1、Dynamic Balance Force Control for Compliant Humanoid Robots

论文信息：

引用：312

时间：2010-10

收录：2010 IEEE/RSJ International Conference on Intelligent Robots and Systems

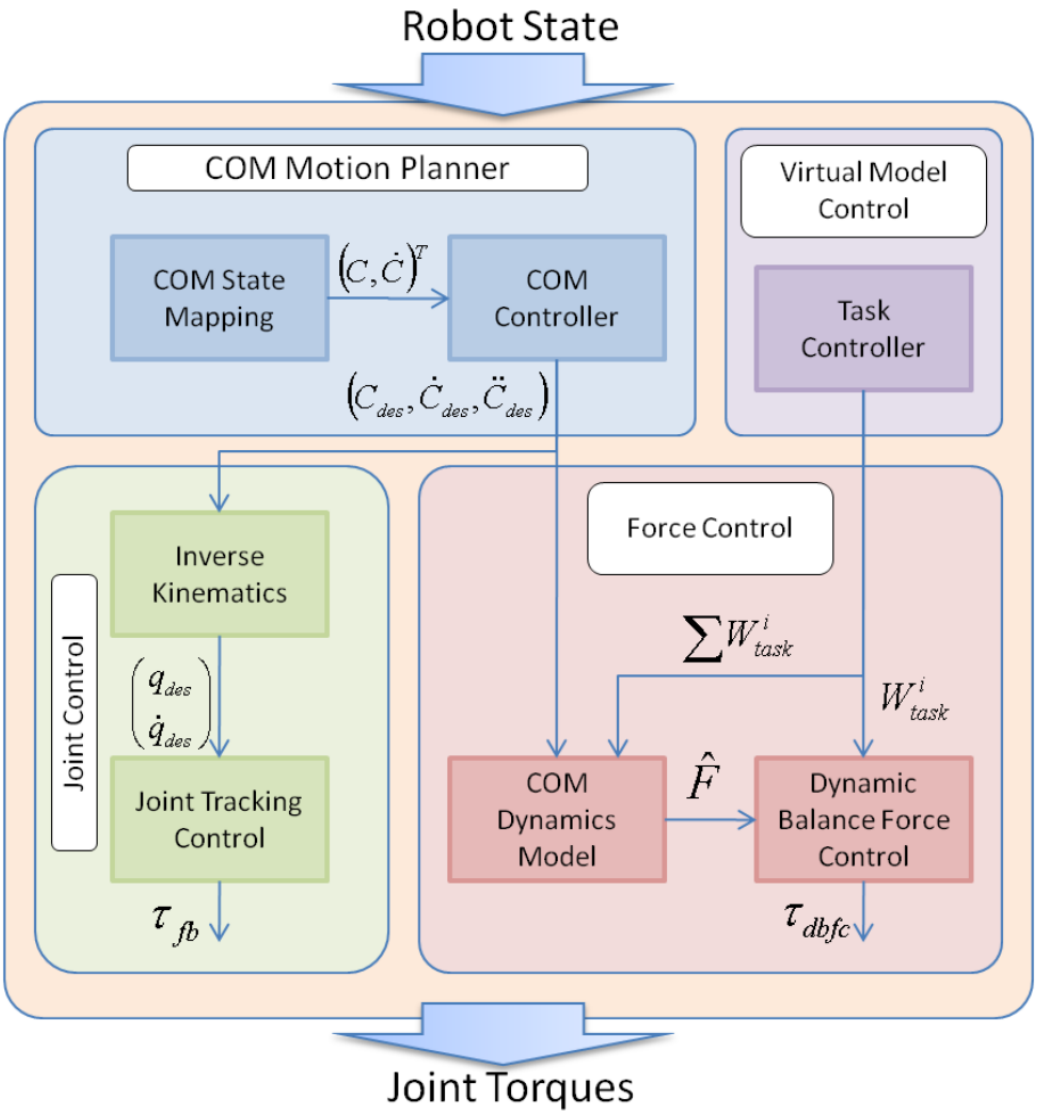
关键词：

●柔顺机器人；

●全身平衡：平衡→系统中各动量→接触力→关节转矩，本文方法结合 desired COM motion 和 contact forces 计算维持平衡需要的关节力矩；

