

Die Prozesskette: Von Mimics über AnyBody zu ANSYS

Dr.-Ing. Sebastian Dendorfer
AnyBody Technology, Aalborg, Denmark
sd@anybodytech.com



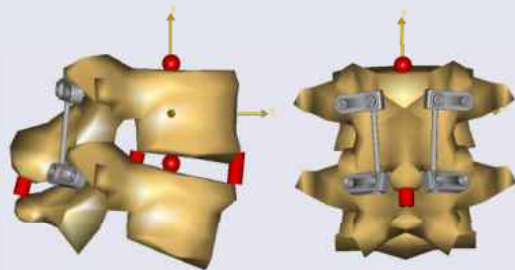
AnyBody Modeling System

- Developed for musculoskeletal analysis
- Self-contained system
- Fully developed and supported in-house (since 2001)
- Open body model (since 1997)
- Multi-level model validation
- Interfacing to
 - Motion capture
 - Medical image based bone and muscle data
 - Finite element software

Product design optimization



Ergonomic analysis and documentation



ANYBODY Modeling System



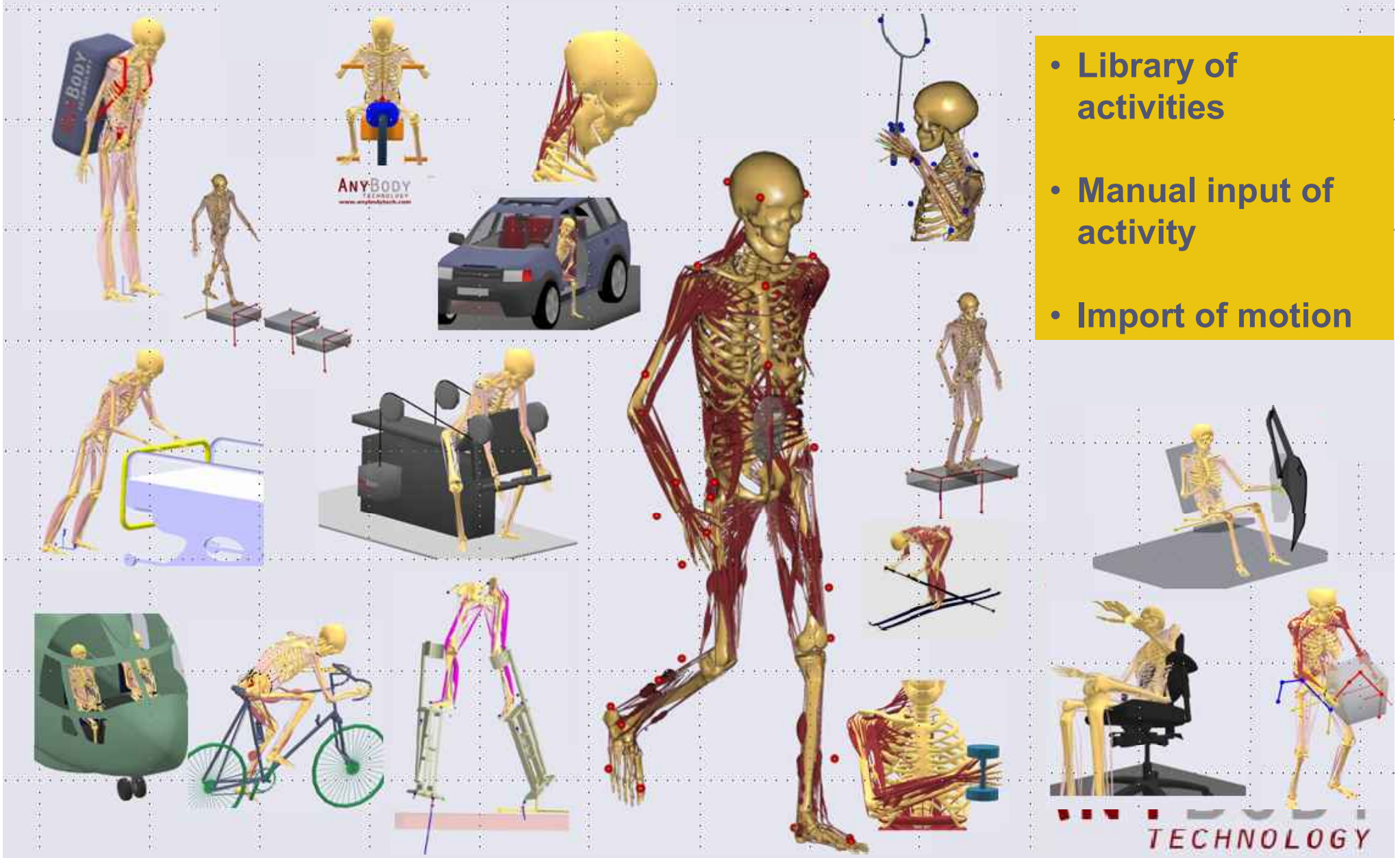
In-vivo load cases for Finite Element Analysis



