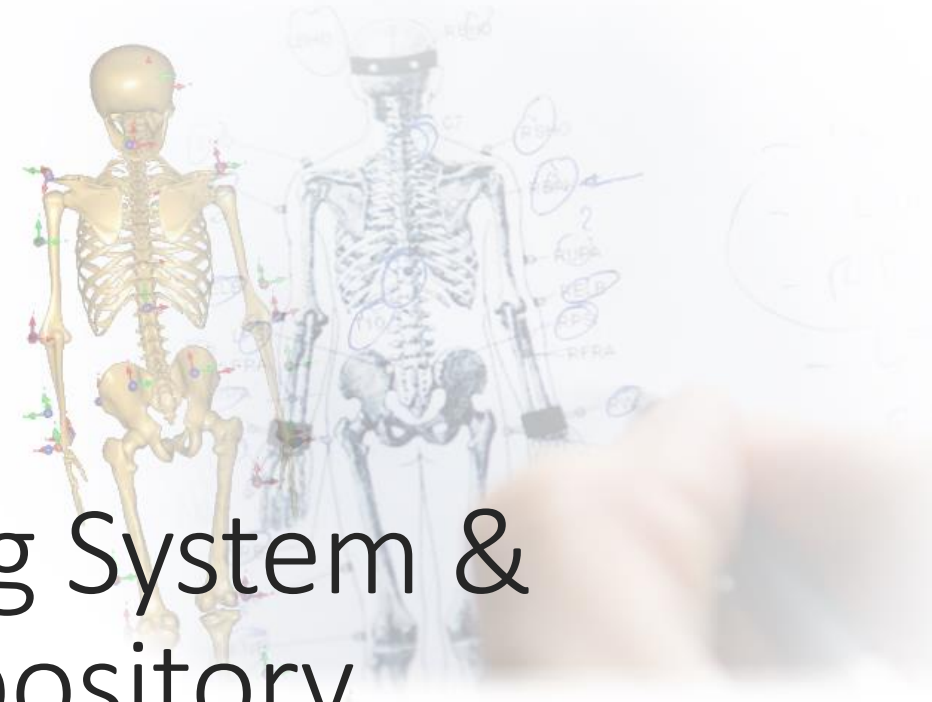




Presenter:
Morten Enemark Lund
R&D Engineer
AnyBody Technology

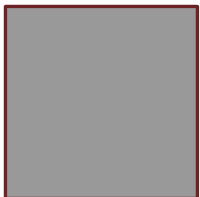


Support:
Kristoffer Iversen
Technical Sales Executive
AnyBody Technology



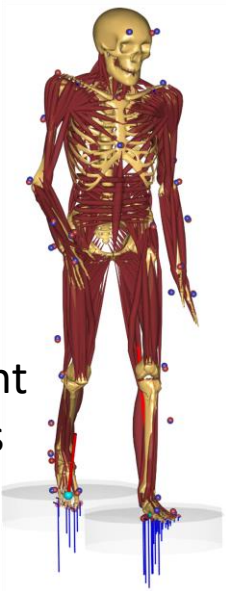
The new AnyBody Modeling System & Musculoskeletal Model Repository

TOUR AND OVERVIEW OF THE NEW 7.4 VERSION



Agenda:

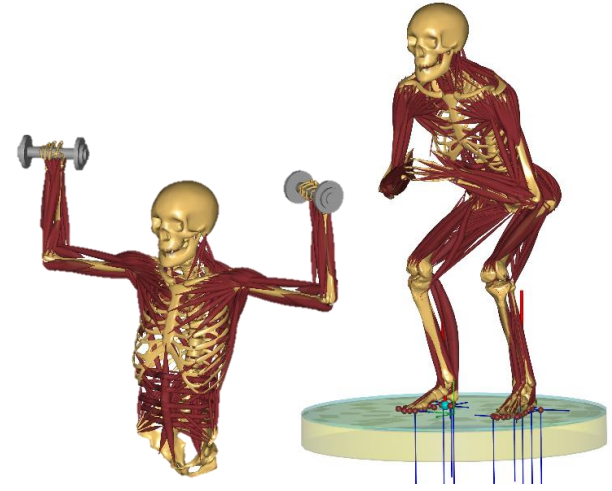
- Model Repository (AMMR 2.4)
- AnyBody Modeling System 7.4



Movement
Analysis

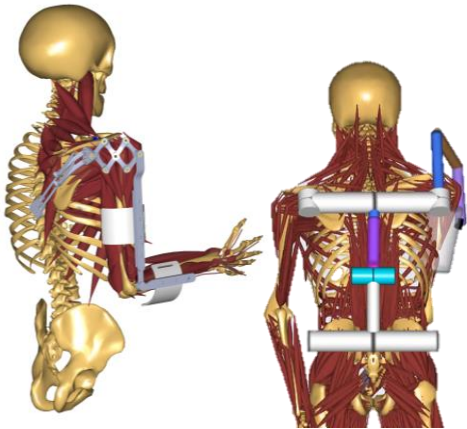


Product optimization design

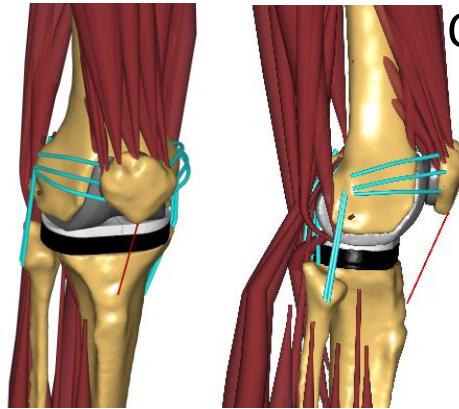


Sports

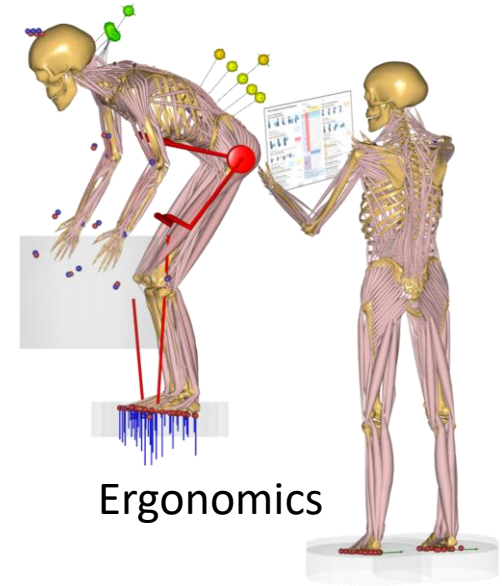
ANYBODY
Modeling System



Assistive
Devices



Orthopedics
and rehab

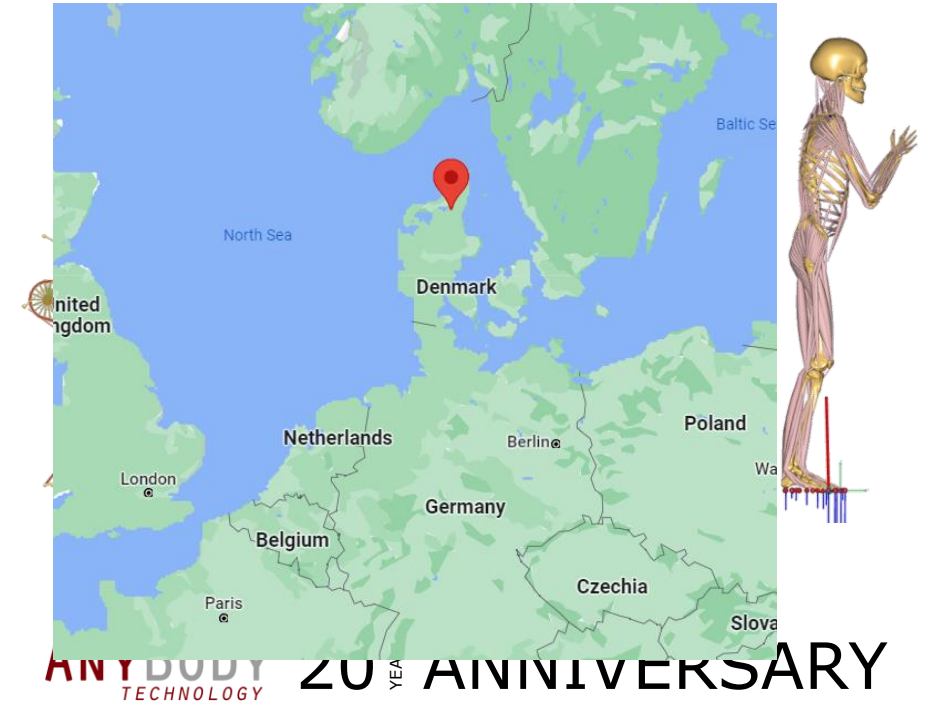


Ergonomics

Who is AnyBody Technology?

