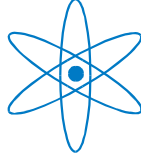




Technical University of Munich



Faculty of Physics

Experiments and Validation of a Three-Dimensional Accelerometer in a Belt Buckle – ActiBelt – for Continuous Multiple Sclerosis Patient Monitoring

Diploma Thesis by Thomas Goßner

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Abstract

This diploma thesis is a further step in the development of a gait analysis instrument by the Sylvia Lawry Centre for Multiple Sclerosis Research, usable for almost every kind of physical activity, a three-dimensional accelerometer in a belt buckle, the ActiBelt.

The aim of this diploma thesis is to evaluate how much of the real trajectory is to be obtained by the acceleration data and to check if the device is usable for path length analysis.

The data is therefore validated by a highly accurate trajectory tracking system for data correlation and comparison, as well as a lot of other reference systems.

Algorithms for Hand-Eye Calibration, as well as Point-Based and Feature-Based Registration were used to transform the data.

Feature-Based Registration with a mean-square error of 0.03m and a standard deviation of 0.01m was achieved and the path length of a non-circular movement could be obtained to 95% of the original length.

Further ideas to use the ActiBelt for trajectory analysis, like in pedestrian navigation, are presented, along with the technical specifications and motion models that describe the human gait.

Also several other applications of the ActiBelt are introduced, which range from diving deep under to moving in zero-gravity in space.