CS-208:Artificial Intelligence
Lectures-10
AO* Algorithm

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Preliminaries.

- AO* algorithm uses a single structure graph **G**.
- Each node in the graph **G** will point both down to its immediate successors and up to its immediate predecessor.
- Each node in the graph **G** will also have associated with it an ***h*** value (an estimated cost of the path from itself to a set of solution nodes)

AO* Algorithm

Step-1: Initialize the graph **G** consist of anode representing the initial state and call it as *INIT.* Compute ***h***(*INIT*).

Step-2: Until INIT is labeled as SOLVED or ***h***(*INIT*) becomes greater than *FUTILITY,* repeat the following

a) Trace the labeled arc from *INIT* and select for expansion of the as yet unexpanded nodes that occurs on this path. Call the selected node as *NODE*.

b) Generate the successors of the *NOD*E. If there are none then assign FUTILITY as ***h*** value of *NODE*(this equivalent to say that *NODE* is not Solvable). If there are successors then for each successor that is not the ancestor of the *NODE* do the following:

   i. Add the successor to the graph **G**.

   ii. If the successor is the terminal node then label it as SOLVED and ***h***(successor)=0.

   iii. If the successor is not a terminal node then compute ***h***(successor)

c) Propagate the newly discovered information up in the graph **G** by doing the following:

Let ***S*** be a set of nodes that have labeled as SOLVED or whose h value have been changed. So this information need to be propagated back to their parents. Initialize ***S*** to NODE. Until ***S*** becomes empty repeat the following:

i. If possible select a node from ***S*** such that none of its descendents in Graph occurs in ***S.*** If there is no such node then select any node. Call this node as CURRENT and remove it from ***S.***

ii. Compute the cost of each arc emerging from CURRENT. Assign the minimum of the costs just computed for arcs emerging from CURRENT to h(CURRENT).

iii. Mark the best path out of CURRENT by marking the arc that had the minimum cost that were computed in the previous step.

iv. Mark CURRENT as SOLVED if all the nodes connected to it though the newly labeled arc has been labeled as SOLVED.

v. If CURRENT has been SOLVED or the cost of CURRENT was just changed then its new status must be propagated up in the Graph. So add all the ancestors of the CURRENT to ***S.***