- Small company in Northern Denmark.
- Long expertise in biomechanical simulations
- Business areas:
 - Maintain/sells AnyBody Modeling System
 - Training / Support
 - Consultancy projects/services

 **Get in touch?** sales@anybodytech.com



Spin out from biomechanical research
at Aalborg University.

New AnyBody release

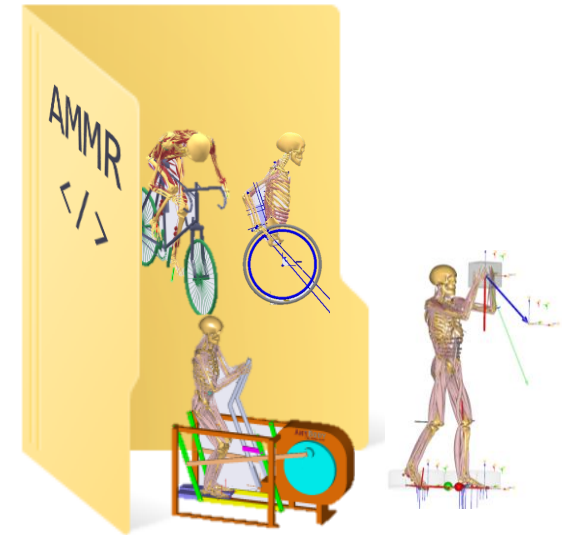
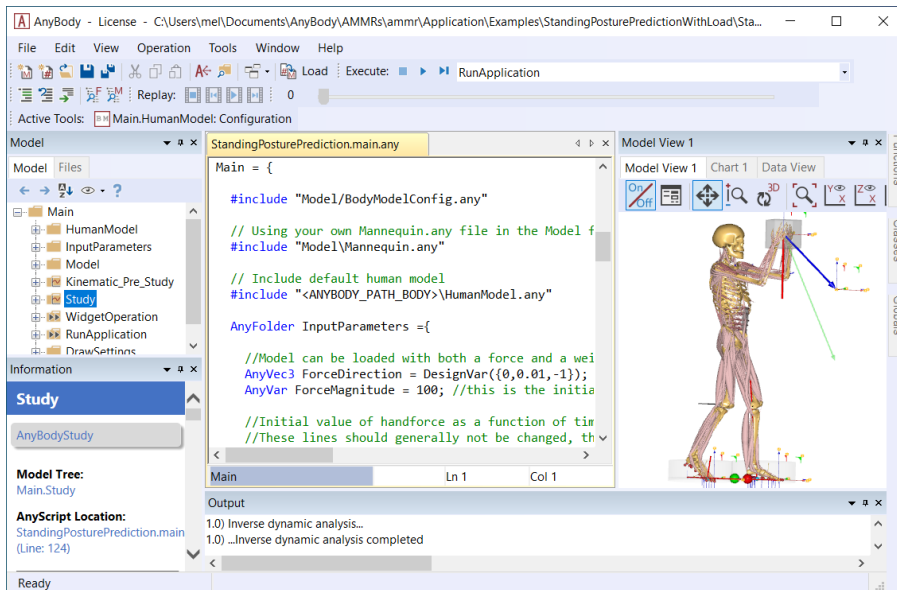
ANYBODY
Modeling System

Version 7.4.1

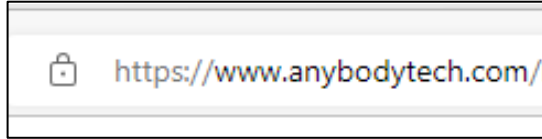
Just released!

ANY
MODEL REPOSITORY

Version 2.4.1



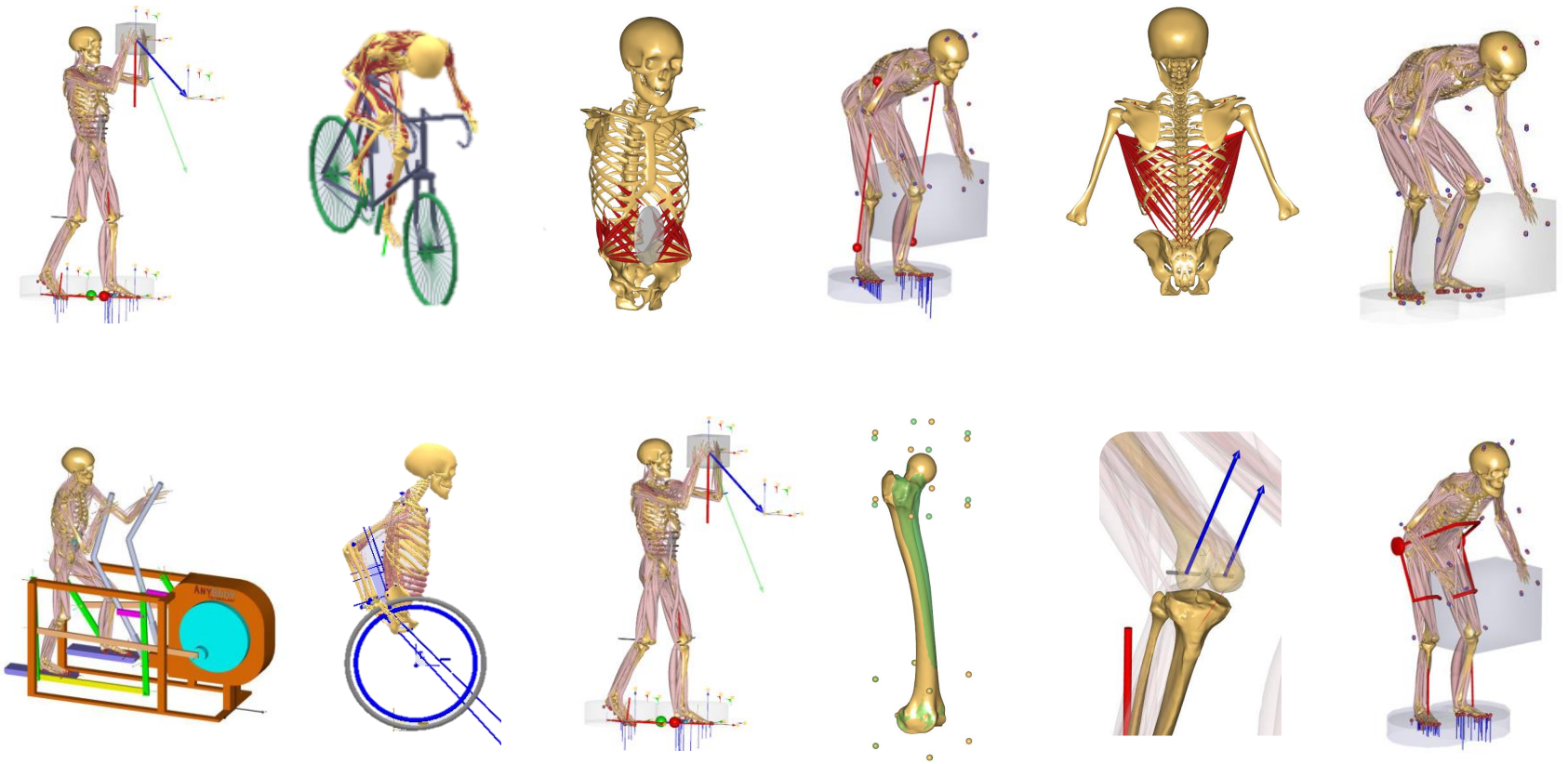
How to get AnyBody?