Pre-op planning and post-op evaluation

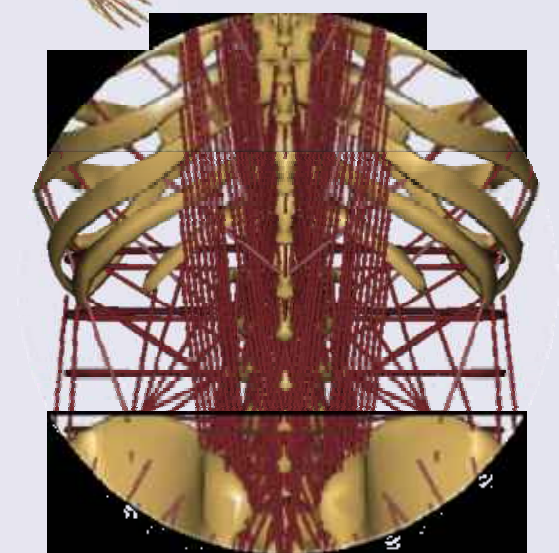
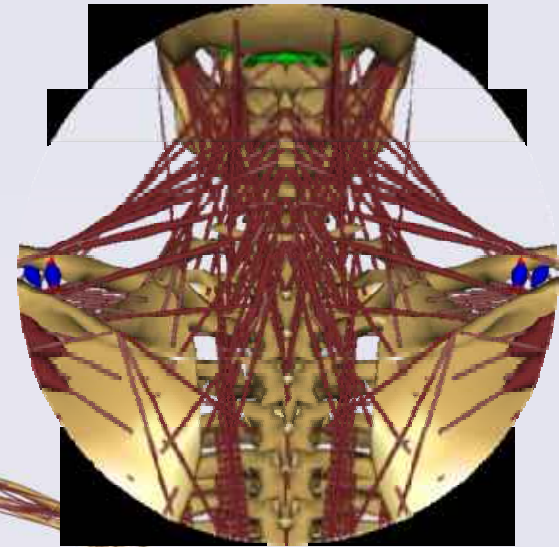
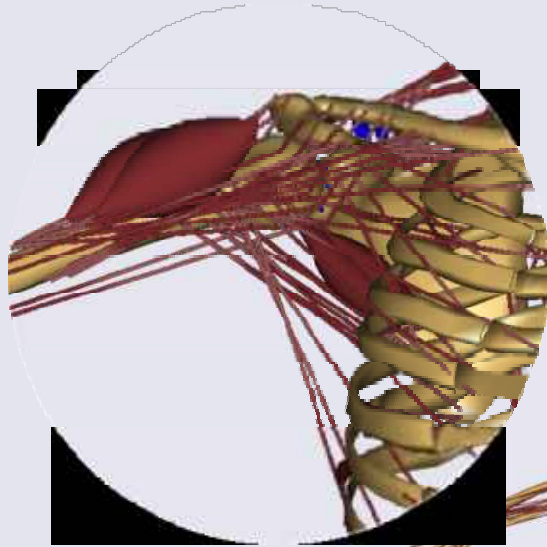
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Activities of daily living



- Library of activities
- Manual input of activity
- Import of motion

Unique open body model library

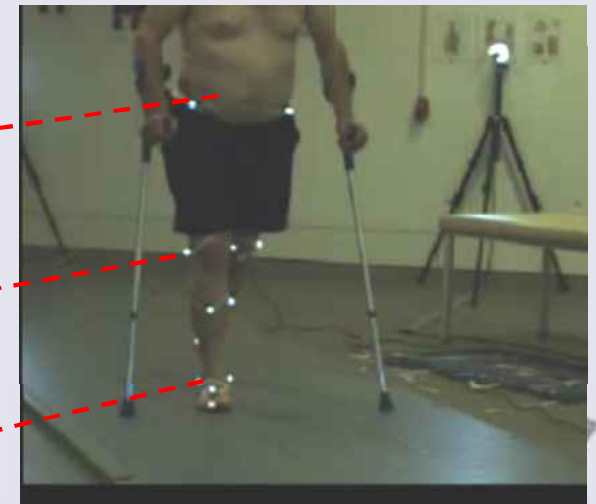
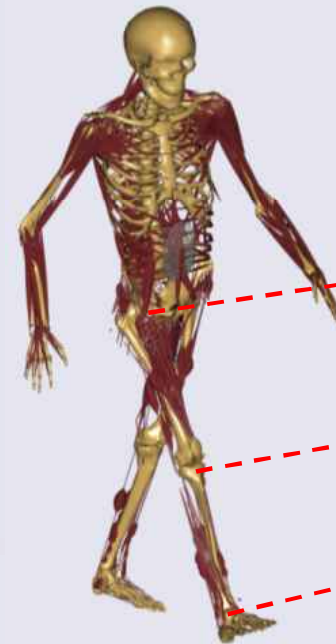


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Body model customization

Increasingly patient specific

- Anthropometric scaling
- Automated scaling
- Strength calibration
- Bone shape matching
- Effects of surgical procedure
- Muscle physiology
- ...

