



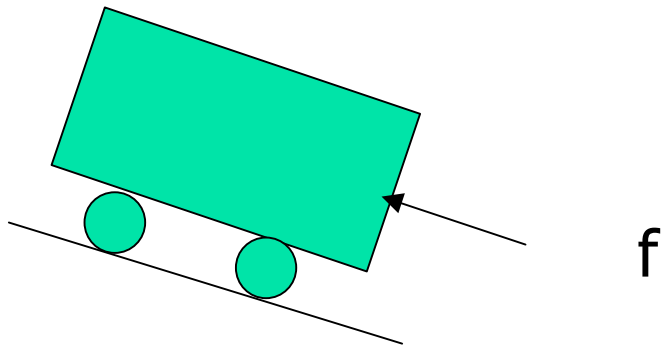
Research Topics

Dr. Ming Liu

- Force control
- Non-linear control systems
- Decentralised control
- Dynamic vision
- Real-time image processing



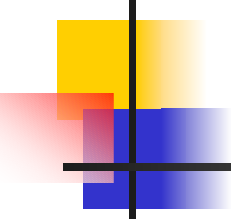
Force Control





Applications

- Surgery robots
- Master-slave systems
- Remote controlled surgery robots
- Painting, Deburring and Grinding
- Assembling

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- Control the motion and contacting force of a robot manipulator while it keeps moving and contacting with the environment.
 - Ensure the smooth transition from free motion control to constrained motion/force control.
 - Collision dynamics needs to be carefully studies.
 - Nonlinear frictions become dominant.