●柔顺机器人通用力控任务：VMC；

●全身动态模型+不需要准静态假设；



2、Movement Imitation with Nonlinear Dynamical Systems in Humanoid Robots

论文信息：

引用：1078

时间：2002-5

收录：Proceedings 2002 IEEE International Conference on Robotics and Automation (Cat. No.02CH37292)

关键词：

- Movement planning;
- On-line trajectory modification;
- Imitation learning based on a set of nonlinear differential equations with well-defined attractor dynamics;
- Locally weighted regression;
- A trajectory which does not require time-indexing and which is robust against perturbations;
- Dynamical systems that encode desired trajectories, not motor commands;

主要工作/成果：

- Robust movement encoding systems;
- Encoding desired trajectories, or more precisely complete control policies (CPs), in terms of an adjustable pattern generator built from simple nonlinear autonomous dynamical systems;

实现的效果

- Multi-joint human movements can be encoded successfully by the CPs（control policy）;
- A learned movement policy can readily be reused to produce robust trajectories towards different targets;
- A policy fitted for one particular target provides a good predictor of human reaching movements towards neighboring targets;

- The parameter space which encodes a policy is suitable for measuring to which extent two trajectories are qualitatively similar;
- The ease of representing and learning a desired trajectory;
- Robustness against perturbations and changes in a dynamic environment;
- Ease of re-use for related tasks and easy modification for new tasks;
- Ease of categorization for movement recognition;

3、Dynamic Movement Primitives –A Framework for Motor Control in Humans and Humanoid Robotics

论文信息：

引用：746

时间：2006

收录：书籍 **Adaptive Motion of Animals and Machines**

关键词：

- Identifying movement primitives（units of actions, basis behaviors, motor schemas）;
- Fundamental building blocks that are strung together, adapted to, and created for ever new behaviors;
- Units of action that are formalized as stable nonlinear attractor systems;
- Highly flexible autonomous robotics;
- Dynamically changing;
- Stochastic environment;
- A formal framework that also lends itself to investigations in computational neuroscience;
- Well-understood statistical learning;
- Principled model;
- General approach to motor control in robotics and biology;

- Formalizing the learning of coordinated movement;
- Describing the goal of learning control in learning a policy;
- Reinforcement learning;
- Complex nonlinear control problems;
- Prior information about the policy;
- Substantial and reactive modifications of control commands;
- Generating entirely new trajectories by generalizing from previously learned knowledge;
- Statistical learning;
- Nonlinear function approximation problem;
- Generate and combine primitives in a principled and autonomous way;

想解决的问题：

- What is a good set of primitives, how can they be formalized,
- How can they interact with perceptual input,
- How can they be adjusted autonomously,
- How can they be combined task specifically,
- What is the origin of primitives;

4、Dynamics and Balance of a Humanoid Robot During Manipulation Tasks

论文信息：

引用：120

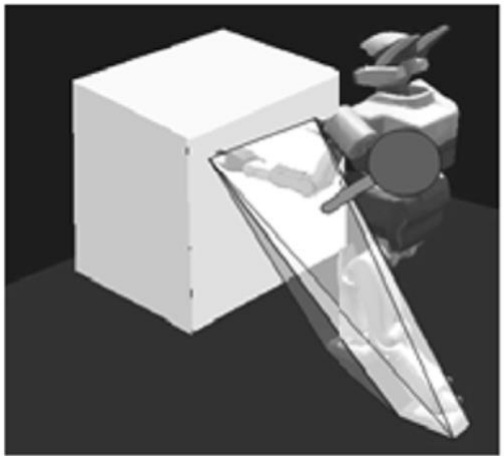
时间：2006-6

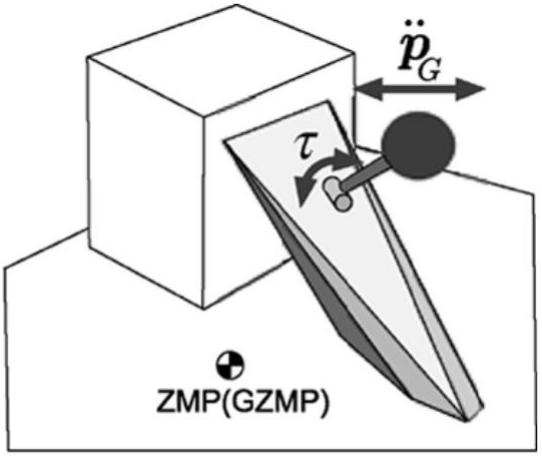
收录： IEEE Transactions on Robotics (Volume: 22, Issue: 3, June 2006)

