Assignment 1: Case Study and Digital Reconstruction

Due Date: Monday, July 6, at 9:30 am (PST) on Gauchospace

Introduction

In the first week, we learned the basic concepts of soft robotics. During the lab and discussion, we also learned hands-on skills related to wearable design and 3D modeling techniques. This assignment will bridge the skills and knowledge that we have learned, and ask you to create a digital work.

Objective

To be able to use the skills developed in the first week to carry out a research case study and build a digital wearable device.

Assignment

Choose a case study from Appendix I (if you want to work with a research project that is not on the list, please confirm with the instructor). Do a case study to understand the research work. Reconstruct the project in Rhino.

Format

1. Submit a PDF file of the assignment form on Gauchospace. Name the file “yourname_assignment_1.pdf”.
2. Submit a .3dm file of the 3D model and/or a .gh file. Name the file “yourname_projectname.3dm” and/or "yourname_projectname.gh".
3. Prepare a 3 minutes presentation slides to show your research and the reconstruction digital work you made. Name the file “yourname_Assignment1_presentation.pdf”. Submit a pdf file of the presentation file on Gauchospace. The presentation should mainly focus on the case study. Your reconstruction work is not required perfectly like the case study project. You should include the challenges you encountered.

Assignment form

Your Name Anshul Patil_____ Case Study_Synapse__

Project Feature

(Feature could be the innovative design process, the material they created particular for this project, the special function,or the creative concept, etc..The unique feature about the project.)

The main feature of the synapse is that its EEG technology allows the recording and monitoring of the electrical activity of the brain, produced from the firing of neurons.

Function

Synapse is a multi-material 3D-printed wearable piece that moves and changes shape in response to the activities of the brain. The main intention of this project is to explore the possibilities of multi-material 3D printing in order to produce a shape-changing structure around the body as a second skin.

Research Method

Research was conducted through several trial and error processes. Different brain frequencies were tested and based on what kind of state the user was in, the specific threshold would be set for the expansion/contraction motion. Either the user would be in a meditative state or an active state and the level of frequencies were studied and a software program was developed to correspond with these frequency levels so the synapse would move accordingly.

Material

Although the specific material used to create this device is not stated, it has been 3D printed with soft materials therefore giving it the ability to contract and expand. This follows the principles of soft robotics as its design allows it to expand/contract in one direction only. Additionally, this device was created using the Connex500™ 3D printer which is the first multi-material 3D printer.

Design / Fabrication Method

The synapse helmet was made from soft material to enable it to expand and contract to its maximum level. It consists of the helmet section which is constructed through 3D printing. Additionally, there are the servos where the actual “attention” is being translated into actual motions of the helmet. Lastly, there are the brain sensors which contain the EEG chip which reads the brain waves.

If you are redesigning this project, how could this work be improved?

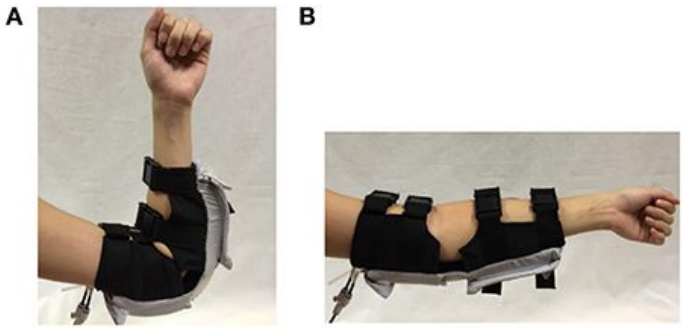
If I were to redesign this product I would make the product better looking because it looks very unnatural on the user’s head and it seems very heavy although it is made from soft material. Additionally, I would create movements that would be more useful than just covering your face. For example, maybe one could use this concept but instead of the head, they could use it to move a missing limb or body part.

Appendix I.

