

❖ Informed Search

(Heuristic Search): - A heuristic is a method that might not always find the best solution but is guaranteed to find a good solution in reasonable time. By sacrificing completeness, it increases efficiency. Heuristic search is useful in solving problems which: -

- Could not be solved any other way.
- Solution take an infinite time or very long time to compute.
- Heuristic search methods generate and test algorithms, from these methods are: -

1- **Hill Climbing.**

2- **Best-First Search.**

3- **A and A* algorithm.**

1- **Hill Climbing:** - The simplest way to implement heuristic search is through a procedure called hill climbing.

هي ابسط طريقة لتنفيذ تسلق الجبل

- Hill climbing strategies expand the current state in the search and evaluate its children the best child is selected for further expansion; neither its sibling, nor its parent are retained search halts when any of its children.

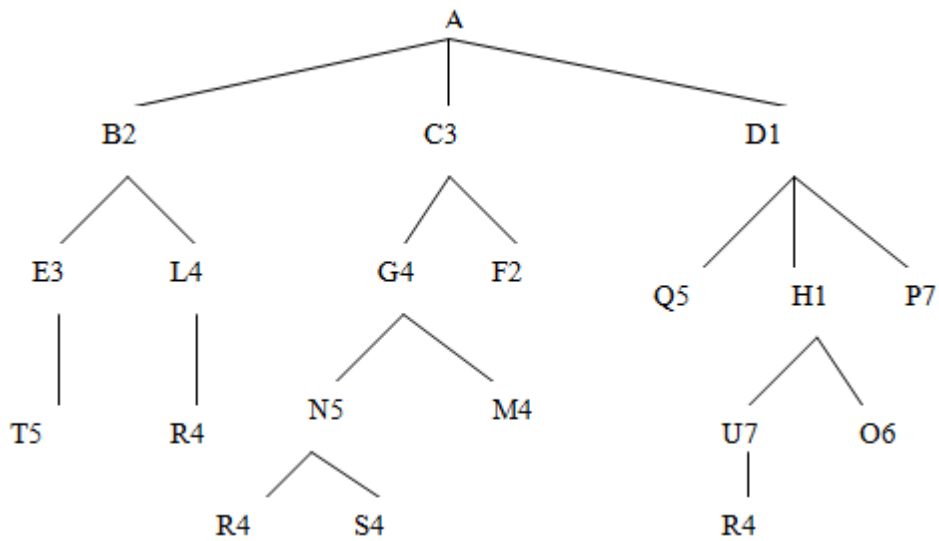
تقوم بفحص الحالة الحالية وتقيم الابناء لتلك الحالة والابن الافضل هو الذي سيتم اختياره بعد ان يتم اختيار الافضل لايهتم بالاخوة والاب لذلك يتوقف الحل عند الوصول الى الابن الذي هو الافضل بين الابناء.



Hill Climbing Algorithm: -

- *Begin*
- *Cs = start state;*
- *Open = [start];*
- *Stop = false;*
- *Path = [start];*
- *While (not stop) do*
- *{*
- *if (cs = goal) then*
 - *return (path);*
 - *generate all children of cs and put it into open*
 - *if (open = []) then*
 - *stop = true*
 - *else*
 - *{*
 - *x = cs;*
 - *for each state in open do*
 - *{*
 - *compute the heuristic value of y (h(y));*
 - *if y is better than x then*
 - *x = y*
 - *}*
 - *if x is better than cs then*
 - *cs = x*
 - *else*
 - *stop = true;*
 - *}*
 - *}*
 - *return failure;*
 - *}*

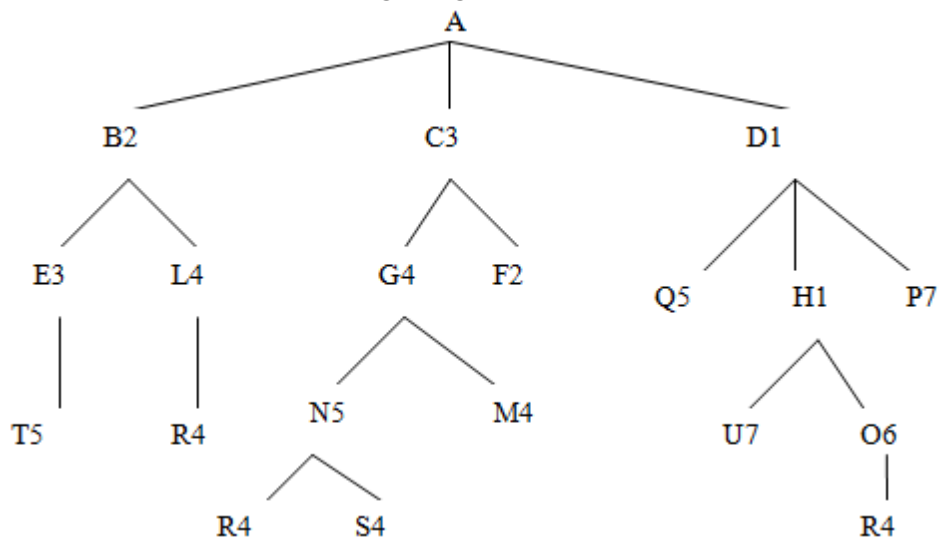
- A trace of Hill Climbing Algorithm Local Maxima



Open= [A]	Closed=[]	A
Open= [C3, B2, D1]	Closed= [A]	C3
Open= [G4, F2]	Closed= [A, C3]	G4
Open= [N5, M4]	Closed= [A, C3, G4]	N5
Open= [R4, S4]	Closed= [A, C3, G4, N5]	R4

The solution path is: A-C3-G4-N5-R4

- A trace of Hill Climbing Algorithm Local Minima



Open=[A]	Closed=[]	A
Open= [D1, B2, C3]	Closed= [A]	D1
Open= [H1, Q5, P7]	Closed= [A, D1]	H1
Open= [O6, U7]	Closed= [A, D1, H1]	O6
Open=[R4]	Closed= [A, D1, H1, O6]	R4
	Closed= [A, D1, H1, O6, R4]	

The solution path is: A-D1-H1-O6-R4