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

Control a Punctuated Rolling Motion for Tensegrity Robotic locomotor Mechanism

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

The purpose of this project is to present a new teleoperated spherical tensegrity robot capable of performing locomotion. With a novel control scheme centered around the simultaneous actuation of multiple cables, the robot demonstrates robust climbing on inclined surfaces in hardware experiments and speeds significantly faster than previous spherical tensegrity models. We will analyze locomotion in simulation and hardware under single and multicable actuation, and introduce novel multi-cable actuation control policies. **There is a Master's student from Mechatronics engineering Department and the Lab Engineer from ARAtronics, guiding and directing the student with Assist. Prof. Dr. Eng. Amir Roushdy.**
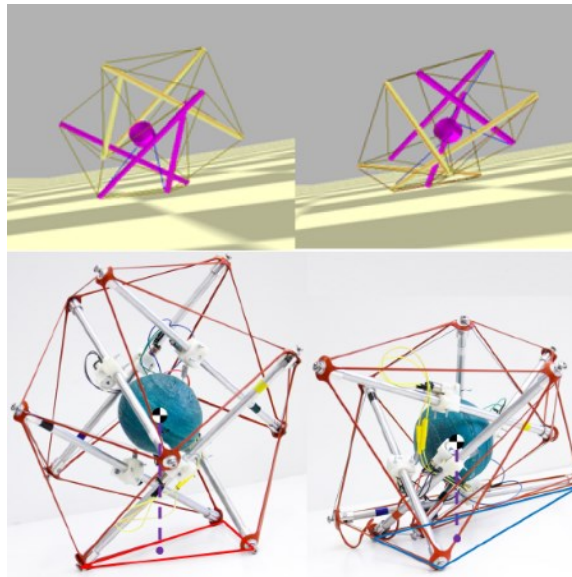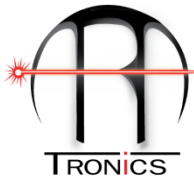

Fig.: Spherical Tensegrity Robotics Mechanisms in locomotion

Project description and objective:

The Common robotics platforms have limitations in the terrain they can cover and their robustness to unknown environments. Additionally, these heavy and typically expensive robots make certain missions impractical. In contrast, robots based on the structural concept of tensegrity ("tensile-integrity") can potentially locomote over dangerous terrain, may have less weight than comparatively equipped wheeled robots, and may not require external landing equipment. This high strength-to-weight ratio has prompted much research into the deployability of tensegrity structures, and their ability to fit into space-constrained

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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 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