

# AnyGait: A powerful gait lab application to process motion capture trials

Amir Al-Munajjed, Søren Tørholm & Arne Kiis

The web cast will start in a few minutes....





#### Presenters



Arne Kiis (Host/Panelist)



Søren Tørholm (Panelist)



Amir Al-Munajjed (Presenter)



# Agenda

- Who is AnyBody?
- The AnyBody Modeling System
- AnyGait
- Examples
- Q & A





# AnyBody Technology





# AnyBody Modeling System

- Developed in-house for musculoskeletal analysis
- Self-contained system
- Interfacing to
  - motion capture
  - image-based bone and muscle data
  - CAD
  - finite-element software
  - office systems
- Open body model
- Broad and deep model validation
- API for imbedded use





#### **Body Model Library**





# Subject Specific Modeling

- Anthropometric scaling
  - Overall body size and shape
- Subject-specific scaling
  - Joint centers
  - Body anthropometry
- Patient-specific bones:
  - Muscle attachments
- Surgical effects
  - Muscle removal



### Activities of Daily Living





### **Dynamic Physiological Loads**







# AnyGait: A powerful gait lab application to process motion capture trials



# AnyGait - Model

AnyGait is:

- an easy-to-use model to analyze motion capture trials in a gait lab or clinical environment.
- a *Gait Application* with all major muscle fascicles.
- highly customable to fit specific needs of gait labs (gait lab setup, patient group, ...)





# AnyGait – GUI

New Graphical User Interface:

- enables easy processing of motion capture trials.
- requires no modeling/programming skills.
- is adaptable to specific needs of gait labs.





# AnyGait – Input/Output

Input:

- C3D files including force plate data
  - predefined and ready-to-use for most Motion Capture system
  - adaptable to almost any kind of setup

Output:

- Important results are displayed in an easy-to-read form.
- All features and results of the AnyBody Modeling System are accessible.
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# **Open AnyGait**

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#### **Nonlinear Morphing**



M.S. Andersen et al. 2012



# **Processing Environment**

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2.0.0.3) ...Initial conditions are fully updated.

2.0) Inverse dynamic analysis...

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2.0) Inverse dynamic analysis...



#### Results





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# Marker Names

// Right Leg RThighSuperior, RKneeLateral, RKneeMedial, RShankSuperior, RAnkleLateral, RAnkleMedial, RHeel, RToe // Left Leg LThighSuperior, LKneeLateral, LKneeMedial, LShankSuperior, LAnkleLateral, LAnkleMedial, LHeel, LToe // Hip RAsis, LAsis, RPsis, LPsis

// Right Leg

RTHI, RKNE, RTHL, RTIB, RANK, RMMA, RHEE, RTOE // Left Leg

LTHI, LKNE, LTHL, LTIB, LANK, LMMA, LHEE, LTOE // Hip

RASI, LASI, RPSI, LPSI



# Some Examples of Early Stage Users







Putzer et al. 2011





Special Issue Article

#### Measuring functional outcome after total hip replacement with subject-specific hip joint loading

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Figure 1. (a) The specified marker set used in this study and its placement on the bory landmarks; (b) front and rear view of subject 1 during the musculoskeletal simulation.



Figure 2. (a) Force path (line) on the head of the implant for every computed time step (t<sub>i</sub>) during the stance phase. (b) Force angles (and their definition) on the cup of the joint for every computed time step (t<sub>i</sub>) during the stance phase.



#### The effect of including accurate pelvis bony landmarks in a nonlinearly scaled musculoskeletal lower extremity model

Andersen M. S. <sup>1</sup>, Mellon S. <sup>2</sup>, Lund M. E. <sup>1</sup>,Grammatopoulos G. <sup>2</sup>, Gill H. S. <sup>2</sup> <sup>1</sup>M-Tech, Aalborg University, Aalborg, Denmark, msa@m-tech.aau.dk <sup>2</sup>NDORMS, University of Oxford, Oxford, United Kingdom

#### 3DHMA 2012, Bologna, Italy

#### WHY DON'T ALL MALPOSITIONED RESURFACED CUPS HAVE HIGH WEAR? - A DYNAMIC, GAIT LAB STUDY.

G Grammatopoulos, S Mellon, M S Andersen, H Pandit, R Gundle, P McLardy- Smith, D Murray, H Gill NDORMS, University of Oxford, Oxford, Nuffield Orthopaedic Centre, Oxford, UK, Aalborg University, Denmark

#### ORS 2012, San Fransisco, CA





### **Final Remarks**

- AnyGait is a powerful model to analyze motion capture trials in a gait lab or clinical environment.
- Pre-defined GUI makes it easy-to-use, but still highly customable to fit specific needs.
- In a few minutes from C3D to e.g. *Joint Reaction Forces* and *Muscle Activations*...





### Q & A

- www.anybodytech.com
- <u>www.anyscript.org</u>



#### Webcast:

- 28 June: Features of the New AnyBody Modeling System v5.2
   <u>Conferences</u>:
- 18-20 July: 3D Analysis of Human Movement, Bologna, Italy
- 15-18 Aug: Am. Soc. Biomechanics, Gainesville, FL
- 13-15 Sep: ESMAC, Stockholm, Sweden

This presentation will be available in a few days and sent to you!