

Theia3D Merge

This tutorial demonstrates the process of merging Theia3D's output [C3D](#) files and other C3D files. The typical scenario is to merge Theia3D's motion capture output and analog signals such as force platform recordings.

There are two methods for achieving this merge:

1. Users can [interactively](#) merge C3D files using the Visual3D interface.
2. Users can use the [Manage_Theia3D_Merge](#) pipeline command.

Demo Files

Download the [zip file](#) containing folder paths and files for this tutorial.

Merging C3D files interactively

Open Theia3D C3D File

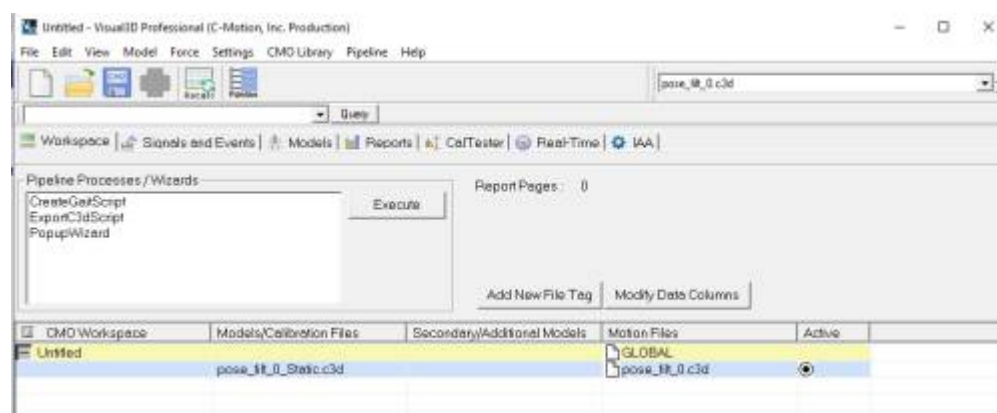
If you use TMBATCH, select the default folder paths, which should be in the form.

STUDY : GROUP : SESSION : ACTION : TRIAL : pose_filt_0.c3d

The relative path for this example data is: ...\\Visual3D_Tutorial\\001_THEIA\\WALK\\001\\pose_filt_0.c3d

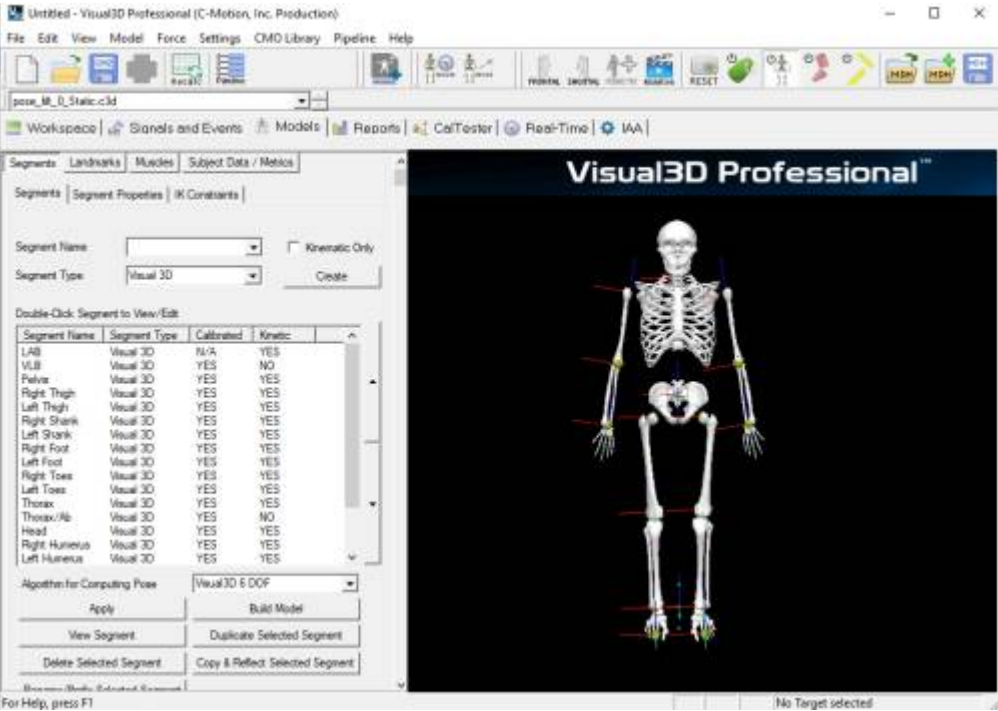
Open this file:

