Sampling-Based Motion Planning: From Intelligent CAD to Crowd Simulation to Protein Folding

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Abstract

Motion planning has application in robotics, animation, virtual prototyping and training, and even for seemingly unrelated tasks such as evaluating architectural plans or simulating protein folding. Surprisingly, sampling-based planning methods have proven effective on problems from all these domains. In this talk, we provide an overview of sampling-based planning and describe some variants developed in our group, including strategies suited for manipulation planning and for user interaction. For virtual prototyping, we show that in some cases a hybrid system incorporating both an automatic planner and haptic user input leads to superior results. For crowd simulation, we describe techniques for evacuation planning and for evaluating architectural designs. Finally, we describe our application of sampling-based motion planners to simulate molecular motions, such as protein and RNA folding.

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