ARAtronics Research Center for
Opto-Mechatronics Engineering

ARAtronics Research Center,
Mechatronics Engineering Department,
Faculty of Engineering and Material Sciences (EMS),
The German University in Cairo (GUC)

Bachelor's Thesis, Term Project

Design and Control an Origami Inspired 3D Printed Soft Robotics with Embedded Sensors

Supervisor (s): (**Assist. Prof. Dr. Eng.** Amir Roushdy)

This is not the first time we have seen origami-inspired work, from innovative surgical instruments to expandable applications for engineering, antennas, and even folding robots. In this project, the researchers sought to program materials into a robotic system. This meant examining not only 3D printability but also foldability and the required mechanical properties. The art of origami is now being accepted as an intuitive and fertile inspiration for mechanical meta material design due to its foldability, deployability, flexibility, scale-free geometry as well as programmable reconfiguration, noting that previous research has yielded miniaturized robots, soft robots, ingestible robots for medical tasks, compliant modules, medical devices, grippers, and more. **There is a Lab Engineer from the ARAtronics Laboratory, guiding and directing the student with Assist. Prof. Dr. Eng. Amir Roushdy.**

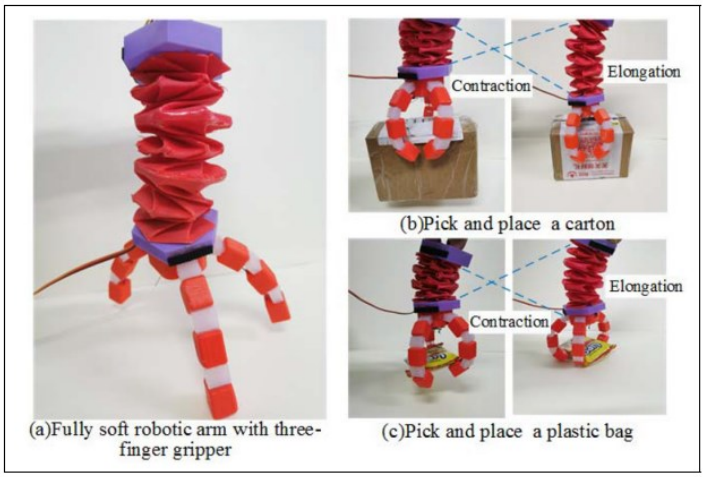

Fig.: Origami Inspired 3D Printed Soft Robotics

Project description and objective:

In this project, Origami-based flexible, compliant and bio-inspired robots are believed to permit a range of medical applications with unpredictable environments. Here in this project, we experimentally demonstrate a novel origami inspired mobile robot structure which reconstructs its shape in the pivotal direction and launches peristaltic motion. To be able to sustain shear stress and counteract buckling, while

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accommodating the whole Origami robot in some stochastic confined environment, mobile robot sufficiently needed structural rigidity.

Research focus of this project:

- Literature review on the project should be studied properly.
- Not only, creating a software control system for the project but also the hardware.
- Experiments using the gadget and control system should be built properly.
- The outcomes must be documented.

Requirements:

- Passionate to learn more about, Soft Robotics, 3D Printing design, Robotics and control.
- Prior mechatronic design expertise is desired like "SolidWork and Arduino".
- Enthusiasm for completing actual practical work with 3D printing staff (design fabrication and construction).
- A method of working that is both structured and self-contained.

General tasks of the project:

- The complete methodology is already available in the ARAtronics Lab, so we will discuss it from the first day to start the automation process for it
- Fabricate the machine/system using 3D printer/CNC machine (small parts).
- Assembly all parts of the Robot.
- Changing the working variables and see the effect on the locomotion of the robot.

Other notes:

- A weekly meeting with the advisors will be required for this project, as well as weekly progress updates (***The meeting could be more than once during the week based on your progress and based on your achievements***).
- You should to be in the Lab two days per week (***It could be more than two days based on your progress and based on your achievements***).
- All reports must be prepared in the style of a research paper.
- The outcome of this research will be published in one of the coming international Conferences and , or Journal

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