



Thesis Project Form

Title (tentative): Comparative Analysis and Validation of Robotic Walking: Kinematic Characteristics and Therapeutic Applications of Robot-Assisted Overground Walking UAN.GO.

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Description

Motivation and application domain

The health benefits of walking are endless, and experts agree on the fact that daily walking can greatly improve physical and mental health. Walking may lower the risk of high blood pressure, heart disease, and diabetes and it can strengthen bones and muscles.

It is therefore essential to improve the configurations of UAN.GO so that it promotes active participation of patients with severe lower limb disabilities. This aims to stimulate opportunities for treatment and recovery of their motor functions through the neuroplasticity of the nervous system.

This project aspires, through the introduction of ankle dorsiflexion, to make walking with an exoskeleton as close as possible to physiological walking

General objectives and main activities

The project consists of two main phases: an initial comparative analysis, and a subsequent testing phase.

The first phase involves a literature review of reference standards (minimum requirements) for the characteristics of robotic walking with O-RAGT devices, followed by a comparison with physiological walking. The aim of this phase is to identify the main drivers of differentiation between physiological and robotic overground walking. Subsequently, the choice of kinematics within the U&O library will be made and they will be loaded onto the test device.

After the first phase, bench measurements are planned to detect the kinematics and position of the ankle joint center and the insole position during the step cycle.

This first phase, in general, involves data processing that includes the development and comparison of movement trajectories and the calculation of segments upstream and downstream of the joints implemented to analyze behavior on sagittal and frontal planes.

Then, the second phase of the project involves the direct engagement of patients in specific facilities; it includes patient measurements: some kinematic data will be directly recorded from the device and correlated with other data acquired with other instrumentation to detect the behavior of the joints upstream and downstream of the implemented ones.

During the patient testing phase, one or more scales related to the usability of the tool in a rehabilitation context will be administered (to be determined based on the type of patient).

Training Objectives (technical/analytical tools, experimental methodologies)

Comparative analysis

Data processing

Direct contact with the U&O exoskeleton

Testing sessions with patients

Place(s) where the thesis work will be carried out: U&O S.r.l, Fiorenzuola d'Arda (Piacenza).

Maximum number of students: 1