

Bachelor's Thesis, Term Project

Design and Control of the Tensegrity Robotics Manipulator for Absorbing Large Impacts

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

The Dynamic Tensegrity for the robotic manipulator is the main goal for this project. So we will study multiple tensegrity morphologies and control strategies for robotics exploration. The primary goal concept envisions a tensegrity robot with a controllable tension network, which allows the robot to be tightly stowed for launch and then unpacked for landing. During landing the robot will act much like an airbag and absorb impact forces by diffusing them through the tensile network, protecting a science payload. The robot will then transport the payload on the floor body, with the added benefit that the payload remains protected. **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.**

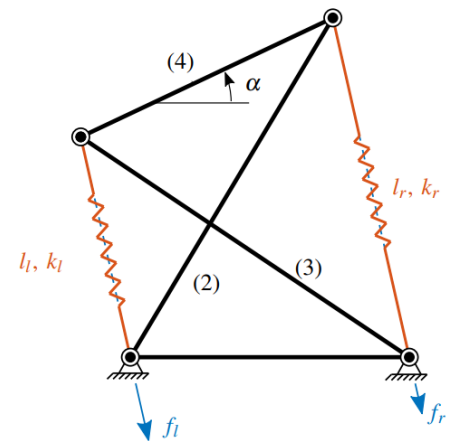
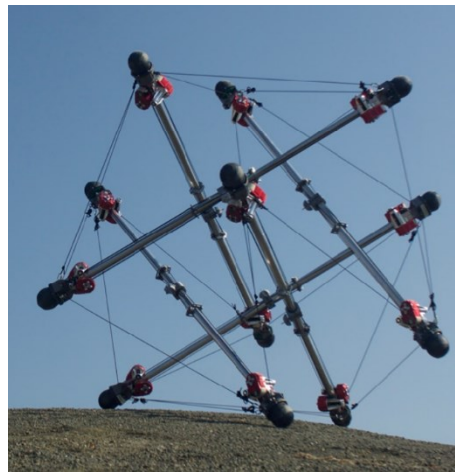
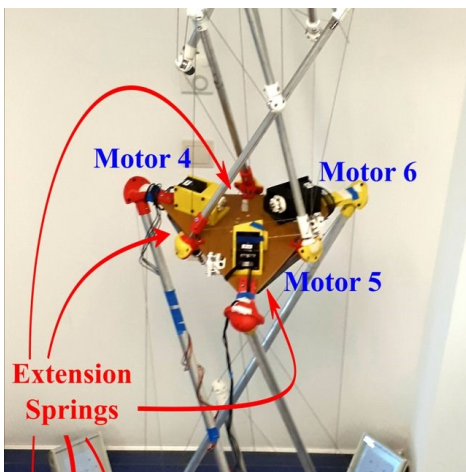


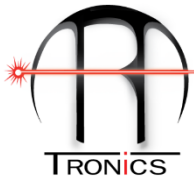
Fig.: Tensegrity Robotics Manipulator

Project description and objective:

This work will focus on designing and control of the working platform of mentioned robot in locomotion. It will include sufficient sensing and actuation to test true highly dynamic rolling, the first time that such

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sensing and locomotion has been combined with a (limited) feedback controller on an untethered tensegrity spherical robot.

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