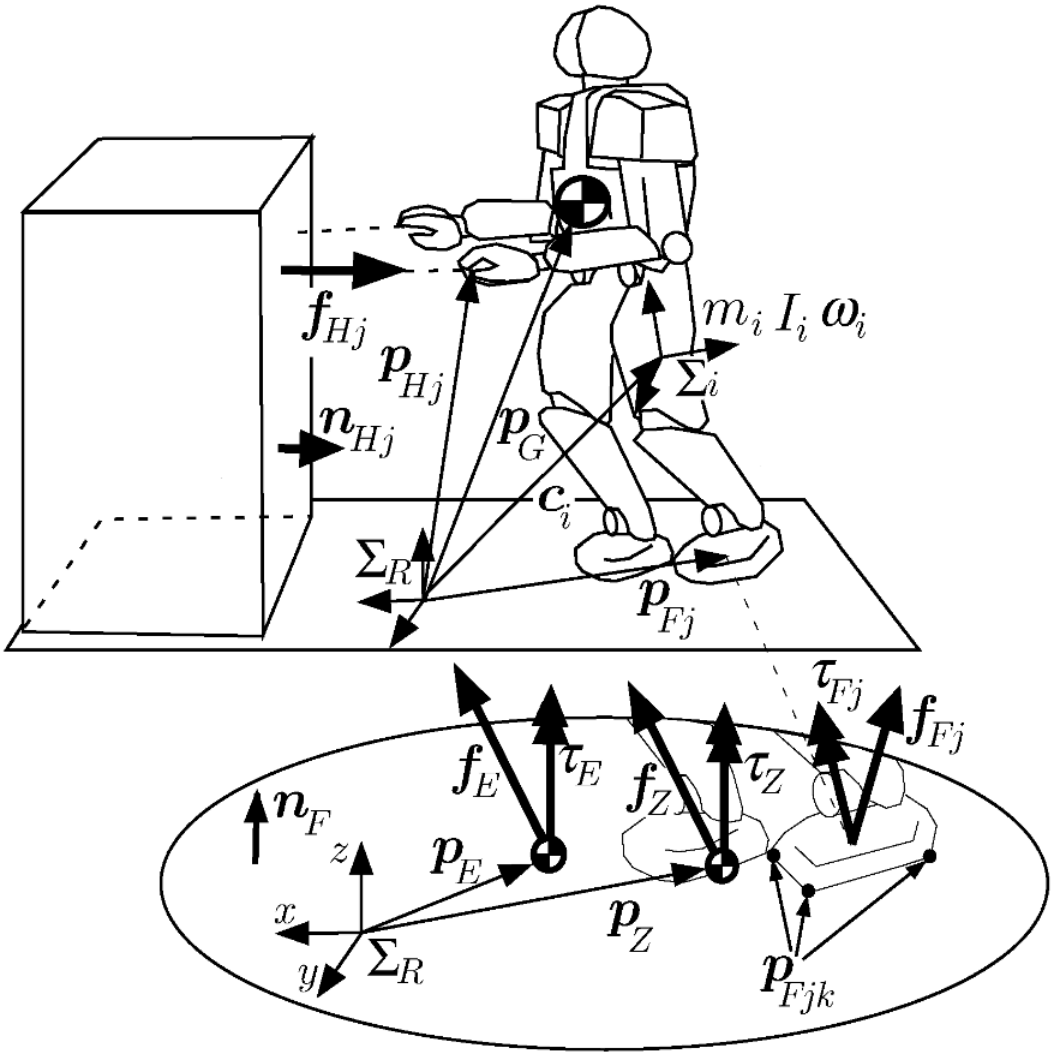
关键词：

- 人型机器人与外界交互（如推、拉）时的平衡性判断。
- zero-moment point（ZMP，常用在判断在平地上步行时的平衡性）+center of pressure

(COP 在机器人的手和环境存在交互力时判断平衡性)→GZMP;







●通过判断 GZMP 在地面上的投影是否落在某个特定区域内，来判断此时机器人的稳定性如何。