

CSCI-4290/6290: Robot Motion Planning  
Lecture 25: November 29, 2005  
**Carton Folding, and  
Motion Planning for Flexible Objects**

## Announcements

- The course project due date is Monday, December 5. Hope you are making good progress on your final course projects!
- You should create a web page for the project and make your project report available there.

## Today's Class

We have previously looked at motion planning for rigid objects. Today we will discuss path planning for articulated objects, and flexible objects such as elastic plates and cables. These have applications in computer-aided design and automated manufacturing.

1. Carton folding: Carton folding is a packaging task that involves manipulation and motion planning of (non-rigid) hinged objects. By treating the object to be manipulated as an articulated robot, carton folding sequences can be automatically generated. Potential applications include automated packaging and the design of 3D microelectromechanical systems (MEMS) devices.
2. Motion planning for flexible objects: Spline representations are used to model the continuous deformations of the objects with a finite set of parameters. A variation of the PRM approach is used to generate paths.

## References

- Folding Cartons with Fixtures: A Motion Planning Approach. Liang Lu and Srinivas Akella. *IEEE Transactions on Robotics and Automation*, volume 16, number 4, pages 346–356, August 2000.
- Planning Paths for Elastic Objects under Manipulation Constraints, F. Lamiroux and L.E. Kavraki, *International Journal of Robotics Research*, volume 20, number 3, pages 188–208, 2001.
- Towards Planning for Elastic Objects, L. E. Kavraki, F. Lamiroux, and C. Holleman. In *Robotics: The Algorithmic Perspective*, P. K. Agarwal, L. E. Kavraki, and M. T. Mason (editors), pages 313–325, A. K. Peters, Natick, Massachusetts, 1998.

## **Reading**

Chapter 7.5, Choset et al.

## **Next Class**

Manipulation planning for parts feeding.