Objective & Impact of Professor’s Research

Professor Neda’s research focuses on the dynamics of soft materials and structures with broad applications in biology and engineering.

Soft robotics focuses on the design of deformable robotic systems using elastomers and flexible materials. They offer more versatility and maneuverability, but lack structural strength.

Materials and Methods

The pneumatic arm model was created in CAD (Solidworks), specifically designed to bend when a pressure is inputted.

The model is imported into Abaqus. The Neo-Hooke model describes material and Finite Element Method (FEM) simulates the arm under load.

We found the change in deformation over pressure, and the change in deformation over air chamber size, then plotted it in MATLAB.

Application of Findings

We created the mold for the pneumatic arm in Solidworks with simulation parameters, then 3D printed it at home and at the Baum Family Makerspace.

We casted the silicon with the mold, and let it cure for two days before taking it out. A pump was inserted to exert pressure, bending the arm.

After the working proof of concept, we created a 3-arm gripper combining three pneumatic arms. We followed the same procedure with CAD, 3D printing, casting, and testing.

Conclusion

This lab allowed me to foray into the use of elastomers in robotics, and challenged my 3D printing and CAD skills. I hope the parameters I researched illustrate the behavior of the pneumatic arm and will help optimize their design in the future.

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Citations
