Week 8:
Project Introduction

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Lab 6 recap:
Soft Sensors

Soft Sensor

1. How does the soft sensor work?

- Why do we get a change in the capacitance as the sensor is stretched?

- From what you learned in lecture about capacitors, how could we get a bigger change in capacitance?

Soft Sensor

2. What other motions of the sensor cause a change in the reading (twisting, pinching, bending)?

- How large are the responses to these other motions, compared with the change when stretching?

- How might this be a problem when using the sensor?

- And how could it possibly be beneficial?

Measurements

3. Test and calibrate your sensor with the Hapkit board following the steps in Section IV. Record the starting capacitance and length values and record the sensor reading and length as you stretch the sensor.

4. How linear are the readings you measured? Comment on how well the sensor output measures length after you add your values to the code.

Your Ideas

5. What are potential uses for this soft sensor? Imagine potential uses for other types of soft sensors like the ones shown in the lecture.

6. Any other thoughts?

Project Introduction

For this project, you will **build and analyze** a **novel soft robot** that **serves a humanitarian purpose**.

Your project must:
- be clear in its objectives: know how you define success!
- be demonstrated in the lab on demonstration day
- include a technical analysis of the mechanical principles involved
- include a qualitative analysis of the humanitarian nature of the robot

Timeline

<u>Tuesday, Nov. 12</u>: Form teams, brainstorm, and downselect

<u>Thursday, Nov. 14</u>: Meet with teaching team, finalize soft robot, set checkpoint plans

<u>Tuesday, Nov. 15</u>: Checkpoint 1 wiki report due (12 pm), tutorials as needed, build

<u>Thursday, Nov. 17</u>: Consult with teaching team, build

<u>Tuesday, Dec. 3</u>: Checkpoint 2 wiki report due (12 pm), consult with teaching team, build

<u>Thursday, Dec. 5</u>: Demonstrations during class period

<u>Tuesday, Dec. 10</u>: Final wiki report due (5 pm)
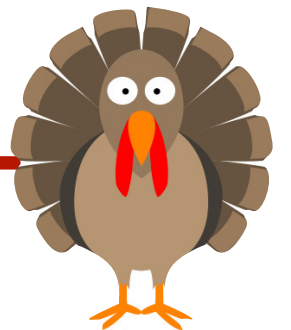
Materials and Resources

- You should be able to make your project from the materials in your lab kits and using our 3D printer.

- During the initial project meeting we will review what materials you would need, and help you procure additional materials if necessary.

- You can work on your project in 520-145, when other classes are not in session. (See https://meintranet.stanford.edu/faculty-intranet/d-arbeloff-undergraduate-research-and-teaching-lab)

- You can store your project materials in 520-145 if desired; keep them in a box that is clearly labeled on a shelf in the alcove.

Demonstration

- Soft Robots for Humanity Demonstration Day will be on <u>Thursday, December 5</u> in 520-145 during class time.

- Please reserve some time before the open house to set up, as well as afterward to clean up.

- At the demonstration, you will:
  - Demonstrate and explain your project to the teaching staff for grading.
  - Show a 1-page simple flyer that gives (in large font) the title of your project, your names, an overview of the project, and describes its humanitarian aspect.
  - Invite visitors to see your demonstration, while you explain your project and answer questions.

Project wiki page

- To document your project, you will create short checkpoint reports and a more detailed final report via your project wiki page at http://charm.stanford.edu/ME23N

- The wiki page will be a single document with the checkpoints in an Appendix at the end.

