

RAI 813: Robotic Grasping and Fixturing

Textbook

1. Fundamentals of Robotic Grasping and Fixturing. Caihua Xiong, Han Ding, and Youlun Xiong, World Scientific Publishing Company, 2007.

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Handouts and research articles may also be used by the instructor.

Objective

2. This course focuses on providing comprehensive information and mathematic models of developing and applying grippers and fixtures in industry, and present long term valuable essential information for the academic researchers who are interested in robotic manipulation as a good reference.

Pre-Requisite

3. Robot Mechanics and Control

Course Outcome

4. This course will furnish the students with a comprehensive insight into robotic grasping and fixturing. It involves study of multifingered robot hand grasp, basic fixture design principle, and evaluating and planning of robotic grasping/fixturing, and focuses on the modeling and applications of Robotic Grasping and Fixturing. **Course Outline:**

Topics	Allocated Periods
Robotic Grasp and Workpiece-Fixture Systems	48
• Introduction • Robotic Manipulation and Multifingered Robotic Hands • AMT and Fixtures • Comparison between Grasping and Fixturing	
Qualitative Analysis and Quantitative Evaluation of Form-Closure Grasping/Fixturing	

• Kinematic Characteristics of Grasping/Fixturing • Discriminances of Form-Closure Grasping/Fixturing • Minimum Number of Contacts with Frictionless • Grasp Evaluation Criteria	
Stability Index and Contact Configuration Planning	
of Force-Closure Grasping/Fixturing	
• Description of Contacts with Friction • Conditions of Force Closure Grasp • Grasp Stability Index	
Active Grasp Force Planning	
• Nonlinear Programming in Grasp • Force Planning Using Neural Networks	
Grasp Capability Analysis	
• Evaluation of Multifingered Grasp Capability	