ARAtronics Research Center for Opto-Mechatronics Engineering

ARAtronics Research Center,
Mechatronics Engineering Department,
Faculty of Engineering and Material Sciences (EMS),

Bachelor's Thesis, Term Project

Sensing and actuation technologies for the Manufacturing smart socket prostheses based on the Linear Variable Differential Transducers (LVDT) Based on Clinical Data

Main Advisor(s): (**Assoc. Prof. Dr. Eng.** Amir Roushdy)
Co-Advisor(s): (**Eng.** Ramy Masoud , **Eng.** Malek Mahmoud, **Eng.** Hatem Samir)

In this work, we present an approach for sensing and actuation technologies for the manufacturing of smart socket prostheses based on linear variable differential transducers (LVDT) based on a clinical data. The proposed system utilizes LVDT sensors for measuring the shape of the residual limb and clinical data to optimize the design of the socket. The proposed system is designed to provide a more comfortable and secure fit for the patient, as well as to improve the ease of use and durability of the prosthesis. **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.**

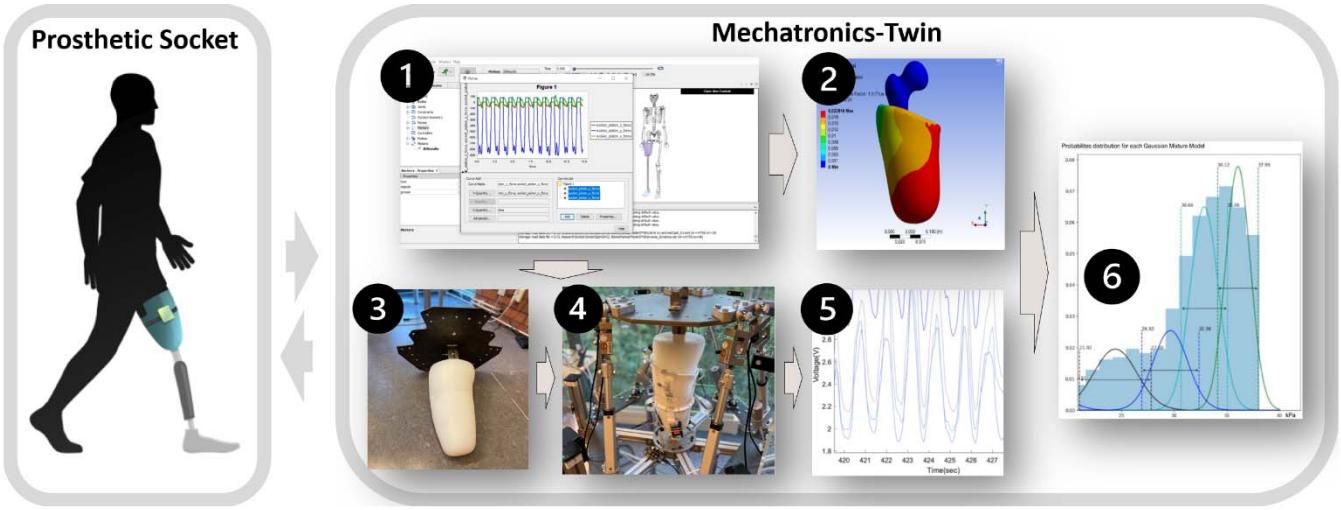

Fig.: BCI at the ARAtronics Research Center

Project description and objective:

The system is evaluated through simulations and experiments on test patients (We will do that with our Doctors of Physical Therapy Program at Cairo University (ElQasr Elany)), showing significant improvement in the comfort and fit of the socket. This work highlights the potential of advanced sensing and actuation technologies for improving the performance and usability of prostheses, and the importance

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of incorporating clinical data in the design of prostheses to ensure optimal performance and patient satisfaction.

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 Robotics, automation, 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.

General tasks of the project:

- The complete design for the Robot is already exist in the ARAtronics Lab and the ARAtronics Lab Engineer will hand it to you from the first day.
- ARAtronics will support you with the CAD robot design on Solidwork. You, will adjust some parts on the design to fit with the motors and actuators in the local market.
- Fabricate the Robot using 3D printer.
- Assembly all parts of the Robot.
- Motion control study for 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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