1. Caress of the Gaze, by Behnaz Farahi

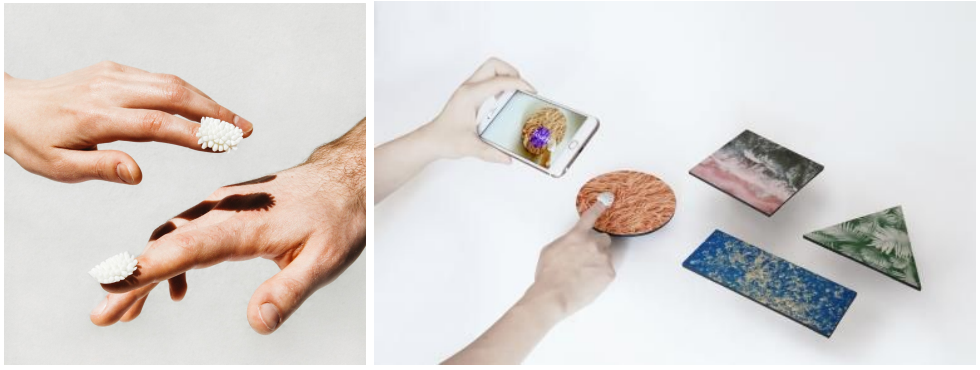
2. Deflated collar/helmet(left) by Hövding

