Planning and Optimization

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Exercise Sheet G
Due: January 8, 2018

The files required for this exercise are in the directory $\textbf{exercise-g}$ of the course repository ($\textbf{https://bitbucket.org/aibasel/planopt-hs17}$). All paths are relative to this directory. Update your clone of the repository with $\textbf{hg pull -u}$ to see the files.

Exercise G.1 (7+5+3+5 bonus marks)

(a) Write a 1–2 page summary of a lecture part of your choice (A–G). It should contain the most important results of the part, explain their importance in relation to the other parts of the lecture, and it should be useful as a study aid for the exam.

(b) Make a list of all heuristics introduced in the lecture, compare them to each other, and discuss their strengths and weaknesses. Your discussion should include heuristic quality, computation speed, admissibility, and use cases.

(c) Draw a graph with the heuristics from exercise (b) as nodes and a solid directed edge from h_1 to h_2 if h_1 dominates h_2. Remember to include h^* and h^+. To keep the graph readable, do not include transitive edges, i.e., if h_1 dominates h_2 and h_2 dominates h_3 do not include an edge from h_1 to h_3.

If a heuristic dominates another only under certain conditions, draw a dashed edge instead of a solid one and explain the conditions for dominance below the graph.

(d) In the file pyperplan/src/search/bdd.py you can find an incomplete implementation of the BDD utility methods discussed in the lecture. Complete the code in the functions bdd_union and bdd_complement. Then complete the methods create_transition_relation and run in the file pyperplan/src/search/bdd_bfs.py to implement the breadth-first search introduced in the lecture (do not change the constructor yet). Test your search on a couple of small tasks and make sure that it can find valid plans.

The constructor of BDDSearch contains a commented out alternative variable order for the variables within the BDD. Change the order by commenting out the old order and including the new order instead. Add a print statement to print the ID of the BDD representing the transition relation after adding each operator. Compare the two variable orders on a small task and discuss the results.

The exercise sheets can be submitted in groups of two students. Please provide both student names on the submission.