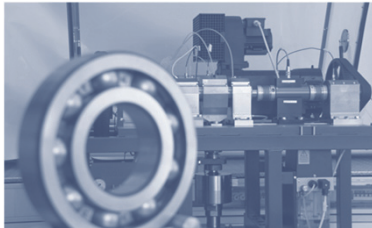


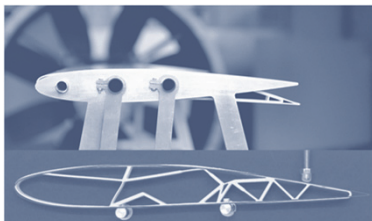
# Research focus areas



Virtual product development  
and design methodology



Machine elements and  
component design



Mechatronic systems in  
mechanical engineering

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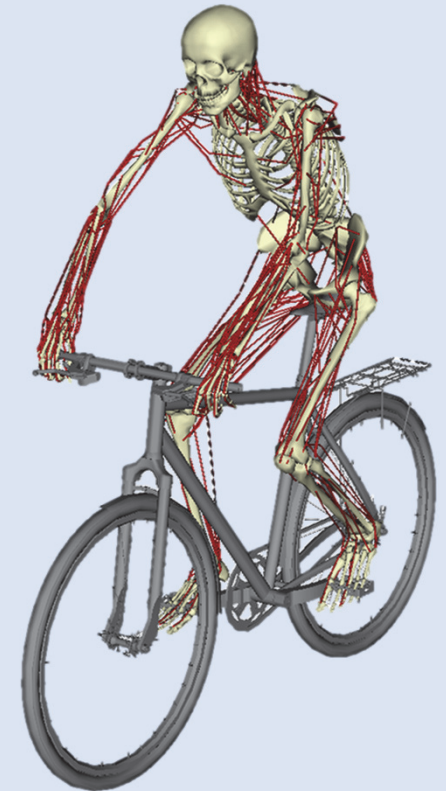
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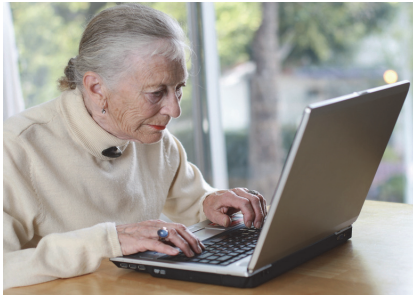
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## User-centred product development



## Focusing on the user

The demographic change in industrial nations has not only got a huge impact on social and healthcare services. The ever changing needs of people in different phases of life also pose further challenges for product development. Therefore, user-centred design promotes product adaptation to the skills of future users. Age-sensitive products tailored to the users' requirements and needs demand for new development processes and methods. For instance, it is essential to predict the impact of product use and behavior on human-specific product features. New virtual tools support product developers to ensure that user-product-interaction is designed and optimised effectively.



### Research focus areas:

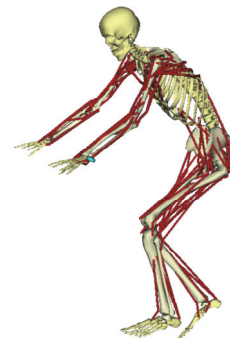
- acquiring and integrating individual user requirements in early stages of product development
- modelling and predicting user-product-interaction
- creating digital human models adapted to age and performance
- integrating human simulation with CAx

## Design follows generations

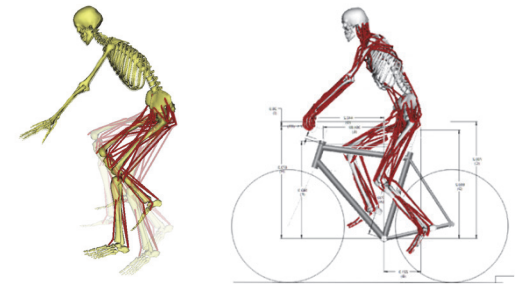
In future, individual needs of users in different ages must be carefully considered more than ever throughout the entire development process. Striving for this, user requirements are systematically identified and included in the early stages of the product development process. This leads to individually adapted, age-specific products which are better adjusted to the individual skills and needs of any user. This work is based on close interdisciplinary collaboration with psychologists, medical experts and specialists from other fields.

## Predicting user behaviour

User-oriented product features should be assessed based on the effectiveness and efficiency of the actions required from the user to achieve the product's purpose. In the context of simulation with digital human models it is therefore necessary to predict the user behaviour required to achieve a given purpose depending on the product behaviour.



Considering ergonomic aspects, a realistic synthesis of human motion and posture is required which can be achieved using advanced methods of inverse kinematics and optimal control to explore physiological factors.



## Biomechanical user modelling

In addition to representing the interaction between user and product, digital human models must also describe the users of an intended target group as precisely as possible. Ageing and disease processes can cause individual differences. Biomechanical digital human models must therefore be adjusted to the intended target person or group including differences in anthropometry and body function parameters such as the maximum isometric muscle strength.

## Integration in CAD and CAE

Software solutions which can be integrated into existing CAD and CAE systems are being developed for effective use of biomechanical simulations in virtual product development. Assistant systems help the developer to design user-centred products by providing recommendations.