3. Multi-material fluidic actuators glove by Harvard Biodesign Lab

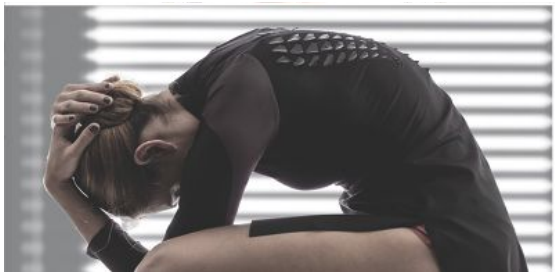


4. Elbow Sleeve, by Evolution Innovation Laboratory

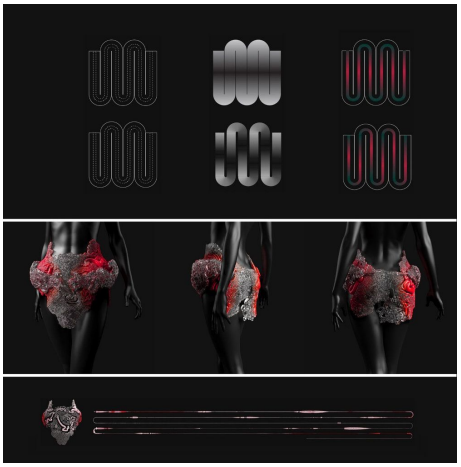
5. ElectroDerm



6. Fulu by Studio Tada

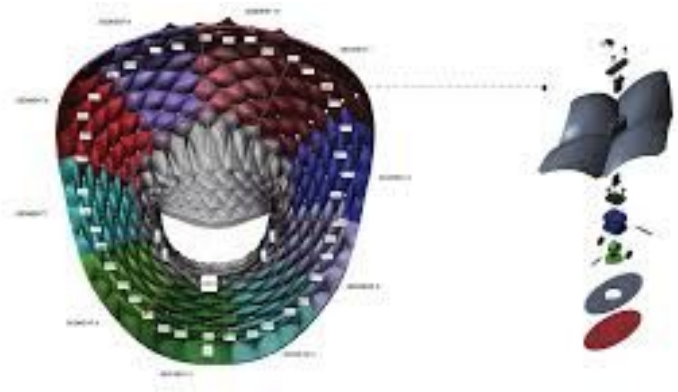



7. bioLogic by Tangible Media Group

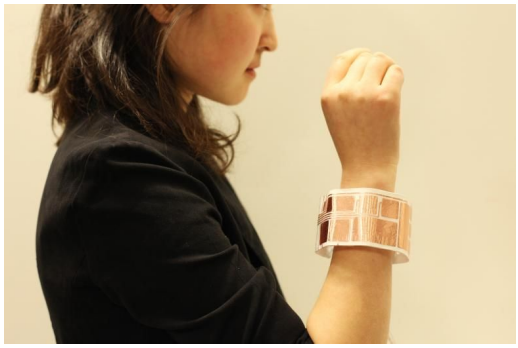



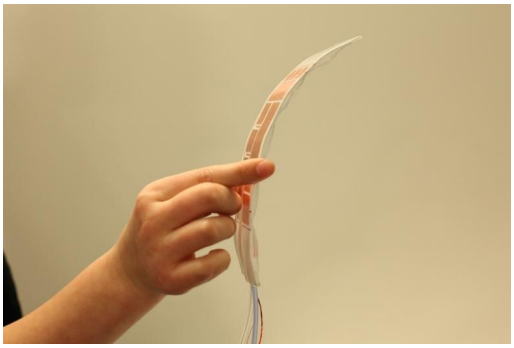
8. Jupiter's Wanderer, by Neri Oxman


9. ambienBeat, Kyung Yun Choi



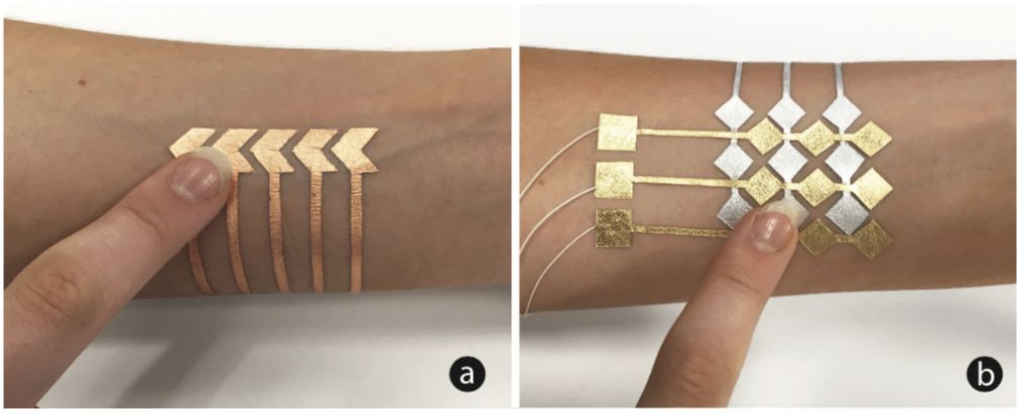