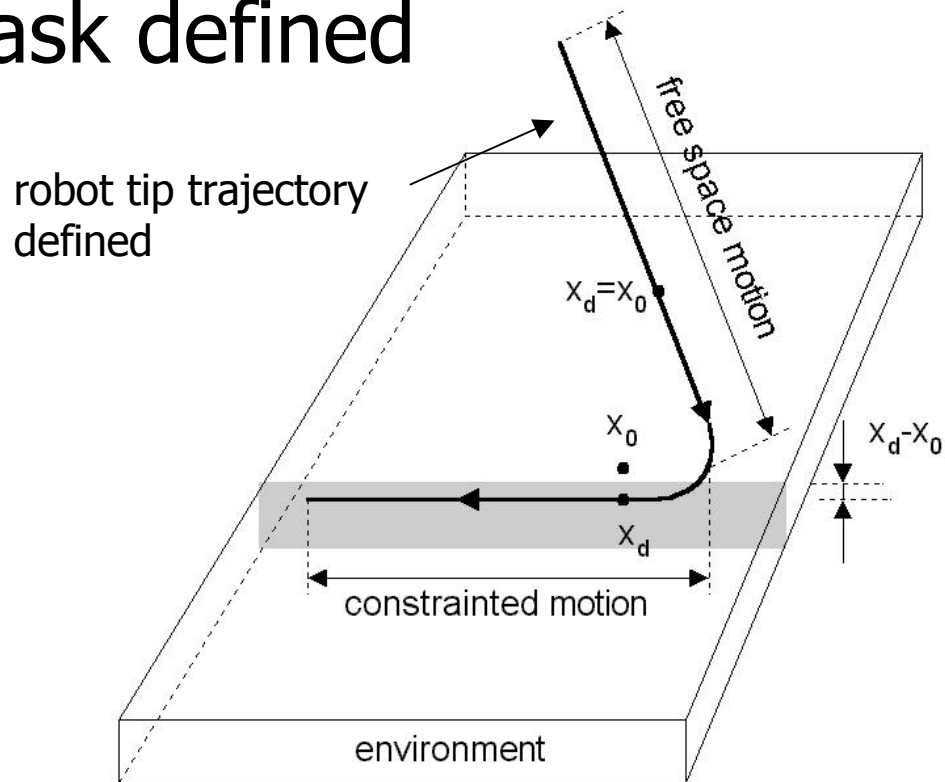
Force control scheme

by N. H. Quach and M. Liu

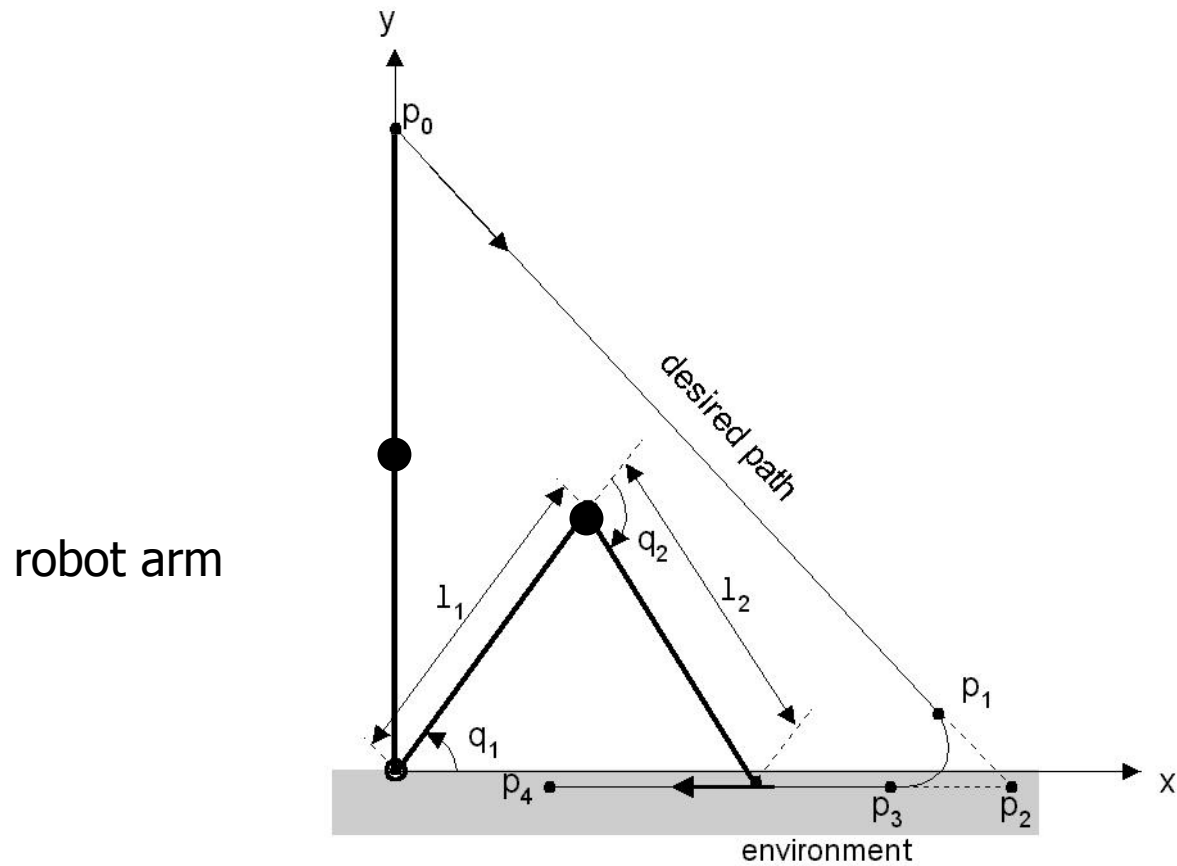
- Based on the investigation on the transit dynamics from free motion to restrained motion/force control some effective control schemes have been proposed which
 - ensures the smooth transition and asymptotic stability.
 - takes the complicated friction dynamics into account.

