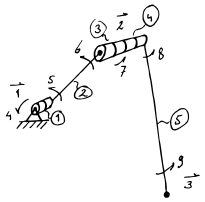
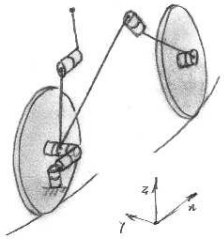
New Course for Spring Term 2003



TAM 674



Applied Multibody Dynamics

A How-To Course

Spring Term 2003, Mon & Wed 10:10-11:00, 202 Thurston Hall, 3 credits

Instructor: Arend L. Schwab, Visiting Assistant Professor (from Delft University), als93@cornell.edu, 255-7108, 306 Kimball Hall

Prerequisites: An excellent knowledge of topics in TAM 203 or completion of TAM 570, MAE 571, or AEP 333. Some knowledge of MATLAB.

Description: After the first courses in dynamics a student can often deal well with the dynamics of one rigid body. In this course we will cover a systematic approach to the generation and solution of equations of motion for mechanical systems consisting of multiple interconnected rigid bodies, the so-called multibody systems. This course differs from "advanced dynamics", which mostly covers theoretical results about classes of idealized systems (e.g. Hamiltonian systems), in that the goal here is to find the motions of relatively realistic models of systems (including, for example, motors, dissipation and contact constraints).

The main approach is the reduction of the constraint Newton-Euler equations using the principle of virtual work and the principle of D'Alembert. However the relation of this approach to Lagrange's equations, Kane's equations, and to the differential algebraic equations approach will also be covered. The course will start with 2D examples and then move on to 3D systems. Rotations will be represented with matrices, various Euler angles, and Euler parameters. Various computer solution techniques for the ODEs or DAEs will also be covered.

Goal: By the end of the course students will be competent at finding the motions of linked rigid body systems in two and three dimensions including systems with various kinematic constraints (sliding, hinges and rolling, closed kinematic chains). Collisional interactions will be considered in a unified manner for all the different ways of formulating the equations of motion.

Homework: There will be weekly homework assignments and a final project.