Title: Impasse-Driven Tutoring for Reactive Skill Acquisition

Abstract:

We introduce a new approach to intelligent tutoring in performance-oriented training environments based on a method called situated plan attribution. The aim of this method is to provide contextualized tutoring for procedural tasks requiring reactive, goal-oriented skills. We use the term plan attribution instead of plan recognition because it does not assume that the problem solver is consciously executing plans. We avoid some of the pitfalls of other popularly used methods, i.e., model tracing and procedure net grammars, by selectively using an expert cognitive model to generate advice after detecting a problem solving impasse. The tutor attributes a set of plans to the student based on a task description. Each action is evaluated with respect to: the student’s attributed plans, its actual effects on the training device, and the contextualized goals associated with the plans. Impasses fall into three categories: action constraint violations, unsatisfied goal violations, and plan constraint violations, which is the weakest category since the tutor purposely does not force students to follow an expected plan if they are able to achieve the task goal by other means. Tutoring is impasse-driven. Once an impasse is detected, the tutor’s expert cognitive model resolves the impasse in the context of the current situation, i.e. the state of the training device and the task goals. The expert cognitive model is capable of learning and is thus often able to recognize the impasse and its resolution in the task context without searching through a set of problem spaces. We have implemented our method in Soar and are using it in a training system for communications link operators in NASA’s Deep Space Network (DSN).