AI Lab - Lesson 2

Informed Search

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Start Your Working Environment

Start the previously installed (lesson 1) conda environment *ai-lab*

Listing 1: Update Environment

```
cd AI-Lab
git stash (NB: remember to backup the previous lessons before this step!)
git pull
git stash pop
conda activate ai-lab
jupyter notebook
```

Listing 2: Open Lesson

To open the tutorial navigate with your browser to:
lesson_2/lesson_2_problem.ipynb

Uniform-Cost Search Example

At the beginning of *lesson_2/lesson_2_problem.ipynb* you can find an implementation of the last uninformed search algorithm you have seen in class, the Uniform-Cost Search (UCS). The pseudocode is in the next slide.

Uniform-Cost Search (UCS)

Input: $problem$
Output: $solution$

1: $node \leftarrow$ a node with $\textsc{State} = problem.\textsc{Initial-State}, \textsc{Path-Cost} = 0$
2: $frontier \leftarrow$ $\textsc{Priority-Queue}$ ordered by $\textsc{Path-Cost}$, with $node$ as the only element
3: $explored \leftarrow \emptyset$
4: **loop**
5: **if** $\textsc{Is-Empty}(frontier)$ **then return** $\textsc{Failure}$
6: $node \leftarrow \textsc{Remove}(frontier)$ ▷ Remove node with highest priority
7: **if** $problem.\textsc{Goal-Test}(node.\textsc{State})$ **then return** $\textsc{Solution}(node)$
8: $explored \leftarrow explored \cup node.STATE$
9: **for each** $action$ **in** $problem.\textsc{Actions}(node.\textsc{State})$ **do**
10: $child \leftarrow \textsc{Child-Node}(problem, node, action)$ ▷ Increase path cost over parent
11: **if** $child.\textsc{State}$ **not in** $explored$ **or** $frontier$ **then**
12: $frontier \leftarrow \textsc{Insert}(child, frontier)$
13: **else**
14: **if** $child.\textsc{State}$ **is in** $frontier$ **with higher** $path - cost$ **then**
15: replace that $frontier$ $node$ with $child$

Note: this is a graph search version

Assignments

- Your assignments for this lesson are at: *lesson_2/lesson_2_problem.ipynb*. You will be required to implement some informed search algorithms
- The pseudocodes are variations of the Uniform-Cost Search (UCS) where the *priority queue* is ordered by h and $f = g + h$ respectively