The screenshot shows the AnyBody Technology website. The page title is "Customer Downloads". The navigation menu is open, showing options like "Trial Downloads", "Customer Downloads", "Publication list", "Previous webcasts", "Fact sheets & brochures", "Documentation", "Projects", and "Partners". A yellow arrow points to the "Customer Downloads" option in the menu. Below the menu, there is a table of download links for the AnyBody Modeling System. A yellow arrow points to the "Download" button for the 7.4.0.8782 version.

Download installers for the AnyBody Modeling System

Title	Version			Download
AnyBody Modeling System (64-bit version)	7.4.0.8782	2. May 2022	851.73 MB	Download
AnyBody Modeling System (64-bit version)	7.3.4.8518	5. July 2021	881.28 MB	Download



Model repository

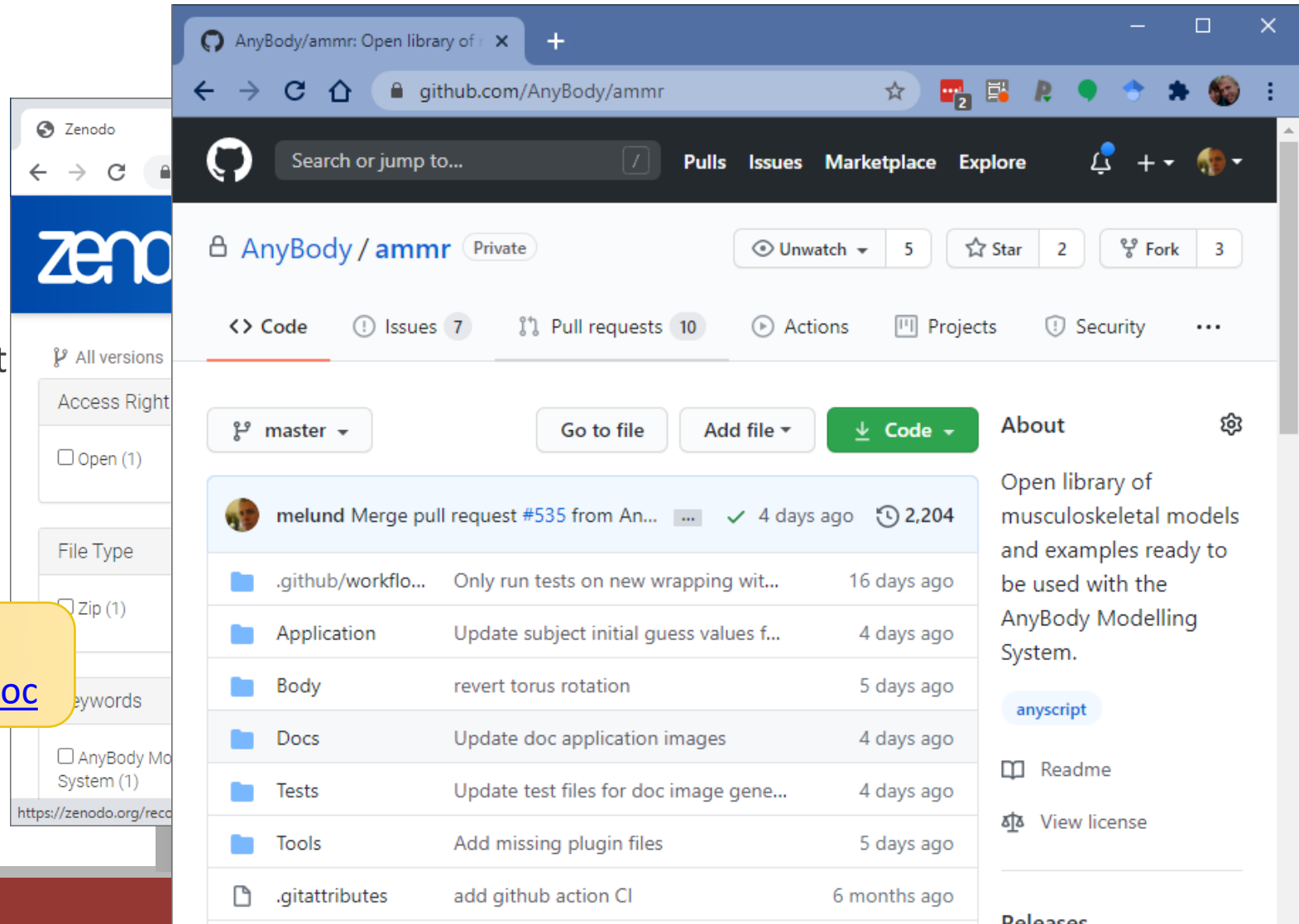
What is new in AMMR 2.4

How to get the model repository...

- Bundled with AnyBody
- Archived on zendo.org
- Development repository on GitHub
 - Bleeding edge models
 - Semi-private repository on GitHub

Apply for access here:

<https://github.com/AnyBody/ammr-doc>



Model Repository (version 2.4.1)

- Development since version 2.3
 - 80+ pull requests
 - Many contributions on GitHub from external users
- New model examples and improved body models
- Many fixes and tweaks to performance and robustness

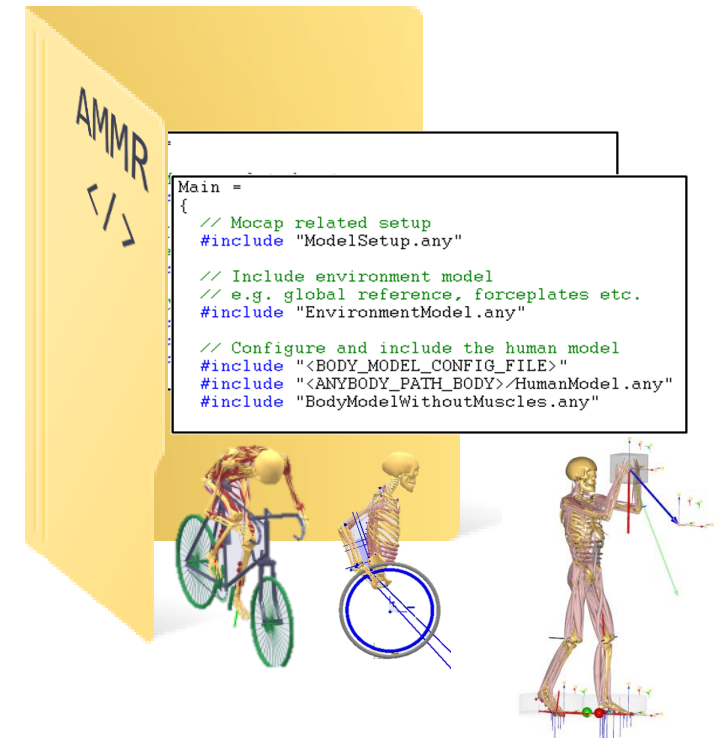
AnyBody Managed Model Repository



What is new?

Highlights:

1. Many new examples
2. Automatic tool for video creation
3. Host of smaller fixes/changes



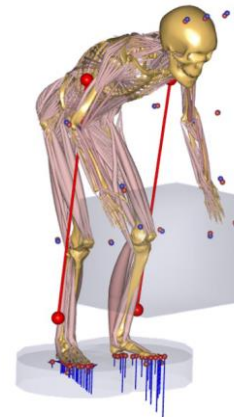
New lifting examples

- Box Lift MoCap example Model
 - Shows how to connect MoCap model with environment.

