

Curso de posgrado – JAR2006

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Course title: Modelling, simulation and motion control of complex robotic systems

Outline of the Course:

1. Orientation description of rigid bodies in 3D Space
2. Kinematics of rigid body
3. Kinematics of complex robotic systems. Generalized coordinates and velocities
4. Kinematical equations of motion
5. Kinematical equation of motion for a helicopter
6. Introduction to the Kane-Method for deriving dynamical equations of motion
7. Dynamics of rigid body
8. Simplified dynamical equations of motion for a helicopter
9. Dynamical equations of motion for complex robotic systems
10. Algorithm for the Kane-Method
11. AUTOLEV: Software package for modelling of complex mechanical systems based on the Kane-Method
12. Motion simulation of complex robotic systems
13. Introduction to robust motion control
14. Motion control in sliding mode
15. Robust motion control for manipulators
16. Modelling and control of an autonomous helicopter
 - a. Model decomposition
 - b. Kinematical and dynamical equations of motion
 - c. Simulation and analysis of helicopter behavior
 - d. Controller design
 - e. Embedded real-time system for helicopter control
 - f. Experimental validation
17. Stable motion of humanoid robots
 - a. Zero moment point (ZMP) concept
 - b. Kinematical and dynamical equations of motion
 - c. Generation of trajectories for stable motion
 - d. Controller design
 - e. Validation using computer simulation
18. Control algorithms for a hand exoskeleton
 - a. System description
 - b. Robust position control, force control
 - c. Experimental validation