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.

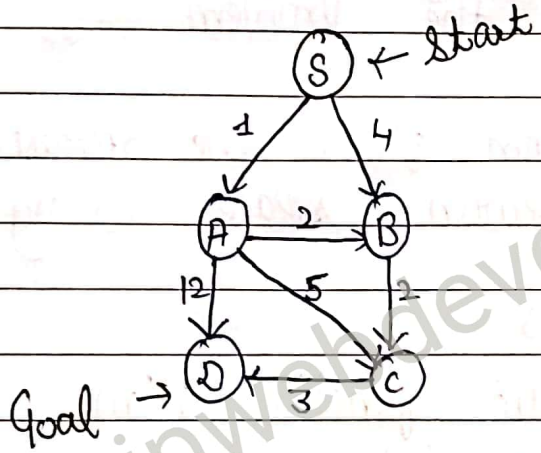
→ Optimal and Complete.

→ Solving Complex problems.

Disadvantages

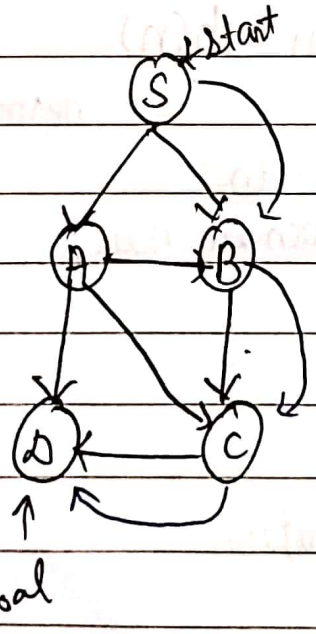
- It does not always produce shortest path.
- It has some complexity issues.

Example



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

Sol:-



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

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

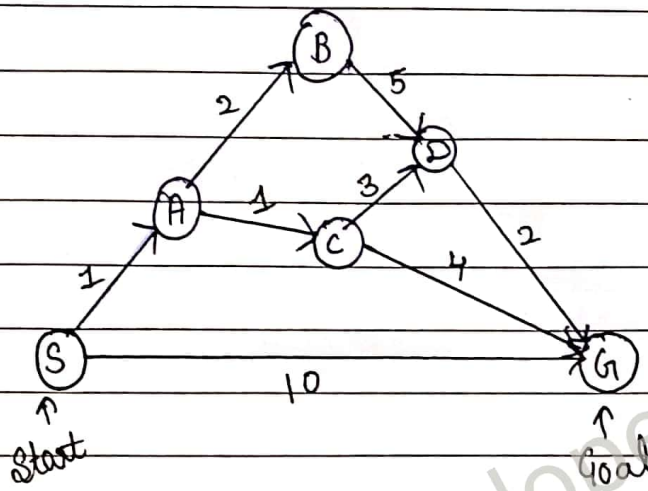
✓ $S \to B = 4 + 2 = 6$

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

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

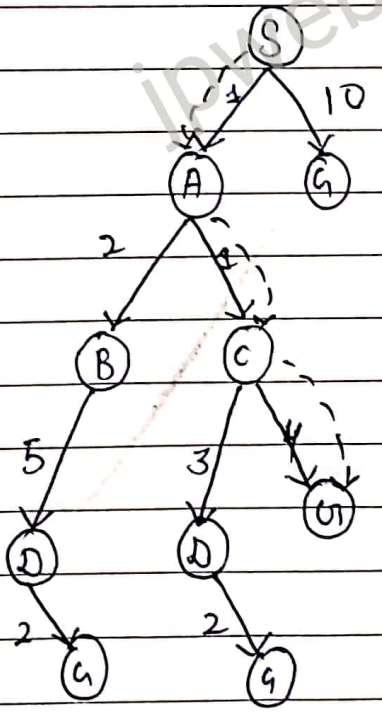
$4 + 2 + 3 + 0 = 9$

(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.

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