- Two concept models for exoskeletons
 1. Explorative model -> See webcast
 2. Example of a simple trunk exo

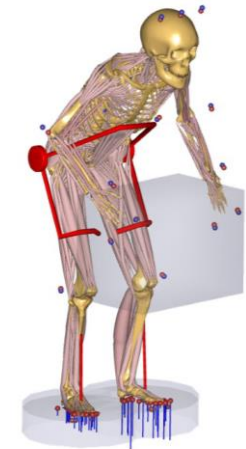


MoCap box lift example



Exoskeleton concept
example

See webcast by:
Prof. John Rasmussen
Aalborg University



Trunk exoskeleton
example



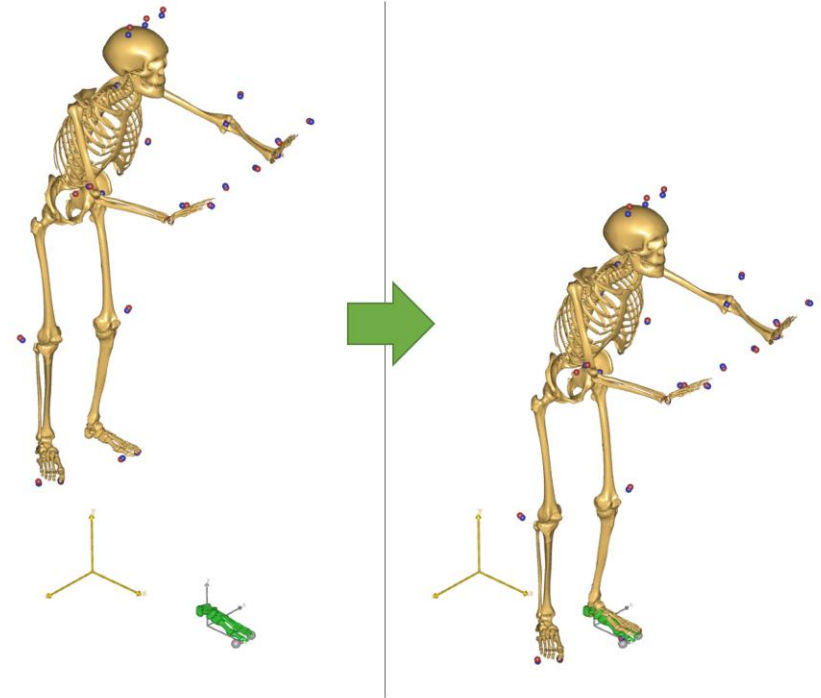
Added/created by:
Dr Divyaksh (Dave) Chander
Exoskeleton/Biomechanics Specialist
AnyBody Technology.

Optimizing MoCap model positions

- Inertial MoCap Models (Xsens / BVH)
 - Align inertial models with environment
 - Constrains hands/feet to positions in time/space:

New class template tool:

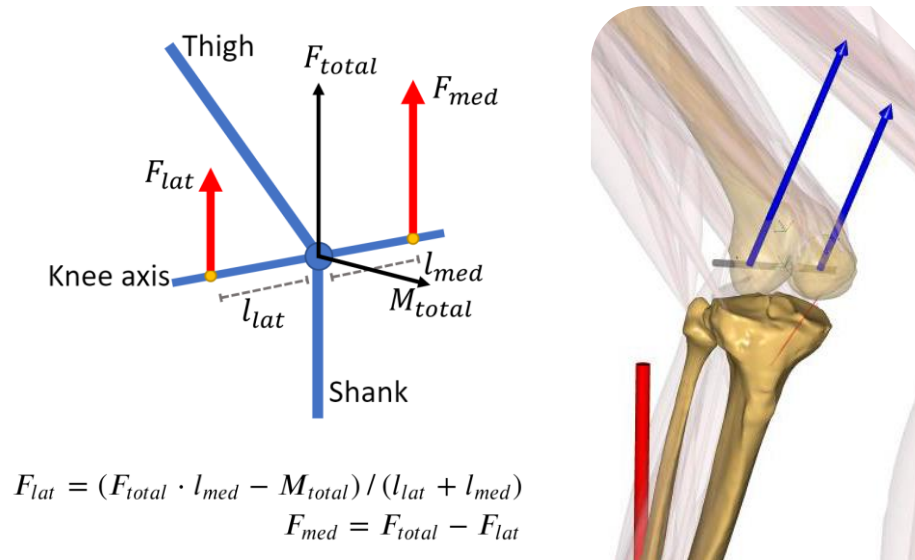
```
OptimizeBVH_Origin BVH_Origin_Modifier (HUMAN_SEG = "LFOOT") =
{
  Active_Time_Start = 0.0;
  Active_Time_End = 0.4;
  Target_Position = {0.5,0.0,0.0};
  Target_Orientation= RotMat(0*pi/180,x);
};
```



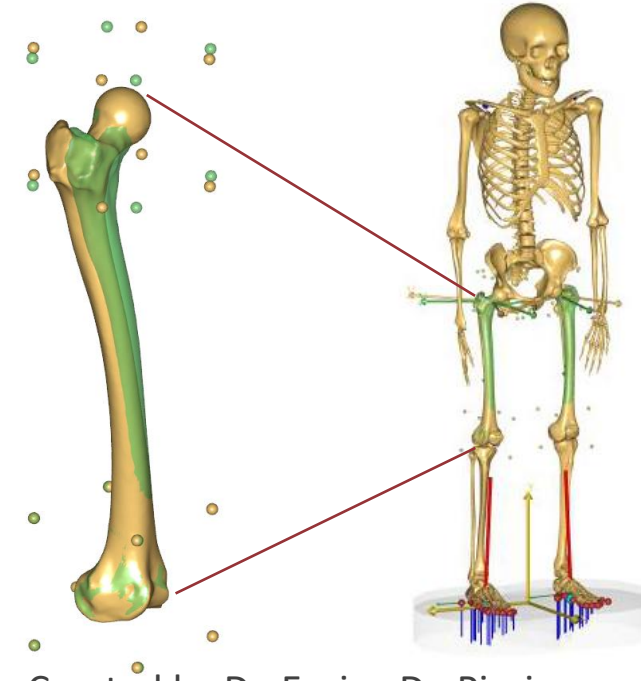
Added/created by:
Dr Divyaksh (Dave) Chander
Exoskeleton/Biomechanics Specialist
AnyBody Technology.

Other new examples:

SIMPLE KNEE FORCE ESTIMATION



TOOL FOR MODELING FEMORAL TORSION



Created by Dr. Enrico De Pieri

- Previously at: University of Basel Children's Hospital (UKBB)
- Currently: Zimmer Biomet

 Cite his work if you can use the tool

Application Examples — AMMR · x +

https://anyscript.org/ammr-doc/beta/auto_examples/index.html

AMMR v2.4.1-beta Documentation » Application Examples


previous next toc index

Application Examples


In the repository, you can find musculoskeletal applications from a wide area of interests. These models are from various AnyBody users, and all demonstrate features from the AnyBody Modeling System.

Note: All examples are powerful computational models where variables of interest have been biomechanically checked to make sense. However, when modifying or using models for other purposes results may occur that cannot be interpreted by anatomical or physiological considerations.


Daily activities and ergonomics



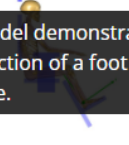
Squat



Hand crank model



[Pedal demo simple](#)



Seated Human

This model demonstrates the construction of a foot pedal example.

https://anyscript.org/ammr-doc/beta/auto_examples/ADLs_and_ergonomics/plot_PedalDemo.html#sphx-glr-auto-examples-adls-and-ergonomics-plot-pedaldemo-py

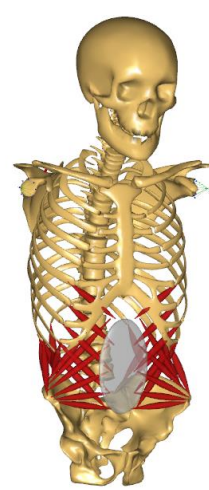
- **Application Examples**
- Daily activities and ergonomics
 - Motion Capture and gait analysis
 - Orthopedics and rehab
 - Other examples
 - Sports
 - Validation

Table of Contents

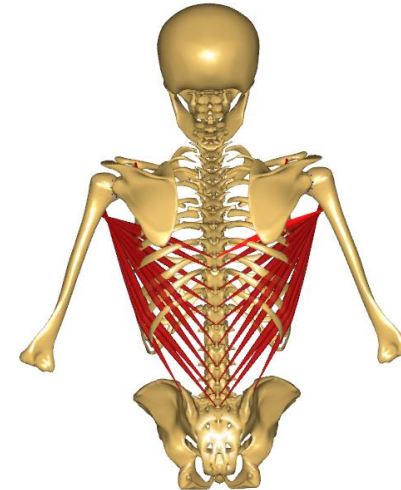
- Welcome to the AMMR documentation!
- Getting Started with AMMR
- Configuring the Body Model
- The Body Models
- **Application Examples**
 - Daily activities and ergonomics
 - Motion Capture and gait analysis
 - Orthopedics and rehab
 - Other examples
 - Sports
 - Validation
- Creating a Human model from scratch
- Introduction to Scaling
- The AnyMoCap Framework
- About the AMMR

Body model changes:

1. Improved oblique muscles
2. More latissimus branches
3. More realistic neutral scapula posture
4. Simplified implementation of elbow/forearm joints
5. Multiple smaller fixes and changes...



