

Bachelor Thesis Proposal

CoP calculation and visualization from a force-torque sensor and a Wii Balance Board

Embedded Mechatronic Systems (Prof. Schütz) - Project EmKIPro²

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Background

The main idea of the EmKIPro² project is to develop an innovative leg prosthesis that uses artificial intelligence (AI) to provide users with precise feedback on movements and environmental conditions. To do so, multiple sensors will be integrated into the foot. These include, but are not limited to, strain gauges to measure the foot deformation and one or more IMUs to determine the gait phase. Using the information from these sensors, the center of pressure (CoP) can be estimated and returned to user through electro-tactile feedback. Combined to these sensors is an experimental environment which will have its own set of sensor and measurement devices such as force plates, a motion capture system, pressure mats, and a treadmill.

Project Description

In order to validate the CoP estimation from the strain gauges, the true values need to be known. One way to do that is to use values calculated from the forces and torques at the ankle. These can be measured with an integrated force-torque sensor. Furthermore, for presentations and demonstrations, the CoP can be extracted using the weight data from a Wii Balance Board. The topic of this thesis would therefore be to calculate the CoP coordinates from the data acquired through a force-torque sensor as well as the weight value returned by the Wii Balance Board. In addition, an application or script should be created to simultaneously visualize these CoP coordinates. The coordinates extracted from both devices should be nearly identical.

Tasks

Below are some example tasks that you will have to perform. These tasks can be discussed and expanded to best fit the needs of the project and the interest of the student.

- Literature review
- Implement the calculation of CoP from the force-torque sensor
- Estimate the CoP from the weight data of the Wii Balance Board
- Create a visualization application (can be a web app, python script, ...) for simultaneous live viewing of the CoP coordinates
- Write the thesis

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