

EE209AS (Winter 2016)

Robotics: Design, Manufacture, and Control

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Lab assignment 3
Lab report due 2pm Tuesday Feb. 9, 2016

1 Lab Overview

1.1 Objectives

The goal of this lab is to continue with electromechanical hacking, this time by adding sensing to the system. You will start with your Edison-based “jam band” from last week and incorporate sensors to generate input from a user.

You will be working in your project teams. You will be responsible as a team for dividing the various tasks of this project between all members. Your grade will be based both on team and individual performance.

1.2 Deliverables

There will be two deliverables for this project — one team and one individual.

As a team, you will extend the webpage documenting and demonstrating your band. Be sure to add details and videos of the new sensing subsystem, and instructions for how a user can interact with your robots. As a reminder: just as last week, the rest of the webpage should contain everything necessary to recreate your system. Be sure to include your code, wiring schematics, and a bill of materials, as well as pictures, videos, and text descriptions of the construction and operation. N.B.: Putting your project in a version control system is a great way to share your code and designs amongst your team and to the world.

As an individual, you will write up your individual contributions to the project in the format of an academic report / white paper. This paper should contain at minimum an introduction, methods, results, and conclusions sections. You may want to include background as well. Indicate on your report who you worked with, and for each person including yourself estimate an aggregate percentage of the total work done. Submit a .pdf of your report via email by 2pm Tuesday Feb. 9, 2016. Use the subject heading “EE209AS Lab 3 report: ” + your name. Include in the email a link to the team webpage.

Submissions that are up to 24 hours late will be accepted for a 10 percentage point reduction in final grade. No submissions will be accepted more than 24 hours late.

2 Lab specification

2.1 Sensing

You will be given a collection of sensors with which to extract data from the environment. They generate a variety of digital and analog electrical signals. You must choose two different sensors to include in your robotic system; they can be connected to one or both Edison boards. You may also choose to use other sensors if you’d like.

As a part of your team report, generate figures demonstrating the relationship between the environment and the sensor output. This could take the form of a graph, a timing diagram, a table of values, or some other representation. It should be populated with actual data gathered from the use of your sensors. These figures should help drive the implementation of the human-robot interaction (HRI).

2.2 Human-robot interaction

The sensor measurements are to be used by the system to allow a human musician to influence the operation of the Edison-based band. Come up with an interactive behavior for your system that includes human-in-the-loop control and implement that on your Edisons using the relevant sensors. For example, the Edisons could provide backup music for a human controlled instrument, or play a call and response type song, or help train a user to play music.

2.3 User interface

From last week, your band was controlled through a web-based user interface. Extend this web interface to provide data to the user from the system. Depending on the nature of your HRI behaviors, this could for example take the form of instructions, visual feedback, or analytics.

2.4 Demonstrations

Be sure to record a live performance and include it on your webpage!

3 Resources

3.1 Hardware

You will be provided a variety of sensors. If you need additional hardware, you can check with me to see if I have extras. I may also have limited additional components such as breadboards, jumper wires, and LEDs. You are free to use any additional components, found or purchased, as you wish.

3.2 Computing infrastructure

Feel free to use any web services you'd like. If you'd rather not use such resources and would prefer locally served space to host your website, videos, or code repository, come talk to me.