1



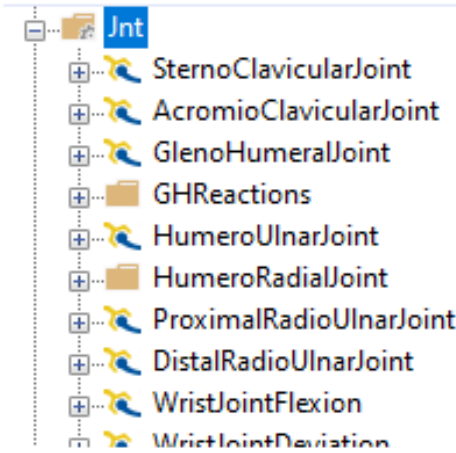
2



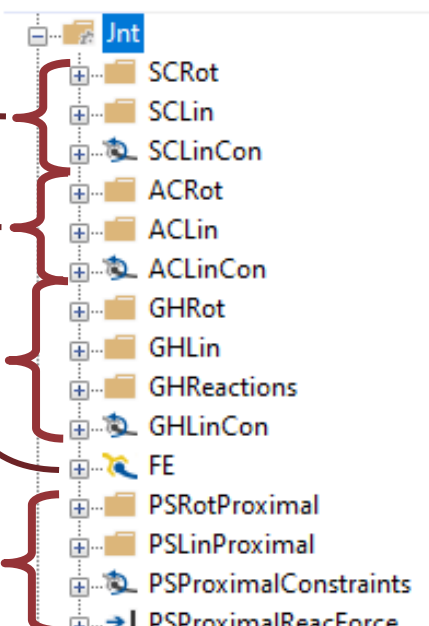
3

Thanks to Johanna Menze
(University of Bern)

New structure



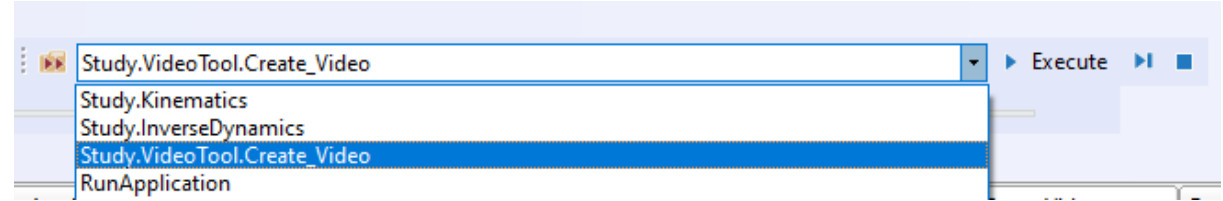
Old structure



New video tool

- Included in many model examples
- Make MP4 videos with one click
- New class template for video creation
- Repeatable and configurable

Copy it into your own models...
-> This has saved me days of works



```
// Include functions to generate a video:
// -> Run `Study.VideoTool.Preview` to preview the camera view
// -> Run `Study.VideoTool.Create_Video` to generate the video
#include "Model/CreateVideo.any"
```



```
VideoLookAtCamera VideoTool (UP_DIRECTION = y) =
{
    // Change this to give the created video a different name
    VideoName = ANYBODY_NAME_MAINFILEDIR;

    // The resolution and aspect ratio of the video
    VideoResolution = {720, 1080};

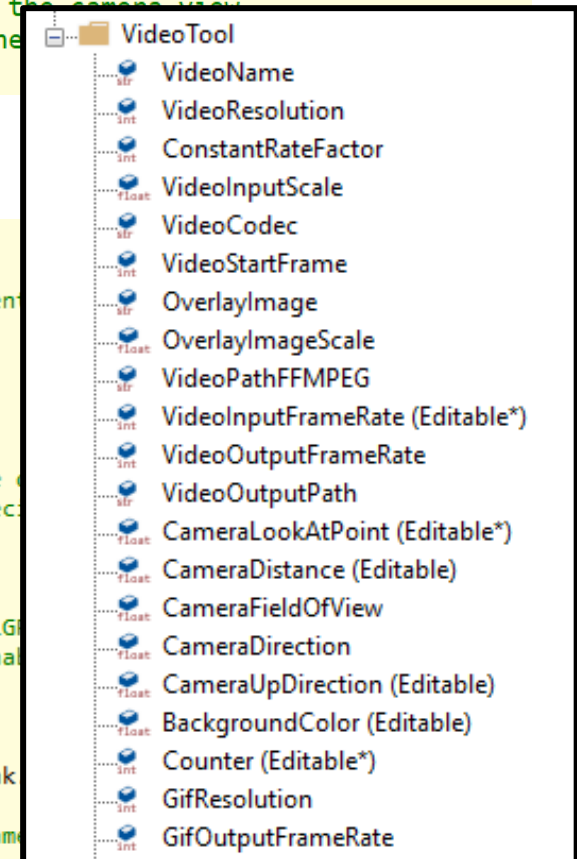
    // Create frames in twice the video size and scale
    // is created. This gives much better videos. Especially
    VideoInputScale = 2;

    // Video codec used in FFMPEG video creation.
    // The included FFMPEG only support free codecs (LGPL)
    // executable in AnyBody's install directory to enable
    VideoCodec = "libvpx-vp9";

    // The point the camera focuses on
    CameraLookAtPoint = Main.HumanModel.BodyModel.Trunk;

    // The vertical field of view in meters at the 'CameraLookAtPoint'
    CameraFieldOfView = 2;

    // The direction which the camera is placed
```



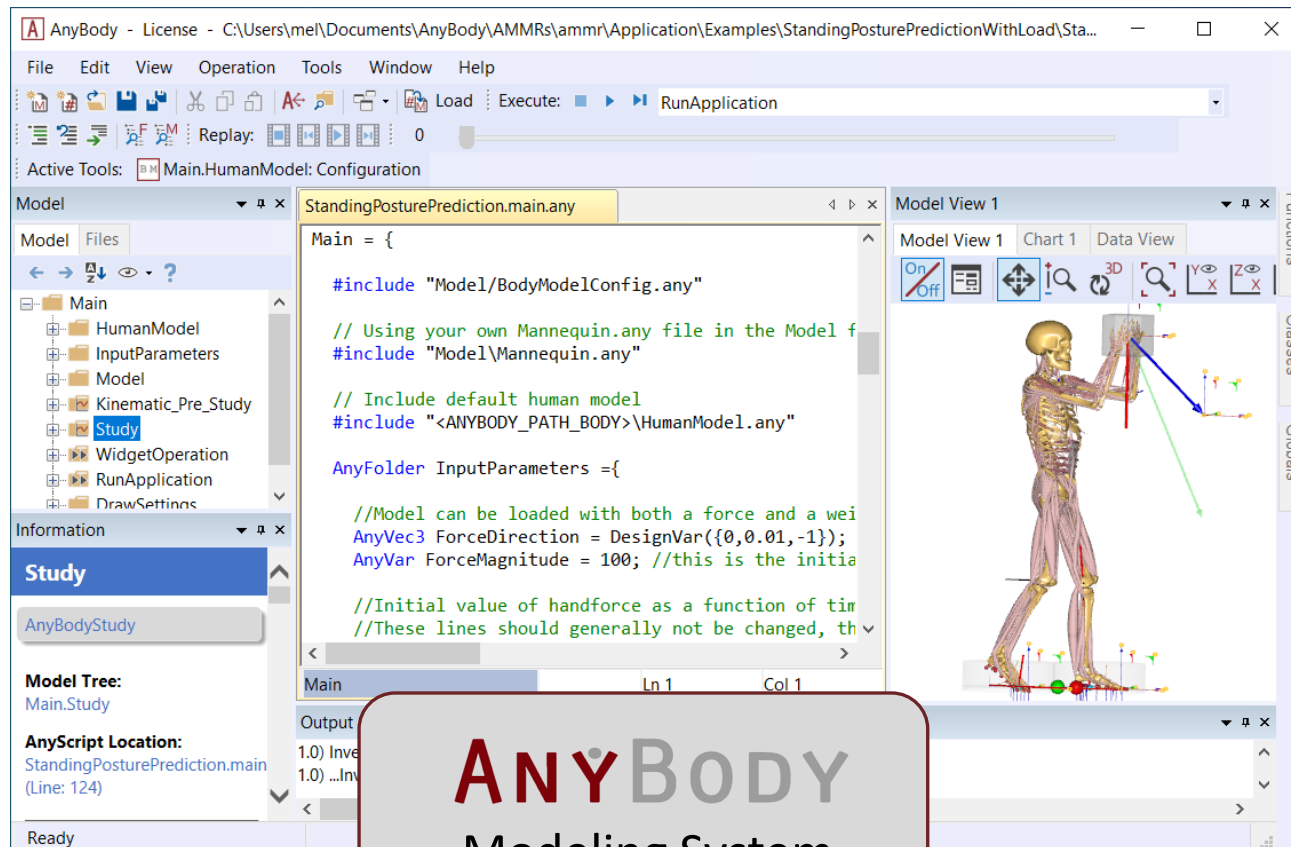
What else has changed?

