Section 1: Robot Control

This first set of papers deals with different aspects of robot control.

The paper of Volpe and Khosla tries to shed light into the confused variety of terminologies used in force control; in particular they discuss equivalence aspects of impedance and proportional gain explicit force control and present experimental results with the CMU direct-drive arm. As in the whole field of robot control these kind of theoretical and practical comparisons are of crucial importance before commonly acknowledged standards will settle down.

The paper of Chiaverini, Siciliano and Egeland is analytically and experimentally concerned with the control of 6 dof-robots near kinematically singular configurations. The approach makes use of the well-known "damped-least-squares" method, but adds a "user-defined accuracy" technique that allows to define directions of high and lower accuracy in the operational space.

Mechanical flexibility in industrial robots in general does not appear in the links but in the joints and may show up considerably adverse effects in case of high accelerations. The paper of Adams, Swevers, Tofts, DeSchutter and van Brussel shows how - by using identification and model-based control - the dynamics (overshoot, oscillations, tracking error) of an industrial robot can be significantly improved. Comparisons are especially related to the PID control systems normally delivered to the robot user.

Adaptive and fault tolerant tracking control of a pneumatic actuator is presented in the paper of McDonell, Bobrow and McCarthy. The authors point out that fixed gain control is not adequate for pneumatic actuators. In contrast they propose (and experimentally demonstrate) a controller based on a recursively identified time-varying linear model which uses full-state feedback and tracking control via feedforward terms.