- You will receive a login and instructions after we review the project proposals.
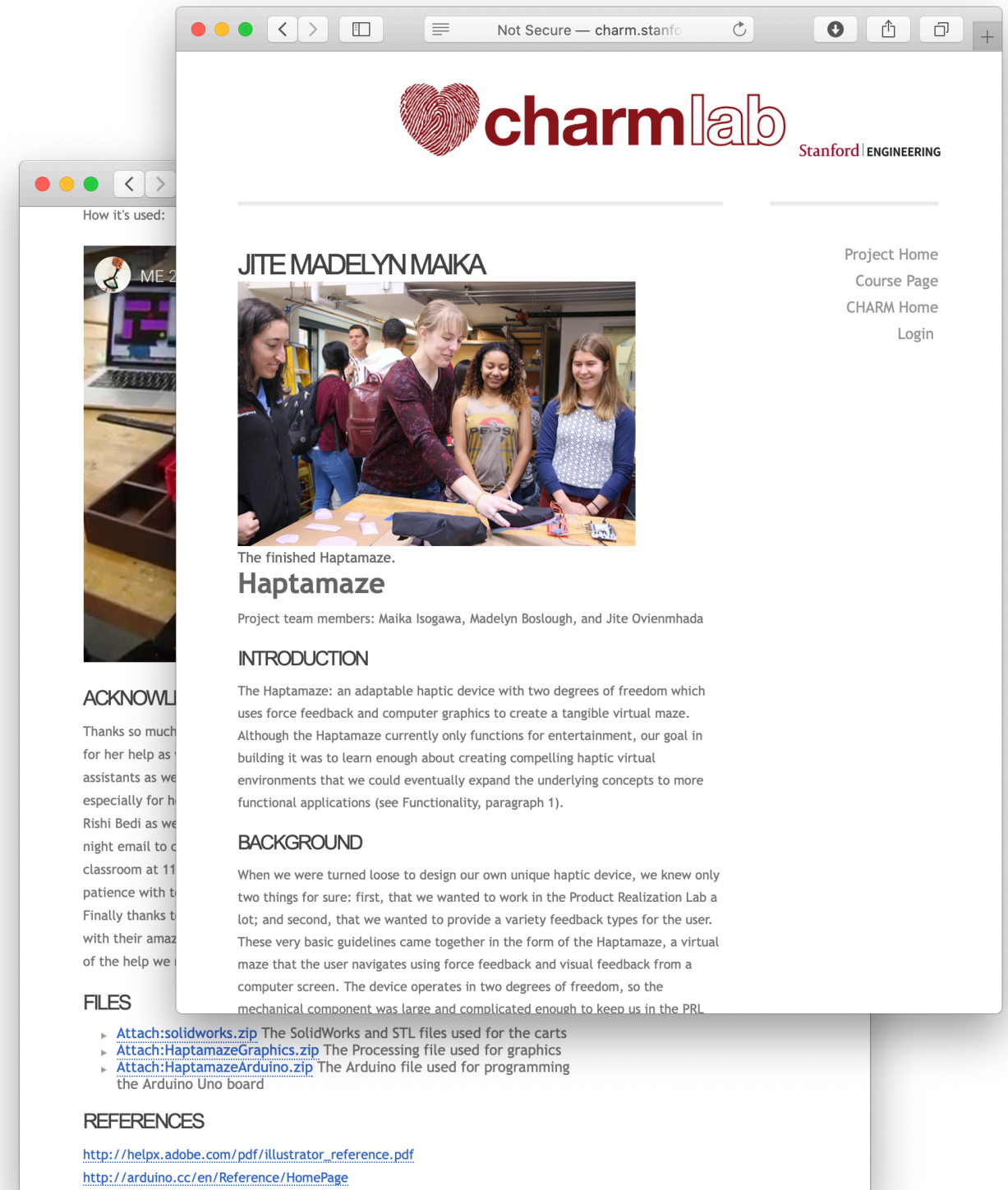
Grading

Humanitarian Concept (20 pts.)
  Does the humanitarian concept make sense?

Technical Approach (20 pts.)
  Is the technical approach appropriate?

Functionality (20 pts.)
  Did the robot function compellingly during the demonstration?

Technical Analysis (20 pts.)
  Is the report technically accurate?

Presentation (20 pts.)
  Is the report well written, with supporting images/videos?

Total: 100 pts.

To Do

- Find a project partner and sign up here: https://tinyurl.com/ME23N-Autumn2019-ProjectTeams

- Start project!
  - Develop a list of at least **10 different soft robots** you could build for this project.
  - Then **pick 2-3 of these soft robots**, and identify the mechanism, the materials required, and the humanitarian purpose for each one.
  - **Write and draw this information** in your lab notebooks, and bring them to class on Thursday.

- If time, Allison will check notebooks for Labs 5 and 6 today. If not, she will check them on Thursday after class.