MOTION PLANNING FOR HUMANOID ROBOTS

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Humanoid robotics hardware and control techniques have advanced rapidly during the last five years. Presently, several companies are developing commercial prototype full-body humanoid robots. This humanoid technology will contribute to the development of sophisticated prostheses in the medical field, as well as human augmentation systems on the military battlefield. In order to improve the autonomy and overall functionality of these humanoid systems, efficient simulation systems, reliable sensors, safety mechanisms, and general integrated software tools and techniques are needed.

The development of practical motion planning algorithms and obstacle avoidance software for humanoids represents an important enabling technology for autonomous motion generation and control. I will demonstrate several motion planning methods for humanoid robots designed to enable *task-level control*. Given a high-level task command and an appropriate model of the robot and its environment, algorithms to automatically compute a motion to complete the desired task have been developed. In particular, humanoid application tasks involving locomotion, object grasping and manipulation, footstep placement, and full-body motions are developed. An overview of each algorithm will be presented, along with experimental results obtained by implementations running within a simulation environment as well as on actual humanoid robot hardware. The current results, promising new directions, and future research challenges are discussed. In addition, I will describe the role of graphical simulation and visualization software for robot development, and show crossover applications in computer graphics, animation, and virtual reality.