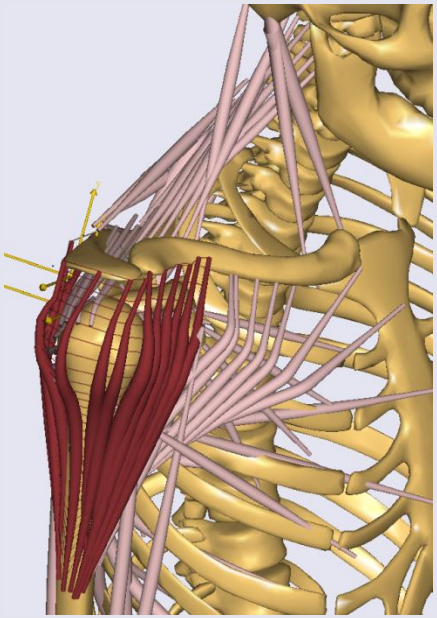
The new release of the AnyBody Modeling System

Version 6.0

Outline

- Simulation core
- AnyBody UI
- Model repository
  (AMMR, v.1.6)



Michael Damsgaard
(Presenter)

News in AnyBody, v.6.0

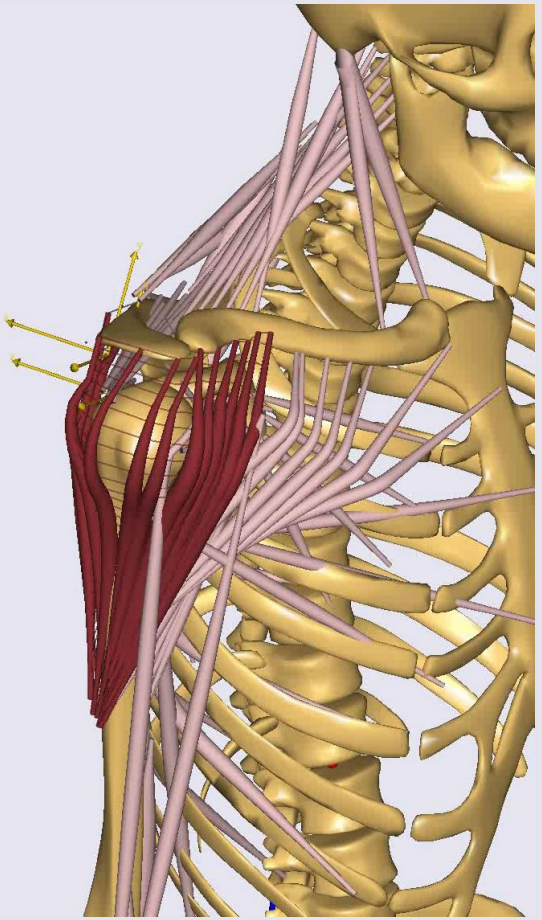
- Simulation core
  - Improved muscle wrapping: *Faster, new sheet-geometries*
  - Improved kinematic engine
  - Increased core efficiency: *64bit version, new core modules, etc.*
- AnyBody's User Interface
  - Improved force visualization
  - New model navigation possibilities
  - Improved chart view and data export
  - New Getting Started tutorials
- Model repository (AMMR, v.1.6)
  - Template models: *A new easy starting point, make your own*
  - Human model: *New body model configuration interface, updated examples*
  - Body parts: *New detailed foot models, updated arm and leg models, restructured for future new human data sets*

See Release notes: *Windows Start Menu->AnyBody Technology->... ->Doc->Release Notes*

Muscle Wrapping

- New wrapping contact algorithm
  - More robust
    - New initial positioning
    - Large step support (as solver and muscle setting)
  - Faster
- Sheet geometries
  - Elastic sheet
  - Wrapping over analytical surfaces
  - Additional constraints

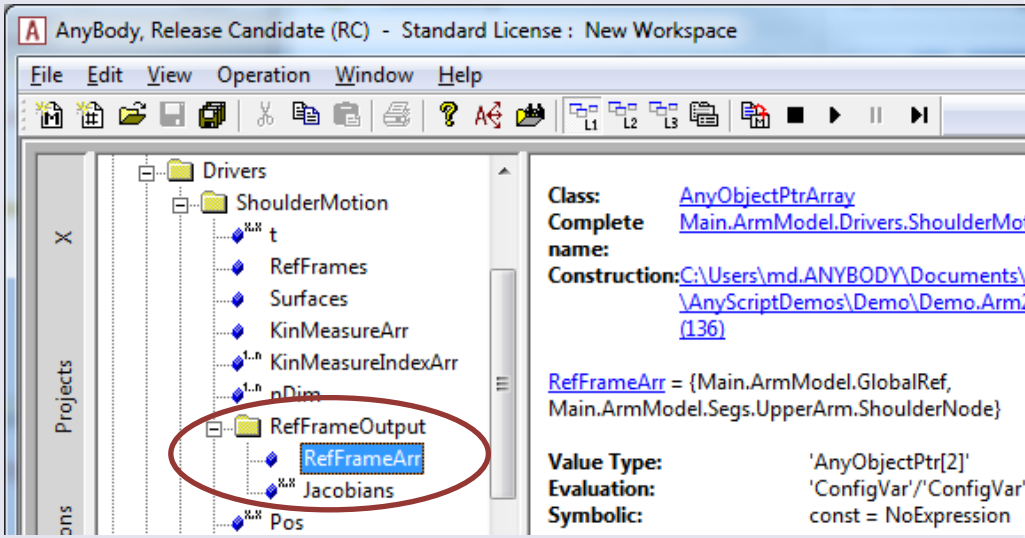
New



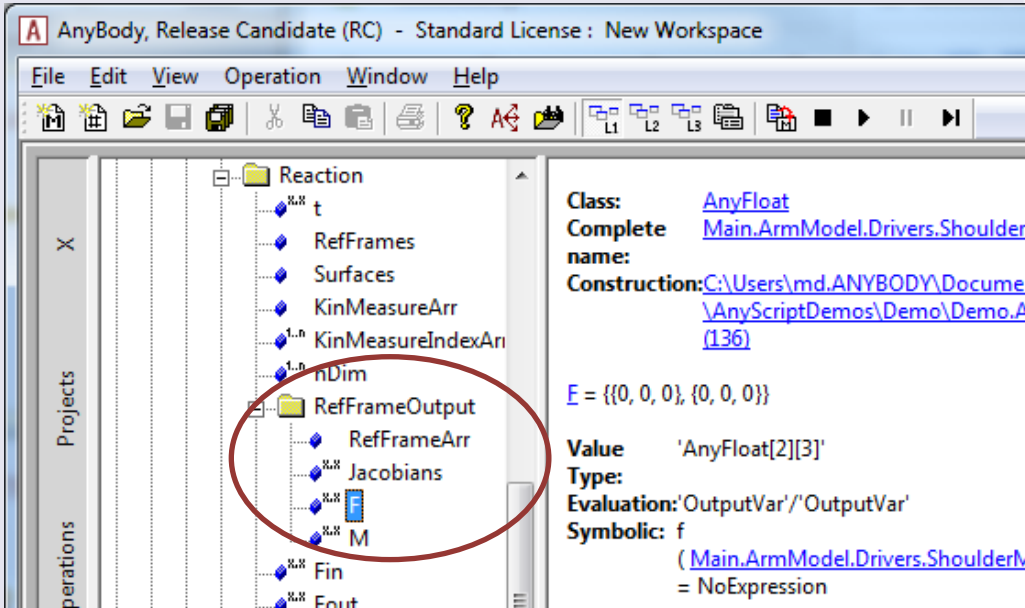
Prototype shoulder model

New Output

- Kinematic Measures:
  - New
  - New output associated with input-nodes
  - More efficient updating