- Improvements/bugfixes....
 - Improvements to muscles/wrapping surfaces
 - Stability improvements for MoCap models.

+50 different improvements/bug fixes

anyscript.org/ammr-doc

The screenshot shows a web browser window displaying the AMMR v2.4.1-beta Documentation page. The page title is "Welcome to the AMMR documentation!". The main content area features a large "ANY MODEL REPOSITORY" logo on the left and a "Quick search" field. Below the search field is a "Table of Contents" with a list of links, including "Welcome to the AMMR documentation!". A yellow callout box with a curved arrow icon points to a specific link in the table of contents, "See also: What's new in AMMR 2.4.1". The callout box is highlighted with a black border. The background of the page shows a 3D anatomical model of a human figure with muscles and bones.



AnyBody Modeling System

What is new in version 7.4

7.4 Release Theme:

- > Making it easier to build models
- > Making it easier to use the Script



New AnyScript syntax: ??=



Improvements to pre-processor logic



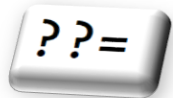
More powerful class templates



Bugfixes / Improvements

New AnyScript Syntax!

The optional assignment operator:



Inspired by syntax in JavaScript & C#...

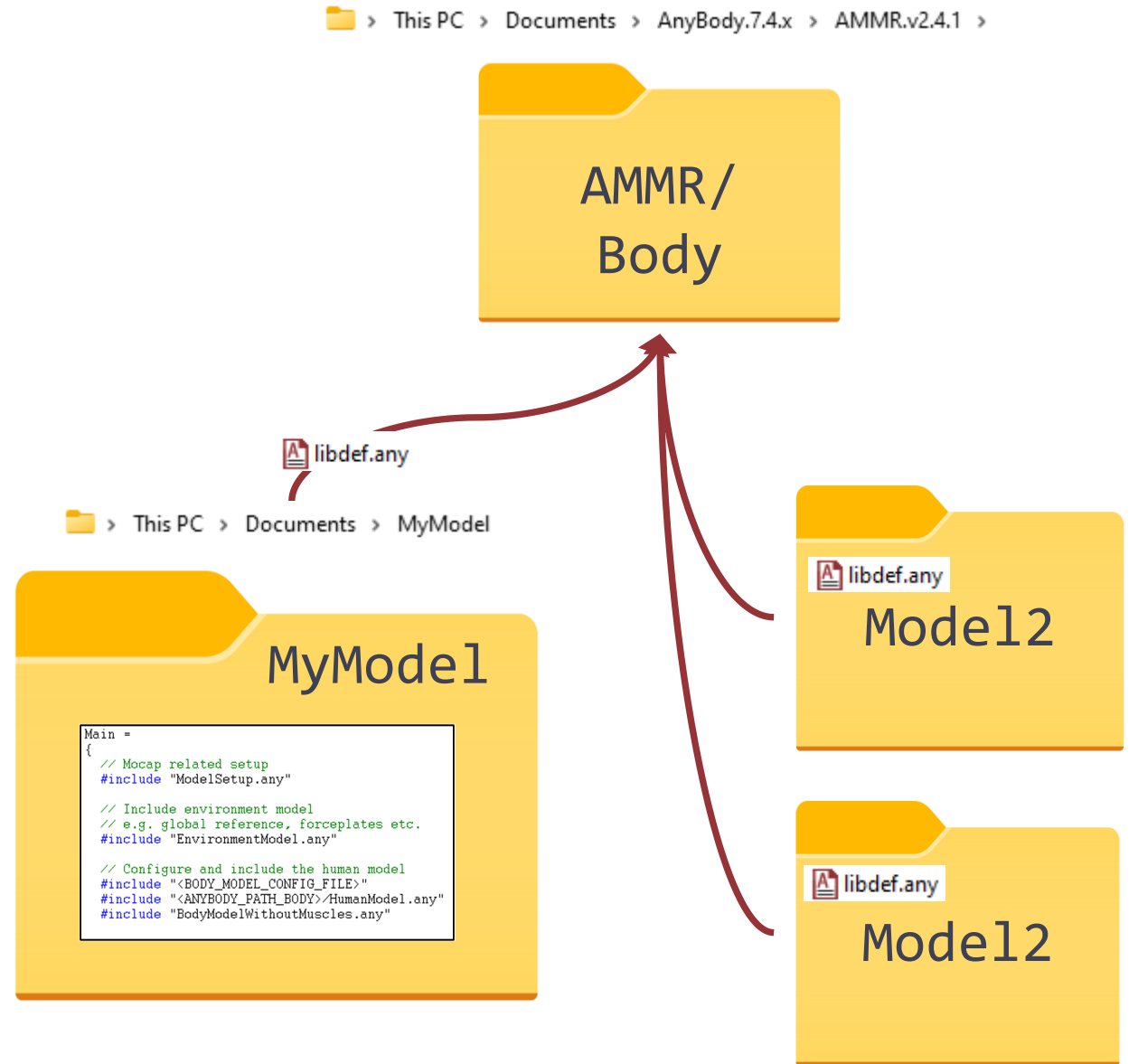
Assigns a default value which can be overridden.

```
// MyValue defaults to `1` if not initilized elsewhere
AnyVar MyValue ??= 1;
```

```
// Optional assignment also works for class members
AnyRefNode AnatomicalFrame = {
  sRel ??= {0.2, 0.0, 0.0};
  viewRefFrame.Visible ??= On;
};
```

Why is ?? = useful?

- No need to change body components directly
- User changes are localized to applications.
- Makes it much easier to update the model repository (AMMR).



Improvement to preprocessor

- What is the preprocessor?
 - Code which is processed before AnyBody constructs the model.
 - Similar to the C/C++ preprocessor
 - `#if #else #include #define`

```
#define SIDE "Right"

#if SIDE == "Left"
...
#else
...
#endif
```

Only numbers and strings were allowed

New in AnyBody 7.4...

```
#define BODYPART Right.Leg.Seg.Foot

#if BODYPART == Right.Leg.Seg.Thigh
...
#endif
```

Arbitrary identifiers are now allowed

More flexible #class_templates

- What are **class templates**:
 - Allow code encapsulation.
 - Allow code reuse

Class definition: (Must be outside Main)

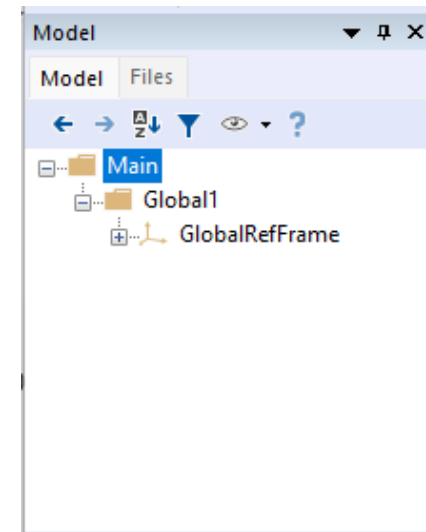
```
#class_template CreateCustomGlobalRef
{
    AnyFixedRefFrame GlobalRefFrame =
    {
        viewRefFrame =
        {
            Visible ??= On;
            RGB ??= {1, 0, 0};
        };
    };
};
```

Class usage:

```
Main =
{

    CreateCustomGlobalRef Global1 = {};

};
```



Note: The Global1 is a folder!!