Visual3D recognizes this as a Theia3D output file and will automatically create a model and assign the motion file. The workspace status TAB will display the model and movement trial. Note that the standing trial was created virtually based on the c3d parameters in the movement trial. The name of the static file is the name of the first movement file loaded with _Static applied to the name.



Switch to Model Builder mode.

The segments and landmarks have been created automatically.



Edit the Right Thigh segment

Segments | Landmarks | Muscles | Subject Data / Metrics

Segments | Segment Properties | IK Constraints | Right Thigh

Define Proximal Joint and Radius

Lateral: None | Joint Center: r_thigh_4X4 | Medial: None

Radius (Meters): $0.5 * \text{Distance}(r_thigh_4x4, l_thigh_4x4)$

Define Distal Joint and Radius

Lateral: None | Joint Center: r_shank_4X4 | Medial: None

Radius (Meters): $0.0376 * \text{Height} / \text{DefaultTheia3DHeight}$

Extra Target to Define Orientation (if needed)

Location: Orientation | r_thigh_4X4

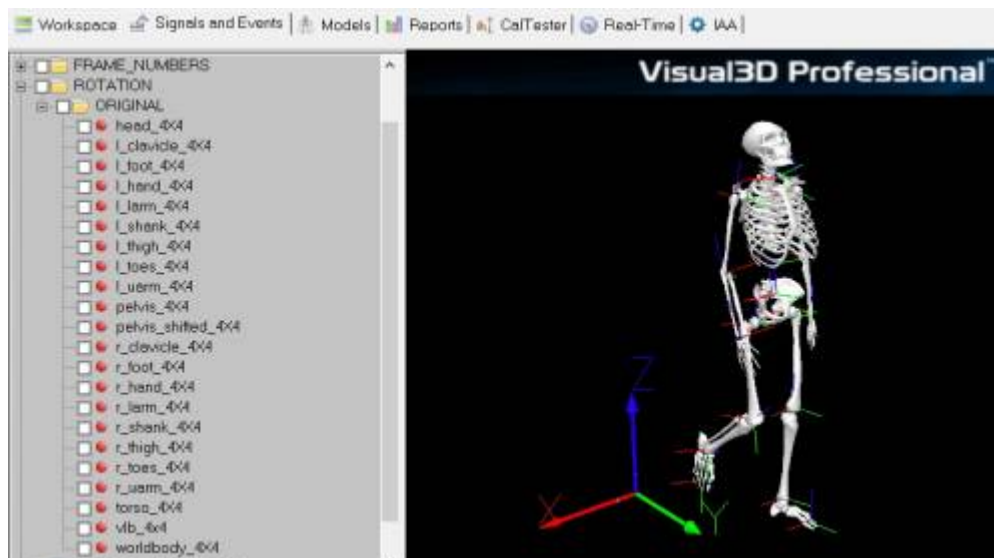
Select Tracking Targets

☐ Use Calibration Targets for Tracking ☒ Ignore calibration

☐ l_shank_4X4	☐ pelvis_shifted_4X4	☐ r_shank_4X4
☐ l_thigh_4X4	☐ r_clavicle_4X4	☒ r_thigh_4X4
☐ l_toes_4X4	☐ r_foot_4X4	☐ r_toes_4X4
☐ l_uam_4X4	☐ r_hand_4X4	☐ r_uam_4X4
☐ pelvis_4X4	☐ r_lam_4X4	☐ torso_4X4

Note that Theia3D stores [ROTATION signals](#), not TARGETS. If a ROTATION signal is selected for a location, only the position information is used from the signal. The "Ignore Calibration" button is selected as Theia3D exports the 6 DOF pose of the segment. Unless there is a reason to modify the coordinate system, the default is to assign the ROTATION signal to the pose of the segment. Switch to the Signals and Events TAB and animate the motion file.