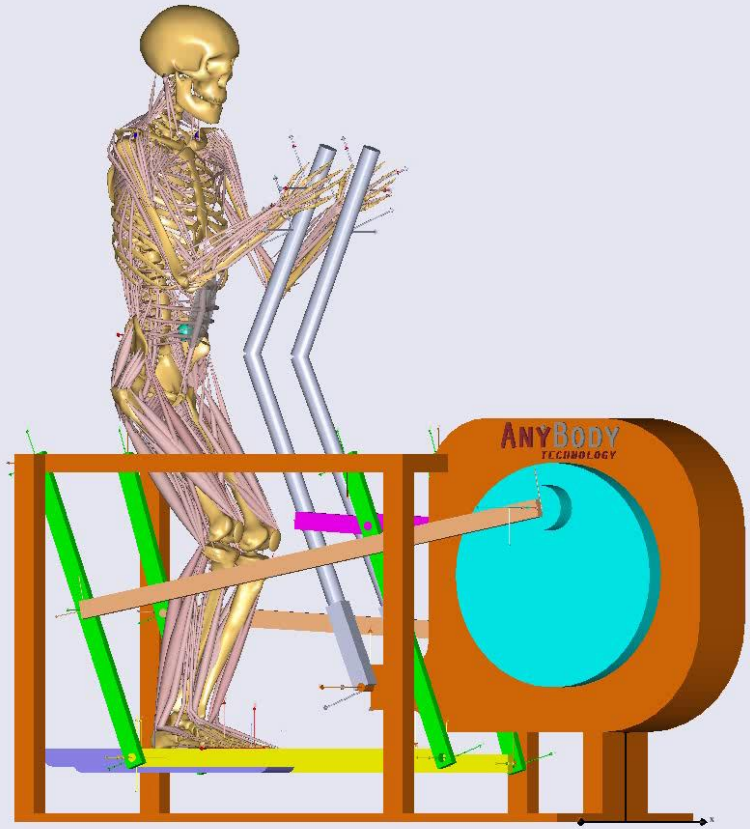
- Forces:
  - New
  - 3D force/moment vectors
  - Global coordinates
  - Similar for all objects



Force Visualization

New

- Display all forces based on the Model Tree
- Show current values or components



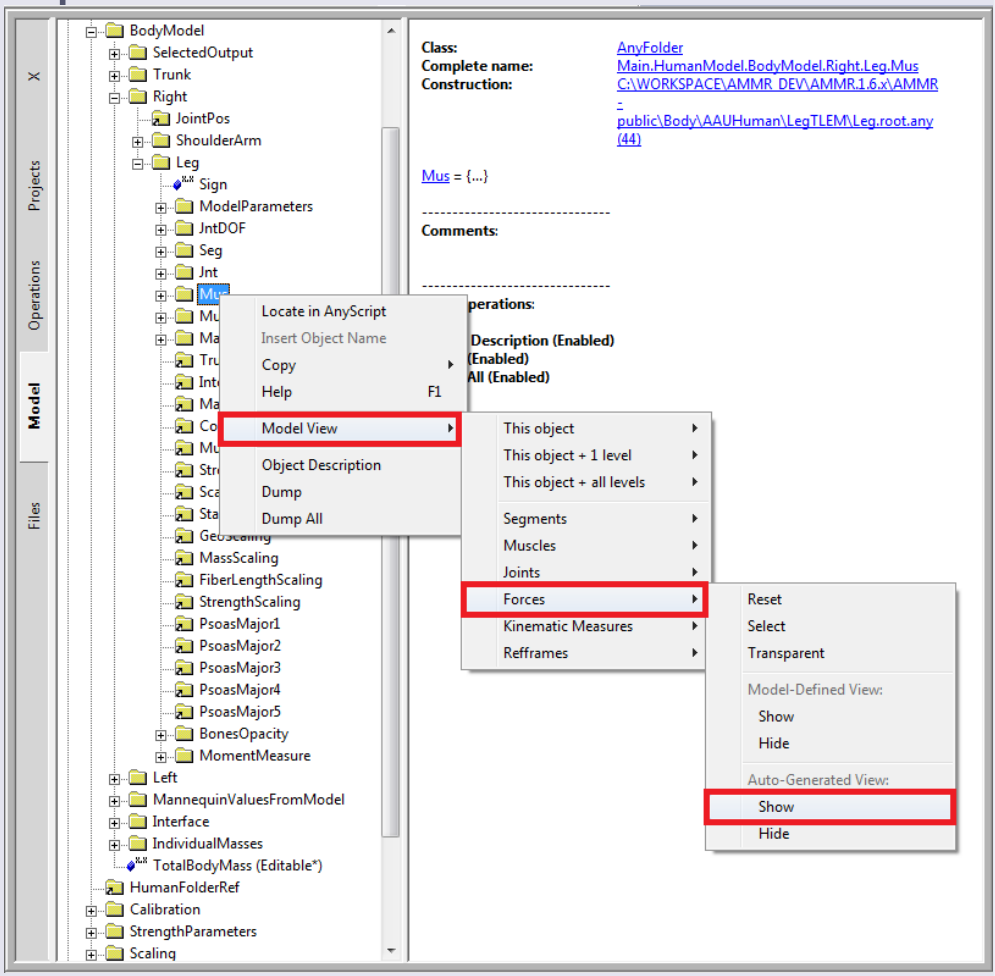
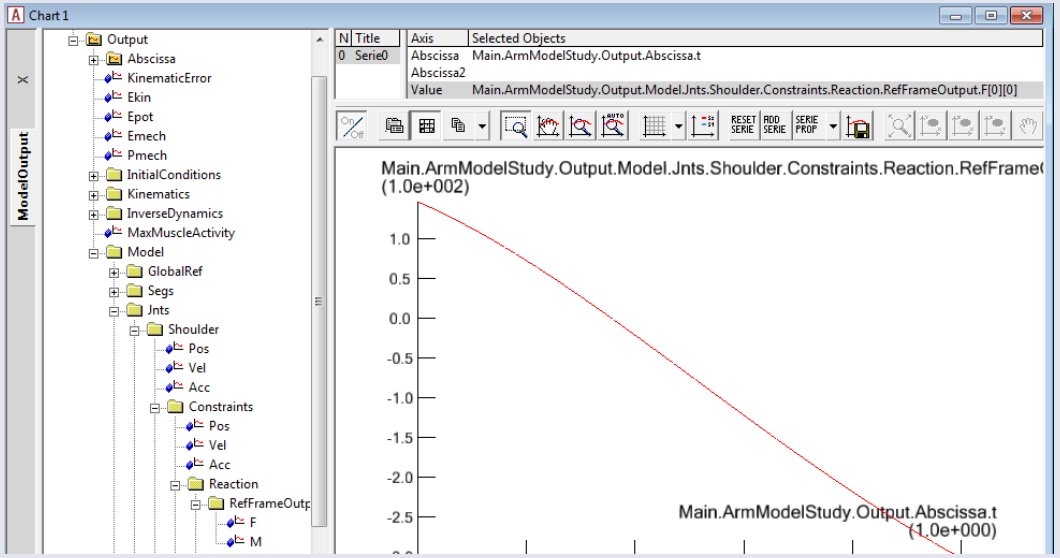
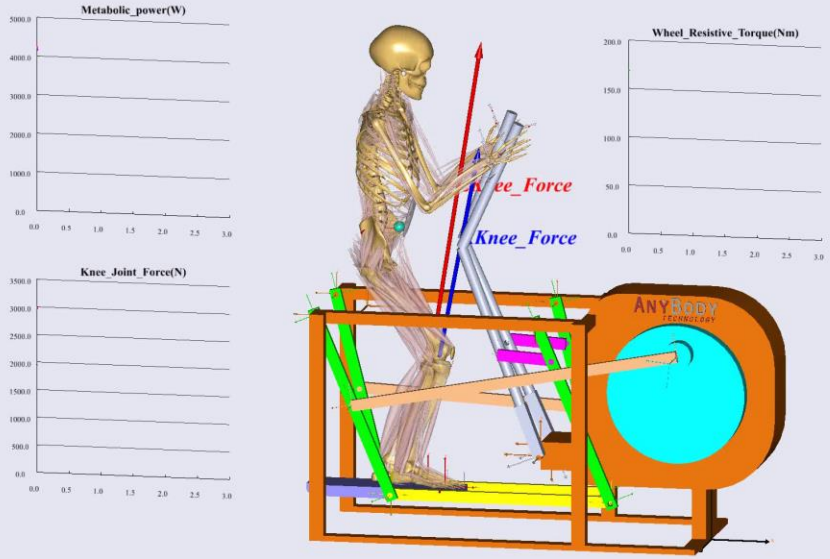


