

16-848 Hands: Design and Control for Dexterous Manipulation

Assignment: Final Project

Deadlines:

- **BEFORE 02/21:** Meet with me about your project ideas.
- **02/21,02/23:** In-class final project pitches (10 minutes).
- **02/28:** Written proposal submission DUE (2-3 pages).
- **03/28,03/30:** In-class final project checkpoint (15 minutes).
- **04/25, 04/27:** In class final project presentations (20 minutes).
- **04/29:** Final project report DUE (6-10 pages).

Overview: In this assignment, you can work individually or in a group of 2-3 to implement a project you are interested in. This project should be related to some aspect of hands and/or dexterous manipulation. You can choose from the topics covered in our class, or you can find another topic of your choice. Clear all topics with me early on. I can also help you find resources and choose an appropriate scope.

Meeting: Sometime before the final project pitches, every group should schedule a meeting with me to discuss final project ideas. Please schedule a specific meeting to do this even if we have already discussed your project in class or at some other opportunity. Bring to the meeting your ideas, preliminary research, thoughts about resources, scope, concerns, etc. If you are not sure about what you want to do yet, try to come to the meeting with three possible proposal ideas. Even if they are very unformed, we can work on them in the meeting.

Final Project Pitches: The goal of final project pitches is to introduce to the rest of the class your final project ideas, get feedback and suggestions related to resources, and make any last decisions before submitting your proposal. Ideas should be fairly far along by this point, although you may be deciding between two possible final project ideas. This presentation can be informal. Visuals are always helpful, but they are not required. Final project pitches are not expected to take more than 10 minutes; you may or may not need all of that time, depending on the stage of your project. Although it is informal, tell us as much as you can about what you are thinking of doing, why you chose that topic, what resources you have available to you, how you will measure progress / success, and what you are thinking of in terms of goals / milestones.

Written Proposal: The written proposal is your first formal deliverable. Please submit it by email to nsp at cs.cmu.edu by 11:59pm on the day of the deadline. Your proposal should be a written document of approximately 2-3 pages, and should contain the following sections:

- **Problem statement / goals:** What is the overall idea of the project? What are your goals? Why is it interesting? You may want to start with a question you want to answer or two things which you would like to compare.
- **Approach:** What is your overall approach to accomplishing your goal? If you are building a device, show us a hardware diagram. If you are building a software system, show a block diagram with inputs, algorithms, and outputs. If you are doing a study, what are your hypotheses and experimental designs? Break your approach into several steps so that you can have something to show one third of the way through the project, two thirds, etc., i.e., design milestones into it from the beginning.
- **Resources:** What resources are already available to you? Will you use libraries, code, or CAD drawings from other authors? Have you examined or tested these resources yet? What must you create or write yourself?
- **Demos:** How will you show off your system? Give both intermediate, final, and stretch goals for the demos.
- **Evaluation:** How will you measure success? Will you be using standard benchmarks or trying to match or exceed published results? How will your evaluation answer the questions you posed in your problem statement?
- **Timeline:** Break down the steps for completing your project and give approximate times. What will you be able to show along the way? Please plan for early demos that can show partial progress in case you get stuck at some point in the project.

Final Project Presentation: Your final project presentation should be a fairly formal presentation, with slides and results. You should have 20-25 minutes available to you for this presentation. Your presentation should review your motivation and project goals, your approach, and evaluation plan, and give results. You should discuss your results and challenges you met along the way, things you learned while doing this project, and what you would do if you had more time. This should be a presentation version of your final report, which will be described next.

Final Report: Your final report can be an updated version of the proposal. It should be a document of approximately 6-10 pages. Please hand in both your written report and final project presentation by emailing them to nsp at cs dot cmu dot edu.

- You should correct and expand the technical section of the proposal and describe the algorithms, designs, etc. that you actually used in your project.
- Present some results (plots, tables, screen shots, images, videos...), making use of the evaluation metrics outlined in your proposal.
- Discuss the results. Describe pros and cons of your approach.
- State the problems you encountered and how you solved them.
- Tell us what else you would do or what would you do differently if you had time.