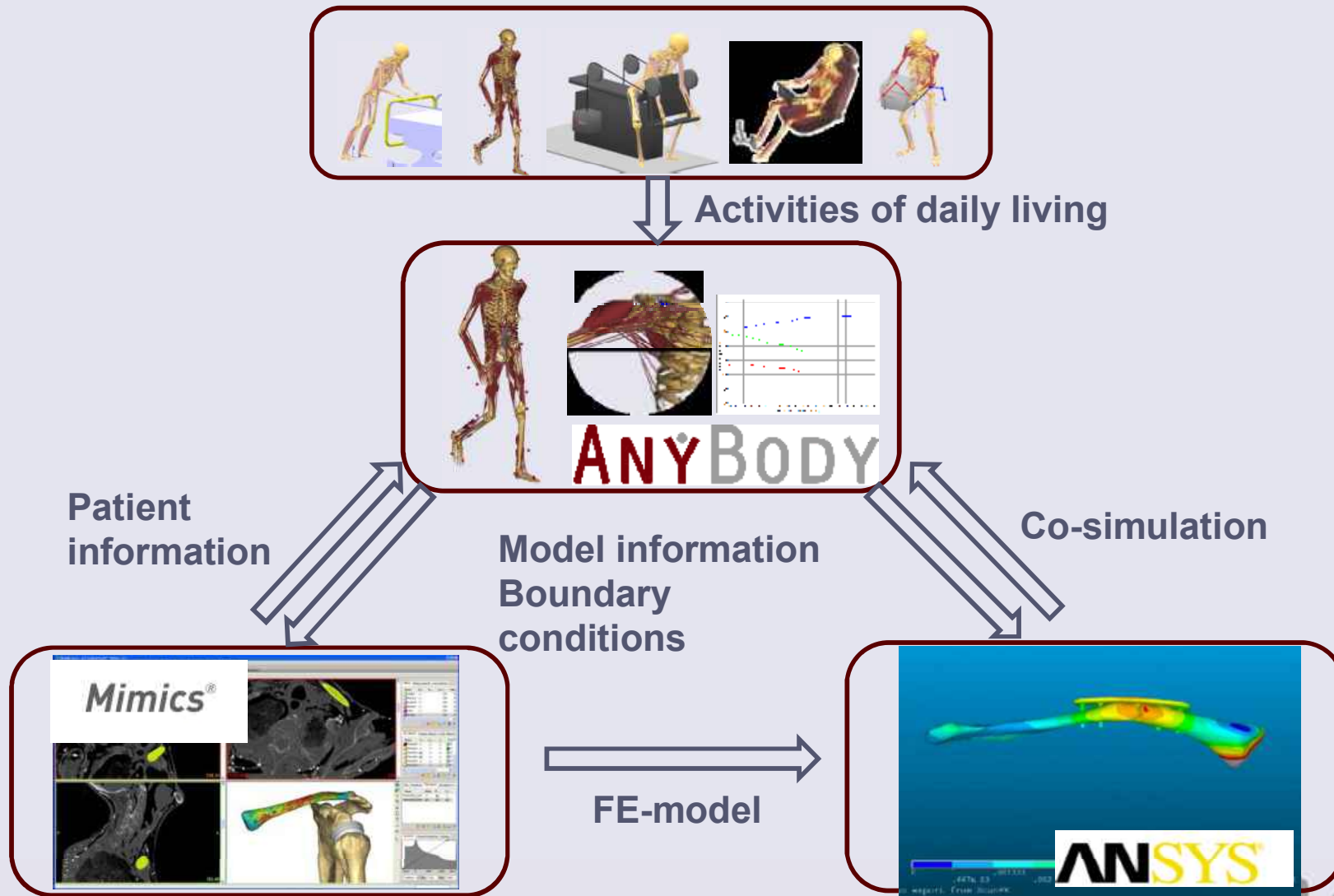


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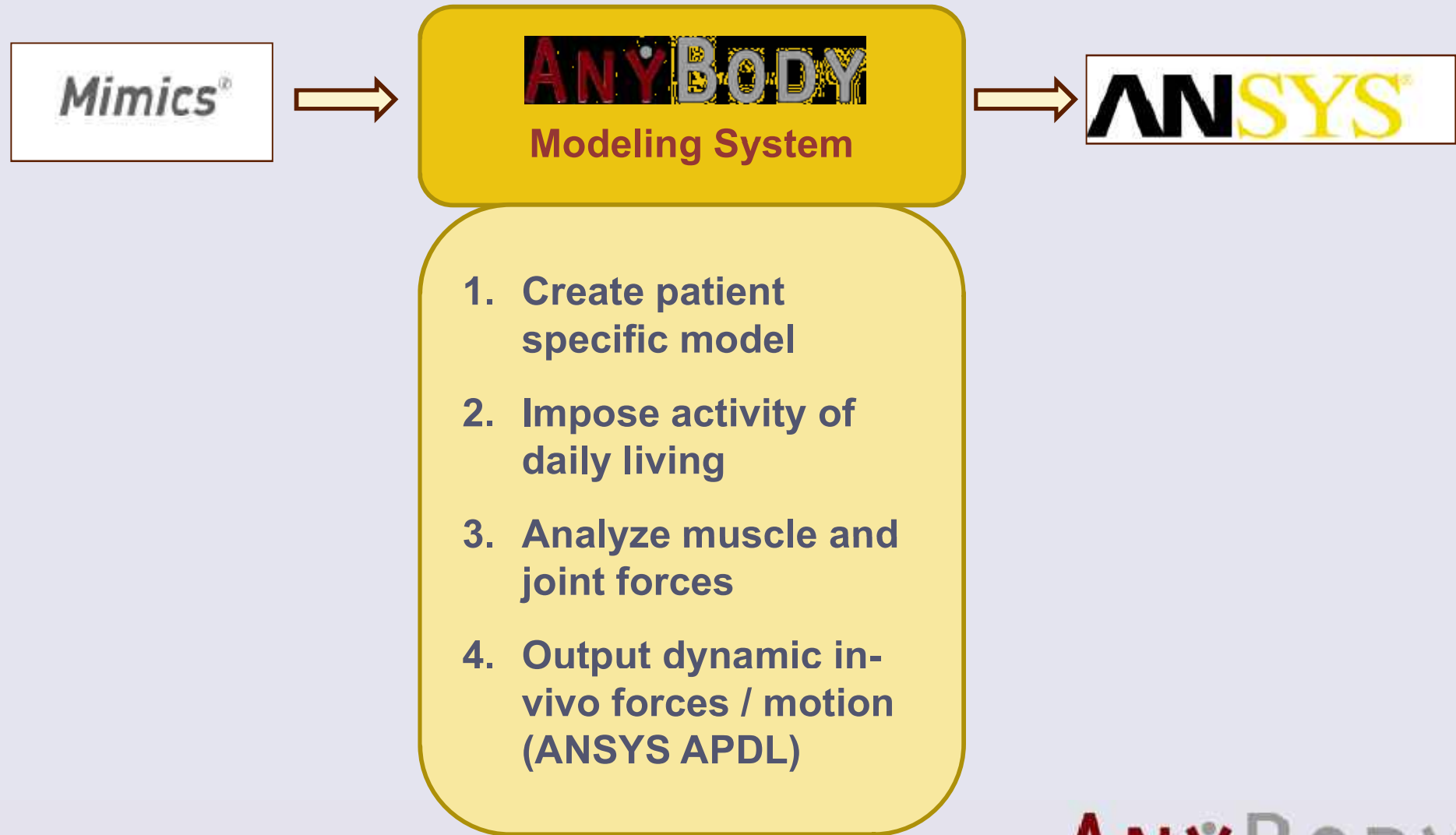
Materialise-AnyBody- ANSYS workflow