Chart View

New

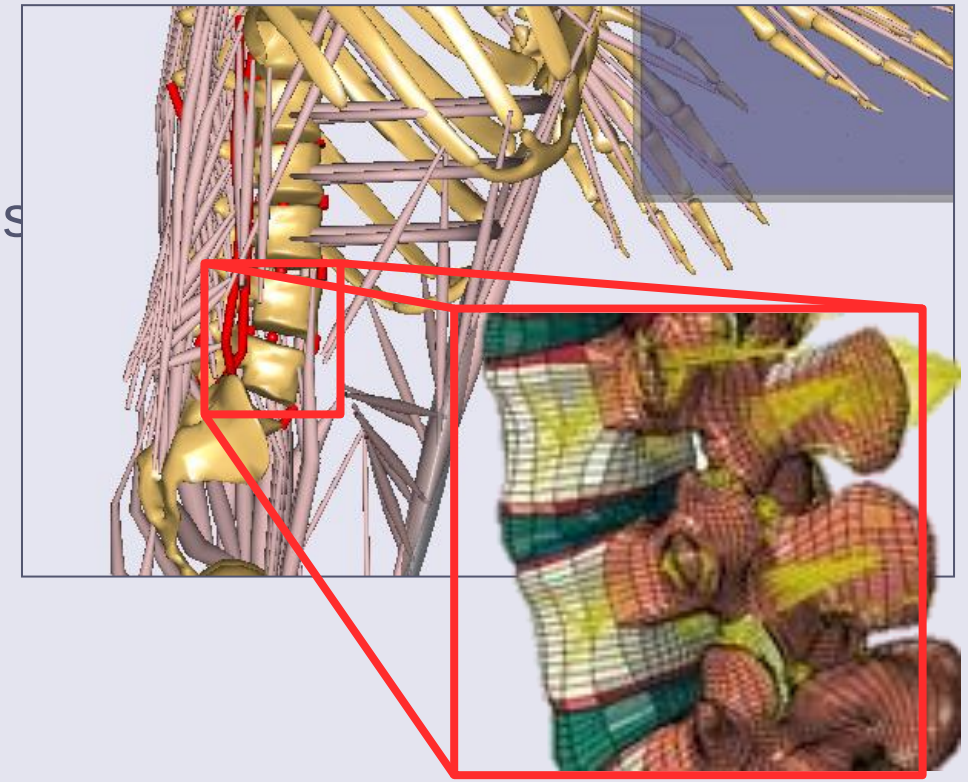
- **One Chart View:**
  AnyChart improved, ChartFX removed
  - *New toolbar for easy access to style options*
  - Improved export to e.g. CSV/Excel
  - New export to Python
- AnyChart in model and GUI





Finite Elements Interface

- FE interfaces:
  - Abaqus: AnyBody2Abaqus converter
  - Ansys: AnyBody2APDL converter
  - Others: Generic XML or TXT
- Export-filters **New**
  - Easier to define selected output for FE
  - Support for multi-segment FE modeling

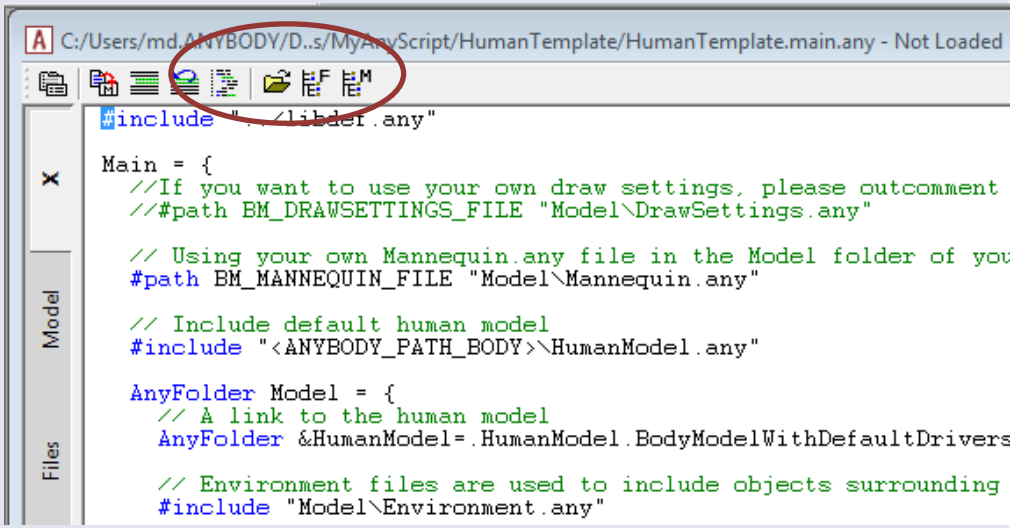


FE model: Gardomski et. al., 2011

```
AnyMechOutputFileForceExport ForceOutput = {
      ...
      // Filters
      ForceObjectList = ObjSearchRecursive("refTrunk.MusclesSpineRight", "*", "AnyMechObject");
      // Exclusion
      ForceObjectExclude = ObjSearchRecursive("refTrunk.MusclesSpineRight", "Multifidi*", "AnyMechObject");
    };
```