Simulation results

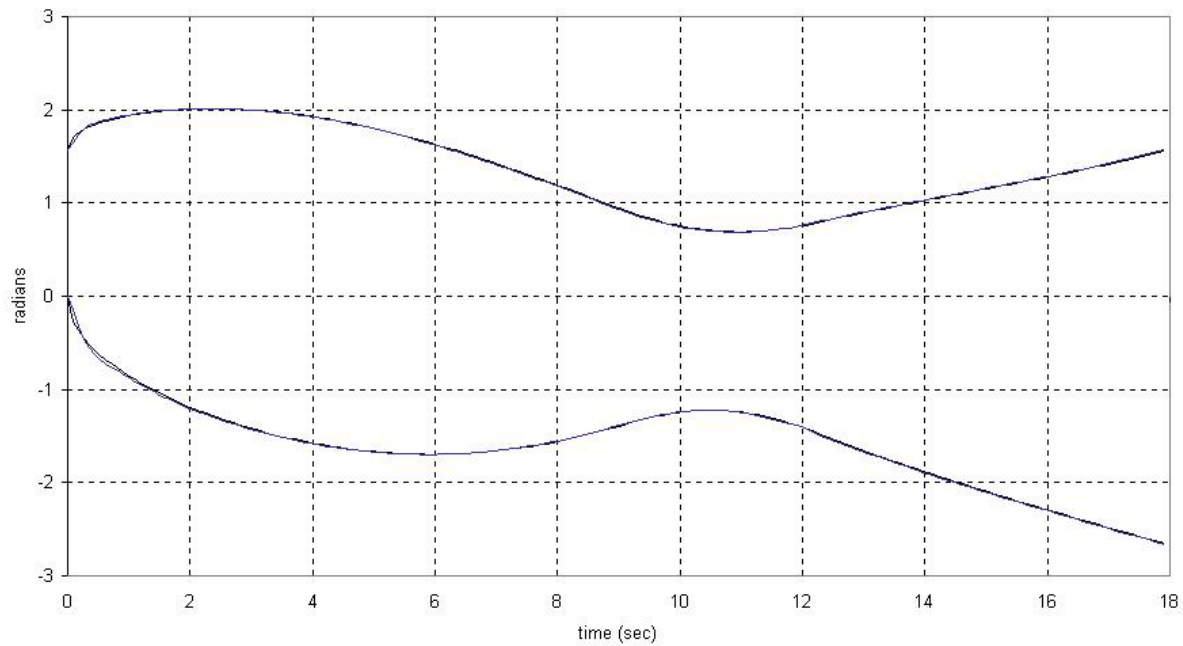
- Task defined



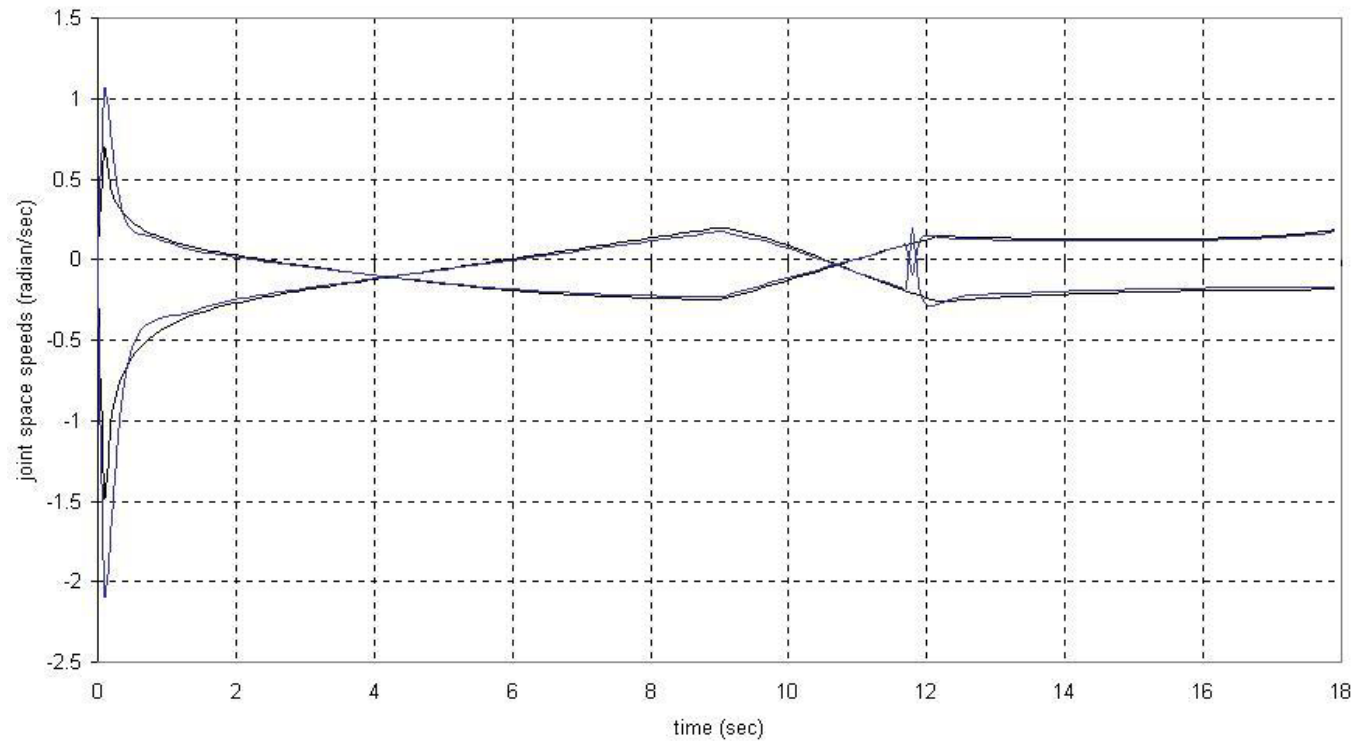
Work space trajectory planning