Note the ROTATION folder is open in this image displaying the ROTATION signals exported by Theia3D.



Import Analog signals and Force Platform parameters from QTM C3D File

The QTM files should be stored in the following

STUDY : GROUP : SESSION_QTM : ACTION : Trial#.c3d

The QTM filenames should be similar to the Theia3D TRIAL path name. For example,

The relative path for this example data is:

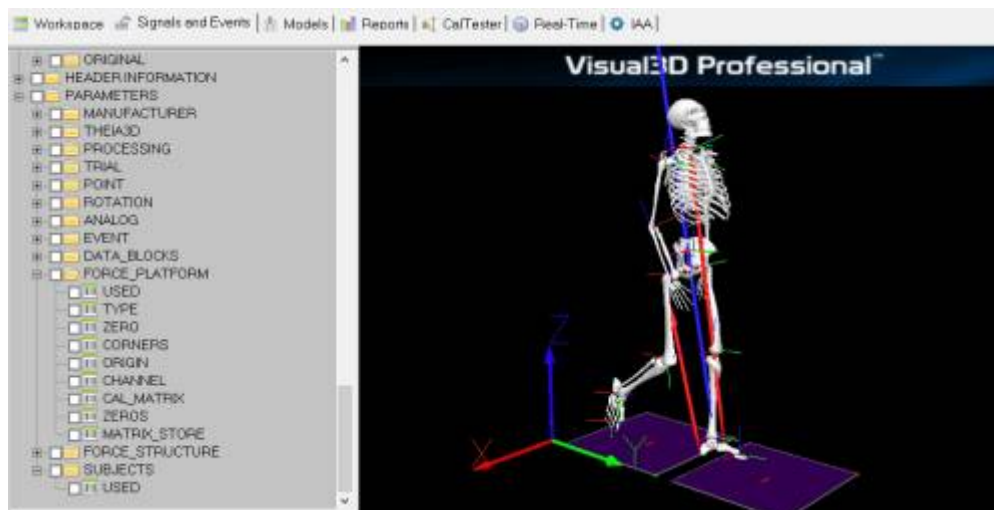
\\Visual3D_Tutorial\001_QTM\WALK\MoCapNwalk_001.c3d

Use the following command to import analog signals and force platform parameters from the QTM generated c3d file.

[Import_Signals_From_C3D_File](#) For this example, we only need to specify a few of the possible parameters for this command and leave the remaining parameters to their default values

```
Import_Signals_From_C3D_File
/ANALOG_RATIO=5
/IMPORT_FORCE_PLATFORM_PARAMETERS=TRUE
;
```

