Constraint-based planning for decision making in robotic systems

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Mots-clés : AI planning, Discrete decision and optimization, robotic systems

The capability of an autonomous system to plan its own actions to act on its environment is a corner-stone of intelligence and is essential for a system to adapt to great number of tasks and contexts. However, while robotics systems have seen important progress in terms of control, their capability to take complex decisions in realistic environments remains very limited and prevents deployment in complex scenarios.

The objective of this internship is to build an automated planning tool for integration with the other modules taking part in the deliberative system of a robotic system. This internship will in particular be interested in the development of new methods for task planning (Ghallab, Nau, and Traverso 2004) based the recent advances in constraint programming and automated reasoning (SAT/SMT). The candidate will be tasked with improving existing compilation (Bit-Monnot 2018, Nareyek et al. (2005)) as well as conceive and implement decision procedures or specialized propagators for planning problems.

The intern will be integrated in the Robotic and InteractionS (RIS) team of LAAS-CNRS. The RIS team positions itself at the intersection of AI and robotics to tackle the emerging problems in autonomous systems, in particular the ones that appear when robots are brought to interact among themselves (multi-robot) or with human beings. While this research project is focused on AI (and in particular in the task planning subdomain), it is expected that the intern will develop a broad vision of the various methods used in the decision making and situation assessment of modern robotic systems.

Skills related to discrete decisionand optimization would be an asset for this internship : constraint programming, mathematical programming (LP), automated reasoning (SAT/SMT), tree search, planning and AI.

References

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Ghallab, Malik, Dana S. Nau, and Paolo Traverso. 2004. *Automated Planning: Theory and Practice*.

Nareyek, Alexander, Eugene C. Freuder, Robert Fourer, Enrico Giunchiglia, Robert P. Goldman, Henry Kautz, Jussi Rintanen, and Austin Tate. 2005. "Constraints and AI Planning." *IEEE Intelligent Systems* 20 (2): 62–72.