Depth-first search

• Choose deepest node to expand.
• Data structure for frontier?
  – Stack (or just use recursion)
• Suppose we come upon the same state twice. Do we re-add to the frontier?
  – Yes. (And remove old node from frontier.)
• Complete? Optimal? Time? Space?
Iterative deepening DFS

• Suppose we have a DFS algorithm that cuts off at some maximum depth.
• Run this algorithm with max-depth=1.
  – Then 2, then 3, ...
• Complete? Optimal? Time? Space?
Heuristics

• A heuristic function $h(n)$ is **admissible** if it never over-estimates the true lowest cost to a goal state from node $n$.

• Equivalent: $h(n)$ must always be less than or equal to the true cost from node $n$ to a goal.

• What happens if we just set $h(n) = 0$ for all $n$?
Heuristics

• A heuristic function $h(n)$ is **consistent** if values of $h(n)$ along any path in the search tree are non-decreasing.

• Equivalent: given a node $n$, and an action which takes you from $n$ to node $n'$:
  - $h(n) \leq \text{cost}(n, a, n') + h(n')$
  - $h(n) - h(n') \leq \text{cost}(n, a, n')$

• Consistency implies admissibility (but not the other way around).

• Difficult to invent heuristics that are admissible but not consistent.