Lecture five

Topics that must be covered in this lecture:

- Methods of Heuristic search (A*- algorithm).
- A* Algorithm Properties

4- A-Star search algorithm

Minimizing the total estimated solution cost. (A star search). A* algorithm is simply defined as a best-first search plus a specific function. It evaluates nodes by combining g*(n), the cost to reach the node, and h*(n), the cost to get from the node to the goal:

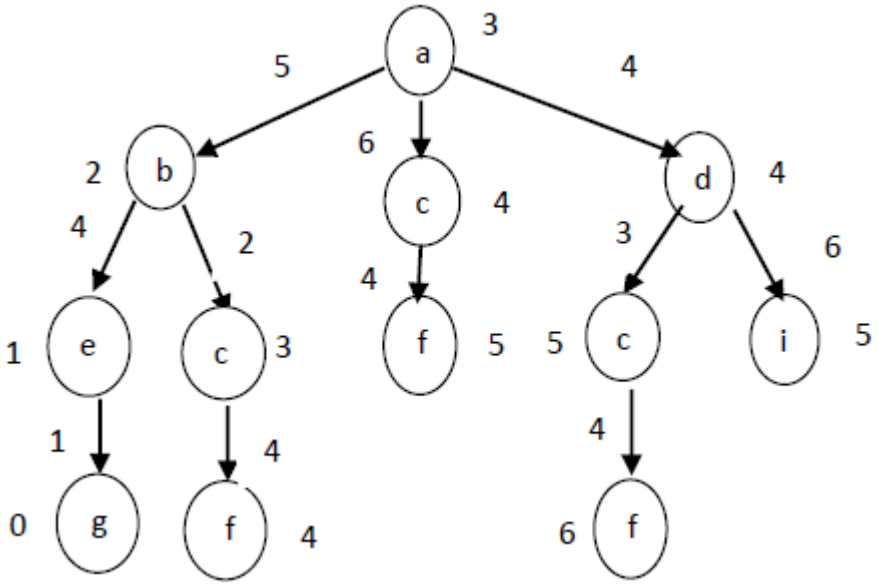
$$F^*(n) = g^*(n) + h^*(n).$$

g*(n): The cost to reach the node.

h*(n): The cost of node

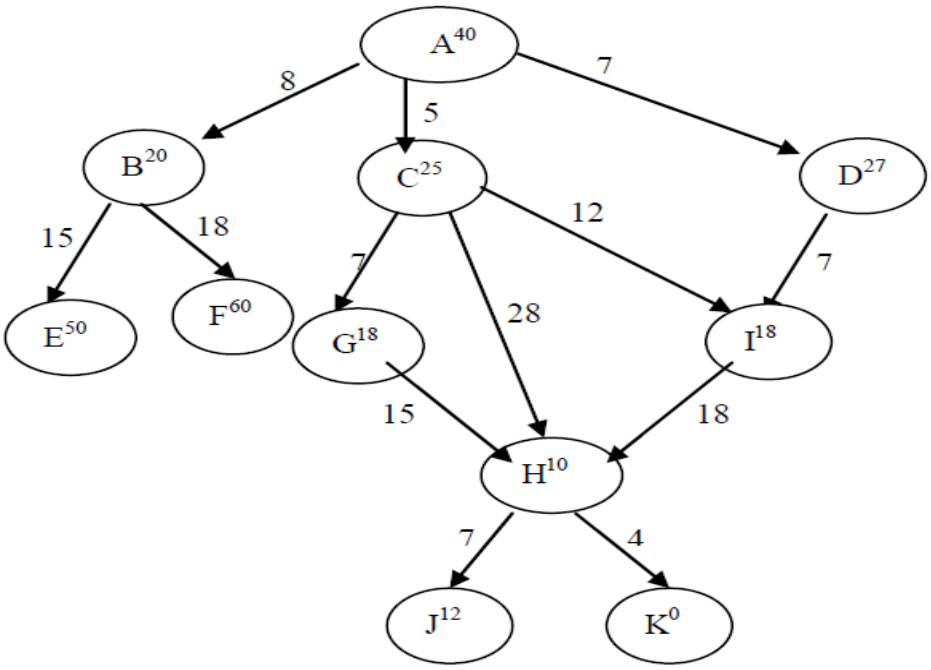
f*(n): Value of Heuristic

Function Example:



open	closed
[A3]	[]
[B7,D8,C10]	[A3]
[D8,E10,C10]	[B7,A3]
[E10,C10,l15]	[D8,B7,A3]
[G10,C10,l15]	[E10,D8,B7,A3]
	[G10,E10,D8,B7,A3]

Example: Use A* algorithm to find the path between A and K for the following search space. Start=[A], goal=K.



open	closed
[A40]	[ ]
[B28,C30,D34]	[A40]
[C30,D34,E73,F86]	[B28, A40]
[G30,D34,I35,H43,E73,F86]	[C30,B28, A40]
[D34,I35,H37,E73,F86]	[G30,C30,B28, A40]
[I32,H37,E73,F86]	[D34,G30,C30,B28, A40]
[H37,E73,F86]	[I32,D34,G30,C30,B28, A40]
[K31,J46]	[H37,I32,D34,G30,C30,B28, A40]

Since K is a goal, stop.

Properties of Heuristic Function

1. Admissibility: A heuristic function is admissible if it finds the shortest path to a goal state. Note: All A* algorithms are admissible.

2. Monotonicity: A heuristic function is monotonic if the first visit to any intermediate node gives the shortest path to that node. Note: Each Monotonicity Function is Admissible but not the complement because it chooses the shortest path.

3. Informed ness: A heuristic function hl is said to be more informed than a heuristic function h2 If hl(n)>=h2(n) for all nodes n. If hl is more informed than h2 then the subsequence searched by hl will be less than that searched by h2.