Model Navigation

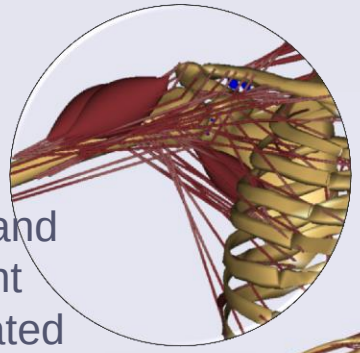
- AnyScript Editor w. extended toolbar

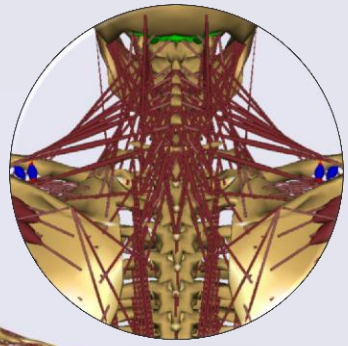


- See YouTube demonstrations

AnyBody Managed Model Repository (AMMR)

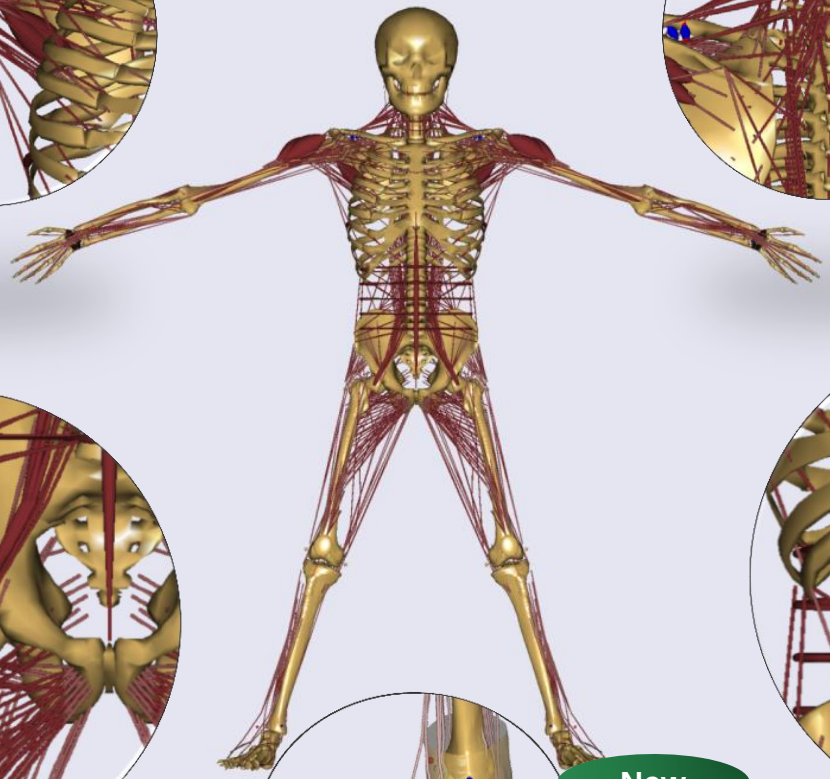
Tutorial





Shoulder-Arm:

- More robust and better moment arms by updated muscle wrapping

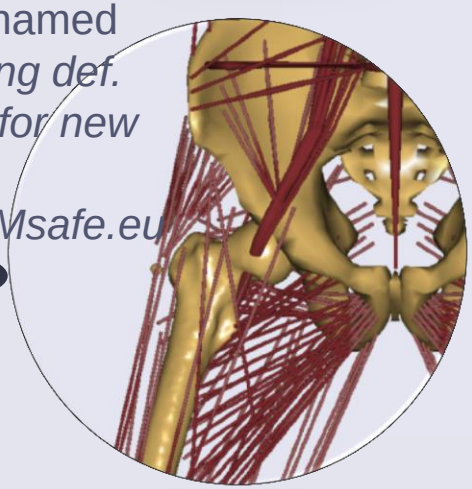


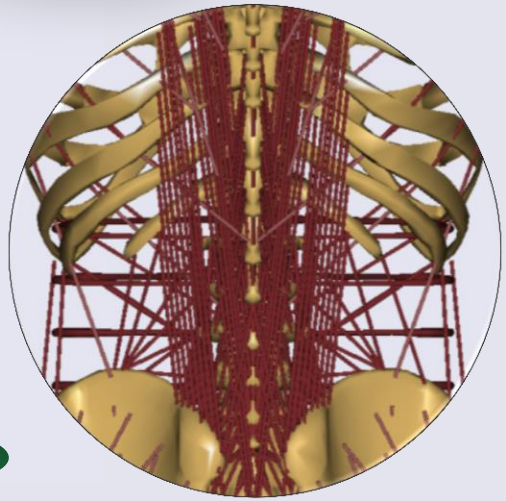
LegTLEM

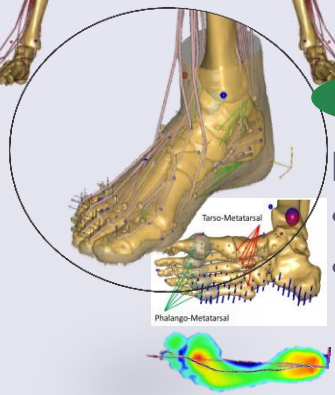
New

- LegTD renamed
- *New scaling def.*
- *Prepared for new data from www.TLEMsafe.eu*

Webcast







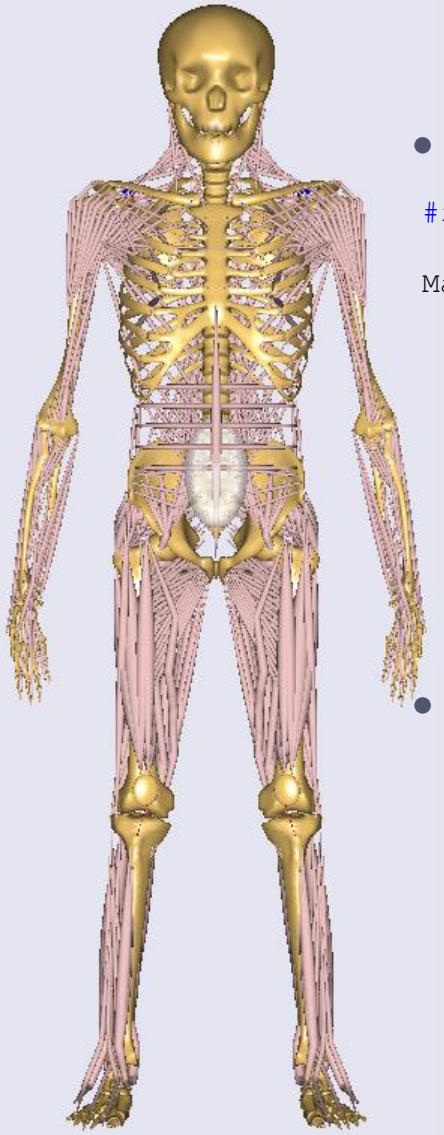
New

Detailed Foot (GMFoot):

