BRSU

Planning and Scheduling
Assignment 3
Plan Space Planning

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October 25, 2015

1 What is the plan representation in plan-space planning? Describe what each component of the plan tells us.

"A plan is defined as a set of planning operators together with ordering constraints and binding constraints.",
Ghallab, M., Nau, D., & Traverso, P. (2004). Automated planning: theory & practice. Elsevier.

"A *parial plan* is a tuple $\pi = (A, <, B, L)$, where:

- $A = \{a_1, ..., a_k\}$ is a set of partially instantiated planning operators.
- $<$ is a set of ordering constraints on A of the form $(a_i < a_j)$.
- B is a set of binding constraints on the variables of actions in A of the form $x = y, x \neq y$, or $x \in D_x, D_x$ being a subset of the domain of x.
- L is a set of causal links of the form $\langle a_i \xrightarrow{p} a_j \rangle$, such that a_i and a_j are actions in A, the constraint $(a_i < a_j)$ is in $<$, proposition p is an effect of a_i and a precondition of a_j, and the binding constraints for variables of a_i and a_j appearing in p are in B."

"A partial plan is a solution plan for problem $P = (\Sigma, s_0, g)$ if:

- its ordering constraints $<$ and binding constraints B are consistent

- every sequence of totally ordered and totally instantiated actions of A satisfying < and B is a sequence that defines a path in the state-transition system Σ from the initial state s_0 corresponding to effects of action a_0 to a state containing all goal propositions in g given by preconditions of a_∞."

Ghallab, M., Nau, D., & Traverso, P. (2004). Automated planning: theory & practice. Elsevier.

A contains all the actions that we have to take during the progression from the initial to the goal state.
The **ordering constraints** tell us which actions have to precede which other actions.
The **binding constraints** give us information about the values that certain variables of actions may or may not have.
The **causal links** tell us about correlated actions, i.e. that the effect of one action is the precondition of another and that they therefore have to be performed in the correct order without any actions reverting the proposition in between.

2 Look at the POP procedure (final slides). Determine if there are differences to PSP and, if yes, where are they.

PSP is a generic schema and PoP is a variant of PSP.
The main difference is that PSP processes the two types of flaws in a similar way. It heuristically selects a flaw from any type at any recursion.
PoP first refines with respect to a subgoal and then proceeds by solving all threads due to the resolver of that subgoal.

Taken from: *Ghallab, M., Nau, D., & Traverso, P. (2004). Automated planning: theory & practice. Elsevier.*