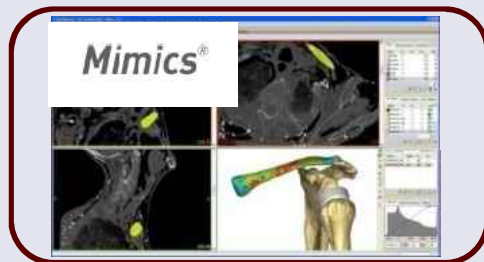
Functional patient based modeling



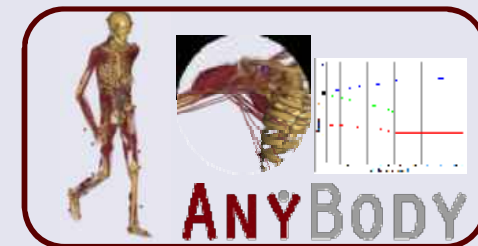
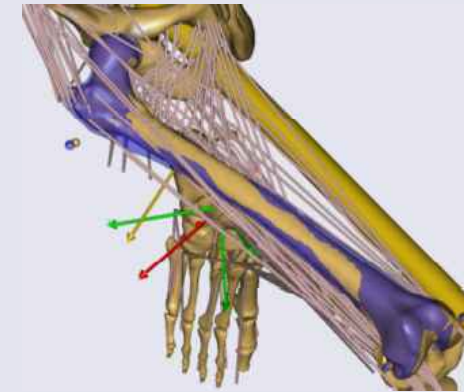
Workflow



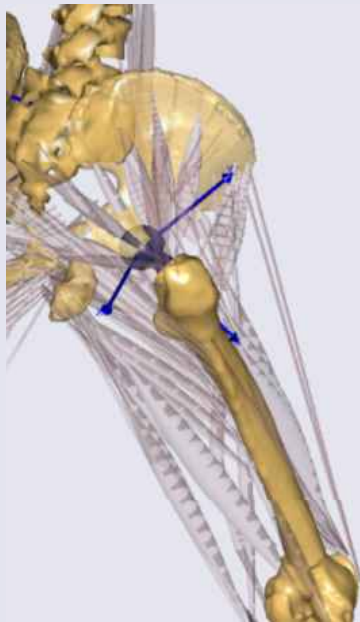
Mimics – AnyBody interfacing



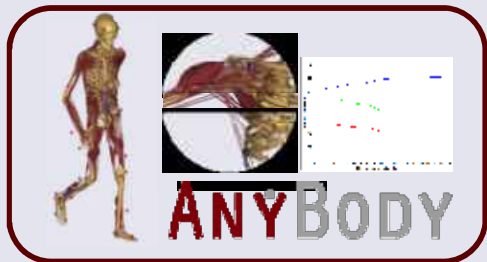
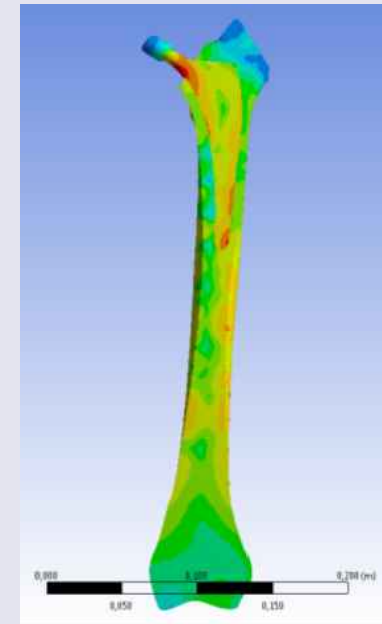
- .stl geometry
- Bony landmarks
- Muscle attachment points
- Muscle geometries



