COS402- Artificial Intelligence
Fall 2015

Lecture 3: Heuristic search

Outline

- **Best First Search (f(n): evaluation function)**
  - **Choose a node n with minimum f(n) from frontier**
- **Greedy Best-First Search**
  - **$f(n) = h(n)$**
  - **h(n) : An estimate of cost from n to goal**
- **A* Search**
  - **$f(n) = g(n) + h(n)$**
  - **g(n) : cost from initial state to n**

BFS, DFS and Uniform-cost Search

- **Breadth First Search**
  - **f(n) = depth of node n**
- **Depth First Search**
  - **f(n) = -(depth of node n)**
- **Uniform-cost Search**
  - **f(n) = g(n)**
  - **g(n) : cost from initial state to n**

A* and Heuristics

- **Heuristics**
  - **Admissible vs consistent**
- **Optimality of A***
  - **If h(n) is admissible, A* using tree search is optimal**
  - **If h(n) is consistent, A* using graph search is optimal**
- **Constructing heuristics**
  - **Relaxed versions of the original problem**
  - **Combine multiple heuristics**

Review questions: true or false

1. **The f values are non-decreasing along any path for A* using graph search with consistent heuristic.**
2. **The f values are non-decreasing along any path for A* using tree search with admissible heuristic.**
3. **A* using graph search with consistent heuristic expands nodes from lowest f-value to highest f-value.**
4. **A* using tree search with admissible heuristic expands nodes from lowest f-value to highest f-value.**

Review questions: true or false (cont'd)

5. **If a heuristic is consistent, then it is admissible.**
6. **If a heuristic is admissible, then it is consistent.**
7. **If $h_2(n)>=h_1(n)$ for any node n, then A* search with h_2 searches fewer nodes than or as same number of nodes as A* search with h_1.**
8. **$h(n) = max\{h_1(n), h_2(n),\ldots h_m(n)\}$. If $h_1, h_2,\ldots h_m$ are admissible, then h is admissible.**