Платформа 3
Інформаційні технології та інновації в текстильній та фешн-індустріях

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POSSIBILITY FOR TRANSFER OF MOTION DATA FROM 4D BODY SCANNING IN OPENSIM FOR BIOMECHANICAL SIMULATIONS

Purpose: *The purpose of this work is the development of methodology for connection of OpenSim model simulation data with scan results in order to biomechanical analysis and development of functional clothing.*

Keywords*: high speed scanning, biomechanical analysis, functional clothing, Move4D, OpenSim*

Objectives. The development of functional clothing requires good knowledge about the human body geometry and its changes during specific motion. For specific activities as sport, work with heavy objects, or providing medical care to patients, conventional clothing does not offer sufficient freedom of movement or even prevents certain activities. In addition, targeted muscle support can help improve performance and maintain physical health. The aim of this work is to establish a stable method for transferring data from the Move4D high-speed body scanning system to the open-source software OpenSim for simulating the body as biomechanical system. The OpenSim software can be used e.g. to simulate muscle loads and then use the data for evaluation.
The knowledge from the OpenSim simulation will be combined with the use of textile physical properties and suitable cut design. This contributes to supporting the execution of movements and thus to maintaining the wearer's performance and health.
Methodology. The biomechanical analysis is based on a musculoskeletal model. An initial adjustment of the model's marker set configuration was necessary in order to link it to the scan data (body geometry and movement)

from the Move 4D software. The software used inverse dynamics in combination with optimisation-based algorithms to calculate muscle forces. The forces of the defined muscles can then be visually illustrated as diagrams.

A movement involves both smaller and larger muscles. To illustrate muscle forces and active muscles, OpenSim offers the option of distinguishing them by colour.

Research results: The result is a biomechanical analysis of complex movements in terms of tendon length, muscle fibre length, tendon force, active and passive muscle fibre force, and total muscle force.

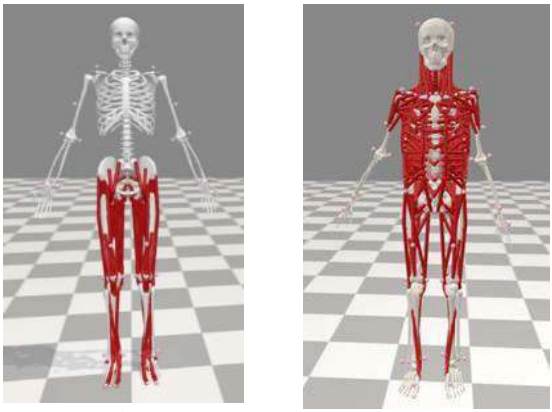


Fig. 1. **Models with adapted marker sets**
The Models RajagopalLaiUhlrich 2023 (left) and FemaleFullBodyModel_v2.0 (right) after adjustment of the marker sets.

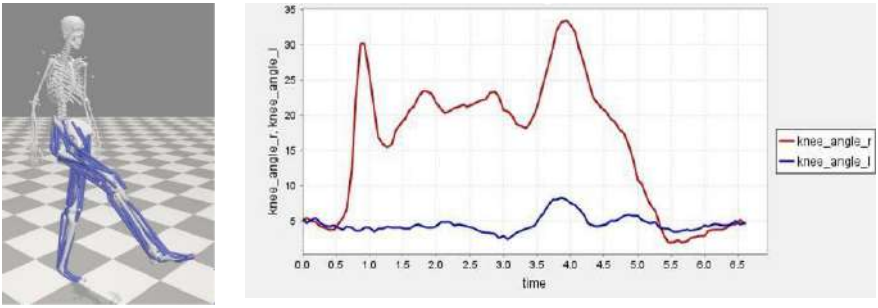


Fig. 2. **Visualisation and Chart of knee angles during a movement.**
Representation of the knee angles of the right and left legs. During the movement, the right leg is lifted, muscle activity is shown in blue.

Conclusion: In future, after intensive biomechanical analysis of complex movements, the findings on different forces, lengths and their changes over time will be used to adapt functional clothing to the movements of the wearer and to support them.

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CROSS-BORDER INTEGRATION OF CONTEMPORARY HAND-MADE BEADS: FROM TRADITIONAL COLLECTIBLES TO FASHION ITEMS

Purpose. This paper aims to deeply analyze the internal logic behind the transformation of bracelets from traditional cultural antiques into trendy items.

Keywords*: bracelets; cross - boundary integration; cultural symbols; DIY culture*

Objectives. With the deepening of global cultural exchanges, bracelets are expected to integrate more cultural elements and become a new bridge for cultural exchanges. Integration with smart technology is a future trend. It not only provides new ideas for the design of smart