

Assignment 1: "Hello, World!"

CS 393R: Robotics

8-29-2011

Assignment due: Thursday, September 8, 2011

The purpose of this assignment is for you to get the fairly complex hardware and software system that is your Aibo robot to "turn over" (to use automotive terms).

You will learn how to connect to the Aibo, read its sensors (joints, camera, and others), send motor commands to the head and legs, and write simple control programs to close the loop. For this assignment, the control programs should be very simple, so you can concentrate on getting all the pieces to work together. Note that everything should be run on the robot - you can start behaviors from the ControllerGUI, but you should not be controlling the robot from the GUI. For example, you should write a behavior for your robot to walk in an arc instead of using the joystick controller.

You will do much of your work using Tekkotsu Version 5.1 (<http://www.tekkotsu.org/>), an open source development toolkit for the Aibo. You will be programming in C++ using many of the features already incorporated into Tekkotsu, including the preprogrammed walks and color segmentation features. You can find documentation for Tekkotsu at <http://www.tekkotsu.org/development.html>. The tutorial found at <http://www-2.cs.cmu.edu/~dst/Tekkotsu/Tutorial/> contains examples of how to use many of the features of Tekkotsu that this and future assignments require. The tutorial also describes how to form your own color table using EasyTrain.

You may run across some examples in the tutorial that are not updated to work with version 5.1 (such as the walking section). You may also find it useful to consult the tutorial documents from Tekkotsu Version 4.0 (archived at <http://web.archive.org/web/20081212020015/http://www.cs.cmu.edu/~dst/Tekkotsu/Tutorial/>), as well as some CMU class notes (<http://www.cs.cmu.edu/afs/cs/academic/class/15494-s08/Lectures.html>), as these contain some concepts that are not present in the newer tutorial. However, as explained partially in the pink box on the 5.1 Tutorial index page, some coding conventions and syntax have changed between the versions. We've provided a partial list of notes between version 4.0 and version 5.1 on the resources page that should help if you are looking at version 4.0 examples. However, note that the state machine in version 5.1 can nicely handle walking, poses, and other things that were messier in version 4.0 - so some of the examples found in the 4.0 documentation can now be done using the state machine.

To get started, go to the lab and visit <http://www.cs.utexas.edu/~pstone/Courses/393Rfall11/resources/intro.html>. Follow the Initial Setup steps and read the Memory Stick Care and Management section before beginning this assignment.

Your Tasks:

- * Establish contact between your workstation and your Aibo. Demonstrate that you can read the sensors and make the Aibo move its head and walk.
- * Get started using a colored-blob-tracker on the camera image.
- * Write a couple of simple control programs to control the Aibo's gaze and walk.

Checklist

This assignment is worth 10 points. Here's how you earn them. Partial credit is possible.

- [] (1 point) Demonstrate the ability to read the changing values from the Aibo's sensors, and then display them on your workstation.
- [] (1 point) Same for the camera image.
- [] (1 point) Demonstrate the ability to detect and locate a pink blob in the camera image with the head held still.
- [] (1 point) Demonstrate that you can control sitting, standing, and head-turning.
- [] (1 point) Demonstrate that you can control walking: forward walking and turning in place.
- [] (1 point) Demonstrate that your Aibo can walk in a curve: forward and turning at the same time.
- [] (2 points) Demonstrate that your Aibo can move its head to keep the visible blob from a pink ball near the center of the image (if the ball isn't moving too fast).
- [] (2 points) Demonstrate that your Aibo can spot a blue colored patch in the distance, and walk toward that patch until it fills more than half of its camera image, and then stop.

Extra Credit

- [] (1 point) Identify the orange ball in the distance, walk up to it, and use a pre-packaged routine to kick the ball. Don't worry about accuracy (yet).