Planning in a Normative System

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Introduction

- Multi-agent system + Normative system
- Norms = desired behavior
- Our proposal is to implement a planner that takes into account a set of norms during planning
- In (Panagiotidi and Vázquez-Salceda 2011) they formalized norms with activation, deactivation, maintenance and repair conditions, and in order to find a plan they introduced intermediate states responsible to check norm compliance.
- In (Panagiotidi, Alvarez-Napagao, and Vázquez-Salceda 2013) norms are specified in Linear Temporal Logic (LTL), and they use TLPlan as their base planner.

Technical Approach

- System formalization
  - PDDL
  - Planning:
    - Forward state-space search
    - Backward state-space search
    - **Planning-graph search - Graphplan**
- Norm formalization
  - Deontic logic (obligation, permission, prohibition)
  - Types:
    - Norm has a context and a trigger condition (Chang and Meneguzzi ; Oren and Meneguzzi 2013)
    - Using Linear Temporal Logic (LTL) (Cranefield et al. 2015)
    - Norm has an activation, deactivation, maintenance and repair condition (Panagiotidi and Vázquez-Salceda 2011)

Technical Approach

- Planning with norms
  - Return norm-compliant, norm-violation or minimum cost plan
- Evaluation
  - Plan quality
  - Time efficiency
    - Compare with a naive solution = use a classical planner, and then filter those returned plan results which are norm-compliant or norm-violation.

Project Management

- Implement the Graphplan algorithm (or use an already existing version, e.g. JavaGP (Meneguzzi and Luck 2008)) (1 week)
- Modify Graphplan algorithm to consider the first type of norm (1 week)
- Modify Graphplan algorithm to consider another type of norm (2 weeks)
- Perform experiments (1 week)
- Write the final report and prepare the presentation (1 week)

Conclusion

- Interesting
  - Connects classical planning with norms
- Challenging
  - Practice concepts seen in class - Graphplan
  - Explore new concepts - Norms
- There are already similar work in the literature
  - We could not find one that uses planning graph
  - Lack of comparative experiments

References

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