- www.AFootPrint.eu
- Glasgow Cal. Uni & Maastricht Uni

Webcast

Models: Configuration



- Easy setup with default human

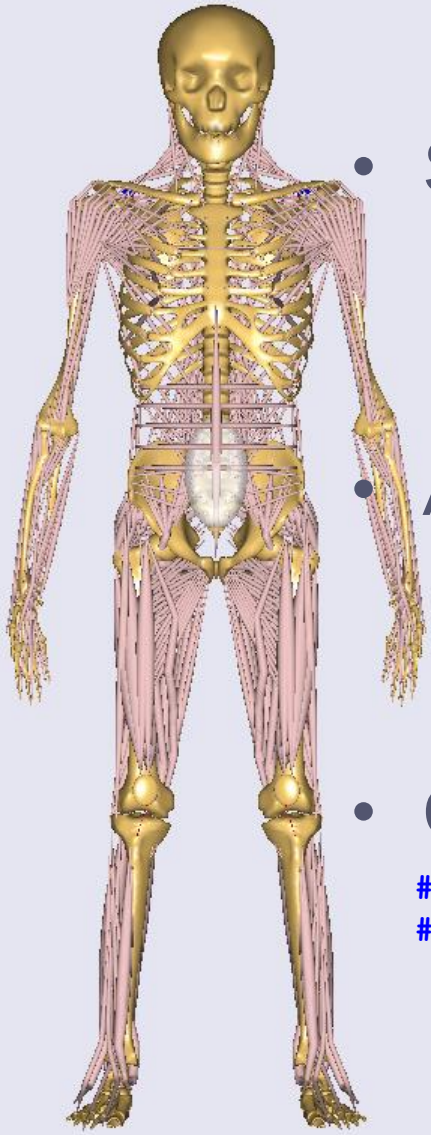
```
#include "../libdef.any"

Main = {
  //#path BM_DRAWSETTINGS_FILE "Model\DrawSettings.any"
  #path BM_MANNEQUIN_FILE "Model\Mannequin.any"

  // Include default human model
  #include "<ANYBODY_PATH_BODY>\HumanModel.any"
```

- Options, such as **Tutorial**
  - Body part configuration
  - Muscle configuration
  - Model scaling
  - Default kinematic joint drivers (weak or strong)

Models: Configuration



- Simple body configuration

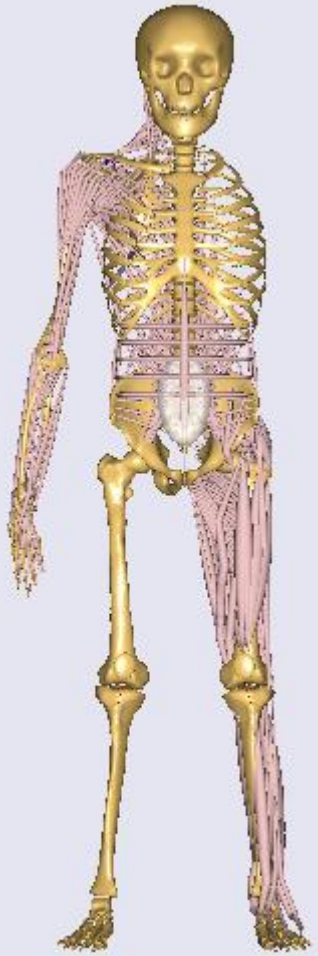
```
#define BM_ARM_LEFT OFF
#define BM_LEG_MUSCLES_RIGHT  CONST_MUSCLES_NONE
```

- Antropometric scaling law

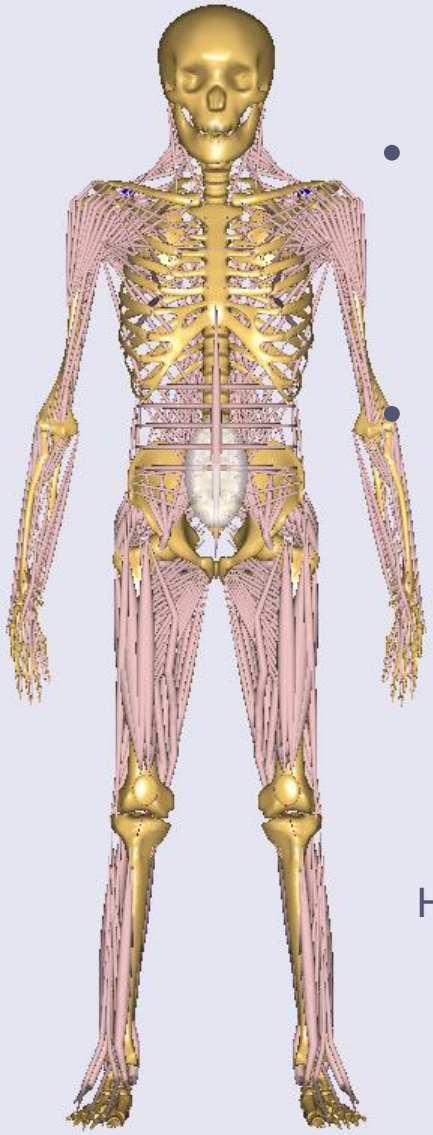
```
#define BM_SCALING  CONST_SCALING_UNIFORM
#path BM_SCALING_ANTHRO_FILE "Model\AnyManUniform.any"
```

- Own anthropometric laws

```
#define BM_SCALING CONST_SCALING_CUSTOM
#path BM_SCALING_MY_FILE "Model\myAnthroLaw.any"
```



Models: Scaling options



Webcast

Tutorial

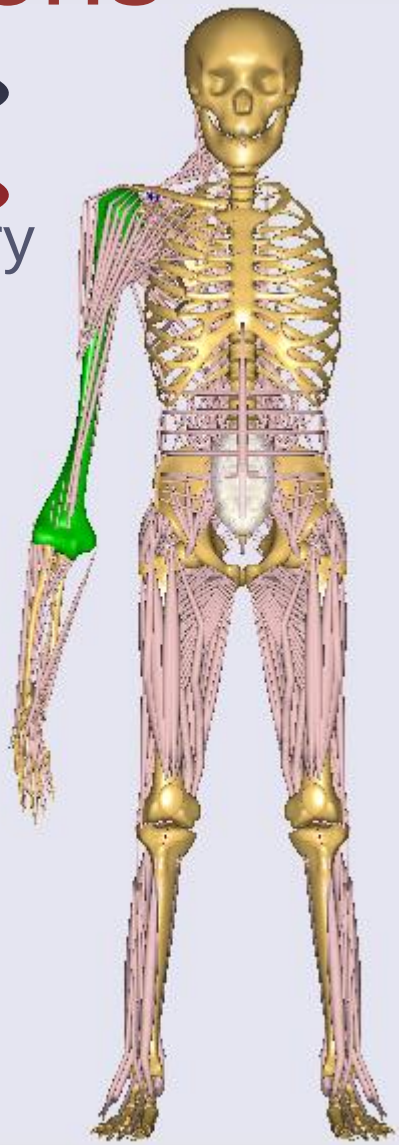
- Scaling Laws: defines the Scaling Functions based on anthropometry