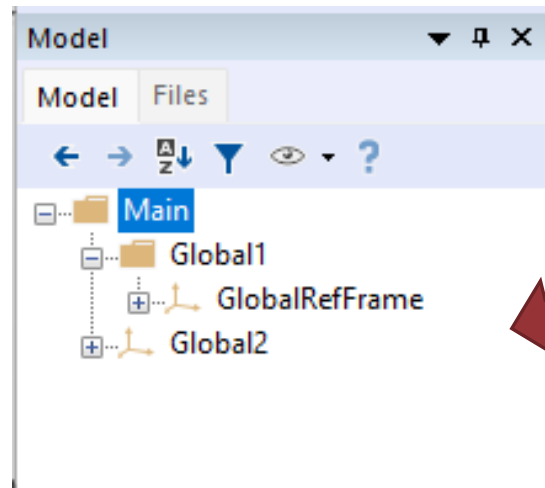
Previously class template could only be folders

More flexible #class_templates

- Now: class templates can be any type:

```
#class_template CustomRedAnyRefNode ( __CLASS__=AnyRefNode ) =
{
    viewRefFrame = {
        Visible ??= On;
        RGB ??= {1,0,0};
    };
};
```

```
#class_template CustomGlobalRef(__CLASS__=AnyFixedRefFrame)
{
    viewRefFrame =
    {
        Visible ??= On;
        RGB ??= {1, 0, 0};
    };
};
```



```
Main =
{
    CreateCustomGlobalRef Global1 = {};

    CustomGlobalRef Global2 ={};
};
```

More flexible #class_templates

- New implicit `__NAME__` argument.

```
#class_template CustomClass =
{
    // variable with the name of the parent scope
    AnyString self_name = #__NAME__;
    // Object point to the parent object.
    AnyObjectPtr this= &.__NAME__;
};
```

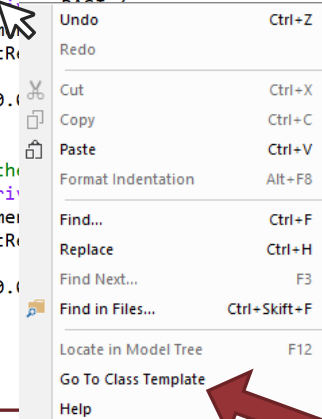
Holds object name when class_template is used.

- Small improvement, but important to model builders
- Updates to Editor interface:
 - Custom class templates are now **syntax highlighted !**
 - 'Right click' menu -> **"Go to Class Template"**

```
// Marker on the Left Posterior Superior Iliac
CreateMarkerDriver LPSI (
    UseC3DWeightResiduals = ON,
    MarkerPlacement=Trunk.SegmentsLumbar.PelvisSeg,
    OptX=OFF, OptY=OFF, OptZ=ON,
    UseC3DWeightResiduals=ON
) = {
    sRelOpt = {-0.145,0.02, -0.04};
};

// Marker on the Right Posterior Superior Iliac
CreateMarkerDriver RPSI (
    MarkerPlacement=Trunk.SegmentsLumbar.PelvisSeg,
    OptX=OFF, OptY=OFF, OptZ=ON,
    UseC3DWeightResiduals=ON
) = {
    sRelOpt = {-0.145,0.02, 0.04};
};

// Marker on the Right Anterior Superior Iliac
CreateMarkerDriver RASI (
    MarkerPlacement=Trunk.SegmentsLumbar.PelvisSeg,
    OptX=OFF, OptY=OFF, OptZ=ON,
    UseC3DWeightResiduals=ON
) = {
    sRelOpt = {0.0,0.0,0.0};
};
```



Jump to template definition

What else has changed in AnyBody?



AnyBody Release notes

AnyBody, v.7.4.1 (30-05-2022)

AnyBody, v.7.4.1 provides minor fixes to the AnyBody Modeling System as well as new AnyScript language feature (optional assignment) which was not ready when 7.4 was and hence arrives a bit delayed. The included updated AMMR (v.2.3.4) contains mostly bug fixes. Please see the AMMR documentation for a full changelog.

AnyScript Language:

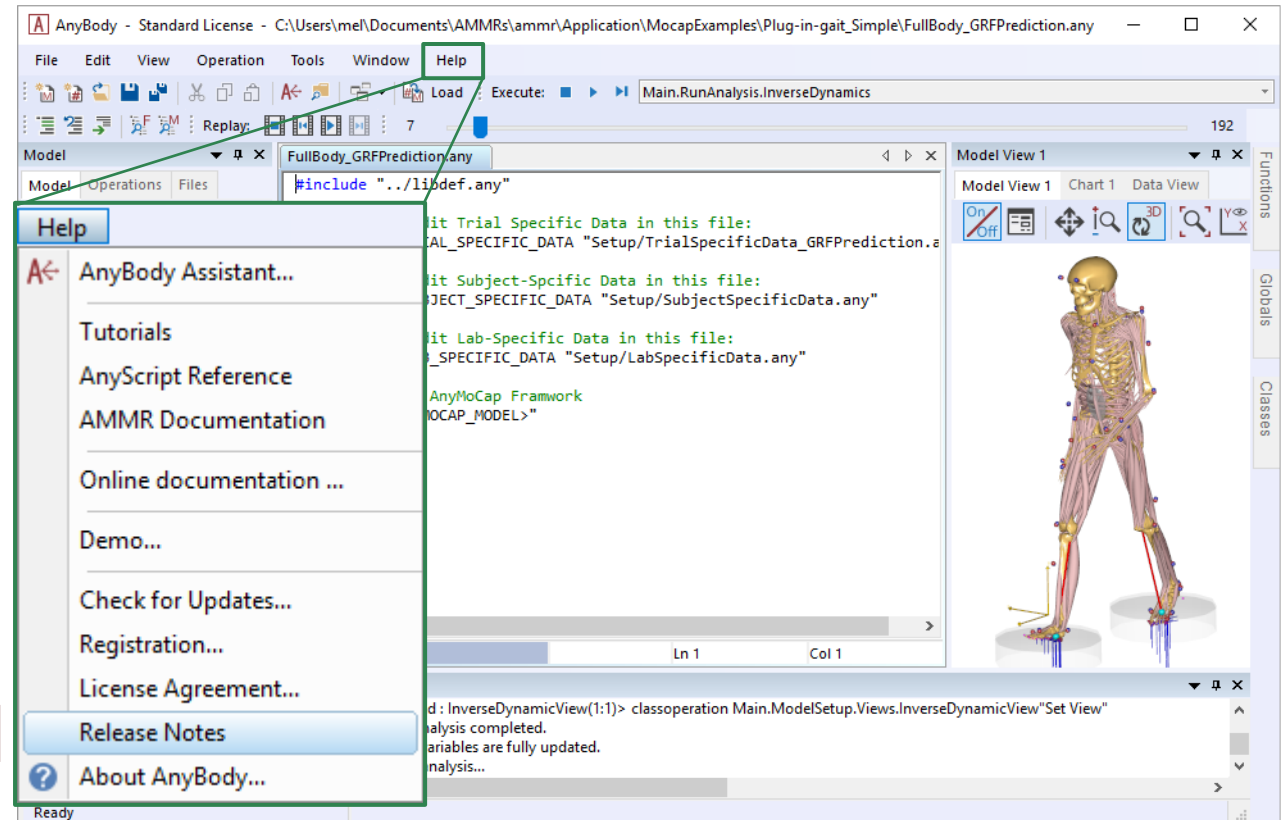
- New syntax `??=` for optional assignment of AnyValue objects. The new operator can be used in place of the normal `=` assignment for all AnyValue objects. It works like assigning a default value to the variable and allowing the value to be reassigned somewhere else in the script.

```
// MyValue defaults to `1` if not initialized elsewhere
AnyVar MyValue ??= 1;

// This initialize `MyValue` to 10, hence overwriting the default
MyValue = 10;
```

The syntax also works on class members where a default value can be assigned. This feature works identical to what is possible inside class templates with the `#var` prefix.

Tip: The `??=` is an advanced script feature, which is useful when creating reusable model components. It allows the user of the component to redefine inputs without needing to edit the component script files directly.



