

Graphplan

Assignment 4

Plan Space Planning

Bastian Lang

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1 IS THE GRAPHPLAN ALGORITHM SOUND? WHAT DOES THIS MEAN?

Yes

Whenever the algorithm finds a plan, this plan has to be legal. Graphplan does that.

2 IS IT COMPLETE? WHAT DOES THIS MEAN?

Yes

A search-algorithm is said to be complete if it finds a solution every time given that a solution exists.

If a legal plan exists, then Graphplan will find it.

3 WILL IT ALWAYS FIND THE SHORTEST PLAN?

Yes

In each level the algorithm either finds a valid plan for time step i or gives proof that there is no valid plan taking i or less steps. It therefore will always find the shortest plan, if it finds a

plan.

4 HOW DO WE BUILD THE PLANNING GRAPH (FOR EACH LEVEL, WHAT DO WE DO)? DO WE CHECK FOR MUTEXES EACH AND EVERY THAT TIME WE ADD A LEVEL? (BE CAREFUL ANSWERING THIS ONE ;-)
PLEASE REFERENCE THE PAGE IN EITHER THE BOOK OR THE PAPER IN YOUR ANSWER)?

We **start** by creating the initial proposition level by placing all initial conditions in it.

To **create an action level** we insert an action node for each operator and each way of instantiating preconditions of that operator to the previous level's propositions, if no two preconditions of that operator are marked mutually exclusive.

Additionally we add all no-op operators and the precondition edges.

We then check the actions for mutual exclusiveness. This is done in two ways:

- Check if either of the actions delete a precondition or an Add-effect of the other action [inference]
- Check if there is a precondition of action a and a precondition of action b that are mutually exclusive [competing needs]

For each created action we store a list of mutually exclusive actions.

We create a **propositional level** by simply placing all Add-Effects of the previous action level and connecting them with add- and delete-edges.

Two propositions are marked as mutually exclusive if all ways of generating the first are exclusive of the ways to create the second.

Except for the very first propositional level we check for exclusiveness every time we create a new level (see paper, p.7)

There may be action levels without mutually exclusive actions. Then there would also be no need to check for exclusiveness in the following propositional level, because no two propositions could be created by exclusive actions (because there are none...).