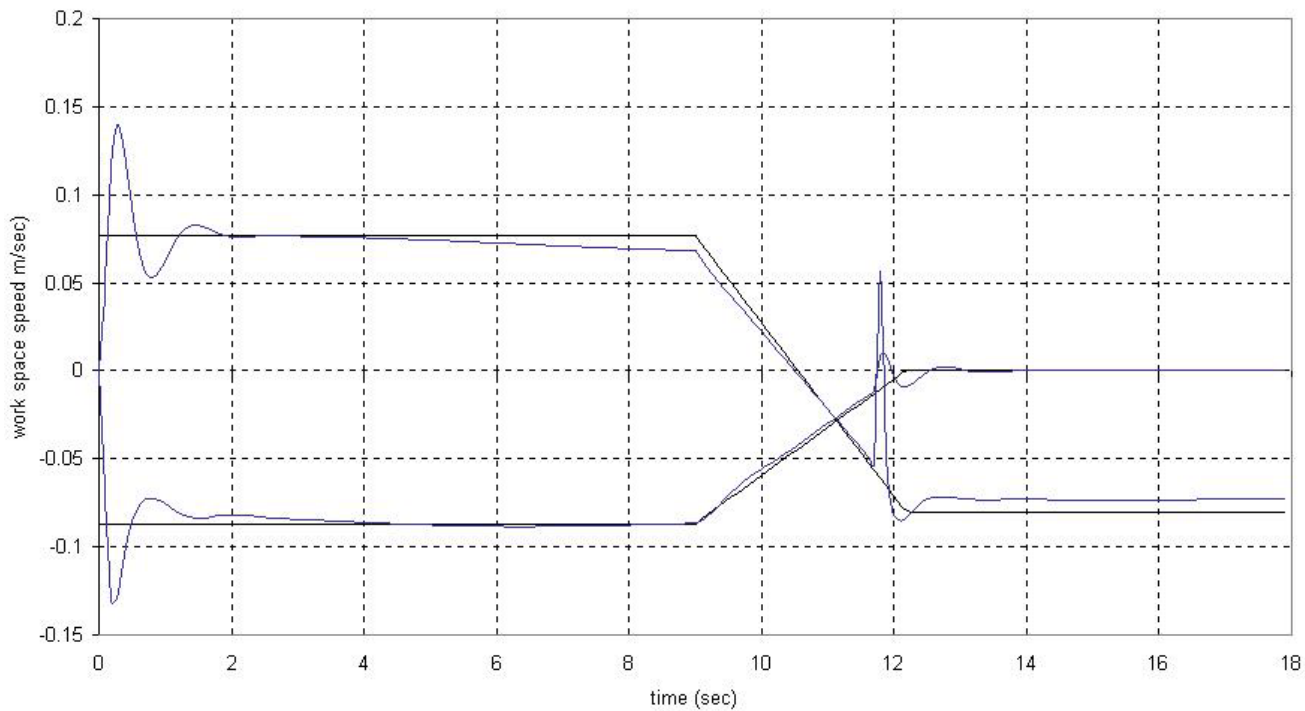
Position trajectories in joint space



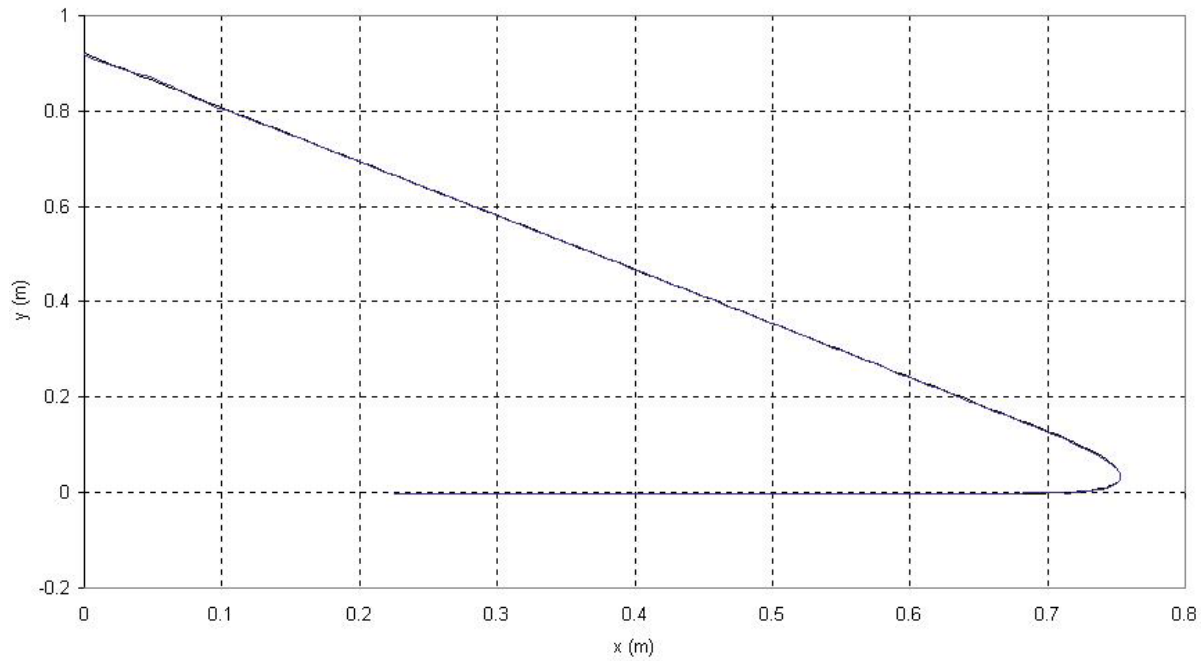
Velocities in joint space



Joint velocity in work space



Reference trajectories in work space



Collision Phase - from free motion mode to constrained force/motion mode