AnyBody - Standard License - C:\Users\me\Documents\AMMR\ammr\Application\MocapExamples\Plug-in-gait_Simple\FullBody_GRFPrediction.any

File Edit View Operation Tools Window Help

Model View 1

Model View 1 Chart 1 Data View

Model View 1 On/Off 3D Y Z X

Model View 1

Ln 1 Col 1

Ready

The screenshot shows the AnyBody software interface. The Help menu is open, and the 'Release Notes' option is highlighted. A red arrow points from the 'Release Notes' option in the Help menu to the 'AnyBody Release notes' webpage shown in the adjacent image.


www.anybodytech.com

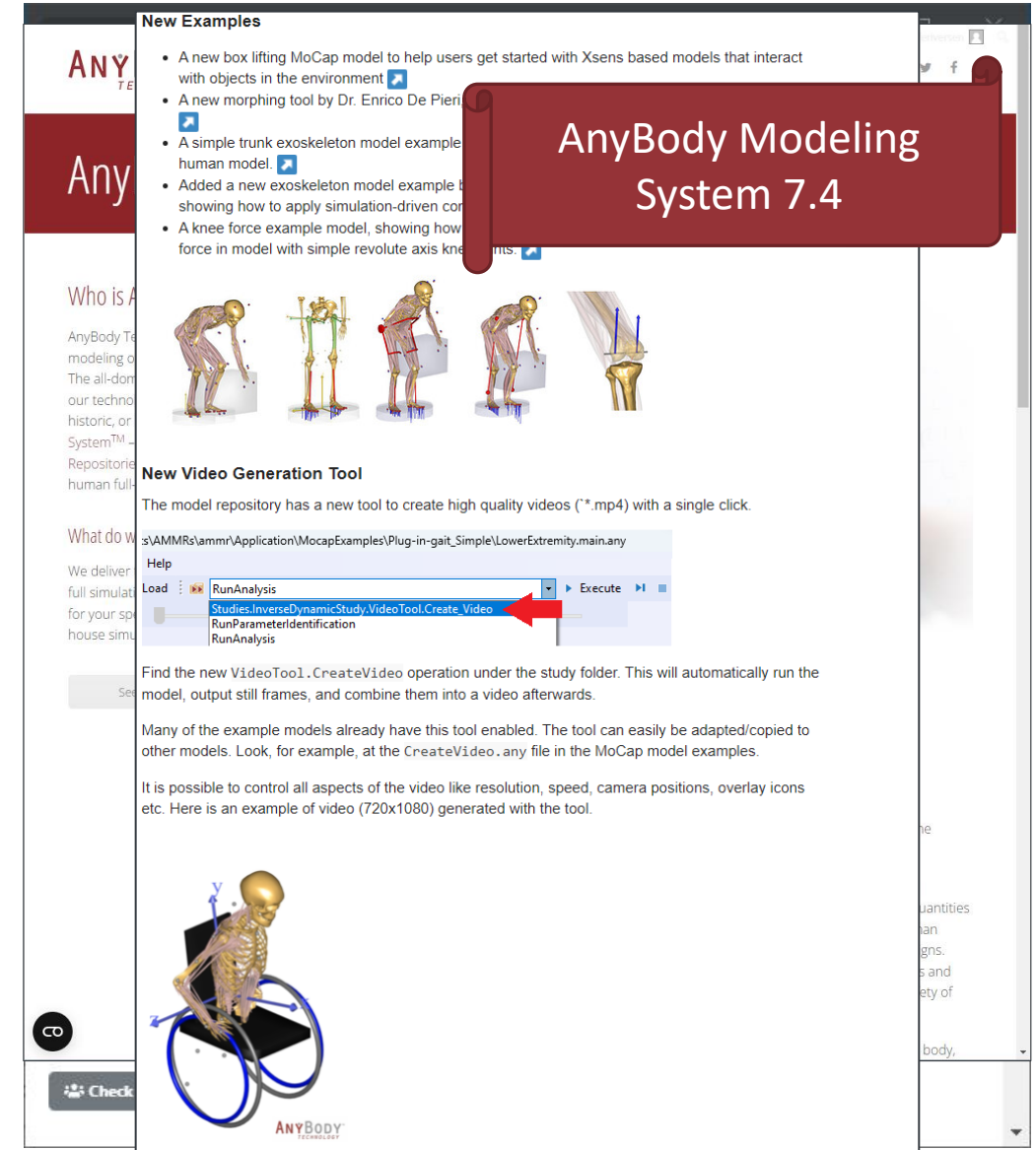
- Events, Webcast library, Publication list, ...

www.anyscript.org

- Wiki, Blog, Repositories, Forum

 **Meet us?** Send email to sales@anybodytech.com

 **Want to present?** Send email to ki@anybodytech.com



AnyBody Modeling System 7.4

New Examples

- A new box lifting MoCap model to help users get started with Xsens based models that interact with objects in the environment
- A new morphing tool by Dr. Enrico De Pieri
- A simple trunk exoskeleton model example for a human model
- Added a new exoskeleton model example to show how to apply simulation-driven control
- A knee force example model, showing how to calculate joint force in model with simple revolute axis knee joints

Who is A

AnyBody Te
modeling o
The all-dom
our techno
historic, or
System™
Repositories
human full

New Video Generation Tool

The model repository has a new tool to create high quality videos (*.mp4) with a single click.

What do w
full simulat
for your sp
house simu


We deliver
full simulat
for your sp
house simu

Help
Load : RunAnalysis | Execute ▶
Studies.InverseDynamicStudy.VideoTool.Create.Video
RunParameterIdentification
RunAnalysis

Find the new VideoTool.CreateVideo operation under the study folder. This will automatically run the model, output still frames, and combine them into a video afterwards.

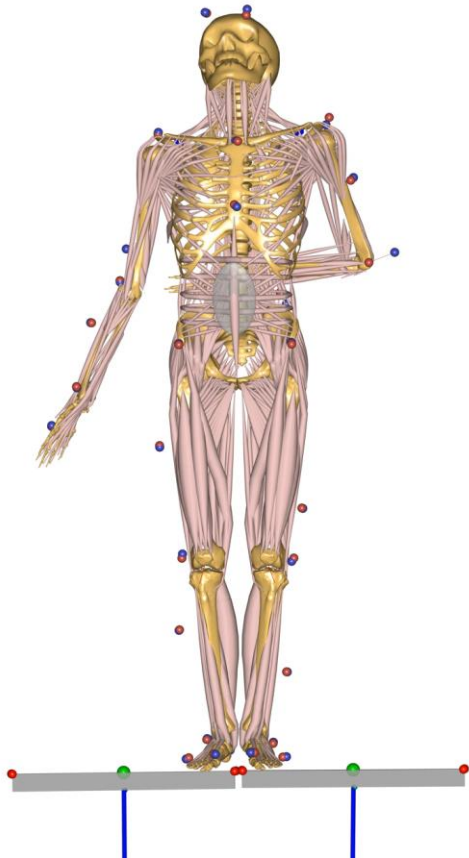
Many of the example models already have this tool enabled. The tool can easily be adapted/copied to other models. Look, for example, at the CreateVideo.any file in the MoCap model examples.

It is possible to control all aspects of the video like resolution, speed, camera positions, overlay icons etc. Here is an example of video (720x1080) generated with the tool.



ANYBODY
TECHNOLOGY

Time for questions:



AnyScript forum

https://forum.anyscript.org

ANYSCRIPT FORUM Sign Up Log In

all categories all tags **Categories** Latest Top

Category	Topics	Latest
Main Forum This is the category for discussion about the AnyBody Modeling System and problems with models	19 / month	Z Error when loading C3D model 1h ■ Main Forum
Announcements Big and small news AnyBody Modeling System, and Model Repository (AMMR)	2	Y Misalignment of robot joint and human joint 8h ■ Main Forum
Blog comments This category is for collecting discussions from blog posts on AnyScript.org . Do not create new topics in this category. They are created automatically when people comment on blog posts.	1 / month	E Changing the TrailFileName with AnyPy Tools 21h ■ Main Forum
		Request for c3d2any.exe and gaitapplication2.exe 9d ■ Main Forum
		Node Orientation 9d ■ Main Forum kinematics