AnyBody - ANSYS interfacing



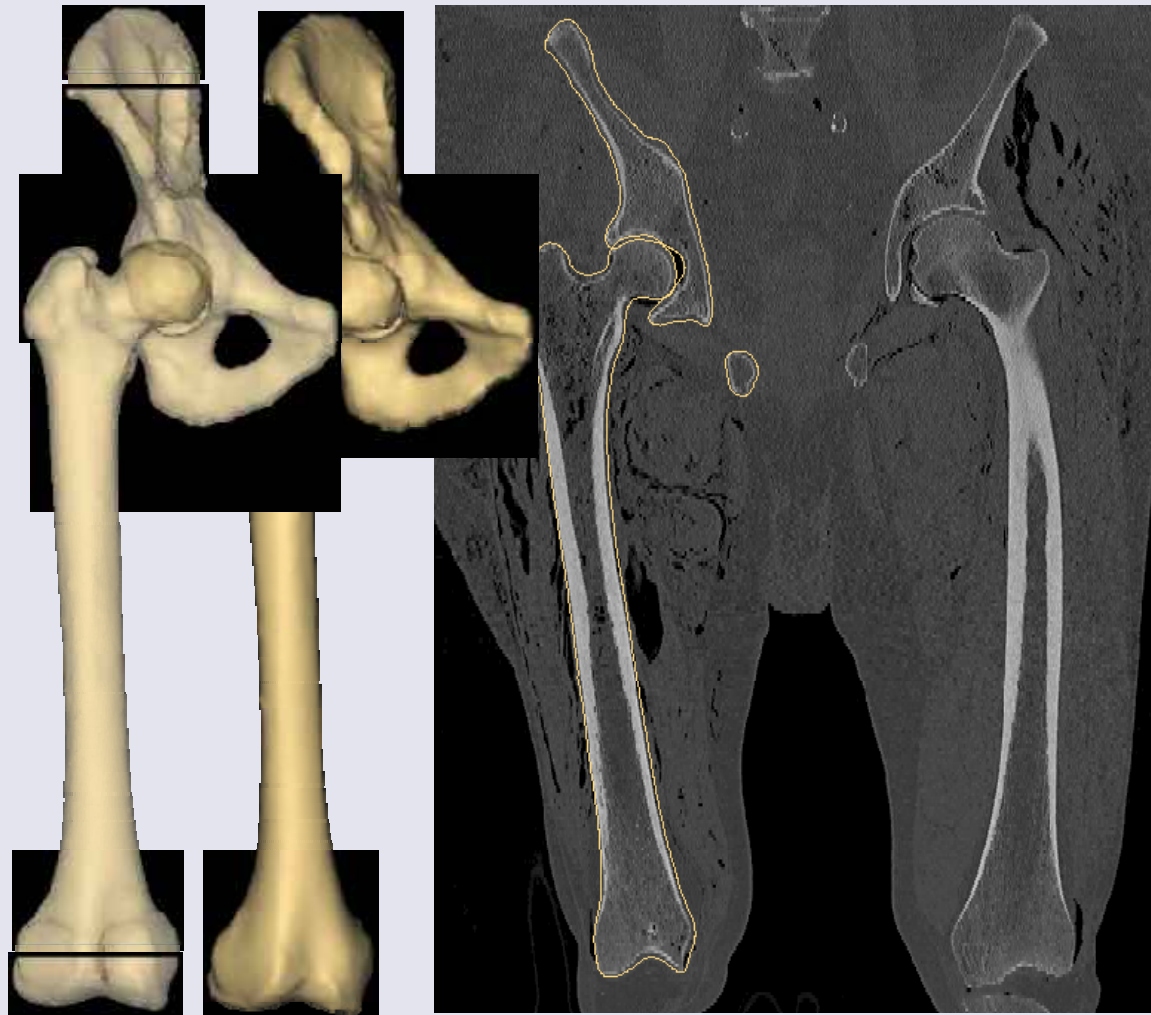
- APDL / text files
 - Forces
 - Motion
- .stl file



