PROBLEM STATEMENT Comprehensive human modelling is needed in many disciplines for time- and cost-efficient solution-seeking since human trials are time-consuming and costly.

AVAILABLE SOLUTIONS Reduced solution – for coupling with larger scale models, e.g. weather, urban scale, building energy balance, CFD models
Advanced solution – for enhanced analysis at smaller scale, e.g. functional apparel, medical therapies, vehicle cabin models

IMPACT For well-being and safety in human occupation space and clothing performance

Thermal Human-clothing-environment interactions

Development of comprehensive models

Thermal Human-clothing-environment interactions

Ansprechperson

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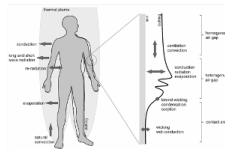Biomimetic Membranes and Textiles
Phone +41 58 765 77 68

Models

Human thermoregulation model
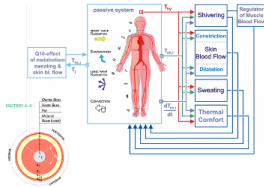
Clothing physical model
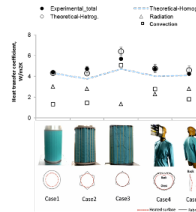
Clothing air gap model
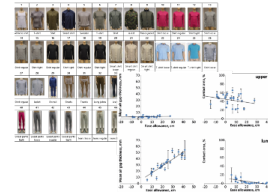

Reduced solution

Regression model of human thermoregulation acting on passive system based on bio-heat equation and a suite of global and local thermal sensation models

Analytical-empirical model of the air gap-fabric assembly accounting for dry and latent heat exchange and heterogeneity of the air gap
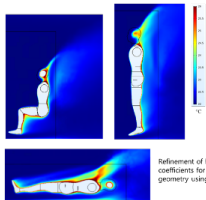
Empirical model based on large database of 3D scanned clothing relating air gap to ease allowance (difference between body and garment girths)
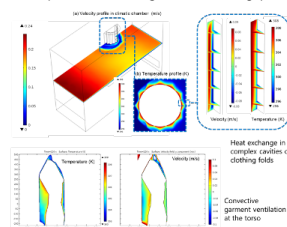

Advanced solution

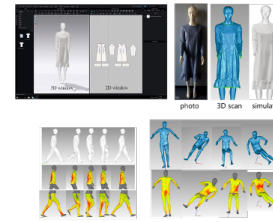Refined spatial resolution and individualisation of the humanoid based on the anatomical models and CFD modelling

CFD models of radiant and convective heat exchange in complex and deforming cavities and air gaps

3D fashion design software used to design clothing patterns, virtual sewing and try-on and animation

Refinement of heat transfer coefficients for anatomical geometry using CFD

Heat exchange in complex cavities of clothing folds

Convective garment ventilation at the torso

photo   3D scan   simulation

Air gap can be determined during different phases of movement, such as walking or Alpine skiing