- Individual bone scaling/morphing

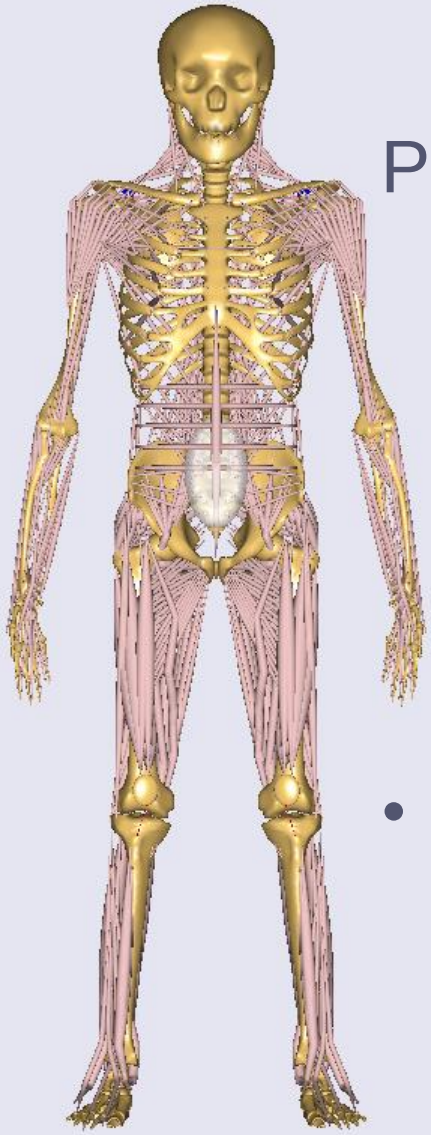
New

```
#define CUSTOM_SCALING_Humerus
 HumanModel.Scaling.GeometricalScaling.Humerus = {
   AnyFunTransform3DLin ScalingFunction = {
     ScaleMat = {{1,0,0},{0,1,0},{0,0,1}}*1.5;
     Offset = {0,0,0};
   };
 };
```

Humerus size x 1.5



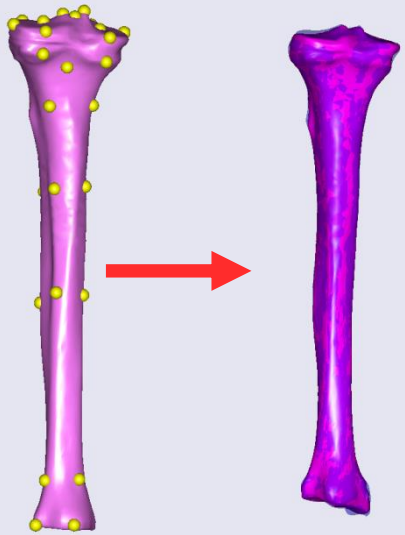
Models: Scaling options

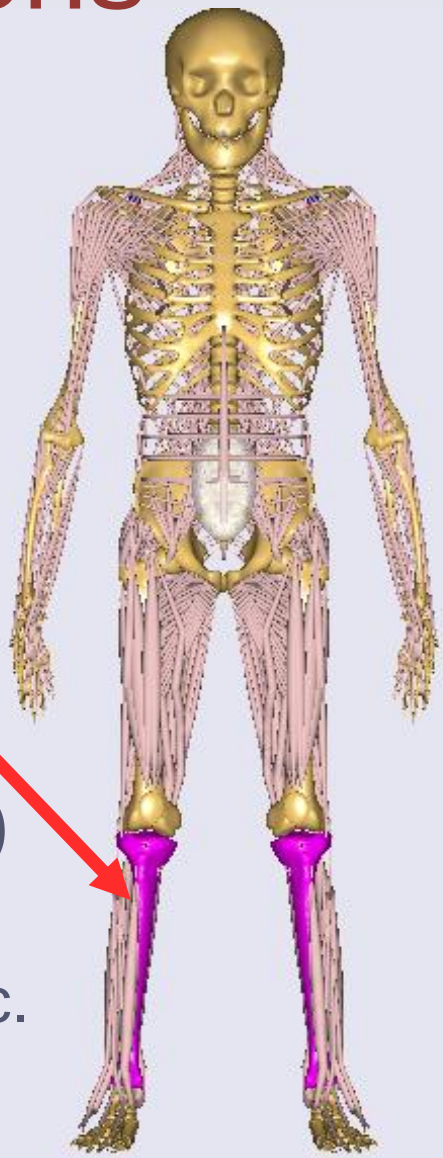


Webcast

Tutorial

Patient-specific scaling:

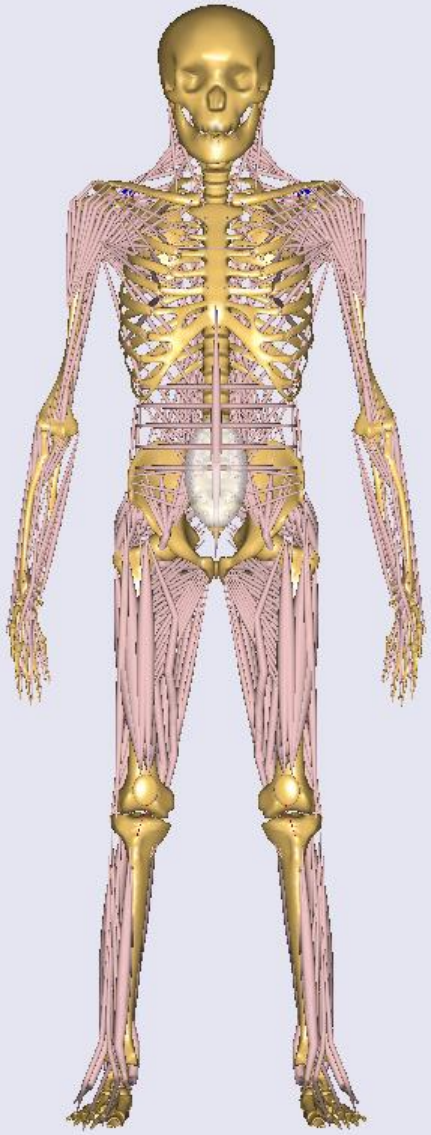




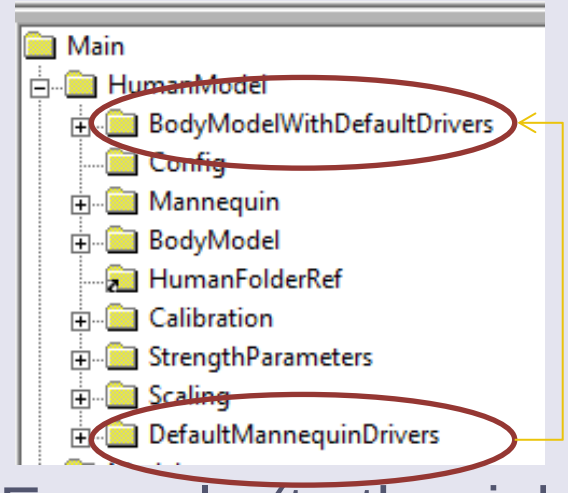
- Non-linear scaling (morphing)
  - Bone morphing based on bony landmarks, surface vertices, etc.
  - Medical image input (CT/MRI)

