Lecture 8 (Informed Search)

1 Greedy Best-First Search

Best-first search but $f(n) = h(n)$

2 A^* Search

Combines UCS and Greedy Best-First Search by using $f(n) = g(n) + h(n)$, where $g(n)$ is cost incurred until now. Surprisingly this algo is optimal for tree-search if heuristic is admissible.

2.1 Admissible Heuristic

Let $h^*(n)$ be actual shortest path. h is admissible if $h(n) \leq h^*(n)\ \forall n$. Only those heuristics are optimal (in A* search) which are admissible.

2.2 Consistent Heuristic

An admissible heuristic is consistent if for every state s and for every successor s', $h(s) \leq c(s, s') + h(s')$ (inspired from triangle inequality). This implies that $f(n)$ only increases along the path and the `graph-search` algo also gives optimal solution.

2.3 Properties

1. Optimal - graph search too for consistent heuristics
2. Soultion will be found if:
   i. b is finite
   ii. $c(step) \geq \delta$
   iii. only finite nodes have cost $\leq C^*$ (least cost)
3. Complexity: $O(b^{ed})$ where b^e is effective branching factor, e is given as: $\dfrac{h^* - h}{h^*}$
4. A^* search is optimally efficient, i.e., with a given heuristic, no other algorithm will be able to expand a fewer nodes.
5. Space is still exponential in length of the solution