Motion Planning for Physical Robots

- Robot Motion Planning

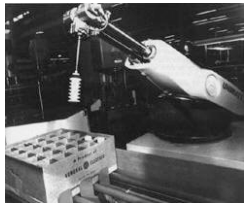
- 1980's: a well understood mathematical problem
  - The problem is decidable
  - Algorithms exist
  - They are not efficient in practice

- Robot Motion Planning

- 1990's: the triumph of empirism!
  - Make use of random search!
  - Benefit from computer power
  - Solutions depend on technology

- Success stories in:
  - PLM, Bio-informatics, … outside robotics!

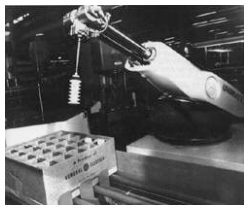
- Origin of the workshop



1960 1970 1980 1990 2000 2010

Motion Planning for Physical Robots

- 50 years of Robotics, 30 years of Motion Planning



What robot among all of them is using motion planning algorithms?

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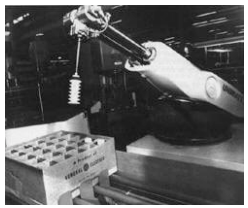
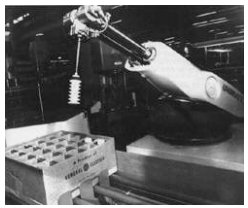


DASSAULT SYSTEMES and SIEMENS UGS are using motion planning for robot programming.

1960 1970 1980 1990 2000 2010

- 50 years of Robotics, 30 years of Motion Planning



Who else?

1960 1970 1980 1990 2000 2010

- What remains to do?

- Algorithm improvements?
- Better link with « AI » (motion and symbols)?
- Better link with dynamics and control?
- Better link with sensor-based feedback?
- More pragmatism towards dedicated solutions?
- Benefit more from technology?

- What remains to do?

Let Motion Planning go back to

Physical Robots

Workshop

- Hierarchical Task and Motion Planning (T. Lozano-Perez)
- Legs, Hands, and Wheels : Bridging the Gap Between High-level Planning and Low-level Control (J. Kuffner)
- Online Generation of Kinodynamic Trajectories (W. Brugard)
- Planning Sequences of Motion Primitives (F. Lamiraux)
- Real-Time Motion Planning and Handling Model Uncertainty (D. Manocha)
- Plan-based Movement Control for Everyday Manipulation (M. Beetz)
- Planning humanoid multi-contact dynamic motions using optimization techniques (A. Kheddar)
- Hierarchical Planning for Robot Manipulation (B. Marthi)
- Humanoid Grasping and Manipulation in the Real World (T. Asfour)
- Departing Kinematics: Reconciling Geometric Planners with Physical Manipulation (S. Srinivasa)

Motion Planning for Physical Robots

Panel

- Several marketed or open-source motion planning software exist.
- Is the generality targeted by motion planning algorithms
  a strength or a weakness?
- Only, a question of linking symbol and geometry?
- Benefit from technology: objects with tags, cloud computing….
- Introduction by:
  - T. Lozano-Perez (MIT)
  - M. Beetz (TUM)
  - J. Kuffner (Google)