Any2Ans
Ozen Engineering



3D Geometry



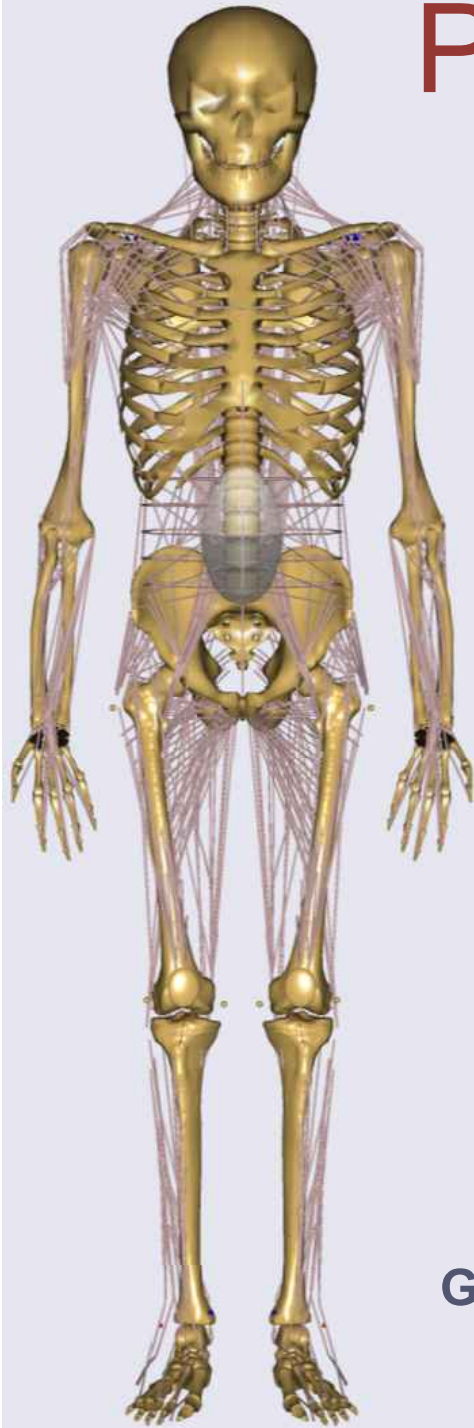
Mimics[®]

3-matic[®]

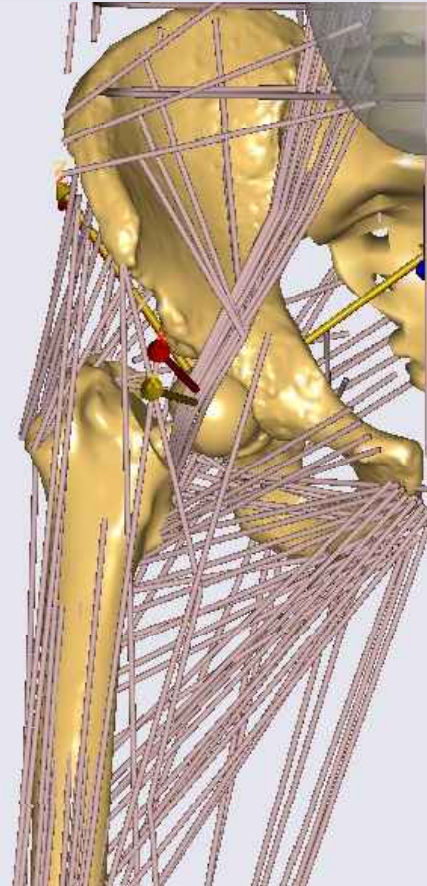
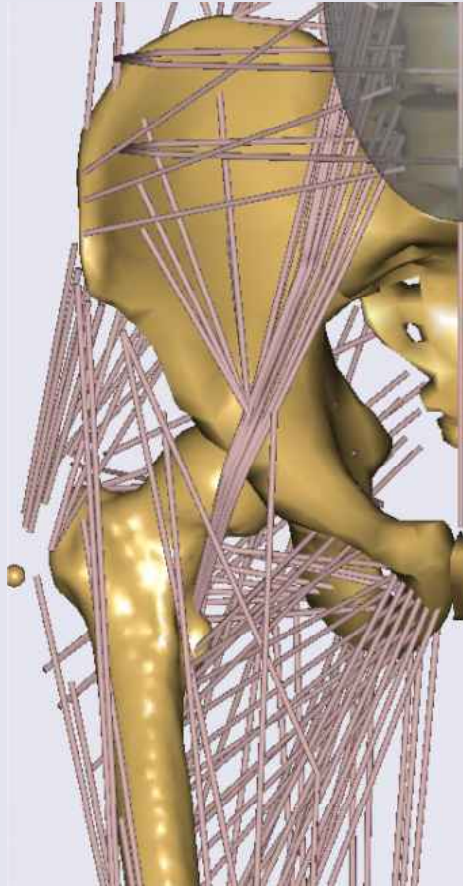
Calculate highly accurate 3D objects

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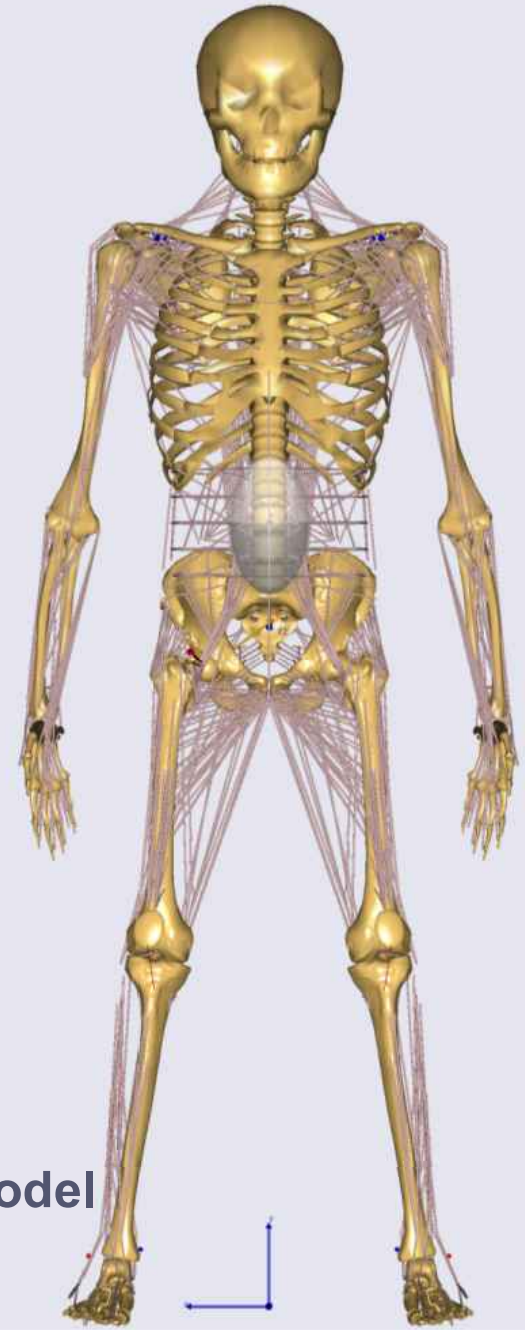
Patient specific model



