Foldable Robotic Elephant Trunk

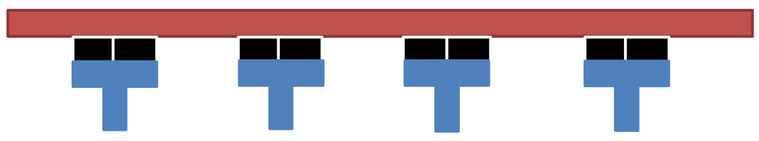
Mannat Rana, Engineering (Robotics)
Mentor: Daniel Aukes, Assistant Professor
Ira A. Fulton Schools of ENgineering

Background:

Hydrogel Robots can have more degrees of freedom in a more compact manner compared to standard robotic manipulators [1]. These degrees of freedom can then be used to imitate complex animal movements such as curling, twisting, extension, and contraction [2].

Research Question:

How can hydrogels be used to imitate complex animal-like movements?



Simplified Design Model

Research Method:

- Create the one-dimensional walking robot to better understand the control and design needed for using hydrogels effectively.
- Create a joint that will enable three dimensional movements using the hydrogels.
- Design an assembly involving three layers of hydrogels that will act as the trunk.
- Code and test the assembly to understand what hydrogels need to be turned on for the trunk to curl and twist.

Progress so far:

- Learned how to create hydrogels
- Designed the PCB needed to operate the robot
- Acquired all the hardware needed to build robot

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References

[1] C. Wartelle, W. Schuhmann, A. Blöchl, and F. Bedioui, "Integrated compact biocompatible hydrogel-based amperometric sensing device for easy screening of drugs involved in nitric oxide production by adherent cultured cells," *Electrochimica Acta*, vol. 50, no. 25-26, pp. 4988–4994, 2005. cells. *Electrochimica acta, 50*(25-26), 4988-4994.

[2] H. Yuk, S. Lin, C. Ma, M. Takaffoli, N. X. Fang, and X. Zhao, "Hydraulic hydrogel actuators and robots optically and sonically camouflaged in water," *Nature Communications*, vol. 8, no. 1, Jan. 2017.

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Ira A. Fulton Schools of Engineering
Arizona State University