

Grasp Analysis and Optimization

Chairs: R. D. Howe, H. Lipkin

Metrics for analysis and optimization of grasps and fixtures

Thomas G. Sugar¹ and Vijay Kumar²

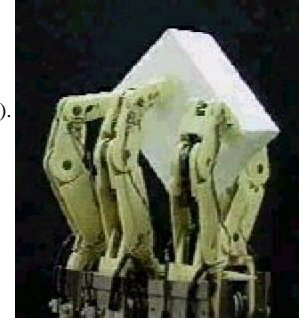
¹Arizona State University and ²University of Pennsylvania

Regrasping Behavior Generation for Rectangular Solid Object

Y. Hasegawa, J. Matsuno and T. Fukuda

Nagoya University

- Generation of regrasping motion for a four-fingered robot hand.
- Using Evolutionary Programming(EP).
- Rotation of rectangular solid object with regrasping motion.
- We control the real robot hand using the controller designed in computer simulations.

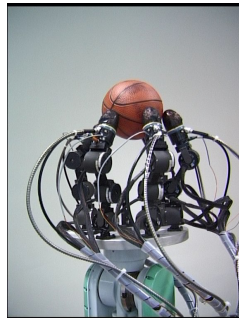


Computing 3-D Optimal Form Closure Grasps

D. Ding, Y. Liu and S. Wang

The Chinese University of Hong Kong

- Constructing a form-closure grasp is of significance for grasp and regrasping planning.
- Given grip points of more than 2 fingers, find optimal grip points for the other fingers.
- The problem is formulated as a NLP problem.
- The performance is verified by two examples.

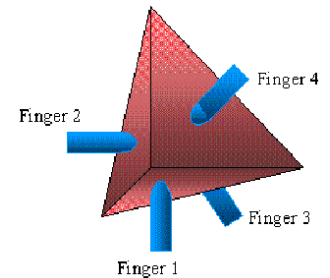


The Synthesis of 3-D Form Closure Grasps

D. Ding¹, Y. Liu¹ and S. Wang²

¹The Chinese University of Hong Kong and ²Harbin Institute of Technology

- A formulation of the synthesis of 3-D frictional form-closure grasps.
- By a recursive reduction technique, the 6-D problem is transformed to a 3-D one.
- The form-closure condition is equivalent to the inconsistency of linear inequalities.
- Numerical simulation results are provided to show the efficiency.



Precision Localization and Robust Force Closure in Fixture Layout Design for 3D Workspaces

M. Y. Wang and D. Pelinescu

University of Maryland

Kinematic Grasability of a 2D Multifingered Hand

Y. Guan and H. Zhang

University of Alberta

- Kinematic feasibility analysis is to determine whether a desired grasp is achieved by the hand with respect to the object, under the consideration of hand kinematics and object geometry.
- Two constraints in a grasp, contact constraint and collision-free constraint, are evaluated in terms of triangular areas. The analysis is then modeled as a constrained nonlinear global optimization problem.
- Numerical examples including the grasps of a rectangle and a disk by a two-fingered hand are provided.
- The unified and effective method gives a definitive answer to kinematic grasability analysis. It is applicable to various 2D grasps including fingertip grasps and power grasps.

