CS 830 Intro to AI, Spring 2025

Written Assignments, Sushma Akoju

Assignment 8

Write-up

Electronically submit your solution using the instructions on the course web page, including your source code as well as a transcript of your program running with the validator and a brief write-up answering the following questions:

1. Describe any implementation choices you made that you felt were important. Clearly explain any aspects of your program that aren't working. Mention anything else that we should know when evaluating your work.

   I implemented weighted a* with h1max. The input extraction is implemented but I have not merged it in this code as I ran out of time due to 2 conference Presentations and 3 interviews for internships. Plus I am not comfortable discussing other serious situations, which are independent of this but have impacted my work.

2. Which of your heuristics are admissible?

   H1max is admissible as it takes the max and we just need the max level all of goal literals remain satisfied. For H1max, we look at all goal literals and find all levels where each one of goal literals are achieved.
   H1add is inadmissible
   H1add - add nodes (states) that may have been visited (Buy(bagels) and Buy(coffee) are from At(supermarket) literal state) so it technically needs levels 1 and 2 so it adds (1+2) + (1+2) one for each buy action for bagels and coffee to reach a goal literal of have(bagels) and have(coffee).
   An ideal heuristic value would be 4 but not 6 like in case of H1add heuristic.
   Therefore a heuristic of H1max is admissible as it gives max so level 2 suffices.
   Persistent actions remain - i.e. once At(Home) is true, even though

At(Supermarket) becomes true, going home may not be in the planning graph anymore, as At(Home) is already true.

3. What can you say about the time and space complexity of your program?

   O(b^d) b - branching factor, d is the depth of solution. However max branching could have been 2^n - 1. As the weight increases, i.e. w = 1.0, 1.5 and 2.5, the expanded nodes decrease and solution convergence is faster. Space requirements are better than O(n) (n = expanded nodes).

   I don’t know but weighted a* with w > 1.0 does not necessarily find optimal paths. Search seems to consider lower heuristic values.

4. What suggestions do you have for improving this assignment in the future?

   A hand solved example over “blocks” world using weighted a* with h1sum, h1max and a couple of values of weights, would have helped.