Motion Planning, State of the Art and Perspectives

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Abstract

How can a robot autonomously decide how to perform a motion task while respecting environment constraints such as obstacle avoidance?

The first part of this talk will sketch the mathematical formulation of the motion planning problem and present a state of the art of the methods developed in the 80's (deterministic approaches) and the 90's (probabilistic approaches and nonholonomic systems). A special focus will be done on random sampling and random diffusion methods. Such methods are today mature enough to give rise to software packages addressing large classes of problems and applications in Robotics and beyond.

The scope of applications is the purpose of the second part of the talk.
Practical problem illustrations will be given in various domains:

- *Mobile Robotics (Hilare and its trailer, transportation of the Airbus A380 components by road)*
- *Manufacturing (spot welding robot programming)*
- *CAD/CAM (mechanical part assembly in automotive industry)*
- *Process Engineering (maintenance operation in nuclear powerplants)*
- *Bio-Engineering (molecular docking and protein folding)*
- *Animation and Graphics (human artefact animation)*

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