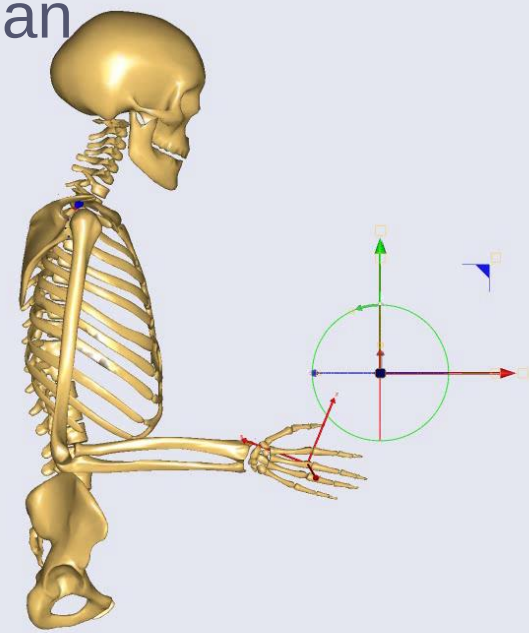
Model: Default joint drivers

New



- Default joint drivers in human model (optional)





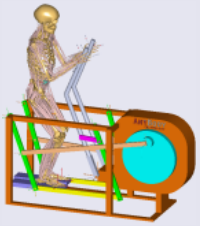
- Example (to the right):
  - Mix of hard and soft default drivers
  - Soft default joint angle drivers specify ”preferred angles”
  - Hand driven by widget

Applications Overview

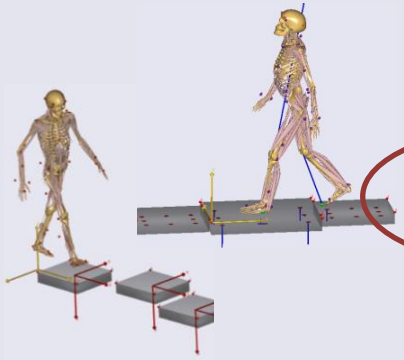
Templates

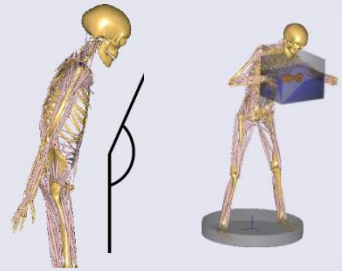
New

- Basic Main
- Human
- Human Standing



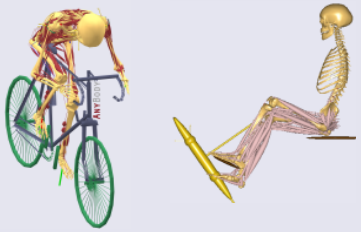
AnyGait

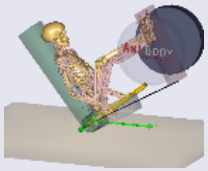


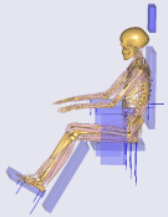


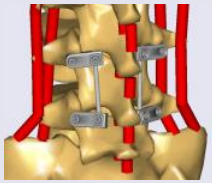
Examples

- AirlinePassenger
- ArmCurl
- BenchPress
- BikeModel — New
- BikeModel2D
- BikeSpring
- C3DProject
- CrossTrainer
- Egress
- FacetJointModel
- FreePosture
- JumpingJack
- LegPressMachine
- MaxForceNeckModel
- MoCapModel — New
- MoCapModel-Runner
- MoCapModel-UniMiami
- PedalDemo
- PedalDemoConditional
- PushUp
- SeatedHuman
- SeatedHumanFullWithNeck
- ShoulderBag
- SpineFixationWithForceDepKinematics
- StandingLift
- StandingModel — New
- StandingModelScalingDisplay
- THA-KneeBendDemo
- WheelChairRancho
- WheelTurn









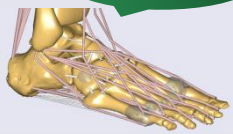
Validation

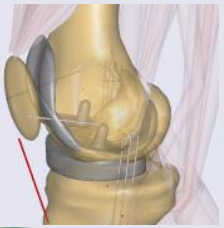
- BergmannGH
- GaitVaughan
- MandibleChewingAndClenching
- WilkeSpinalDiscPressure

Beta

- FreePostureFootGMFoot
- IndexFinger_JohnWu
- MoCap-GMFoot
- TKA-KneeBendDemo
- UlmRatHindlimbModel
- AAUCow

