Constrained Motion Planning and Control
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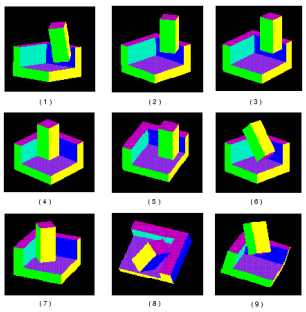
Constrained Motion Planning and Control: An Overview
Jing Xiao
University of North Carolina - Charlotte

- Motivation and Problems
- Survey of Existing Work
- Challenges Ahead
- Conclusions

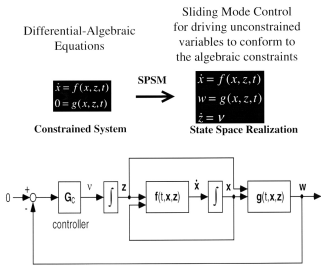


Motion Planning of Objects in Contact by the Silhouette Algorithm
H. Hirukawa[1] and Y. Papegay[2]
[1]Agency of Industrial Science and Technology, Japan and [2]INRIA, Sophia-Antipolis France

Hybrid Dynamic Control and Adaptation of Constrained Manipulation Systems
B. McCarragher
Australian National University

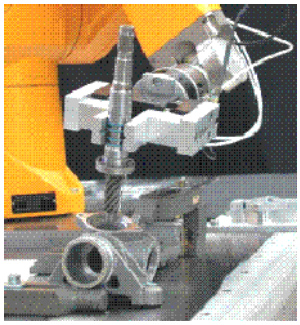
A Unified Approach to Modeling and Realization of Constraint Robot Motion Using Singularity Perturbed Sliding Manifolds
H. H. Asada, B. Gu and B. W. Gordon
Massachusetts Institute of Technology

- A new formalism for dynamic constrained motion
- High-index and highly nonlinear DAE is solved by using the Singularly Perturbed Sliding Manifolds (SPSM) method
- Numerical example of a four-bar linkage formed by a robot arm and a crank is given
- The DAE formalism provides a general, powerful methodology for treating complex, nonlinear behavior of highly coupled robotic systems



Generating Polyhedral Convex Cones from Contact Graphs for the Identification of Assembly Process States
H. Mosemann[1], T. Bierwirth[1], F. Wahl[1] and S. A. Stoeter[2]
[1]Technical University of Braunschweig and [2]University of Minnesota

- Measured forces and torques provide information about contact geometry of subassemblies
- Automatically generate polyhedral convex cones from contact graphs
- Contacts graphs are calculated for several subassemblies using a rapid interference detection algorithm
- Identification of contacts takes about 0.006 seconds



A Divide-and-merge Approach to Automatic Generation of Contact States and Planning of Contact Motion
J. Xiao and X. Ji
University of North Carolina - Charlotte

- Automatically generate contact state graphs between two arbitrary polyhedra.
- A divide-and-merge approach: divide the graph into subgraphs, automatically generate subgraphs, and merge them together.
- Results: contact state graphs for two arbitrary polyhedra in a contact state of up to three principal contacts (PC).
- Conclusions: the approach is efficient and contact state graphs can simplify contact motion planning by stratification.