ANYBODY™
POWERFUL BODY SIMULATIONS

Welcome to a presentation hosted by AnyBody Technology

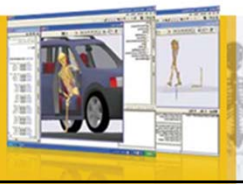
...Public webcasts on AnyBody-related topics are regularly hosted by AnyBody Technology. The web-casts typically address research projects, related technologies and workflows, or instructions on how to use and benefit from the AnyBody Modeling System™.

This presentation will begin shortly...

We hope you will have a good experience. Please take time to respond to the poll after the presenta-tion - it only takes a few seconds. Thank you!

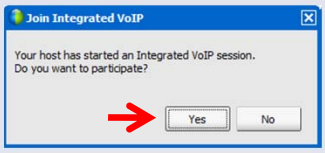
The AnyBody Modeling System™

- Full-body musculoskeletal simulations for activities of daily living
- Muscle and joint force computation + many other features
- Unprecedented model detail and validity



Audio set-up:

During logon



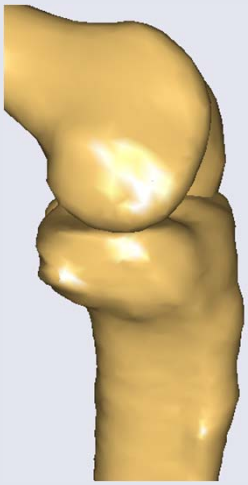
During session

Screen set-up
Select “Sharing” menu (upper right corner) ->View ->Autofit

The web cast will start in a few minutes….

ANYBODY TECHNOLOGY

Modeling and analysis of non-conforming joints in AnyBody



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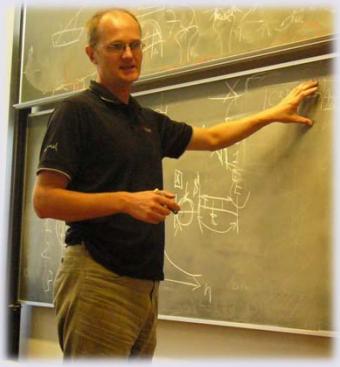
People



John Rasmussen
(Presenter)

Michael Damsgaard
(Host)

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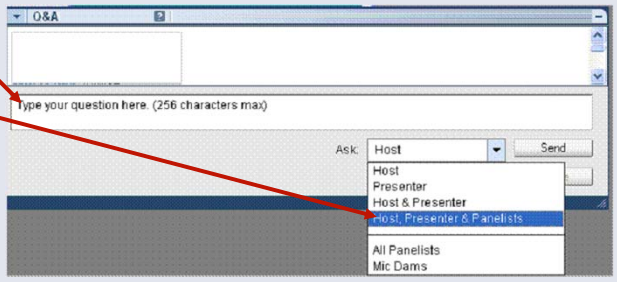
Q&A Panel

- Søren Tørholm
- Launch the Q&A panel here.
- Type your questions in the Q&A panel.
- Send the question to ”Host, Presenter & Panelists”
- Notice the answer displays next to the question in the Q&A box. You may have to scroll up to see it.



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Motivation: Newton’s second law

$$\mathbf{F} = m\mathbf{a}$$

If we know the movement $\mathbf{a}$, then we can compute the force $\mathbf{F}$:
This is inverse dynamics

$$\mathbf{a} = \frac{\mathbf{F}}{m}$$

If we know the force $\mathbf{F}$, then we can compute the movement $\mathbf{a}$:
This is forward dynamics

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- Forward dynamics
  - can handle contact and other phenomena influencing kinematics,
  - but muscle forces are very difficult to deal with.
- Inverse dynamics
  - handles muscle forces if all movements are known,
  - but cannot deal with non-conforming joints because the movement in unknown.

