

Development of a GUI for Interactive Definition of Motion Planning Constraints in Robotics

Bachelor's Thesis

Build an interactive tool that allows a user with limited robotics knowledge define the motion planning constraints for a cooperative task

Motivation

The introduction of cooperative robotic systems in industrial processes has allowed the handling and execution of a wider task range that contain themselves more variation. Be it handling or transporting heterogeneous objects with a wider variation of forms and sizes or flexibly adjusting force and stability for handling power-tools, it enables industrial systems to be more adaptable. However, the challenge still remains on how to efficiently and effectively program such cooperative tasks. One particular limitation is the definition of motion planning constraints. These are complex sets of mathematical equations that restrict the behaviour of the calculated solutions. Process planners in industrial scenarios do not necessarily possess the knowledge for programming and defining those restrictions. This causes long integration times since external and expensive experts have to be called. This problem is exacerbated when considering that current trends in automation require more flexibility for production systems to adapt to changing requirements.

Your work for this thesis will be to develop a graphical user interface (GUI) that allows a user with limited robotics knowledge to define the constraining requirements for a cooperative robotic process in an industrial setting. This allows process experts to interactively and intuitively define complex constraint definitions with virtually no required knowledge on optimization, motion planning or robotics.

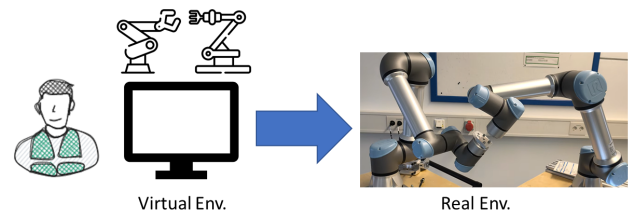


Figure 1: Conceptual Idea for GUI Development

Goals

- Analysis of current options for interactive motion planning in robotics.
- Familiarization with robot programming interfaces and industrial planning principles.
- Development of a constraint-based interface for cooperative motion planning processes.

Interests and Prior Knowledge

- 🤖 Interest in robotics
- >_ Ideally programming skills in Python and/or C++
- 📦 Knowledge in robotics and/or GUI development, beneficial



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Tags: HMI, GUI, Cooperative Robotics, Constraint-Based Planning