Executive Summary for the seminar
Planning in Multi-Agent Systems (08461)

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1 Summary

Planning in Multiagent Systems, or Multiagent Planning (MAP for short), considers the planning problem in the context of multiagent systems. It extends traditional AI planning to domains where multiple agents are involved in a plan and need to act together.

Research in multiagent planning is promising for real-world problems: on one hand, AI planning techniques provide powerful tools for solving problems in single agent settings; on the other hand, multiagent systems, which have made significant progress over the past few years, are recognized as a key technology for tackling complex problems in realistic application domains.

The motivation for this seminar is thus to bring together researchers working on these different fields in AI planning and multiagent systems to discuss the central topics mentioned above, to identify potential opportunities for coordination, and to develop benchmarks for future research in multiagent planning.

2 Topics

The seminar addressed, through presentations, panel discussions, and break-out sessions, the following topics:

Coordination and Task Allocation:
Many cooperation and coordination mechanisms have been developed within the MAS community to ensure multiple agents act coherently in an environment. In the context of MAP, efficient mechanisms have been identified and discussed for avoiding and resolving conflicts among the distributed agents, with or without a common goal, while still trying to optimize the overall and/or individual plan(s).

Dynamic and Temporal Planning:
Many new techniques like dynamic and temporal planning have been proposed within the planning community. They take into account uncertainties and time issues in planning domains. We have discussed techniques to transfer these centralized techniques used in single agent applications to distributed ones such that they are applicable to more complex problems in multiagent domains.

Robust Planning:
This includes dealing with multiagent planning problems not only in dynamic, but also in uncertain, environments. Although many of the single agent techniques are applicable in a multiagent context, detecting and dealing with changes and errors in the *coordination* of agents is a slightly different and more difficult problem. The discussions benefitted from detailed exchanges between experts in diagnosis and repair, and experts in coordination, to give better insight into various flavors of problems in MAP under uncertainty.

3 Program

Each day, the seminar offered a mix of talks, working group sessions, and/or panel discussions.

The first day we started with keynote presentations on Multi-Agent Planning (MAP) from different perspectives, and then MAP was discussed in three working groups, each taking one of the perspectives enumerated above (Task allocation and Coordination, Dynamic and Temporal Planning, and Robust Planning).

The second day started with talks on key challenges and applications for MAP. In the afternoon we had a panel discussion on arising challenges for MAP, and in the working groups we discussed challenges for MAP and ways to measure progress in dealing with them.

The third day contained talks on the relationship between MAP and other related areas like logics, BDI, game-theory. In the afternoon an excursion to Trier was organised.

The fourth day's topic was *particular MAP modeling and solution techniques and what kinds of problems they solve.* We started with 5 talks on topics ranging from mechanism design, to negotiation and task allocation, to CSP solving. Then a panel on MAP and coordination techniques was organised and we spent the rest of the afternoon discussing possible benchmark problems for MAP. In the evening, we held a report out session for the working groups.

On the last day we spent some time on the evaluation of the seminar and discussed some details of potentially useful benchmark problems for MAP.

4 Conclusion

It is our impression that the participants enjoyed the great scientific atmosphere offered by Schloss Dagstuhl, and the scientific program which offered them ample opportunities for discussion. We are grateful for having had the opportunity to organize this fruitful seminar. Special thanks are due to the whole Dagstuhl staff for their assistance in the organization and the running of the seminar.

5 Keywords

- multi-agent systems,
- AI-planning,
- coordination,
- robustness,
- temporal planning,