ARAtronics Research Center for Opto-Mechatronics Engineering

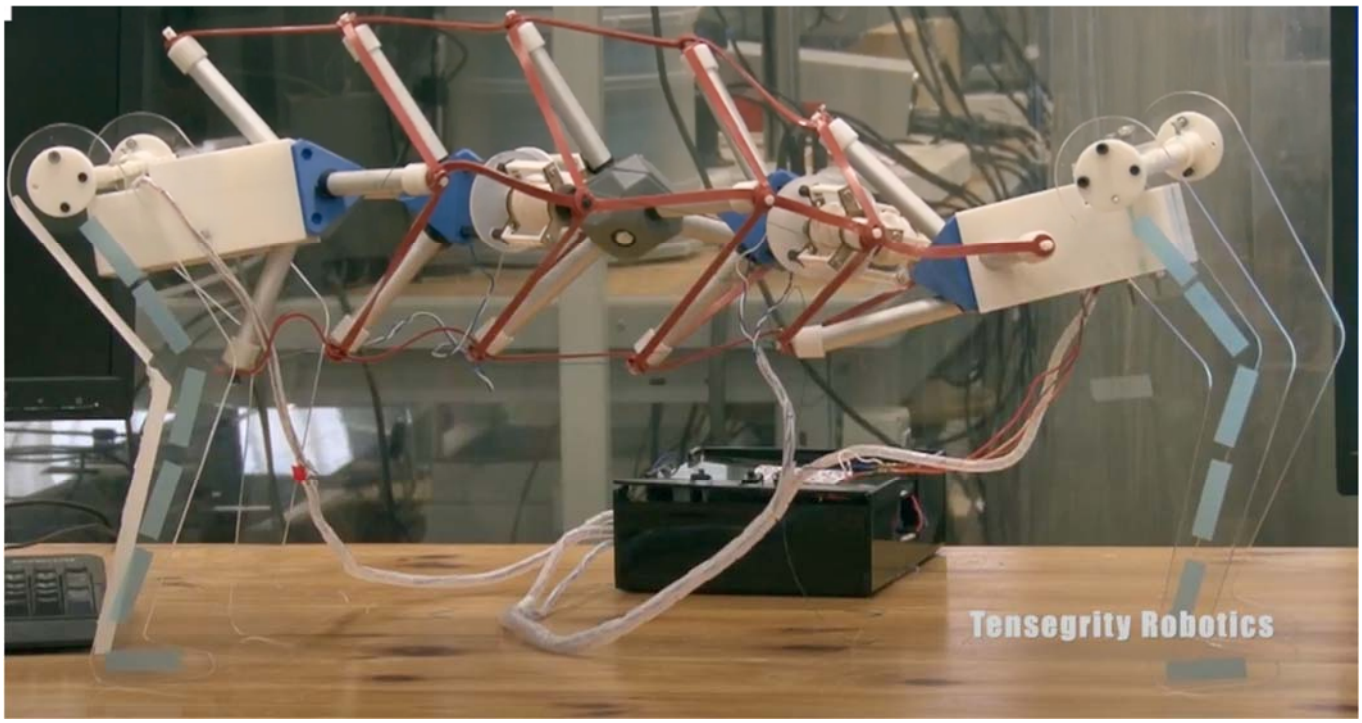
ARAtronics Research Center,
Mechatronics Engineering Department,
Faculty of Engineering and Material Sciences (EMS),
The German University in Cairo (GUC)

Bachelor's Thesis, Term Project

Motion Control for the Four Legged Robot with a Flexible Spine Based on Tensegrity Mechanism Using Two Links for Each Leg

Main Advisor(s): (**Assoc. Prof. Dr. Eng.** Amir Roushdy)
Co-Advisor(s): (**Eng.** Malek Mahmoud, **Eng.** AbdElrahman Ibrahim)

The proposed control system utilizes a combination of model-based and learning-based control techniques to achieve robust and efficient motion control. The control system takes into account the dynamics of the flexible spine, which is modeled using tensegrity theory, and uses this information to generate appropriate control signals for the actuators. The control system also incorporates sensor feedback to ensure accurate tracking of the desired motion. **There is a Master's student from Mechatronics Engineering Department, Senior Researchers from ARAtronics also available to help and advice and The Lab Engineer from ARAtronics, guiding and directing the student with Assoc. Prof. Dr. Eng. Amir Roushdy.**



For more details, please contact:
Assoc. Prof. Dr. Eng. Amir Roushdy, Room: C7.108, E-mail: amir.ali@guc.edu.eg, Web site: www.ARAtronics.com

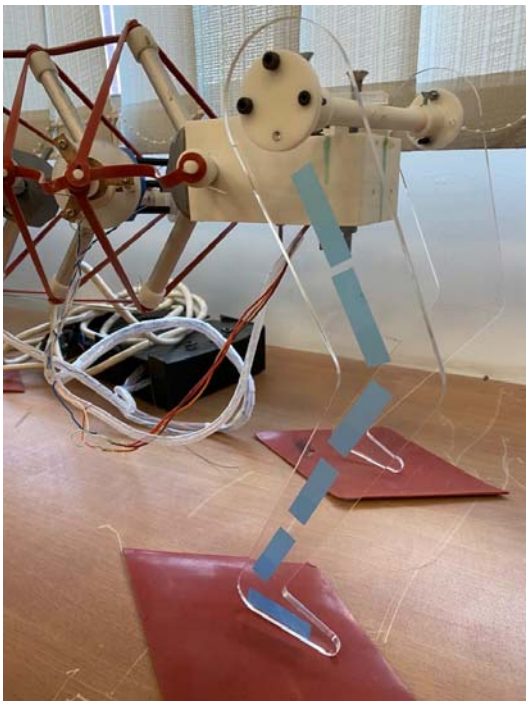


Fig.: The quadruped robot with a tensegrity spine at the ARAtronics Research Center

Project description and objective:

In this project, a 1:1 scale for a two links for each leg must be modelled, drawn and assembled. The performance of the proposed control system is evaluated through simulations and experiments on a physical robot, showing significant improvement in the accuracy and robustness of the motion control. This work highlights the importance of considering the dynamics of the flexible spine in the control of four-legged robots and the potential of advanced control techniques for improving the performance of these systems

Research focus of this project:

- Literature review on the project should be studied properly.
- Creating a 3D Model of the model for the project and the hardware.
- Some experiments on the model and control system should be conducted and 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".
- 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.

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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 .
- 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 project will be publish into one of the coming international conferences/journals.

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