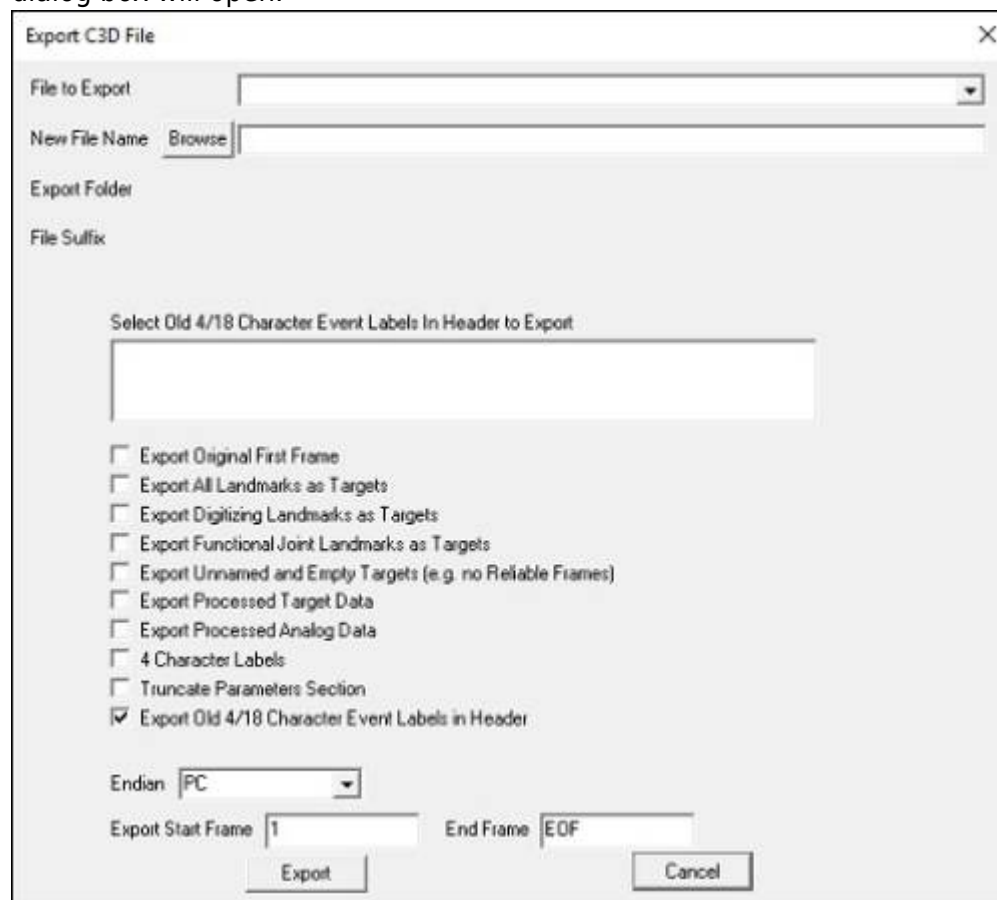
After executing this command the analog signals and force platform parameters have been added to the Theia3D file.



Exporting the merged C3D file (Optional)

The resulting C3D file is still named `pose_filt_0.c3d`, which is a bit of a nuisance in Visual3D as the short filename for all files would be the same.

From the **File** menu, open the **Export** subfolder and select **Export C3D File**. The *Export C3D File* dialog box will open.



From the **File to Export** drop down Select `pose_filt_0.c3d`. Click **Browse**. From the *Save As* dialog box browse to the location where you store your files and enter `New_Filename.c3d` in the **File name** field.

Note: Click **Save**. From the *Export C3D File* dialog box Click **Export**.

Note: Leave all other options at the default values. Many of these options are available to handle

irregularities in the c3d file format, and should only be used when necessary.

Given the merged c3d file, you can save the file as a cmz file or you can [export the c3d file](#)

Manage_Theia3D_Merge

Visual3D has a pipeline command dedicated to merging theia3D output files with other synchronized files containing marker and analog signals and force platform parameters. In order to automate the merge, it was necessary to make some assumptions about filenames and folder paths similar to the [previous example](#). If you use Theia's TMBATCH, select the default folder paths. This should be in the form.

STUDY : GROUP : SESSION_THEIA : ACTION : TRIAL : pose_filt_0.c3d

The Other files should be stored in the following

STUDY : GROUP : SESSION_OTHER : ACTION : Trial#.c3d

The OTHER filenames should be similar to the Theia3D TRIAL path name. For this tutorial the file paths begin at the session level,

001_THEIA : WALK : TRIAL1 : pose_filt_0.c3d

001_QTM : WALK : Trial1.c3d While this example may include only one Theia3D file and one Other file, the command will act on all SESSIONS, ACTIONS and TRIALS in the filepath. A cmz file is created for each session and stored in the corresponding Theia3D session

Import Analog Files

Having all files named pose_filt_0.c3d is a bit of a nuisance for Visual3D and the files are renamed by the command. The new name is a concatenation of the name and TRIAL name. For this example WALK_TRIAL1.c3d

Having the sessions in parallel was implemented because Theia3D keeps evolving and there may be multiple versions of the Theia3D Session for the same original videos.

