

Assignment 5, EECS 397/600: DARPA Robotics Challenge
Interactive Markers and Inverse Kinematics
due by 5pm, Tuesday, 7 October

Refer to the following 4 documents: “Inverse Kinematics for Atlas's Arms”, “Introduction to Interactive Markers”, “Introduction to Action Servers and Clients: the Joint Trajectory Behavior” and “Displaying Atlas' LIDAR Data in Rviz.” Also, refer to the example code under “examples” in packages: `example_ik`, `example_interactive_marker`, and `example_traj_client`.

Your objective is to make a convenient user interface for controlling Atlas's right arm interactively via Rviz. You should combine the example programs to get the following effect:

- *move an interactive marker to a desirable location in rviz (e.g., above an object); you can use the interactive-marker example program as-is (no modifications required).

- *enter a signal to compute the corresponding inverse kinematics (you can simply do a manual “rostopic pub” for this; we'll get to GUI's later).

- *enter a signal to cause Atlas to move his right arm to this solution. (This will require integrating the IK solver with the trajectory-behavior client).

Once you have built your interface, submit your *commented* code, along with *screen captures* illustrating successful convergence of the robot's right grasp frame to your interactive marker.

Try this out in rviz, using the launch file:

```
roslaunch hku_worlds beer_table.launch
```

You will also need to launch `fc_bringup`, the interactive marker, and your (new/modified) kinematics node. (You may want to make a launch file to automate this).

Another nuisance is that Atlas will appear with his neck tilted back, thus making the table scene out of his view. Fix this by tilting his neck down with a `play_file` command. There is a file “tilt_head_down.traj” in the directory “traj_files.” Navigate to this directory, and execute this motion with:

```
roslaunch play_file play_file tilt_head_down.traj
```

With the cans in view, find a successful hand pose corresponding to placing the palm face-down on the top of one of the cans in the “beer_table” scene. You may need to experiment with different orientations of the marker y-axis to find a reachable solution. Show the robot successfully achieving this solution. For clarity, do two screen captures. The first should show a viable marker frame above a can, as in the example of document “Displaying Atlas' LIDAR Data in Rviz.” The second should show Atlas's hand in the desired pose above the can.