Physics 398DLP

Design Like a Physicist
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Unit 3: Communicating clearly; DAQ thoughts

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Goals this unit

- Reports (1), (2), (3) that were assigned last week.
- Select volunteers for the following reports: (1) I2C communication protocol; (2) interrupts; (3) how the MCP4725 DAC works.
- TinkerCad tutorial with GG: grouping and ungrouping objects, aligning objects, making holes, rotating your point of view, using build planes.
- Whole class group discussion: how is it going? What's too hard/too easy? What are your thoughts about the field work you'll be doing in a few weeks? What might your data acquisition code look like? What kind of technical support might I provide to make your work go more smoothly? Have you made contact yet with anyone to learn the rules concerning entering into their environment to make measurements?
- Block out a data acquisition program (DAQ) that you'll use for your field work and measurement; begin writing a skeleton version of it. Do this collaboratively.
- Install Anaconda's iPython IDE and begin building an offline data analysis package.
- Class visitor: Ms. Celia Elliott (Physics). *Communicating clearly.*

Communicating your thoughts

It is important to share the details of your work with others in a fashion that allows them to understand what you've accomplished. This is not an easy, or natural activity for most of us!

Celia Eliot, the physics department's Director of External Affairs and Special Projects, is the driving force behind Physics 496. She is an expert at helping us to speak and write more clearly about our projects. She'll spend somewhat more than a half with us at the start of class today.

TinkerCad tutorial

I'd like you to spend about a half hour blocking out the details of a case that will hold your data logger. We'll look over your shoulders and offer advice and tips as you work.

Whole-class discussion

How is it going? What's too hard/too easy? What are your thoughts about the field work you'll be doing in a few weeks? What might your data acquisition code look like? What kind of technical support might I provide to make your work go more smoothly? Have you made contact yet with anyone to learn the rules concerning entering into their environment to make measurements?

DAQ thoughts

Whole-class discussion: what might need to go into your data acquisition program? How might it be organized?

Group work: generate an outline (or flowchart, if you'd prefer) of an initial version of your DAQ.

Offline analysis thoughts

Whole-class discussion: how will you go about analyzing your data? How will you address calibration issues?

Group work: generate an outline or flowchart of an initial version of your offline analysis code.

Python IDE

Install the Anaconda python IDE if you don't already have it. Unless all members of your group have a strong preference to use a different programming system, I'd prefer you to use python. Whatever you decide, I insist that all members of your group use the same offline software development package.

Coding time

Working collaboratively with other members of your group, start writing a data acquisition program. I'd like all members of the group to use the same code, so work together as you do your code development.

We'll spend the rest of the class period at this.

Volunteers needed

Here are the topics for presentation net week:

- I2C communication protocol
- Interrupts
- how the MCP4725 DAC works

I'd like a report that lasts at most ten minutes, is carried in at most ten PowerPoint slides, will be presented to the class by all the team members, and is suitable for upload to the course web site. As always, keep in mind that your audience is other students in the class, rather than a group of professional engineers.

Post-class assignment

1. Continue writing code for your device's DAQ, and for your offline analysis. Do this in collaboration with other members of your group. Your DAQ must be able to write data to your device's microSD card.
2. Using TinkerCad, start designing the case for your device. (I hope to have a PCB design ready for you by this time.)
3. Develop with your group a detailed plan for field testing your (breadboarded) devices.
4. Run a quick field test. For example, if you plan to study Amtrak trains, ride an MTD bus for a half hour.
5. Keep your schematic diagram up to date.