10. Iridescence, by Behnaz Farahi



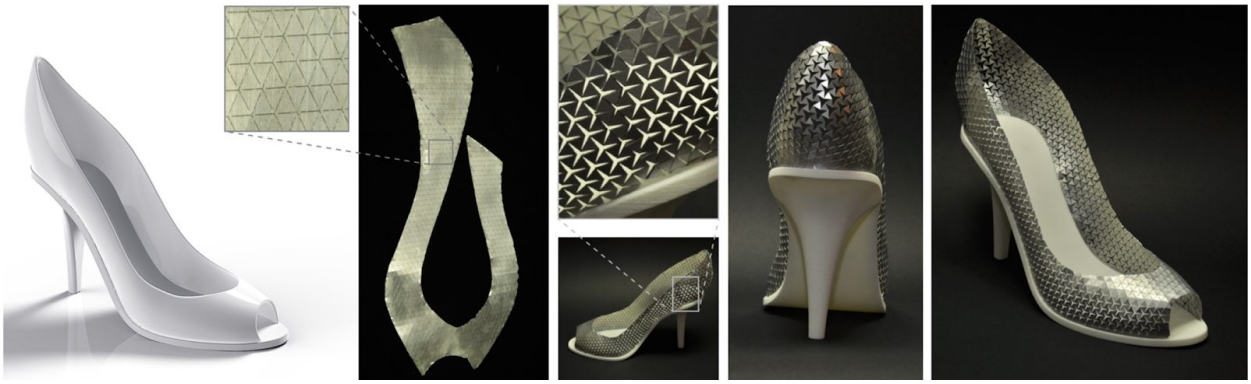


11.PneUI, Hiroshi Ishii

12. Mi. Mu Glove, by Imogen Heap

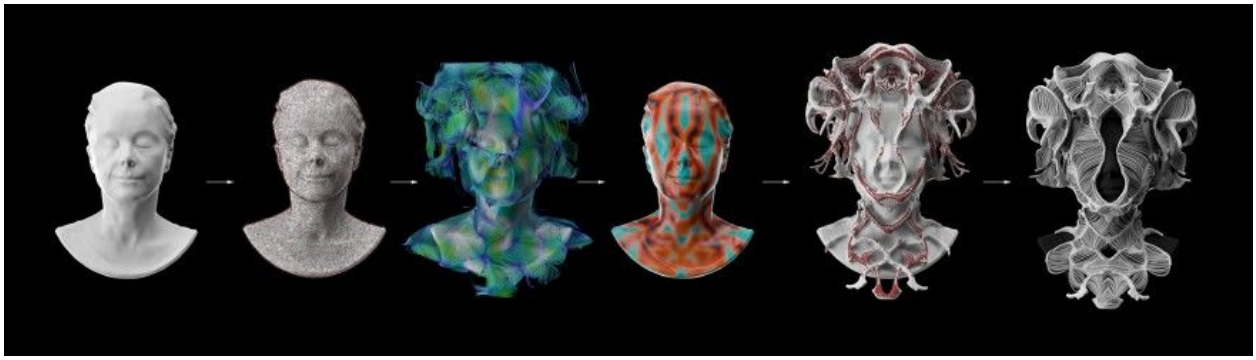


13. Duoskin, by Cindy Kao

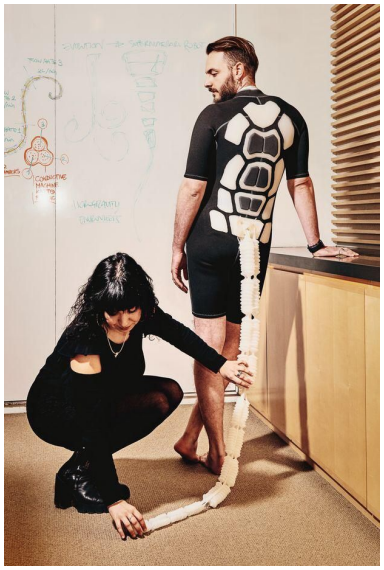


14. Beyond Developable by Konakovic

15. Soft Robot Arm Inspired by the Octopus, by Cecillia Laschi



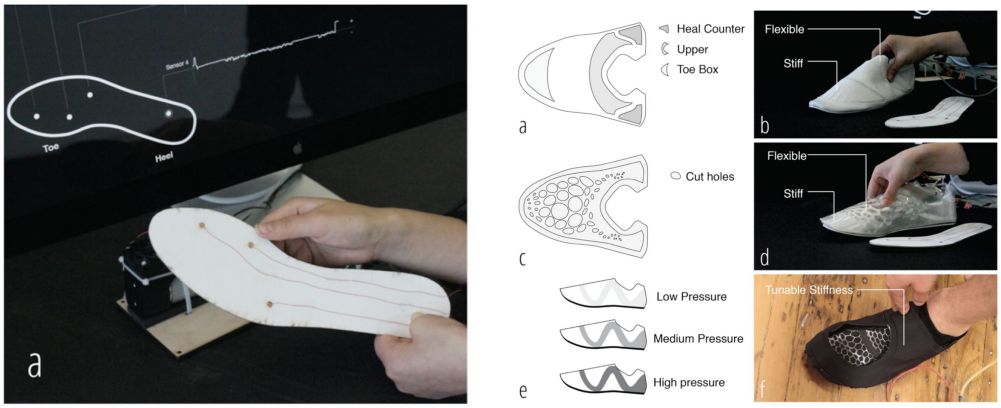
16. Rottlace mask by Neri Oxman



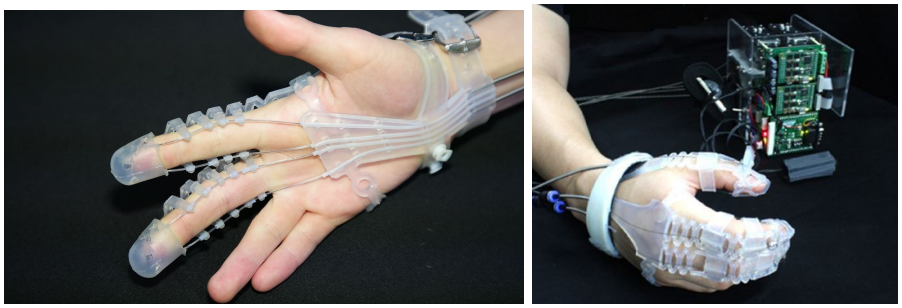

17. Space Human, by Responsive Environments Space Exploration Initiative


