MAPmAKER: A Tool for Performing Multi-Robot LTL Planning Under Uncertainty

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ABSTRACT

Robot applications are increasingly asking for decentralized techniques that allow for tractable automated planning. Furthermore, those applications can be deployed in dynamic environments where its uncertainty must be handled. Typically, environments where human beings are involved can just provide a partial knowledge of its model, i.e. the current state of a door between two rooms in uncertain.

Our proposed tool, MAPmAKERtackle the limitations that current planning techniques are used for teams of robots: (1) it decomposes the robotic team into subclasses, avoiding the not scalable centralized approach; (2) it considers complex-high level missions given in temporal logic; (3) it is able to work also with only partial knowledge of the environment, performing possible plans.

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1 INTRODUCTION

MAPmAKERprovides a planner where a robot application is defined using finite transition systems. A *planner* is a software component that receives as input a model of the robotic application and computes a set of actions (a *plan*) that, if performed, allows the achievement of a desired mission [**?**]. Each robot application contains the robots that conform the team and the mission that they have to achieve.

A *global mission* represents the high-level mission that must be accomplished by the whole team [**? ? ?**] and that is decomposed into a set of *local missions*[**? ? ? ?**]. Every robot is commanded to achieve a local mission, specified as a LTL property. As seen in [**?**], this collaborative fashion of accomplishing the global mission is performed in a *decentralized* way. Each robot that is part of a subset of the team computes the solution for its own sub-mission, avoiding the expensive fully centralized planning and making it more robust to local problems.

Nowadays, most of the planners consider the model of the environment as known and not dynamic [**?**]. However, this is not a real condition of real world scenarios, where only *partial knowledge* can be ensured. For this reason, our tool is able to compute a plan even when only partial information of the environment is available, as seen in [**? ? ?**]. However, the novelty of our work consists in fuse all this features, exploiting a *decentralized* methodology. This kind of approaches are not yet studied in detail, due to there are only a few planners managing this issues [**?**].

Organization. Section **??** introduces robotic applications by highlighting the status of current planners. Section **??** describes the MAPmAKER approach. Section **??** presents the MAPmAKER tool. Section **??** concludes with final remarks.

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