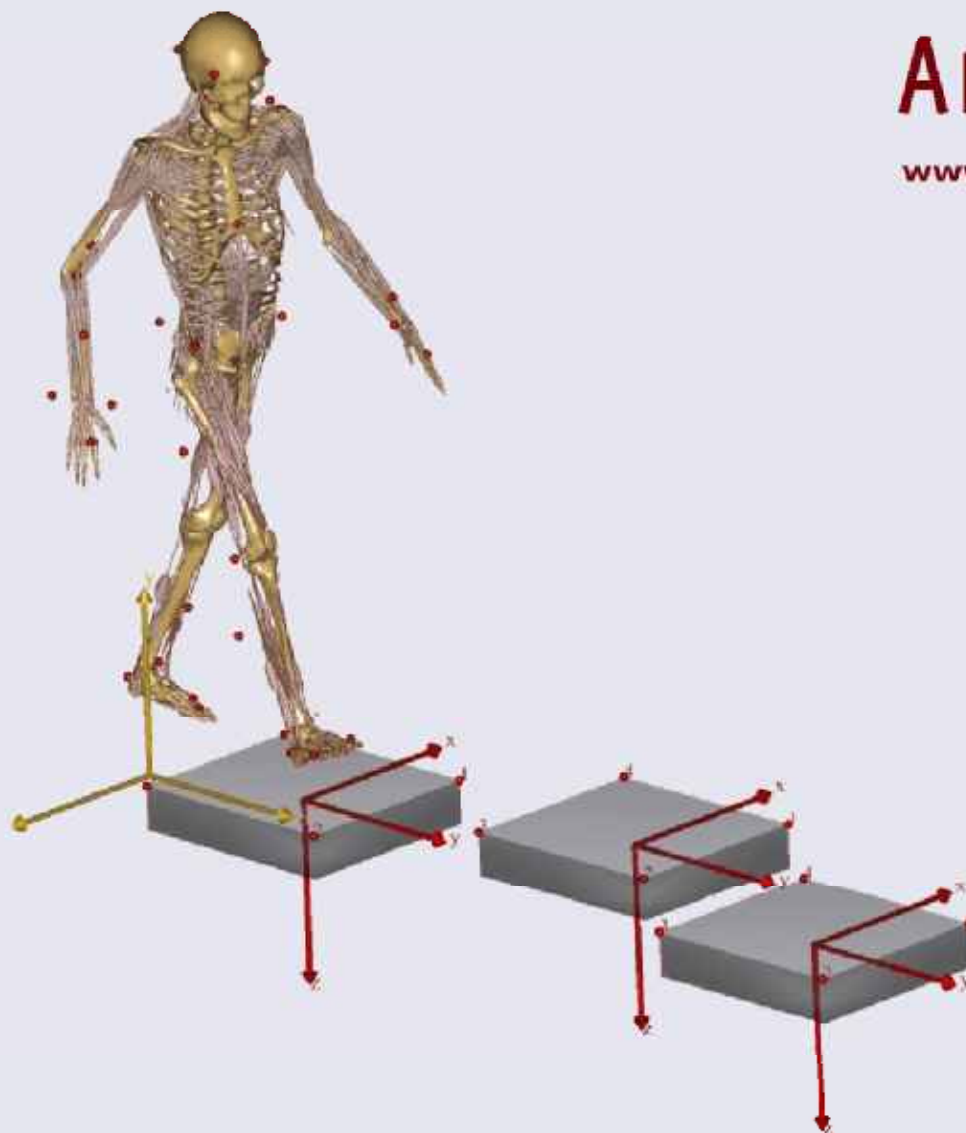
Generic model



Patient specific model



Impose activity of daily living



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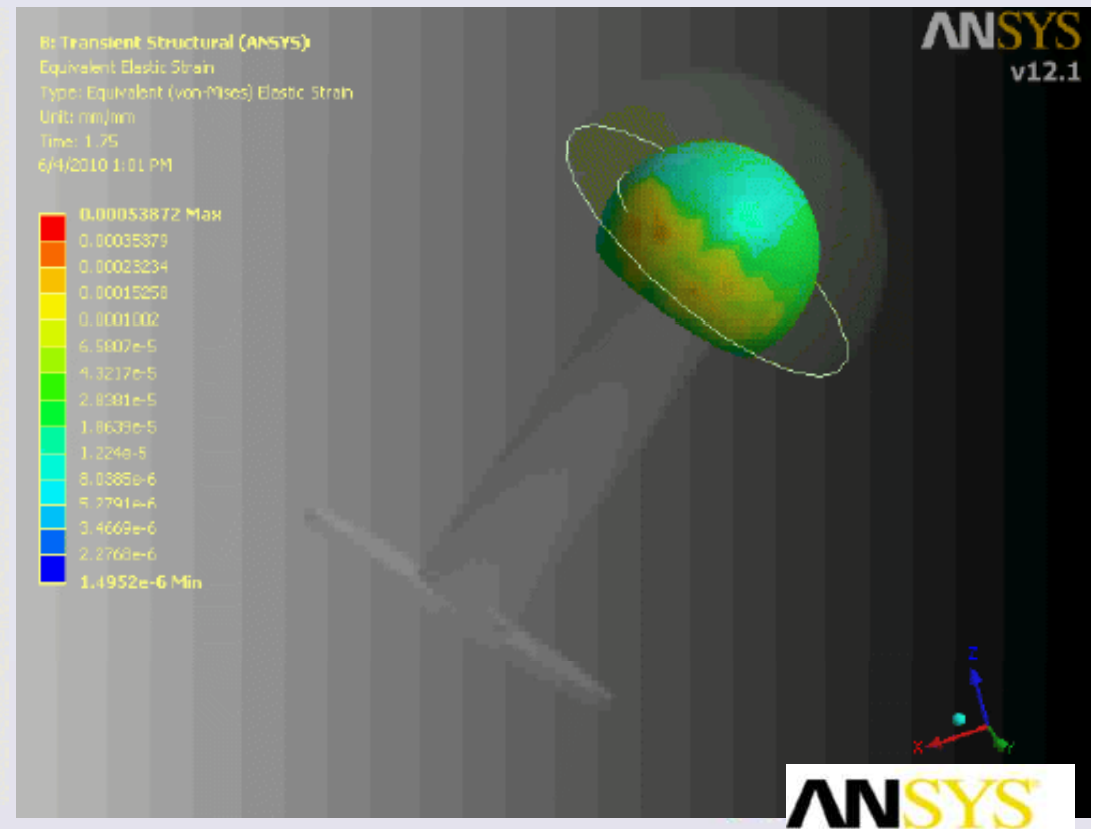
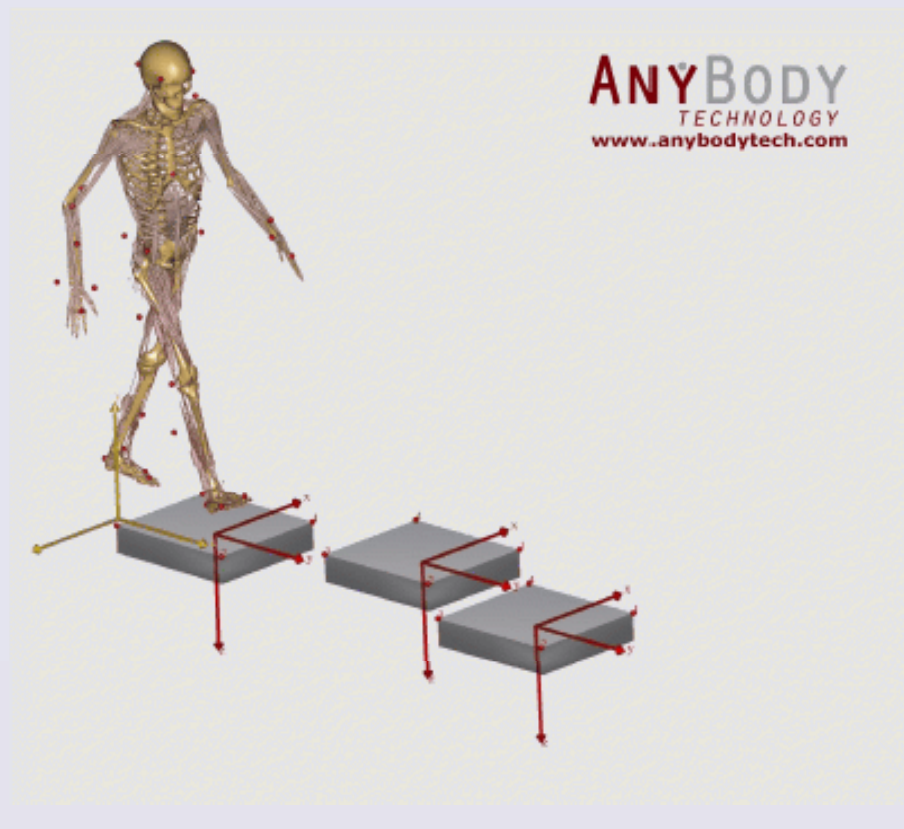
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Impose activity of daily living



Contact stress and wear for realistic load cases

Coupling musculoskeletal simulation with Finite Element Analysis allows for real life investigations on prosthesis design



Conclusion

- **Finite Element Models provide detailed analysis of devices and bones**
- **Musculoskeletal simulations for activities of daily living provide realistic boundary conditions**
- **Anatomical accurate models from medical scans enables patient based simulations**

New opportunities for device design, evaluation, and procedure planning

Materialise 

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Thank you!

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