

# 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.