Assignment 2, EECS 397/600: DARPA Robotics Challenge
due by 5pm, Tuesday, 16 September

1) Familiarization:
Following the notes "ROS and DRC v3", start up the "drcsim" simulator, as well `rosrun simple_joint_interface simple_joint_interface.` With reference to the "atlas_joints" illustration, try moving various joints of the robot.

Start up: `rosrun rviz rviz`. Try changing the settings to observer different axes and different camera views. Move the neck and links to see the effects. See if you can move a hand within view of a head camera.

2) Design a Low-Level Sinusoidal Joint Controller and Identify Robot Properties:
Make a new package called "atlas_interesting_move," with dependencies: roscpp std_msgs atlas_msgs. (see the package.xml file in simple_joint_interface). Copy over (and rename) the source file "simple_joint_interface.cpp." Edit your package's CMakeLists toEdit to have it compile your new source file.

Edit your source file to command Atlas to go to all zero angles. (This will cause Atlas to fall over, but you can reset him in Gazebo with Edit->Reset Model Poses).

After this command, prompt the user to enter an amplitude and frequency. Command joint 23 to oscillate in a sinusoidal motion with this amplitude and frequency. Plot out the position and effort of joint 23 in rqt_plot, and capture the result. (Do this twice, since autoscaling will make the position too small relative to the effort). Experiment with different amplitudes and frequencies.

From your experiments, what is the saturation torque?
Estimate the arm inertia from these experiments.

3) Design an Interesting Motion Controller:
Make a copy of your sinusoidal joint controller (renamed). Add it to your CMakeLists.txt. Edit the source file. Change the code to have Atlas do something interesting. Capture a movie of your result using Kazam. (Use mp4 encoding).

4) Assignment submission:
Submit your source files, your screen captures and your video. State your estimates of torque saturation of joint 23 and inertia of the outstretched arm.