Statement of Research Interests

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Over the past few years[1], I have been studying the representation of time, as it appears in knowledge-based and classical planning. My goals have been to understand (i) the way future actions can be planned both with and without domain knowledge and (ii) how artificial agents and human beings can organize the future *and* react to the present.

My previous work has focused on using engineering knowledge in architectural and managerial domains to generate the construction plans for a new office building [1] [2]. An alternative approach to domain independent planning has been used, consisting of deriving existence of tasks, their characteristics and links from a knowledge base, instead of reasoning on the goals and effects of each task. Given a description of the future building and of each of its floors, the system uses its knowledge of the building techniques about foundations, levels and roofs to incrementally generate a PERT chart of tasks. The resulting knowledge-based planner has generated a whole plan of approximately 1000 tasks in 1.5 minutes for prospective buildings; the correctness of such plans have been confirmed by human experts. That planner was integrated in a larger system, called COPLANER; the overall system acquires the initial building description, retrieves the details of each task from a relational database and, moreover, interacts with the final user.

In classical planning, extending conflict resolution remains difficult because of (i) lack of precision about the definition of basic concepts (e.g. conflicts) and (ii) practical difficulty in choosing the next improvement of the current plan. In more recent work [3], I have implemented a domain independent planner, YAPS. In this work, the heuristic control is clearly isolated from the underlying formalism of action. This planner is based on the *a priori* definition of a criterion (separately introduced by D. Chapman and E. Pednault) which defines the truth of each term of a node in a non-linear zero/first order graph of actions. The criterion also identifies all applicable amendments improving the current plan (precedence, unification, non-unification constraint posting and action addition). YAPS is validated by solving classical example combinatorial problems. Among others, this planner includes a full implementation of Chapman's "White Knight" technique for declobbering preconditions action; I also address the use of a whole liste of successive "White Knights" of alternated sign for this problem [4]. In the subclass of planning problems with *finite* domain variables, I use formal reasoning on the possible amendments (computed by the criterion on the current plan) to reduce the search performed by the control part of the planner. Some of the previous classical examples can then be solved without backtracking [5].

My current work at the Knowledge Systems Laboratory involves using both perception and reasoning to drive efficiently a real robot in indoor environments over extended periods of time. The hope of this research is that the recent epistemic approach in planning will marry neatly with the more classical inferential one.

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References

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