Professor Neda's research centers on investigating the mechanics of soft materials and structures, which have wide-ranging applications in both biology and engineering.

Objective & Impact of Professor's Research

Applying pressure to an asymmetric multi chambered arm makes the arm bend due to the stress and strain forces acting upon the hyperelastic silicone.

Pressure Actuation

The more pressure we apply to the actuator, the more it deforms. Using Abaqus I studies the effect that pressure has on the deformation of the arm.

Pressure Simulation

Simulating Soft Robots

Using the finite element analysis (FEM) software Abaqus, we are able to simulate how a soft robot would deform when certain loads are applied to it. FEM works by breaking a model into thousands of parts and doing calculations on how they all interact.

Material Simulation

This graph makes apparent how increasing the pressure in the arm chambers makes it deflect further.

Casting Soft Robots

Using 3D printing molds made both at home and at the Baum Family Makerspace, we were able to cast two types of silicone. We used a more elastic Ecoflex 00-30 and a more rigid hobbyist casting silicone to create two separate robots. One is a simple linear actuator that bends. The other is a three armed gripper designed to hold objects of different sizes.

Software Learned

There are a variety of ways to make soft robots move. For our lab this summer, we decided to use pressure as an actuation force.

Ways of Actuating Soft Robots

This graph illustrates how the the stiffness silicone (Sylgard 184) bends less than the more flexible silicone (Ecoflex 00-30).

Acknowledgements

There are many people that made my experience at SHINE possible. First and foremost I would like to thank Professor Neda for accepting me into her lab and for her information rich visits. I am grateful for Sungmo Park who spent so much of his summer making sure that I had a great SHINE experience. As well as him, I'd like to thank Regan Song for being the best labmate I could have asked for. Last but not least, I would like to thank Dr. Darin Gray for ensuring I had a great summer.

Citations


Pneumatic Actuations: From Simulation to Experiment

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LACES, Class of 2024

USC Viterbi | Department of Mechanical Engineering, SHINE 2023