

## **Selected research topics in Biomedical Engineering: Biomechanics and Human Movement**

Location: Universitätsspital Basel, Klinikum 1, Hörsaal 3

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### Exploiting kinematics and kinetostatics in biomechanics – Some applications at the boundaries of medicine and technology

**Prof. Andres Kecskemethy**

*University Duisburg, Essen, Germany*

#### **Abstract**

Biomechanics is a rapidly growing field in many medical and engineering areas. Within this, kinematics as the “geometry of motion” and its dual “kinetostatics” can give several clues to more efficient solutions and new technologies. The presentation describes a short version of the theory with focus on some examples in which kinematical and kinetostatic transmissions have led to novel methods with several practical applications: (a) fast determination of musculotendon paths both for idealized thin lines and thick strands, (b) motion optimization along 3D paths with applications from roller-coasters over human spine motion recognition based on retroreflective marker measurement up to optimization of skydiving and simulators for water slides, (c) reliable drift-free extraction of sagittal rotations such as knee flexion/extension from 3D IMU measurements during running, and (d) automatic determination of unknown human knee axis using tactile-robot power iterations on real-system impedance. It is believed that many further applications can emerge from the usage of the rich properties of intrinsic kinematics.