Project: Novel Haptic System and User Study

The purpose of this assignment is for you to plan and execute a haptics project that provides a new contribution to the field of haptics. The project must result in a **device with bidirectional haptic interaction** between a person or a robot and a real, remote, or virtual environment. Beyond that, the options are quite open. Your project must:

- be clear in its objectives: know how you define success!
- be informed by a thorough literature search
- be easily used and understood by a haptics novice on demonstration day
- have high "production values" (haptic and visual)

Teams

The project is to be completed in teams of three (or four). Individual projects are not permitted, and you need to get special permission for a team of two. Teams of five or more are also not recommended. All team members will receive the same grade for the project. We encourage project teams consisting of people with diverse backgrounds and skills.

Project Milestones

Proposal due: Wednesday, October 12
Checkpoint 1: Wednesday, October 19
Checkpoint 2: Wednesday, October 26
Checkpoint 3: Wednesday, November 2
Checkpoint 4: Wednesday, November 9
Checkpoint 5: Wednesday, November 16
Checkpoint 6: Wednesday, November 30
Checkpoint 7: Wednesday, December 7
Fina project demos: Tuesday, December 13 (Design Day)
User study protocol due: Monday, December 19
Final report: Monday, December 19

Project Proposal

Your proposal is due on Wednesday, October 12 at 11:59 pm on Canvas (you will have a group submission link). Your proposal should be typed and easy to understand. Though you should feel free to add in other information, please address the following questions and requirements, in this order:

❑ **Team Members and Skills:** Who is on your proposed team? What specific skills and knowledge does each person contribute to the team in the context of this project?

❑ **Topic and Motivation:** What area, topic, or application of haptics do you want to investigate in your project? Why have you chosen this?

❑ **Previous Work:** Do a search for publications (conference papers, journal articles, and book chapters) and media reports that are relevant to your proposed project. Pick *five or more* of the most relevant, recent sources. At least one paper should be from either of the two major haptics conferences (IEEE World Haptics Conference or IEEE Haptics Symposium. For each chosen source, provide the following information:

The formal citation and a URL link to the publication. At a minimum, this should include author names, title, source (proceedings, journal, or book), page numbers, and year. You should follow the IEEE Editorial Style Manual for formatting references. To obtain this formatting document, Google "IEEE Editorial Style Manual." A reader should be able to find the source given just the information you provide. Also provide a direct link (URL) to the online resources.

A summary of what the previous work reports. This must be in your own words, not copied from the paper, and it should be thorough. You will need to read the paper entirely to understand what it deals with. Talk with your teammates and the teaching staff to figure out confusing aspects. You may wish to divide up the papers between your team members to distribute the workload, but you should all read and discuss the summaries you write. Be sure to state of what implications this paper has for your project.

Identify a paper for presentation in class. You will select this paper from the set of papers presented at the 2021 IEEE World Haptics Conference or 2022 IEEE Haptics Symposium. This can be one of your 5 papers above, or you can add a 6th paper if necessary. Note that your presentation will be evaluated on organization, subject knowledge, slides, presentation skills, and interactivity. The teaching staff will review your proposed paper for presentation and assign you a presentation date during the last few weeks of the semester.

❑ **Plan (1 page)**: Describe what your team proposes to do. What do you seek to design or discover over the course of your project? This should be carefully thought out and clear. It should be a rational, clever, novel plan that has a good chance of success and does not repeat prior work. Include a description of what materials and resources you think you will need. Also include the checkpoints worked out in advance with the teaching staff.

Materials and Fabrication Resources

There are a number of resources that are available to you for the project (see Project Resources document). You will be given a budget to purchase any additional materials needed for your project. Additionally, you may wish to borrow equipment from Prof. Brown's lab that is not being used. During the initial project meeting we will review what materials you will need and discuss costs. You can work on your project in Wyman 140. We recommend that you store your project materials in Wyman 140 and keep them in a box or shelf that is clearly labeled.

Final Demonstrations

You will demo your project on *Tuesday, December 13 during Design Day*. You should plan to give a demonstration of your project as well as a short oral presentation of its characteristics.

Project Summary

Your team will create a report that summarizes and explains your project in a way that is similar to a two-page conference submission. This report is due by 11:59pm Eastern time on ***Monday, December 19***, which is the day of our final exam slot. More details about this report are forthcoming.

Future Work

If your project is particularly promising, we will consider extending the research (with permission of your advisor, if relevant) and turning it into a conference paper. An example would be the Works in

Progress session at the upcoming IEEE World Haptics Conference (https://2023.worldhaptics.org/?page_id=3631).

Grading (subject to change)

General		
Concept	15 pts.	*Is the motivation good, and the general idea logical?*
Approach	15 pts.	*Is the approach the right one to solve the problem?*
Demonstration		
Functionality	15 pts.	*Did the system function compellingly throughout the demonstration?*
Completeness	15 pts.	*Was the working system complete, compared to what proposed?*
Summary Report		
Technical strength	15 pts.	*Is the paper technically accurate and complete?*
Presentation	15 pts.	*Is it well written, with appropriate supporting graphics?*
TOTAL	90 pts.	

These scores will take into account the difficulty of the project tackled. That said, we prefer that you aim to do a simple thing very well instead of trying to do a complicated thing and not succeed. Note that the project is 40% of the overall course grade.