TAM 674
Applied Multibody Dynamics

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

Homework assignment 1

The model of a double pendulum consists of two slender rigid bars made out of Wood ($\rho = 450$ kg/m^3) with length $l = 0.50$ m and a rectangular cross section of $w = 50$ mm by $t = 45$ mm. The first bar is connected to the ground by a cylindrical hinge in A, the left side of the bar. The left end of the second bar, B, is connected to the right end of the first bar by a second cylindrical hinge. We assume a gravitational field operating in the *horizontal* direction with a field strength of $g = 9.81$ N/kg.

a. Derive the equations of motion together with the joint constraint equations for this system.

Calculate for each of the following initial conditions the accelerations of the centre of mass of the bodies, both linear and angular, together with the forces of interaction in the joints (joint constraint forces).

b. Both bars vertical up and zero speeds.

c. Both bars horizontal to the right and zero speeds.

d. Both bars horizontal and with an initial angular speed of $\omega = 50$ rpm on both bars. Also calculate the initial velocities of the centre of mass of the two bodies in this state.