1 Introduction

The purpose of this week's lab/project is to get you acquainted with the subtleties involved in installing and running the Player/Stage/Gazebo (PSG) robot control packages. Player is a network server for robot control. Player runs on board a single robot and provides a clean interface to the robot's sensors and actuators over an IP network. Stage is a 2D robot simulator suited for large populations of robots in an environment specified by a bitmap image. Gazebo is a 3D physics-based robot simulator suitable for smaller numbers of robots simulated at high fidelity. The physics for Gazebo is provided by the Open Dynamics Engine (ODE), which integrates physical dynamics for arbitrary kinematic structures through optimization.

PSG provides an infrastructure for developing robot controllers. Controllers are written as client programs that send control commands to and request information from a robot through its Player server. Stage and Gazebo can simulate various types of robot platforms (i.e., hardware) and populations. The same interface, provided by the Player robot server, is used to control a robot in the real world or its equivalent in a Stage/Gazebo simulation. Robot platforms that are not currently supported in PSG can developed through implementing appropriate Player server interfaces and devices in Stage or Gazebo.

Because of its flexibility and portability, PSG will give you good experience with developing robot controllers. Additionally, many interesting advance track project can be implemented using PSG.

2 Assignment

For this lab, you will be expected to download, install, and run Player/Stage/Gazebo. **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 steps:

1. Download source distributions for Player/Stage/Gazebo.
    - as described in the Gazebo documentation, you will also need the Open Dynamics Engine and Open Scene Graph source distributions
2. Perform a **local** installation of PSG in your directory
    - refer to online sources for installation instructions
    - it will be useful to write a shell script of command to automate installation[1]
3. Execution of Stage and Gazebo with sample worlds provided in the PSG installation

[1] including "make clean" may solve several of your installation problems

- sample worlds are available in the "share" subdirectory of the PSG installation
- move robot in Stage by selecting a robot with a mouse click
- move robot in Gazebo by selecting a robot by double clicking robot
- use playerv to view data being published by the robot

4. **for extra respect**, Creation of a live bootable linux CD with PSG in the distribution (a la Knoppix)

Once completing this implementation, you will turnin the following:

1. the script you used to build/install PSG
2. a 1-3 page report[2] describing problems, nuances, and solutions found during installation and a description of information published by the robot
3. movies from stage, playerv, and gazebo showing a mouse controlled robot and its published sensory information
4. *optionally*: an iso image for your bootable distribution

3 References

1 Player/Stage/Gazebo homepage, http://playerstage.sourceforge.net

2 Simon Fraser Autonomy Lab Guide: http://deckard.cs.sfu.ca:8080/Wiki/PlayerStageGettingStarted

3 Brian Gerkey, Richard T. Vaughan and Andrew Howard. "The Player/Stage Project: Tools for Multi-Robot and Distributed Sensor Systems" Proceedings of the 11th International Conference on Advanced Robotics, pages 317-323, Coimbra, Portugal, June 2003

4 Brian P. Gerkey, Richard T. Vaughan, Kasper Stoy, Andrew Howard, Gaurav S. Sukhatme, and Maja J Mataric. "Most Valuable Player: A Robot Device Server for Distributed Control". Proceedings of the IEEE/RSJ International Conference on Intelligent Robots and Systems, pages 1226-1231, Wailea, Hawaii, October 29 - November 3, 2001.

[2] images not included in page count