AnyBody Managed Model Repository V1.0 release notes:

This repository version runs with AnyBody ver. 4.0.0 or later.

This repository is an updated version of the AnyBody Model Repository Version 1. The repository contains improvements both in terms of new Body parts and new applications. Furthermore there are several changes in the repository structure which aims at improving user friendliness, by increasing model flexibility and giving easier access to the most used output.

Body directory:

Generic body models

Generic body models which enables the user to easily define the desired combination of body parts, has been developed. Previously the main file would include a predefined body model file defining which combination of body parts to use, typical examples of such a file is the FullBodyModel/BodyModel.any which is a full body model using constant strength muscles. The drawback of this setup is that every time you need a new combination of body parts in your model you may need to define a new body model file that collects the bit and pieces, if someone has not made it before. In addition there are thousands of body parts combinations so it is really not possible to predefined them all.

The new way of doing this is to include two files a GenericBodyModel.any file and a BodyPartsSetup.any file. The setup makes use of the new AnyScript facilities which enables certain parts of the script depending on the value of a variable. Counting the number of combinations shows that there are more than 3000 possible combinations of body parts and muscle configurations in the current release of the repository, any of these combinations can be selected by making small changes in the BodyPartsSetup.any file. The file presents a list of individual body parts and it is simply a matter of picking the desired ones.

Here is an example:

```
// Trunk: 1 included, 0 not included
// ******************************
#define TRUNK 1
// This is just the bones,
// Choose one of the following options to add muscles
#define TRUNK_SIMPLE_MUSCLES 1


// RightArm: 1 included, 0 not included
// **********************************
#define RIGHT_ARM 1
```

```
// This is just the bones,
// Choose one of the following options to add muscles
#define RIGHT_ARM_SIMPLE_MUSCLE 1
#define RIGHT_ARM_SIMPLE_MUSCLE_ONLY_ON_NECK 0
#define RIGHT_ARM_MUS_3E 0
```

The example above defines a trunk and a right arm model both with constant strength muscles.

The well know predefined body models which has always existed, will remain in the repository for a while but at some point they may be removed. The new structure makes it much easier to define new combinations with much fewer files, making it easier to maintain the script. In a future release we hope to introduce color codes making it easier to see which parts of the script are active in the current model, this can be difficult to see in the new models.

Selected output

The models contains lots of output and it can be hard to find the needed output. To resolve this all body models now come with a folder named SelectedOutput providing a faster access to the most used outputs. This folder can be found in the HumanModel folder, the folder contains:

- Reaction forces from each joint with explanation on directions and a reference frame
- Muscle envelope curves for each limb
- Summation of the moment the muscles generate around each dof. This is computed by measuring the contribution from all muscles spanning a certain dof. in the model.

Twente Lower Extremity Model:
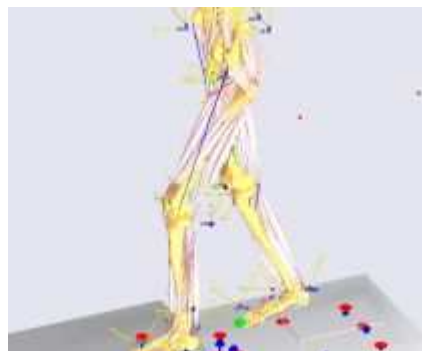
The gait model used for validating TLEM..

Implementation of a new lower extremity model labelled the Twente Lower Extermity Model (TLEM) consistsing of 159 muscles and 6 joint degrees of freedom is almost completed. It has been validated against 'state of the art' literature with respect to its biomechanical performance and first applications in gait and cycling deliver very convincing results.

The model is based on a recently published morphological consistent

anatomical dataset* on muscle and joint parameters by Martijn Klein-Horsman from the University of Twente, The Netherlands. The implementation of the model was started by Karin Gorter, a Master Student, also from the University of Twente, during a three month stay at Aalborg University and is now being finished by the AnyBody Technology.

*Morphological muscle and joint parameters for musculoskeletal modelling of the lower extremit, *Clinical Biomechanics*, Volume 22, Issue 2, Pages 239-247
M. Klein Horsman, H. Koopman, F. van der Helm, L. Prosé, H. Veeger

Arm:

In the forearm the pronation/supination dof has been altered to correct a small misalignment of the axis. The neutral pronation/supination position has also been modified to fit the ISB standard, with 30 degrees of pronation added.

TrunkNeck:

The JointMuscles have been added to the TrunkNeck model. They are artificial torques applied to the joints in the body model with no muscles. The calibration sequence for the combination Arm-TrunkNeck has been added.

Bone's transparency:

A new facility for controlling the bone's transparency has been implemented. Previously the transparency of each bone had to be modified from the segment file located in the Body section of the repository, affecting all the applications. This setting has now been moved to the DrawSettings.any file present in each application. It allows to set easily the transparency of each individual bone for the current application.

New Applications:

"generic" applications which automatically adjust the drivers according to the bodymodel, making it very easy for the user to try out the many combinations of body parts has been added.

Standing model:

The standing model has been made generic meaning that it is now very easy to switch off body parts without doing changes to drivers etc. So if the arms are not needed these are removed and the drivers will automatically be adjusted accordingly.

FreePosture model:

The FreePosture model has been made generic so it has become easy to switch off and on body parts without doing changes in the drivers etc, they automatically adjust.

WilkeSpinalDiscPressure:

The AnyBody model is validated against an experiment form Wilke Hans-Joachim & al*. In this experiment the pressure in the L4L5 intervertebral disc (nucleus pulposus) is measured in a healthy subject for different postures and loads of the daily life.

*New In Vivo Measurements of Pressures in the Intervertebral Disc in Daily Life. Wilke, Hans-Joachim PhD *; Neef, Peter MD +; Caimi, Marco MD ++; Hoogland, Thomas MD [S]; Claes, Lutz E. PhD * Spine. 24(8):755-762, April 15, 1999.

GaitUniMiamiRightLeg:

This is a modified version of the GaitUniMiami model, which contains only the right leg. The environment has been modified by excluding the force plates in contact with the Left leg. The gaitapplication2 release 1.8 can be used for optimization of model with only one leg, this can be useful dependent on the data set.

GaitUniMiamiTD:

A version of the GaitUniMiami application using the new TLEM (also called TD Leg) has been included in the repository.

IndexFinger_JohnWu:

The index finger model from AnyBody user John Wu is included in the Beta section of the repository. The model provide a calibrated 7 muscles and 3 phalangeal segments index finger for analyse of tapping.