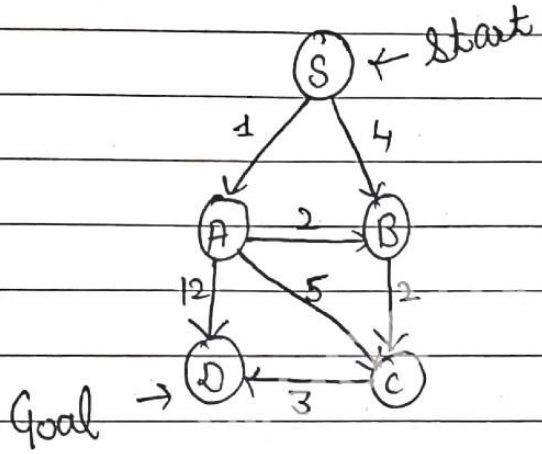
→ Optimal and Complete.

→ Solving Complex Problems.

Disadvantages

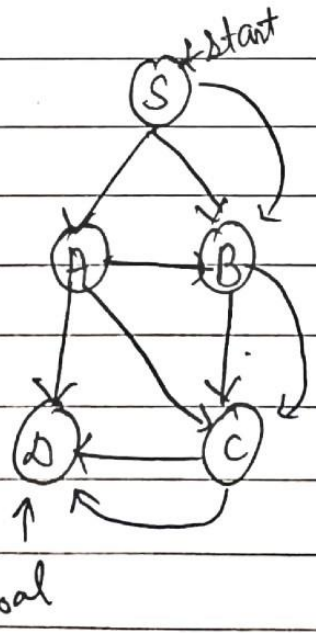
- It does not always produce shortest path.
- It has some complexity issues.

Example



State	h(n)
S	7
A	6
B	2
C	1
D	0

Sol:-



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

(i) $S \to A = 1 + 6 = 7$

✓ $S \to B = 4 + 2 = 6$

(ii) $S \to B \to C = 4 + 2 + 1 = 7$

(iii) $S \to B \to C \to D =$

$4 + 2 + 3 + 0 = 9$

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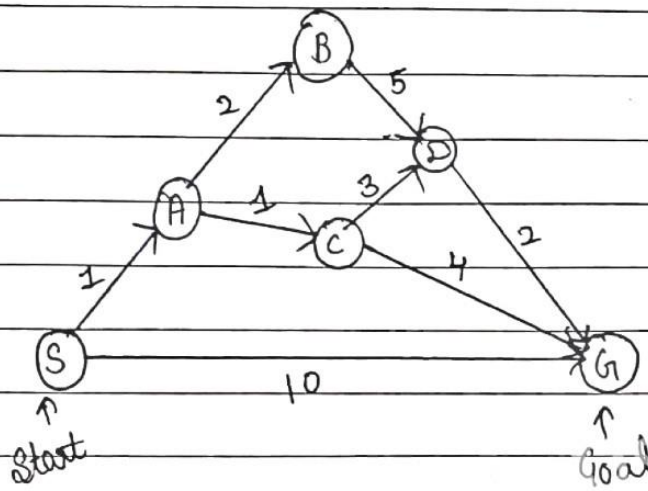
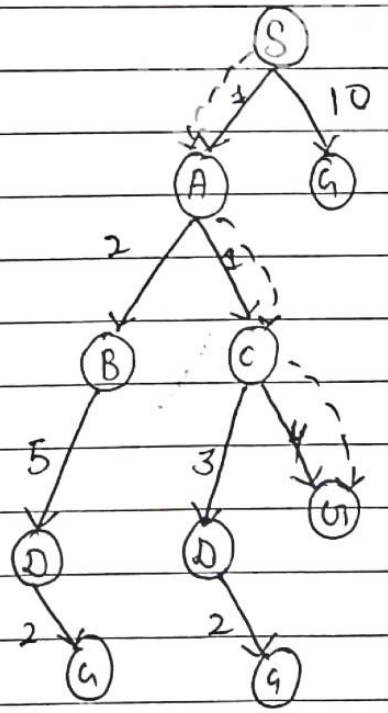
(II) Example of A* Algorithm



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

Solution



{S, 5}

(i) ✓ (S → A) 1 + 3 = 4 (A, 4)

S → G (10 + 0) = 10 (G, 10)

(ii) ✓ S → A → C = 1 + 1 + 2 = 4

S → A → B = 1 + 2 + 4 = 6

(iii) S → A → C → D = 1 + 1 + 3 + 6 = 11

✓ S → A → C → G = 1 + 1 + 4 = 6

(IV) S → A → C → G it provides optimal path with cost 6.