UC San Diego
JACOBS SCHOOL OF ENGINEERING
NanoEngineering

Undergraduate Lightning Talks

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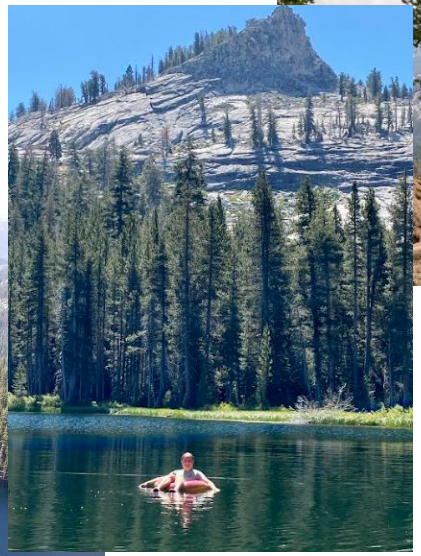
LIPOMI RESEARCH GROUP

NanoEng Dept.

About Me

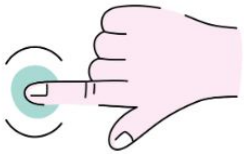


Two Projects

1

Haptics

- Synesthesia
- Five categories of tactile sensations
- Sample fabrication



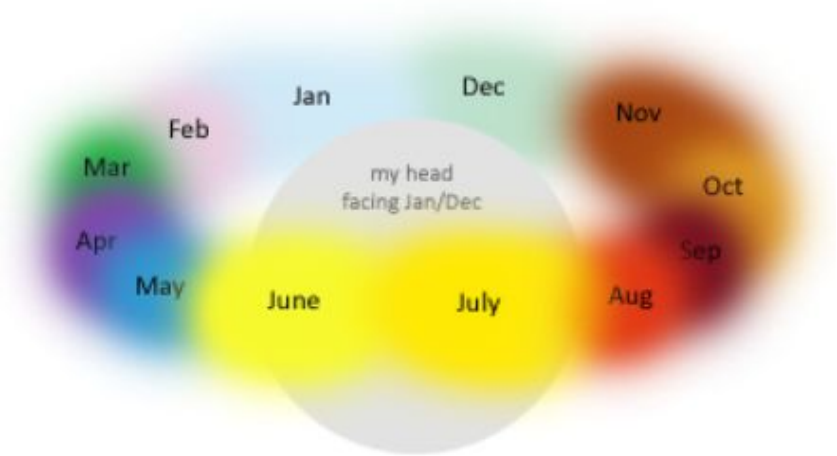
2

Pressure Sensing

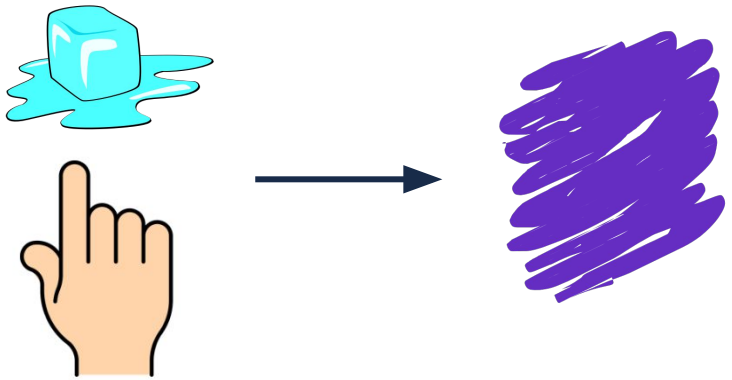
- Two-directional spirometer
- Pressure sensor fabrication
- Capacitive sensing mechanism

Background:

Synesthesia



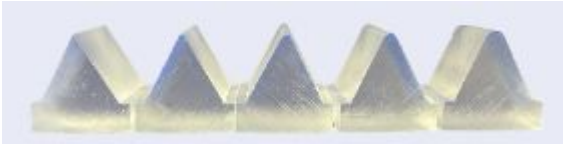
- Stimulation of one sense caus the automotive, conscious experience of another unrelated sense
- 3% to 5% of the world population



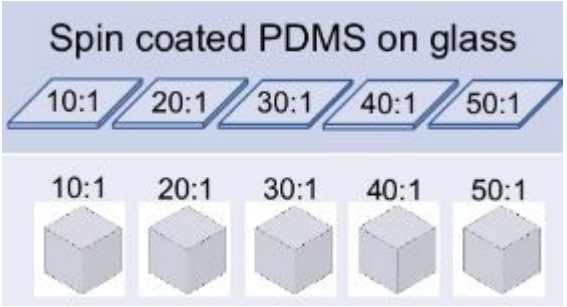
Synesthetes Sample Fabrication

All samples consistent size (1 inch cube)

Sharpness	Peak curve radius
Roughness	Pillar diameter
Softness	Cubes of PDMS of varying curing agent ratios
Tackiness	Spin coated PDMS of varying curing agent ratios
Temperature	Materials with varied thermal conductivity



Sharpness gradations.

