# 1 Notice

You must meet with cjenkins individually to discuss your potential project by 10/14. Send cjenkins mail to schedule an appointment.

# 2 Introduction

From previous assignments, we have established how to setup and control robots in PSG. In this assignment, we will develop a new robot device for Gazebo and write controllers to guide the robot to desired configurations. The new robot device an articulated structure (a torso and two two-link arms) with a wheeled base (a Pioneer2AT with a laser).

# 3 Issues for New Devices in Gazebo

New devices can be created for Gazebo, as described in Chapter 8 of the Gazebo User Manual. The addition of a new device requires modification of the Gazebo source. The rough procedure for creating new devices in Gazebo is as follows:

1. write source code for your new device
   - this code should sit in a new directory under the server/models subdirectory in the Gazebo source distribution
   - the procedures for the device will specify the structure of the robot (via ODE related calls) and various initialization/update/finalization calls
   - this code is best writted through copying and modifying an existing device in server/models
2. register your new device as specified in Chapter 8 of the Gazebo User Manual

An issue for new device addition is that your current Gazebo source cannot be used for adding new devices. Instead, the Gazebo source module from the PSG cvs repository must be checked out. Checking out of the Gazebo source can be accomplished by the following command that will copy the files to a subdirectory of your current directory:

```
cvs -z3
-d:pserver:anonymous@cvs.sourceforge.net:/cvsroot/playerstage
co gazebo
```

# 4 Assignment

For this lab, you are expected to create a new robot device for Gazebo building from the Pioneer2AT model. Additionally, you will be expected to write a client that will command to achieve a desired kinematic pose using PID control on each joint. **This lab, as well as the other advanced track labs, will be due on 10/14/2004.** However, we highly recommend completion of this lab before the assignment of the next lab (1 week from now).

This assignment involves the following tasks:

- addition of a new robot device in Gazebo
- write a control program in the language of your choice to achieve either a kinematic configuration specified through the command line or perform a motion given from a Biovision BVH file
- for extra respect: write a controller that uses inverse kinematics to have the robot reach to a 3D coordinate given at the command line

Once completing this implementation, you will turnin the following:

1. the **commented** source code for your robot device
2. the **commented** source code for your client program(s)
   - usage for the client must be obtainable from the command line and the source file header
   - build instructions should be available from the source file header
3. world files, images, and other necessary files for running your Gazebo worlds
4. a 2-4 page report[1] describing the implementation of the articulated robot, equations for PID control, and issues for achieving desired configurations

# 5 References

1 Gazebo User Manual, http://playerstage.sourceforge.net/doc/Gazebo-manual-0.4.0.pdf

[1] images not included in page count