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Reinventing GPS

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Abstract

One of the oldest ideas in AI is "means-ends analysis," which was incorporated into GPS by Newell, Shaw, and Simon, and which plays an important role in later GPS-style planners such as Strips and Prodigy. These planners operate by stringing together a sequence of actions that take an agent from an initial situation to a situation satisfying a goal description. Because you can't be sure which action comes next, you have to search through a space of action sequences. A step through the space involves adding an action that "reduces differences" between the goal situation and the situation resulting from the current action string (call this the "current situation"). But what if there is such an action, but its preconditions are not satisfied in the current situation? The GPS answer, incorporated in later systems, is to allow for actions that the planner would like to add, but whose preconditions must be treated as subgoals to be achieved first. To implement this idea, search states must contain structures that keep track of all of these desired actions, plus their preconditions. Apparently, no one has explored the alternative, which is to keep search states simple, and, at every search step, to find all actions that are feasible in the current situation and could reduce a difference. This approach requires generating a data structure, which I call the "regression-match graph," that keeps track of all possibly relevant actions and their associated subgoals. It may sound crazy to rederive this graph at every step, but doing so has one big advantage: we get a good estimate of how much effort is required to transform the current situation into a goal situation, and hence achieve much better search control than is usual in planning. The resulting planner not complete, but has been shown to be quite efficient on a wide variety of problems, including some that are hopeless for traditional planners.

Gastgeber: Prof. Dr. Bernhard Nebel

Alle Interessenten sind recht herzlich eingeladen.

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