Lab 10: Integration/Final Demo

EECS 16B Fall 2022

https://links.eecs16b.org/lab10-slides

The 16B Lab Journey

1. **Lab 1: Breadboarding** - A “gentle” refresher/intro to building circuits
2. **Lab 2: Analog & Digital Interfaces** - Helped you understand the bridge between the analog and digital world; how are your voice samples converted to data that you can use to build your classification model?
3. **Lab 3: Motion -** Build utility circuits to get the basic functionality of the car working; Giving it the ability to move using PWM motor drivers.
4. **Labs 4 & 5: Voice Sensing** - Building the mic circuit. Using filters to remove noise from our voice samples for better recognition.

The 16B Lab Journey (continued)

5. **Lab 6: System ID** - Teaching your car how to drive; Understanding your car's drive parameters

6. **Labs 7 & 8: Controls** - Adjust the car's general movement pattern according to its physical characteristics using feedback (Tune f-values). Writing a controller to allow for turning.

7. **Lab 9: Classification** - Using the mic outputs to understand your voice inputs

Where do I go from here?

1. Participate in the Design Contest **(TBA)**
    a. Excellent chance to go beyond the project and have it be like a “side project”
    b. Excellent Opportunity to present projects for autonomous driving companies
2. Take specialized courses:
    a. Good starting points: EE105, EE120 (prerequisites for a lot of classes)
    b. Analog circuits and design: EE105, EE140
    c. Filters/Signal Processing: EE120, EE123, EE122, EECS126
    d. Digital circuits and design: EECS151
    e. Controls/Optimization: EECS127, EE128
    f. Biomedical: EE145B, BioE101
    g. More on the car/robotics: EECS106A/B, EE192

Today's Lab

- Putting it all together!!
  - Copy code from the turning and classification labs into integration
  - Write code to execute the command based on your classified word by setting the drive_mode (instead of printing to serial monitor)
- Demonstrate your final working car!
  - For checkoff, we will give a random sequence of commands for you to say to your car
  - See checkoff requirements (note 10)

Tips and Common Errors

- Check that all I/O pins are defined correctly in Arduino IDE code
- Only replace v* with v*/m in the delta_reference function
- You can manipulate the turn radius and run times of the turning sequence to have your car turn only 90 degrees
    - Keep in mind that the run times are in ms
- If you get an “out of memory” error, try using only 2 PCA vectors or reducing your SNIPPET_SIZE
    - If this happens you may need to quickly rerun the coding part of your PCA lab with updated values and/or run classify.ino again to ensure proper classifications

Parting Thoughts

1. Hopefully the goals of the lab component of 16B are achieved:
    a. You have become better debuggers
    b. You know better on how to approach critical problems and think creatively (hopefully)
    c. You have a much better understanding of circuits and systems than at the beginning of the semester! We bet you didn't know how useful an RC filter could be.
2. You are better collaborators: working, discussing, and conversing with others in lab

3. You have gotten better at balancing things in life - you studied, you took care of yourself and your loved ones, you worked jobs, and you did everything well!

Forms & Information

- Help request form: https://eecs16b.org/lab-help
- Checkoff request form: https://eecs16b.org/lab-checkoff
- Extension Requests: https://eecs16b.org/extensions
- Makeup Lab: https://makeup.eecs16b.org
- Slides: https://links.eecs16b.org/lab10-slides
- Anon Feedback: https://eecs16b.org/lab-anon-feedback
- Lab Grades error: https://links.eecs16b.org/lab-checkoff-error