

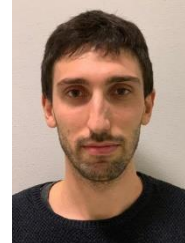
Augmented reality and instrumented crutches to generate a visual feedback during assisted walking

PhD Candidate: **Marco Ghidelli**

Email: m.ghidelli001@unibs.it

XXXVI Cycle

Tutor: Prof. Emilio Sardini, Dr. Matteo Lancini, Ph.D.



Background

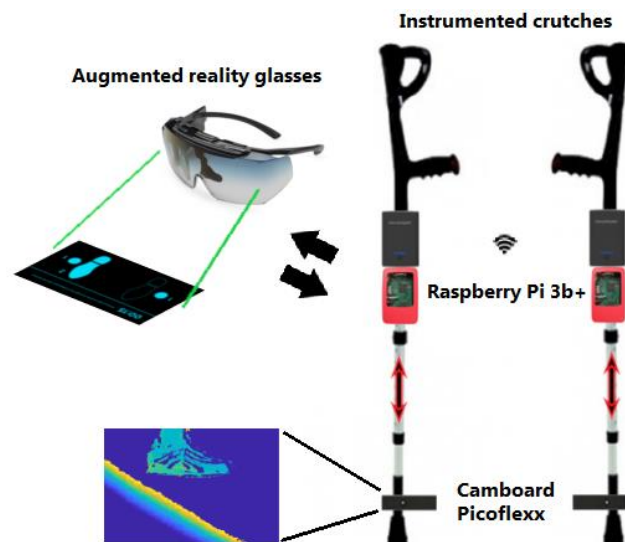
Neurological injuries and diseases often result in physical impairments that interfere with a person's ability to walk. Crutches are among the most used device and learning how to use it is a time-consuming process. Physiotherapist usually provide instant feedback to the patient regarding posture, load and step sequence to avoid incorrect habits, according to their perception and experience. The results are therefore tied to the therapist's skills and the patient's improvements are based on subjective considerations. Technologies such as augmented reality are used in persuasive systems to provide feedback and cues to stimulate the rehabilitation.

Objectives

The aim of the research is to study which visual feedback provided by augmented reality glasses is the most suitable to assist walking with crutches.

Methodologies

The data acquired by a pair of instrumented crutches are processed to provide visual feedback and cues through augmented reality glasses with different strategies in form and frequency. The instrumented crutches measure the load applied to monitor upper and lower limb overloads. The orientations and accelerations of the crutches are collected to recognize tilt and impact events. The gait phases are obtained by processing the images of a pair of Time of Flight cameras.



Expected Results and Impact

- Improve the indoor and outdoor walking performance.
- Improve the rehabilitation of walking with crutches by providing objective results of patients' performance.
- Reduce the risk of injuries due to incorrect use of the crutches.