New

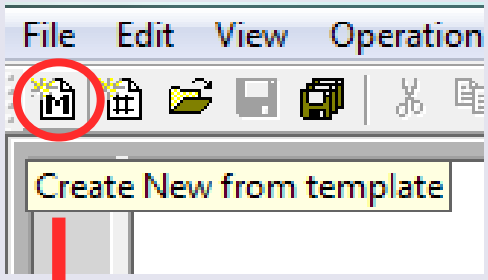


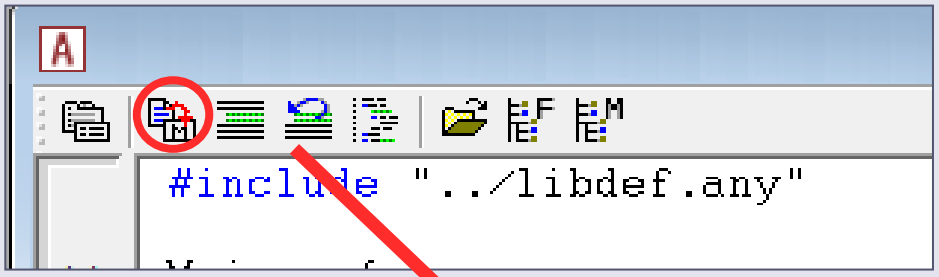


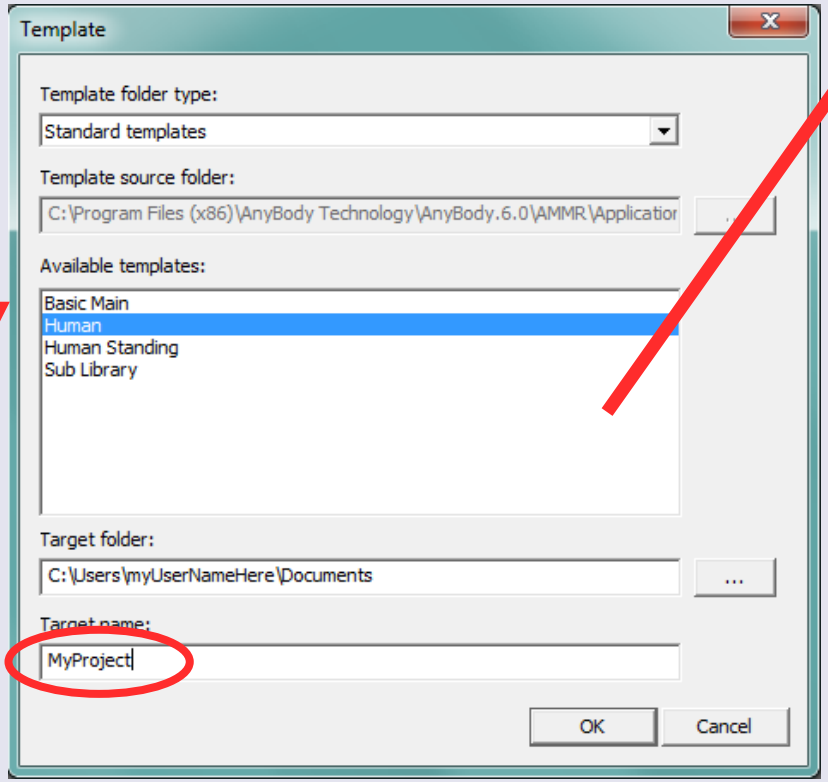
New

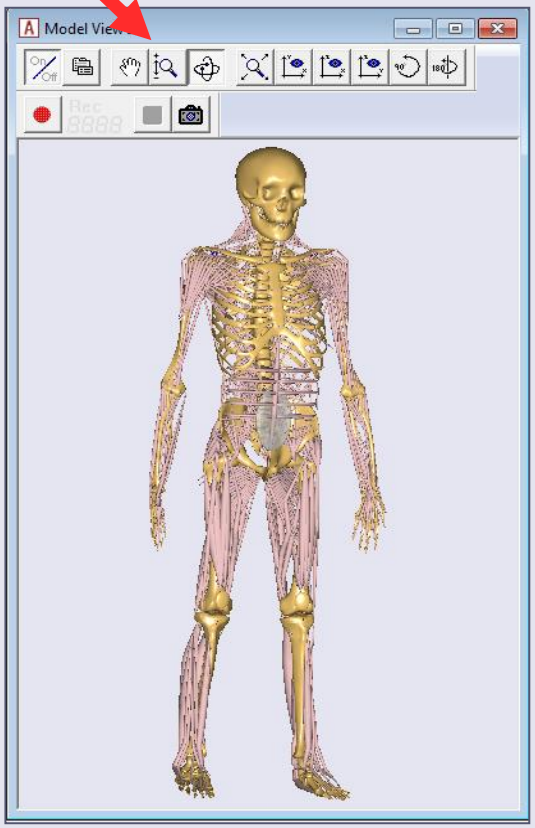
Template Wizard

New



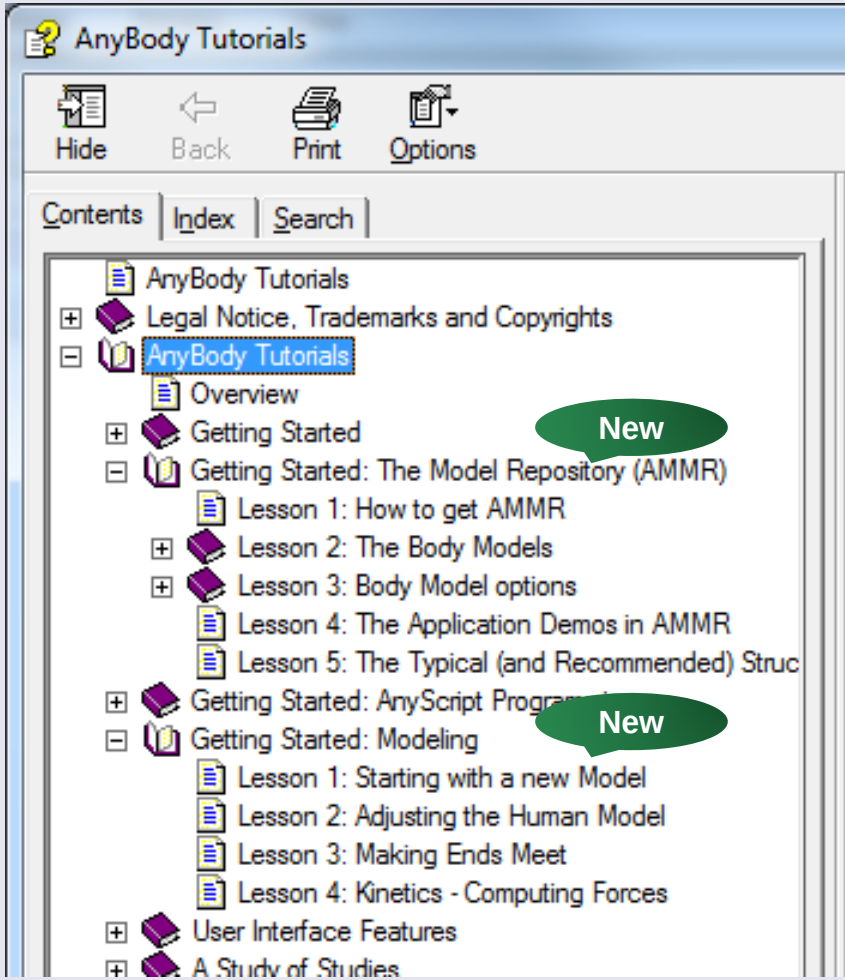






Documentation

- AnyBody Tutorials
  - Four “Getting Started…”
  - Replacing “Building block”



- YouTube
  - Demonstration videos
  - https://www.youtube.com/user/anybodytech

Final Remarks

- Backward compatibility
  - New AMMR models do not run in older AnyBody versions
  - Old models may need updates
- License:
  - **Maintenance:** Use your current license, but you must import the license from AnyBody 6.0

Resources

- Website: **www.anybodytech.com** - Offices in Denmark and the US.

- Publication list: www.anybodytech.com/index.php?id=publications
- Webcasts: https://www.youtube.com/user/anybodytech
- Forum and wiki: www.anyscript.org

The AnyBody Modeling System

- Tutorials: *AnyBody Menu -> Help -> Tutorials*
- Demonstration videos: https://www.youtube.com/user/anybodytech

New

- Release notes: See installation documentation:

  Windows Start Menu -> AnyBody Technology -> ... -> Doc-> Release Notes

- Distributors: http://www.anybodytech.com/index.php?id=564