

## A double pendulum in 3 dimensions – a model-based analysis of the balancing human body

**Balint Petro, Rita M. Kiss**

*Abstract:* Typically, the dynamic model applied in the analysis of upright human posture is a single- or multi-segment model, i.e. an inverted pendulum. Most pendulum models are constrained in a single plane and therefore unable to capture the cross-dimensional compensatory effects that humans demonstrate. We aim to show our most recent work utilising a 4-degrees-of-freedom, two-link double pendulum model to identify or mimic the natural controller in the case of free swaying in bipedal stance. We simulated the forward kinematics of the model with several different types of controllers and control strategies, including various control variables and a range of control parameters. Comparing the simulated motion with human motion capture recordings, the goal is to identify the control strategies that most closely resemble natural movement.

---

<sup>1)</sup> Balint Petro, M.Sc. (Ph.D. student): Budapest University of Technology and Economics, 1111 Budapest, Muegyetem rkp 3, Hungary (HU), petro@mogi.bme.hu, the author presented this contribution at the conference in the special session "Analysis and control of bioinspired and biomimetic dynamical systems — sensors, manipulators and locomotors" organized by C. Behn and A.M. Zelei.

<sup>2)</sup> Rita M. Kiss, Professor: Budapest University of Technology and Economics, 1111 Budapest, Muegyetem rkp 3, Hungary (HU), rita.kiss@mogi.bme.hu.