For example: SESSION_V2 and SESSION_V3

Getting the Theia3D files into this folder structure is straightforward as it is the default from Theia.

Note that the command requires the specification of the full root folder. For this documentation I have represented all but the last folder in the hierarchy

Root path to search	C:\Users\has-m\Downloads\Visual3D_Theia_Tutorial1\Visual3D_Theia_Tutorial1\			Browse
☐ Open CMZ Library After Processing				
☒ Automatically save default CMZ files	<SESSION>			
☐ Use Theia Index Files (.hmx)				Browse
File Tags	ACTION			
Primary Files				
Primary Data Folder	TRIAL			
Theia3D Session Folder Mask	001_THEIA			Browse
Theia File Mask	*pose_filt_0.c3d			Browse
Theia File Mask For Model				Browse
Theia3D Subject Tags (optional)		Theia Prefixes		
Choose Kinetic Thorax	Thorax/Ab			
☐ Merge Theia and Other Files ☒ Import Analog Files ☐ Merge Theia Files				
Secondary Files				
Secondary Data Folder	ACTION	Static Data Folder	SESSION	
Other Session Folder Mask	001_QTM			Browse
Other File Mask (Optional)	*.c3d			
Other Static File Mask (Optional)				
Other Model Template Mask (Optional)				Browse
Other Subject Tags		Other Prefixes		
Analog Filter Cutoff	12	Target Filter Cutoff	12	
		FP_Auto_Baseline	DO_NOT_COMPUTE	
Restrict Number of Session Files	3			
Visual3D Pipeline Pre-Merge (Optional)				Browse
Visual3D Pipeline Post-Merge (Optional)				Browse
OK Cancel				

