ME 397, Robot Design and Control Midterm 1 (Tentatively due Oct 20th)

1) Select a partner
2) Select a serial link manipulator. It must operate in 3D and have at least four degrees-of-freedom. It need not have a wrist. The link must be different than your partner's.
3) Develop a graphical representation for each link (including center of mass and geometry) of the mechanism using Matlab. Make sure to include a world coordinate frame, and coordinate frames located at the center of mass for each link.
4) Derive the D-H parameters and resultant forward kinematics for your robot. If necessary, display new D-H based coordinate axes for each joint.

Animate the motion of the robot across a range of joint trajectories. Try and show off the reachable workspace. You can check your answers using third party tools such as SimMechanics or this toolbox: http://royfeatherstone.org/spatial/, or this one: http://www.coppeliarobotics.com/index.html

5) Derive the Jacobian for your manipulator
6) Determine and plot the singular configurations of the robot
7) Use the Jacobian pseudoinverse to draw a desired shape or pattern using inverse kinematics.
8) Find the manipulability of the end effector. Display as an ellipsoid.
9) For all tasks, compare and contrast results with your partner's mechanism. Discuss the potential advantages and disadvantages of each case and explain why such differences exist. Submit single report using LaTeX for all analyses. Submit animation files as separate movie files.