Title (tentative): Training in real-time postural control and walking abilities with a wearable system providing vibrotactile and auditory feedback

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### Description

**Motivation and application domain**

Efficient postural control is required to prevent falls, while maintaining steady state positions and while walking over ground, especially on not fully stable supports. During the last years some biofeedback systems (e.g. vibrotactile, auditory or multi-modal feedback) have been developed to improve balance.

This work aims at developing and testing a new vibrotactile feedback system that would provide subjects with supplemental information related to their trunk inclination.

**General objectives and main activities**

The proposed work has the following 3 main objectives:

- Design and implementation of a new wearable vibrotactile and auditory feedback system for training in real-time postural control and walking abilities

- Definition and implementation of training protocols for people with sensory disabilities.

- Validation of device and protocols on a group of subjects with postural control problem and sensory deficits e.g. Spinal cord injury subjects, stroke survivors etc.

**Training Objectives (technical/analytical tools, experimental methodologies)**

The student will learn:

- To analyze body motion signals
- To develop the control of an external device based on body signal
- To develop data analysis tools for behavioral data
- To improve the knowledge of Matlab/Simulink, Python, and statistical analysis
- To work (in an international team) with people with different backgrounds (engineers, physicians, physical therapists) and with people with disability at the university and in clinical environments

**Place(s) where the thesis work will be carried out:** Santa Corona Hospital in Pietra Ligure (SV) – Italy

**Pre-requisite abilities/skills:** programming skills in Matlab, experience with Arduino prototyping preferred.

**Maximum number of students:** 1