Manage_Theia3D_Merge

/ROOT_FOLDER=\\Mac\Home\Desktop\TestData\Merge\Wiki

Example\Visual3D_Theia_Tutorial1\

! /HMX_INDEX_MASK=

! /USE_HMX_INDEX=FALSE

! /ACTION=

! /TAGS=ACTION

/IMPORT_ANALOG_FILES=TRUE

! /MERGE_THEIA3D_FILES=FALSE

! /MERGE_THEIA3D_AND_OTHER_FILES=FALSE

! /MERGE_EVENT_LABELS=FALSE

/THEIA3D_SESSION_FOLDER=001_THEIA

/THEIA3D_FILE_MASK=*pose_filt_0.c3d

! /THEIA3D_FILE_MASK_FOR_MODEL=

! /THEIA3D_PREFIX=

! /THEIA3D_SUBJECT_TAG=

/THEIA3D_COLOR=Black

/OTHER3D_SESSION_FOLDER=001_QTM

/OTHER3D_FILE_MASK=*.c3d

! /OTHER3D_MODEL_MASK=

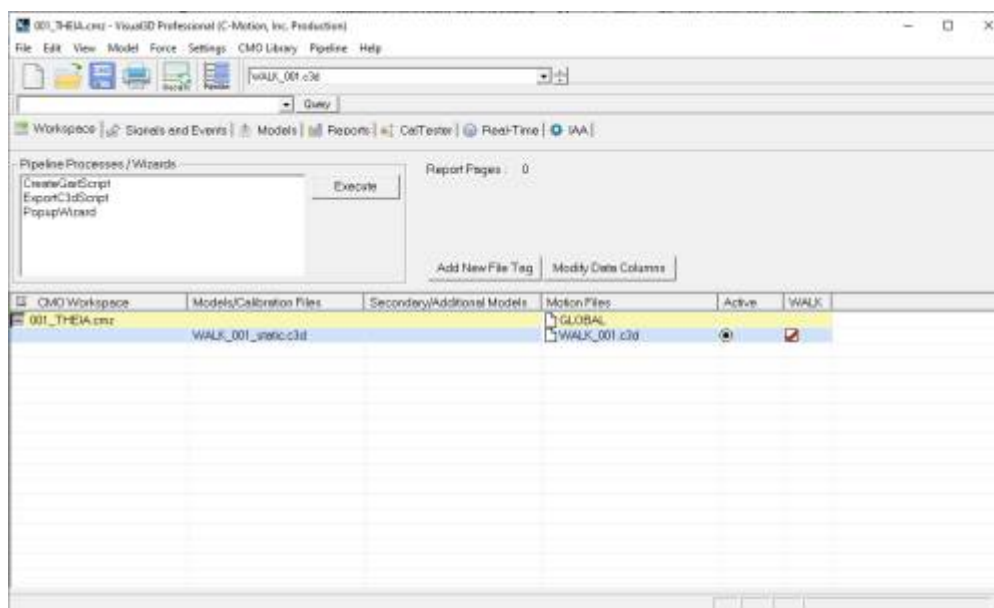
! /OTHER3D_MODEL_TEMPLATE_MASK=

! /OTHER3D_PREFIX=

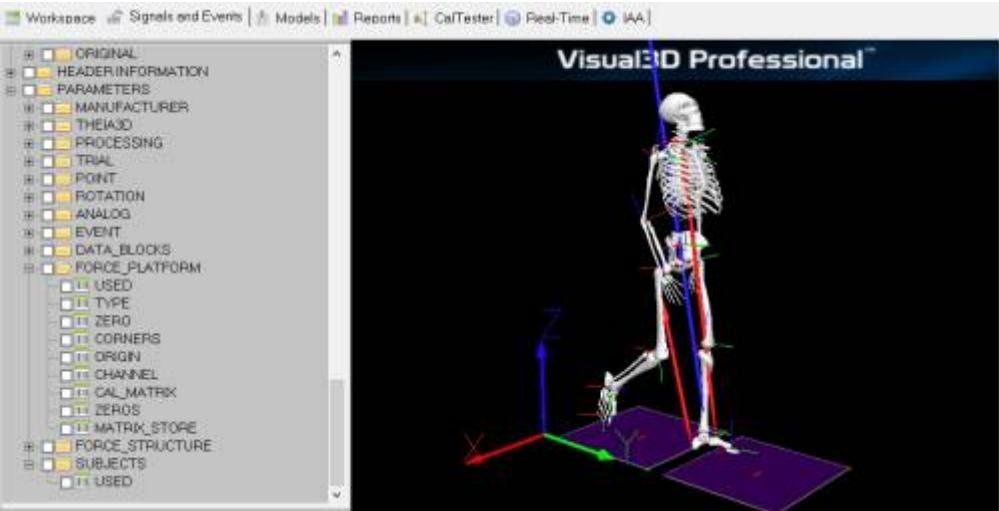
! /OTHER3D_SUBJECT_TAG=

```
/OTHER3D_COLOR=Black
/NUMBER_OF_SESSION_FILES_ALLOWED=3
! /SAVE_DEFAULT_CMZ_FILES=TRUE
! /DEFAULT_CMZ_NAME=<SESSION>
! /OPEN_CMZ_LIBRARY=FALSE
/INPUT_DATA_FOLDER_PRIMARY=TRIAL
/INPUT_DATA_FOLDER_SECONDARY=ACTION
/INPUT_STATIC_DATA_FOLDER=SESSION
! /KINETIC_THORAX=RTA
! /ANALOG_FILTER_CUTOFF=12
! /TARGET_FILTER_CUTOFF=12
/FP_AUTO_BASELINE=Do_Not_Compute
! /VISUAL3D_PIPELINE_POST_MERGE=
! /VISUAL3D_PIPELINE_PREMERGE=
;
```

The Visual3D workspace is as follows: Note the name of the files WALK_001.c3d and WALK_001_STATIC.c3c



The data and animation should look the same as the previous example



Merge Targets and Analog Signals

The following command options merge Theia3D files with QTM files that have markers, a standing trial, and a model template. To distinguish the marker and markerless data, subject prefixes were added. The result will have two models associated with the movement trials.

