Soft Social Haptics: Recreating Human Touch using Soft Materials and Pneumatics

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Background

Social interaction over long distances is primarily dictated using visual and audio devices. However, the most powerful non-verbal communication is through human social touch. We want to replicate common human touch sensations using haptic technology to induce feelings and reconnect separated individuals

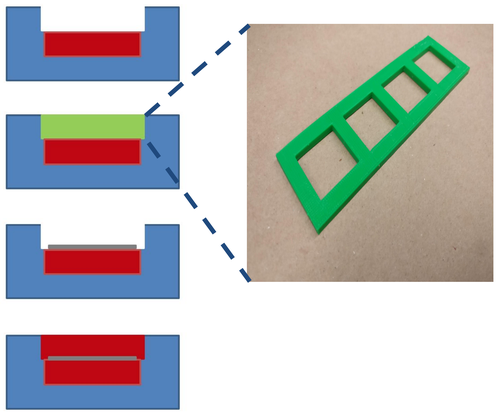
Modelling Approaches

Materials

- Dragon Skin 10, Smooth On
- EcoFlex, Smooth On

Fabrication

1. Mold the bottom layer
2. Place stencil on top of first layer
3. Spray a layer of mold release spray
4. Fill top layer



Actuation

1. Fluid control board
2. Four control valves
3. Air pump (max 30 psi)

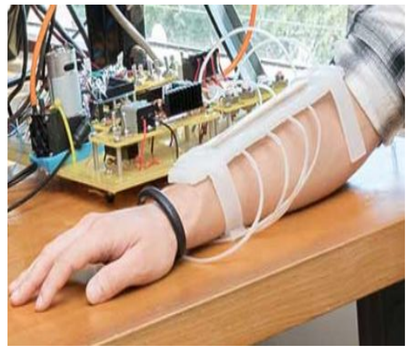
User Study

Parameters

Pulse width: duration of inflation of silicone actuator
Delay: percentage of delay between adjacent silicone actuators

Methods

- A total of five number of individuals participated in our study
- Three different pulse widths and three different delays produces nine unique combinations
- Participants were asked to rate pleasantness and continuity from 1 to 7 (4 represents neutral response)



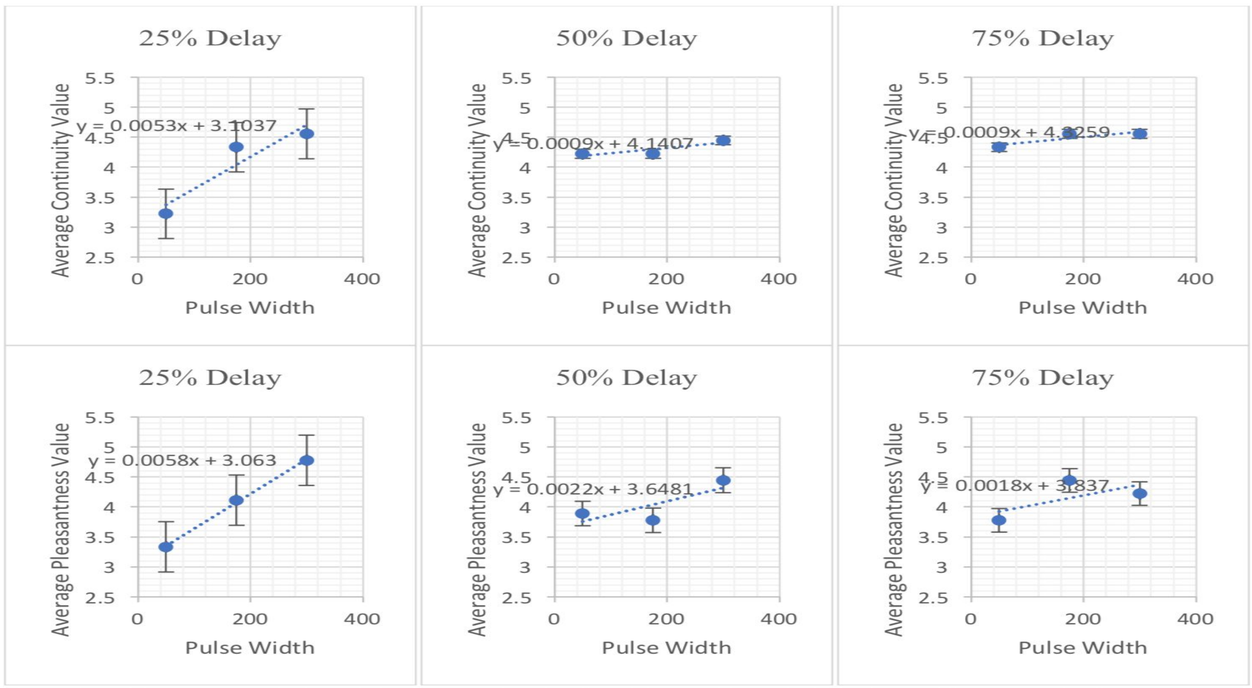
Results

Average Continuity Rating

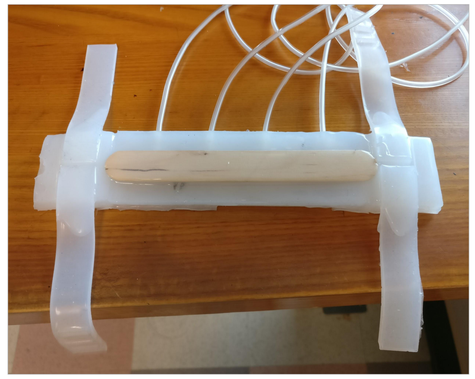
Delay	Pulse Width 50 ms	175 ms	300 ms
25%	3.22	4.33	4.56
50%	4.22	4.22	4.89
75%	4.33	4.56	4.56

Average Pleasantness Value

Delay	Pulse Width 50 ms	175 ms	300 ms
25%	3.33	4.11	4.78
50%	3.89	3.78	4.44
75%	3.78	4.44	4.22



Conclusions



- Our device consisted of **one single actuator** with **four independent air chambers** capable if inflating and deflating for different durations and at different timestamps
- We concluded that **300 ms pulse width** and **25% delay** yielded the best response
- Our work can be used in the future to induce **stroking sensation** using **normal indentation**

Future Work

- Improve fabrication process
- Vary design of actuators (size, shape)
- Increase robustness and consistency of the haptic device
- Increase user study population size

References

[1] H. Culbertson, C. M. Nunez, A. Israr, F. Lau, F. Abnousi and A. M. Okamura, "A social haptic device to create continuous lateral motion using sequential normal indentation," 2018 IEEE Haptics Symposium (HAPTICS), San Francisco, CA, 2018, pp. 32-39.

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