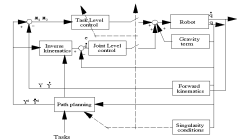# Control 2
Chairs: Jim Bobrow, Genther Schmidt

Energy-efficient Motion Control of a Hydraulic Manipulator
J. Mattila and T. Virvalo
Tampere University of Technology

Hybrid System Design for Singularityless Task Level Robot Controllers
J. Tan and N. Xi
Michigan State University

- Overcoming singularities in task level robot controller.

- A hybrid system for analysis and design of the controller

- Implementing and testing on a PUMA560 robot

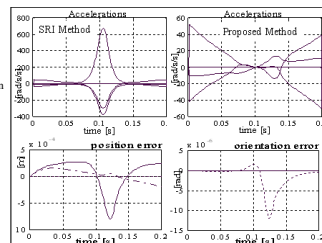- First stable task level controller for robot to pass singularities

Bordered Matrix for Singularity Robust Inverse Kinematics: AMethodological Aspect
J. Foret[1], M. Xie[1] and J. G. Fontaine[2]
[1]Nanyang Technological Univeristy and [2]Ecole Nationale Superieure D'Ingenieurs de Bourges
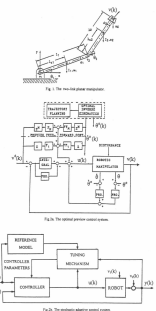
- Motivations: In the context of remote or tele-operated control it is important to insure the feasibility of the desired motion of a robot. Therefore, we present in this paper a new way to make a serial manipulator passing through singular configurations by insuring the continuity of the acceleration and velocity profiles.

- Proposed Approach: The author used the properties of bordered matrices to insure the smooth profile of the acceleration profile. The method presented relies on the knowledge of a complete singular value decomposition of the Jacobian of the system, and is concise enough to expect real-time applications.

- Simulation Results: In the results, are compared the Singular Robust Inverse (SRI) method and the proposed one named Bordered Matrix Singular Robust Inverse (BMSRI). These two method, have been compared since they offer almost the same simple computational aspect and amount of position error. When the proposed method is use, the acceleration profile and position/orientation error at the singular point gives almost 0, whereas using the SRI both reach their maximum.

Preview and Stochastic Controllers for Motion Control of Robotics Manipulator with Control Input Constraints
M. Negm
Technical College at Dammam

- Optimal Preview Controller

- Stochastic Adaptive Controller
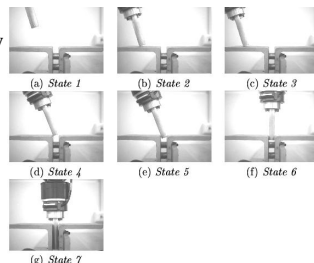
- Simulation Results

- Recomendations and Conclusions

Hybrid Force/Velocity Discrete Event Controller Synthesis for Assembly Tasks with Friction
D. Austin[1] and B. McCarragher[2]
[1]NADA and [2] Australian National University

- Discrete event for error recovery

- Force control gives compliance

- Velocity control overcomes friction

- Robust to 50mm,10degree errors

Observer Based Coordinated Adaptive Robust Control of Robot Manipulators Driven by Single-Rod Hydraulic Actuators
F. Bu and B. Yao
Purdue University

- Control of a hydraulic arm is difficult due to strong coupling effects and rich nonlinear dynamics

- Physical model based control approach is used to explicitly take into account the strong coupling among various joints

- Adaptive robust control approach is employed to improve tracking accuracy in the presence of model uncertainties

- Simulation and experimental results illustrate the proposed algorithm

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