Root path to search

\Mac\Home\Desktop\TestData\Merge\Wiki Example\Visual3D_Theia_Tutorial1\

Browse

☐ Open CMZ Library After Processing

☒ Automatically save default CMZ files

<SESSION>

☐ Use Theia Index Files (.hmx)

Browse

File Tags

ACTION

Primary Files

Primary Data Folder

TRIAL

Theia3D Session Folder Mask

001_THEIA

Browse

Theia File Mask

*pose_fit_0.c3d

Theia File Mask For Model

Browse

Theia3D Subject Tags (optional)

ML

Theia Prefixes

ML:

Choose Kinetic Thorax

Thorax/Ab

☒ Merge Theia and Other Files

☐ Import Analog Files

☐ Merge Theia Files

Secondary Files

Secondary Data Folder

ACTION

Static Data Folder

SESSION

Other Session Folder Mask

001_QTM

Browse

Other File Mask (Optional)

*,c3d

Other Static File Mask (Optional)

static.c3d

Other Model Template Mask (Optional)

*.mdh

Browse

Other Subject Tags

M

Other Prefixes

M:

Analog Filter Cutoff

12

Target Filter Cutoff

12

FP_Auto_Baseline

DO_NOT_COMPUTE

Restrict Number of Session Files

3

Visual3D Pipeline Pre-Merge (Optional)

Browse

Visual3D Pipeline Post-Merge (Optional)

