UNIVERSITY OF GENOA
DEPARTMENT OF INFORMATICS, BIOENGINEERING, ROBOTICS AND SYSTEMS ENGINEERING
MASTER'S PROGRAM IN BIOENGINEERING

Thesis Project Form

Title (tentative): Development of a novel control strategy for assisting carrying with an active back-support exoskeleton

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Description

Motivation and application domain

Back-support exoskeletons for assisting workers performing manual material handling, are becoming more and more spread. We have developed an active robotic device that allows to design and test different control strategies on users. (https://advr.iit.it/projects/inail-scc/esoscheletro)

General objectives and main activities

The student will join the XoLab multi-disciplinary research group, in the ADVR department of the Istituto Italiano di Tecnologia (IIT), Genova, Italy.
Thanks to its electric motors, the active exoskeleton (XoTrunk) developed in our group can generate custom torque profiles to assist users. The profile generated is defined as control strategy and might rely on different sensor inputs.
So far, back-support exoskeletons have been mainly tested and designed to assist with lifting activities. However, taking advantage of the capability of XoTrunk to recognize which task is being performed (e.g., lifting, lowering, carrying, walkingâ€¦) many other activities can be assisted.

The main activity that we aim to involve the student is the contribution to the state of the art to the development and test of novel control strategies for assisting with carrying tasks.
Additionally, to assess the effectiveness of the proposed control strategy, the student will compare muscle activity and metabolic energy expenditure, recorded with and without exoskeleton usage. Testing will allow the student to explore important aspects of research on human-robot interaction, motion tracking, gait analysis and real-time exoskeleton control.

Training Objectives (technical/analytical tools, experimental methodologies)

-Design and implementation of a new real-time control strategy for assisting with carrying activities
-Design of an experimental protocol for assessing carrying assistance strategy
-Data analysis on motion capture, muscular activity and metabolic consumption techniques.
- Gait phase estimation based on kinematic models

Place(s) where the thesis work will be carried out: Istituto Italiano di Tecnologia (Advanced Robotics)

Additional information

Pre-requisite abilities/skills: Conoscenza di Matlab e tecniche di base di analisi di dati e segnali. Conoscenza e tecniche di base di programmazione in C/C++

Maximum number of students: 2