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

Bachelor's Thesis, Term Project

Functional prosthetic fingers controlled by EMG and EEG Signals Based on Clinical Data

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

In this work, we present a novel approach for functional prosthetic fingers controlled by electromyography (EMG) and electroencephalography (EEG) signals based on clinical data. The proposed system utilizes EMG and EEG sensors to measure the muscle and brain activity of the user, respectively, and clinical data to optimize the design of the prosthetic fingers. The signals are then used to control the movement and grip of the prosthetic fingers in a natural and intuitive way, allowing the user to perform daily tasks with ease. 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.**

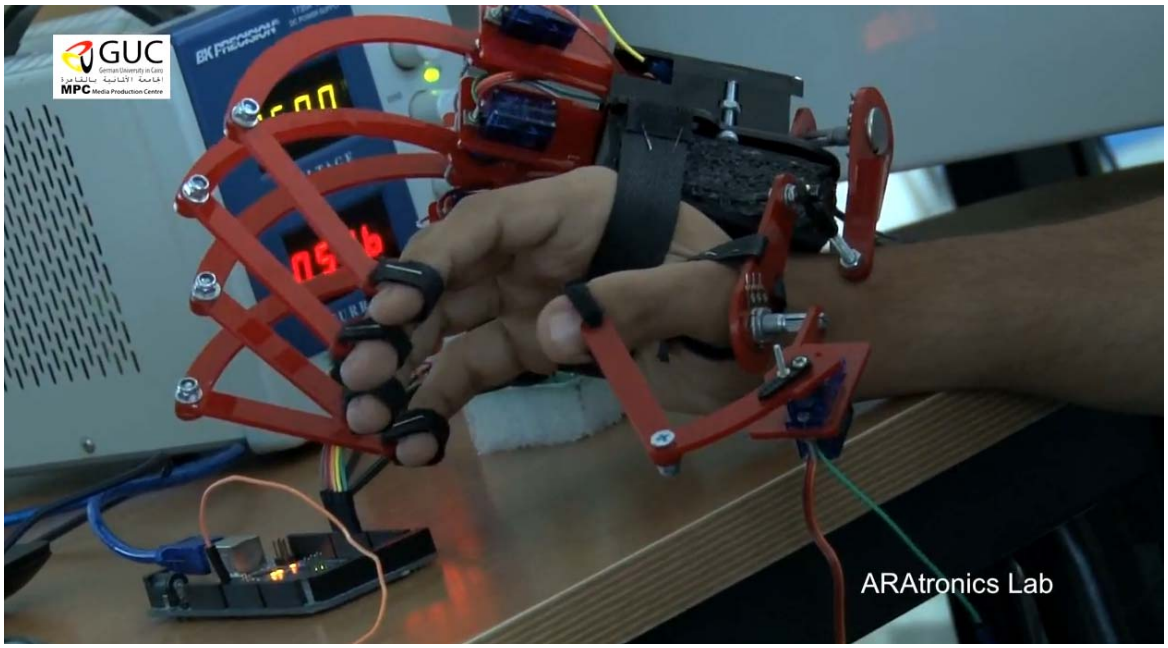

Fig.: BCI at the ARAtronics Research Center

For more details please contact:
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Project description and objective:

The system is evaluated through simulations and experiments on test patients, showing significant improvement in the performance and usability of the prosthetic fingers. This work highlights the potential of advanced sensing technologies, such as EMG and EEG, and clinical data for improving the performance and usability of prosthetic fingers, and for providing natural and intuitive control for prosthetic users.

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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