

This report covers three of these developments, highlighting the relationships between the developments and their impact on the field of AI:

1. Sussman anomaly [1]:

The Sussman anomaly (1975) shows the limitations of non-interleaved planning methods as people used to do planning by considering different subgoals in SEQUENCE. The Anomaly shows that pursuing one subgoal X after satisfying the other subgoal Y may now work because steps required to accomplish X might undo things in subgoal Y. A complete planner must allow for interleaving of actions from different subplans within a single sequence. One solution to the interleaving problem was goal-regression planning.

2. Goal Regression [2]:

- Waldinger (1977) proposed a planner which would satisfy one goal at a time.
 - a. The planner would arbitrarily choose one goal as the first and find a plan for it.
 - b. A second goal would be incorporated into the plan by trying to expand the second goal after the last step in the first plan.
 - c. If the preconditions of the second goal plan were violated then the attempt would fail and the second goal would be reconsidered before the last step in the first plan.
 - d. If the second goal could not be expanded there, then it would be moved to the first plan by another step.
 - e. This regression will continue until the goal is successful, and is expanded, or it fails by reaching the start of the other plan.
- Waldingers approach did not discuss many of the detailed issues. The planner could fail in some situations because of its inability to violate the precondition constraints.
- He also discussed some of the anticipated side-effects which would occur if the preconditions could be violated.
- He asserted that some previously unsolvable problems could be solved, but he also stated that some problems could arise. For example, it is possible to have a solution which repeatedly does an action and then undoes it. It is also possible to generate inefficient solutions having needless operations.

3. Partial-Order planning:

- Tate (1975) proposed partial order planning that includes the detection of conflicts and the protection of achieved conditions from interference [3].
- Any planning algorithm that can place two actions into a plan without commitment about which comes first is a Partial Order plan [1].
- For problems with independent subproblems, it is often easier to find a partially ordered plan: a plan which is a set of actions and a set of constraints. Partial ordered plans are created by a search through a space of plans (rather than the state space) [4].

References

1. <http://www.it.uu.se/edu/course/homepage/aism/st11/Sussman.pdf>
2. http://engineeronadisk.com/V2/hugh_jack_unpublished/engineeronadisk-3.html
3. Russell, S. J., Norvig, P., & Canny, J. (2003). Artificial intelligence: A modern approach.
4. <http://www.cs.nott.ac.uk/~psznza/G52PAS/lecture11.pdf>