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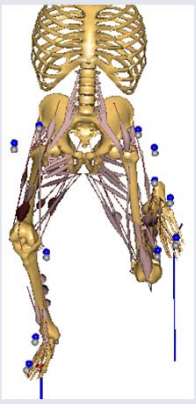
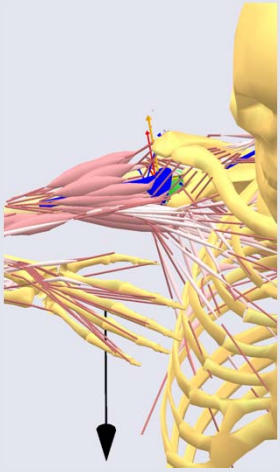
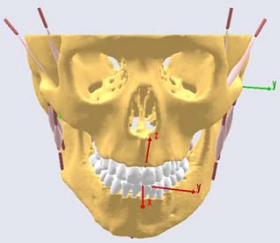
Non-conforming joints



The knee



Protshetic shoulders



The temporo-mandibular joint

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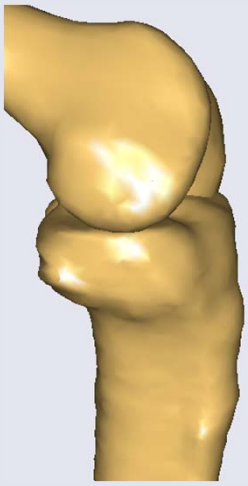
A closer look at the knee



The knee is non-conforming because

- The joint surfaces are incongruent.
- The movement of the tibia w.r.t. the femur depends on the applied forces.

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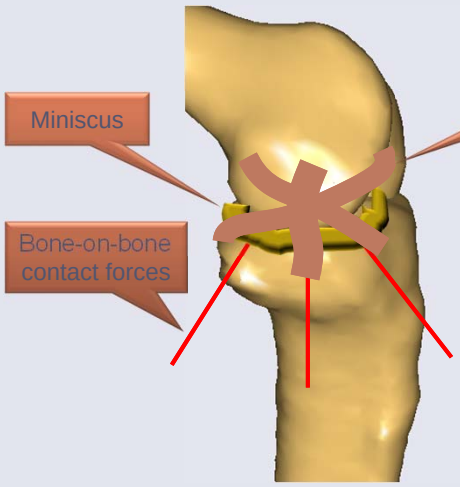
What stabilizes a non-conforming joint?



Force-dependent kinematics: Determine unknown displacements by static equilibrium of (nonlinear) elastic forces.

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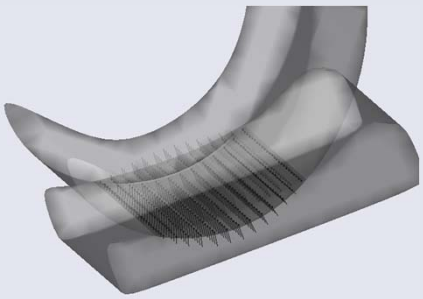
Surface contact measures



- Computes shortest distances and penetration between triangulated surfaces.
- Used to estimate contact force distributions.

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Two demos:

1. In detail:
   Defining a simple knee with FDK
2. Quick:
   Adding real surfaces.

New webcast Sep. 29:

Definition of non-conforming joints in anatomically realistic models.

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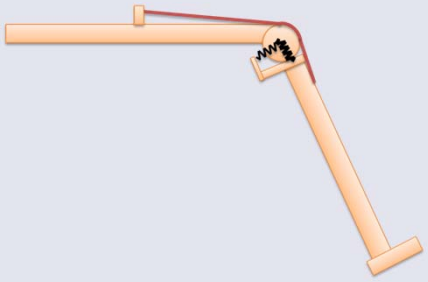
The detailed example

- Example from a new tutorial for version 5.1
- Will be available with the release.
- Femoral condyle + tibial plateau.
- One quadriceps muscle.
- Elastic contact in pressure and shear.



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Online resources

- www.anybodytech.com
  - Free demo license for the AnyBody Modeling System
  - Sign up for the next webcast on Sept. 29th.
- www.AnyScript.org
  - Discussion forum
  - Wiki
  - Model repository
- www.anybody.aau.dk
  - Homepage of the research group

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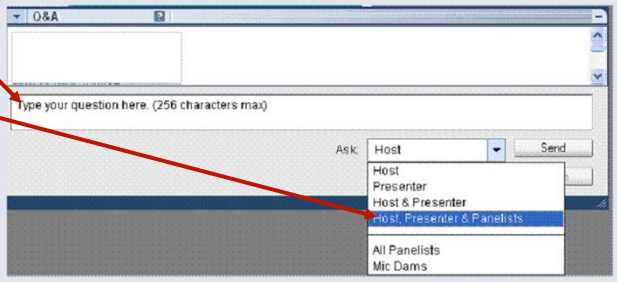

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