18. N95 alternative face mask developed by a collaborative team (Matt Carney)

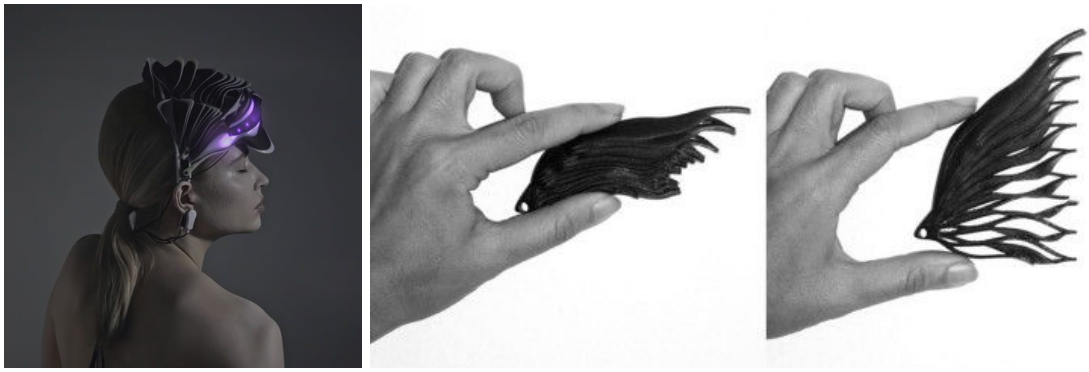
19.Tactum, Gannon



20.Jamming Shoe (jamSheets) by Jifei Ou



21.Exo-Glove, Hyunki In



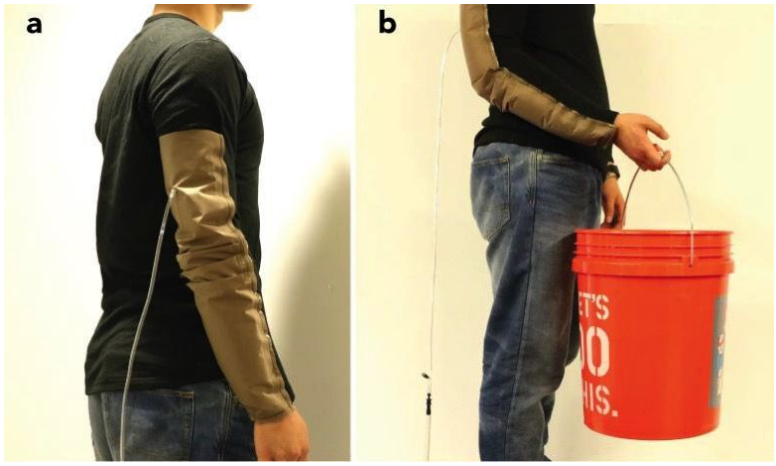
22.Synapse, by Behnaz Farahi

23.Carpal Skin, Wrist Splint, By Neri Oxman

24.Sarotis, by interactive architecture lab

25.Emergency auto-inflatable bandage(Auto-Inflatables), by Penelope Webb

26. Responsive Bracelet, milliMorph, by Qiuyu Lu



27.Arm actuation, Printflatables, by Hiroshi