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Artificial Intelligence

classmate
Date
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Assignment - 1

1. For each of following agents, develop a PEAS description of the task environment

	Performance Measure	Environment	Actuators	Sensors
Robot Soccer Player	To play, make goals, win the match	Team Members, opponents, refree, audience, soccer field	Navigator legs of Robot, view detector	Camera, comm. & orientation & Touch scree
Internet book-shopping agent	Price, quality, appropriateness, efficiency	Current and future WWW sites vendors shippers	display tower follow URL	HTML pages (text, graphics scripts)
Autonomous Mars rover	Collect analyze & explore sample of Mars	vehicle, Mars	wheels sampler motion devices	Camera, Touch scree radio receive
Mathematician's theorem proving assistant	~~Performance~~ Measures New theorem discovered time requirement	CPU, Internet Library	Display tower, accept the right theorem.	

2. Both the performance measure and the utility function measure how well an agent is doing. Outline the differences b/w the two?

A performance measure (typically imposed by the designer) is used to evaluate the behavior of the agent in environment.
It tells does agent do what its suppose to do in the environment. A utility function is used by an agent itself to evaluate how desirable states are.
Some paths to the goal are better than others.

The utility function may not be the same as the performance measure.
An agent may have no explicit utility function at all, whereas there is always a performance measure.

3. Define

·State

A state contains all of the information necessary to predict the effects of an action and to determine if it is a goal state.
One general formulation of intelligent action is in terms of state.

State Space

It is a process used in the field of computer science, including artificial intelligence (AI) in which successive configurations or states of an instance

are considered with the intention of finding a goal state with the desired property.

Search Tree:

A search tree is a tree data structure used for locating specific keys from within a set. In order for a tree to function as a search tree.

Search Node:

The root node is the start state and the set of children for each node consists of states reachable by taking any action while nodes in this tree are called search nodes.

4.

(a) Breadth First Search is a special case of uniform cost search.

Breadth first search is a special case of uniform cost search when all the steps costs are equal.

eg:→ Cost function in UCS = $c(x') = c\{x\} + g(x, x')$ ---①

Cost function in A*: $F(x') = F(x) + g(x, x') + [H(x') - H(x)]$ ---②

put $H(x) = 0$ for all nodes x

substitute $H(x) = 0$, in eqn ②

we get $F(x') = F(x) + g(x, x') + [0 - 0]$

where $F(x)$ = cost of each state x.

Hence $F(x) = C(x)$

Thus, A* becomes UCS if heuristic cost of every node is 0.

So, UCS is a special case of A* algorithms

(b) Depth first search is a special case of best-first tree search

Breadth-First search is best first search with $f(n) = \text{depth}(n)$.

depth-first is best-first search with $f(n) = -\text{depth}(n)$

uniform-cost search is best-first search with $f(n) = g(n)$

(c) Uniform-cost search is a special case of A* search.

Cost function in A*: $F(X) + \ell(X, X') + [H(X') - H(X)]$ --①

put $H(X) = 0$ for all nodes X.

substitute $H(X) = 0$, in equation ②

we get $F(X') = F(X) + \ell(X, X') + [0 - 0]$

where $F(X)$ = cost of reach state X.

Hence, $F(X) = C(X)$

Thus, A* becomes UCS if heuristic cost of every node is 0. So, UCS is a special case of A* algorithms.

5. Evaluate the effect of over-estimation and under-estimation of it on A* algorithm.

With underestimating A* will only stop exploring a potential path to the goal once it knows that the total cost of the path will exceed the cost of a known path to the goal. Since the estimate of a paths cost is always less than or

equal to the paths real cost, A* can discard a path as soon as the estimated cost exceeds the total cost of a known path.

With overestimation A* has no idea when it can stop exploring a potential path as there can be paths with lower factual cost higher estimated cost than the best currently known path to the goal.