

EE183DA (Winter 2017)

Design of Robotic Systems I

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Lab assignment 2
Due 2pm Thursday Feb. 2, 2017

1 Lab Overview

1.1 Objectives

The goal of this lab is to get started with electromechanical hacking, and get comfortable with documentation and design sharing. You will build an electromechanical musical instrument driven by an ESP8266 microcontroller. This instrument will have both autonomous and human-controlled operation modes. It will be commanded via an internet-based web interface. You will be working alone for this lab, but you should feel free to chat and exchange ideas with other members of the class.

1.2 Deliverables

Your deliverable for this lab will be a git repository with associated markdown / web content documenting and demonstrating your instrument.

This should contain all the information necessary to recreate your system. Be sure to include a bill of materials, wiring schematics, mechanical drawings, etc, and reference your code. Pictures, videos, and text descriptions should be used to clearly describe the construction and operation of the instrument. N.B.: Github contains a number of tools to share and present your designs and documentation. Other web-hosting services may also be of use. Contact me if you prefer a self-hosted solution.

The write-up should also include a description of the design of the system. Explain how each element of your system works. Detail your design process, and explain any design decisions you made along the way. Point out potential alternatives and areas for further development to allow others to build off of your work.

Submit a link to your repository / website via CCLE by 2pm Thursday Feb. 2, 2017. 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 Getting Started with the ESP8266

You will be given an ESP8266 microcontroller with a motor breakout board. A quickstart guide for using this hardware can be found on the course website here:

<http://ucla.mehtank.com/class/esp8266-12e-quick.pdf>

Follow the instructions to learn how to program the board and interface to it using an internet based webpage.

2.2 Making noise

You will be given servos to use as actuators; these will probably need to be augmented with some mechanical devices to create “music”. You may also choose to use other actuators if you’d like. Feel free to get creative!

2.3 User interface

Your instrument will interact with a user via a web-based user interface. The interface may be hosted on the microcontroller, or on a separate server with links to command the microcontrollers. Possible communication methods could include HTTP and WebSockets. You are free to decide what options to provide the user. It can involve simple

commands such as start and stop, more detailed options such as select song and set tempo, or full control involving programming the music.

2.4 Demonstrations

Be sure to record a live performance and include it in your documentation!

3 Resources

3.1 Hardware

You will be provided one ESP8266, one motor control board, one standard servo, and one continuous rotation servo. If you would like additional microcontrollers or servos, you can check with me to see if I have extras. I may also have limited additional components such as breadboards, jumper wires, LEDs, or other actuators. You are free to use any additional electrical or mechanical components, found or purchased, as you wish.

3.2 Computing infrastructure

Your code, website, and videos should all be hosted on your Github project page. If you would rather not use Github, and would prefer locally served space to host your website, videos, or code repository, come talk to me.