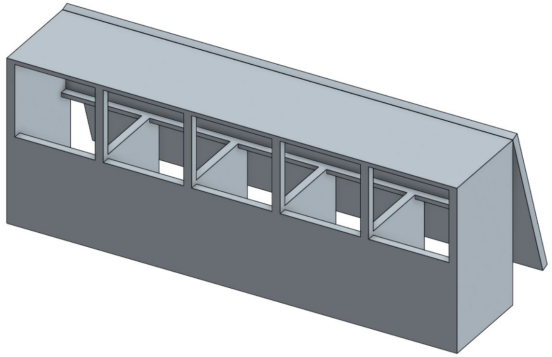


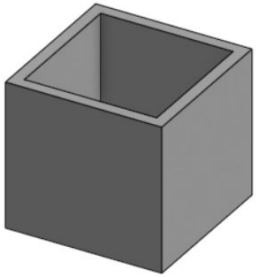
Tackiness and softness gradations.

In collaboration with Dr. Nick Root.

Next Step

- New 3D printed softness cube mold
- Encase samples to isolate touch sense (3D printed case)
- Uniform texture of samples



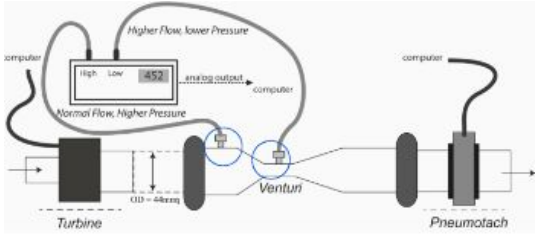


Background:

Spirometer

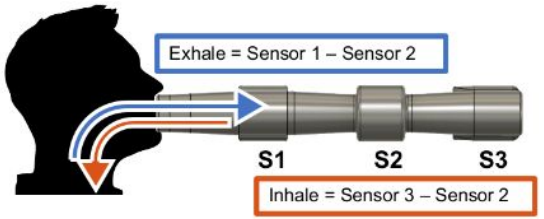
3D printed Venturi Device (fV)

- Two sensor placements
- Airflow calculated from fV transducer outputs



Two-directional 3D Printed Spirometer

- Three sensor placements
- PDMS fabricated pressure sensors
- Symmetrical venturi tube design

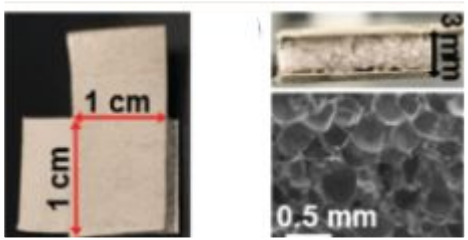


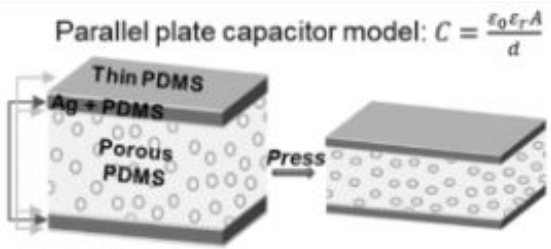
(Titheradge, Praneel, Robergs, 2020) "Static and Dynamic Performance of a Venturi Airflow Sensor."

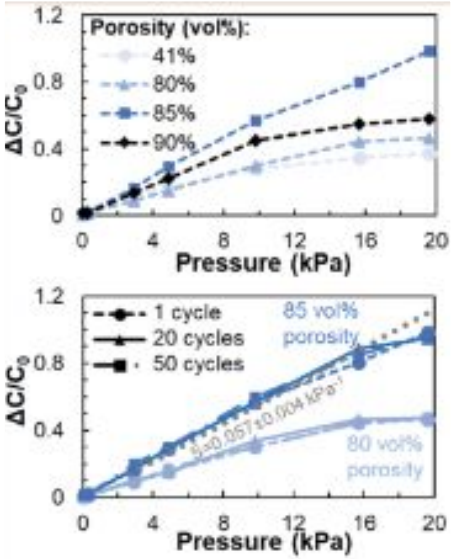
Capacitive Pressure Sensor Fabrication

Based on previous fabrication of the sensor:

- Parallel plate capacitor
- PDMS foam dielectric, NaCl for porosity
- Flexible electrodes, Ag particles and PDMS







Testing of the pressure sensor with varying levels of porosity as well as cycles.

Next Step

- Calibration of spirometer with new sensor batch
- Mark-10 board
- Plots of input air velocity and capacitance for each sensor

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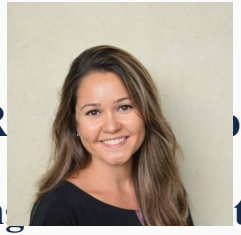
Thank you !



Lipomi R oup

Supervisin t, Laura Becerra

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