Browse

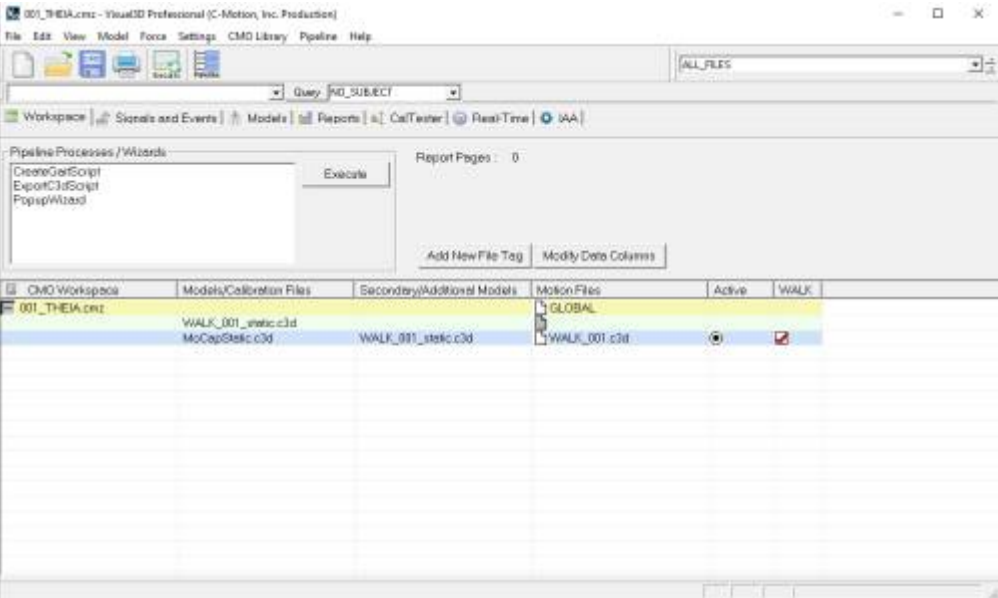
OK

Cancel

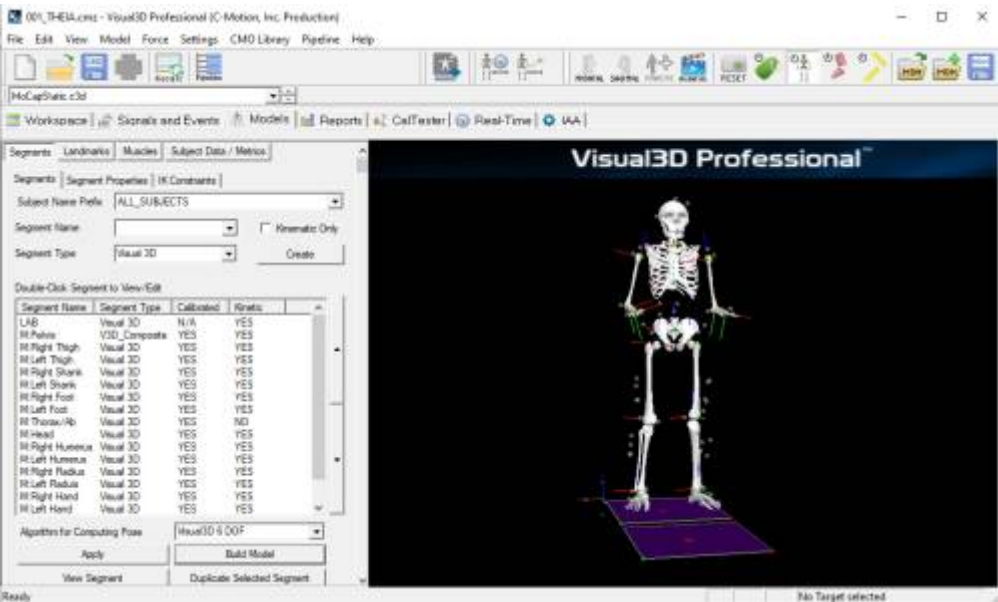
Manage_Theia3D_Merge

```
/ROOT_FOLDER=\\Mac\Home\Desktop\TestData\Merge\Wiki
Example\Visual3D_Theia_Tutorial1\
! /HMX_INDEX_MASK=
! /USE_HMX_INDEX=FALSE
! /ACTION=
! /TAGS=ACTION
! /IMPORT_ANALOG_FILES=FALSE
! /MERGE_THEIA3D_FILES=FALSE
/MERGE_THEIA3D_AND_OTHER_FILES=TRUE
! /MERGE_EVENT_LABELS=FALSE
/THEIA3D_SESSION_FOLDER=001_THEIA
/THEIA3D_FILE_MASK=*pose_filt_0.c3d
! /THEIA3D_FILE_MASK_FOR_MODEL=
/THEIA3D_PREFIX=ML:
/THEIA3D_SUBJECT_TAG=ML
/THEIA3D_COLOR=Black
/OTHER3D_SESSION_FOLDER=001_QTM
/OTHER3D_FILE_MASK=*.c3d
/OTHER3D_MODEL_MASK=*static*.c3d
/OTHER3D_MODEL_TEMPLATE_MASK=*.mdh
/OTHER3D_PREFIX=M:
/OTHER3D_SUBJECT_TAG=M
/OTHER3D_COLOR=Black
/NUMBER_OF_SESSION_FILES_ALLOWED=3
! /SAVE_DEFAULT_CMZ_FILES=TRUE
! /DEFAULT_CMZ_NAME=<SESSION>
! /OPEN_CMZ_LIBRARY=FALSE
/INPUT_DATA_FOLDER_PRIMARY=TRIAL
/INPUT_DATA_FOLDER_SECONDARY=ACTION
/INPUT_STATIC_DATA_FOLDER=SESSION
! /KINETIC_THORAX=RTA
! /ANALOG_FILTER_CUTOFF=12
! /TARGET_FILTER_CUTOFF=12
/FP_AUTO_BASELINE=Do_Not_Compute
! /VISUAL3D_PIPELINE_POST_MERGE=
! /VISUAL3D_PIPELINE_PREMERGE=
;
```

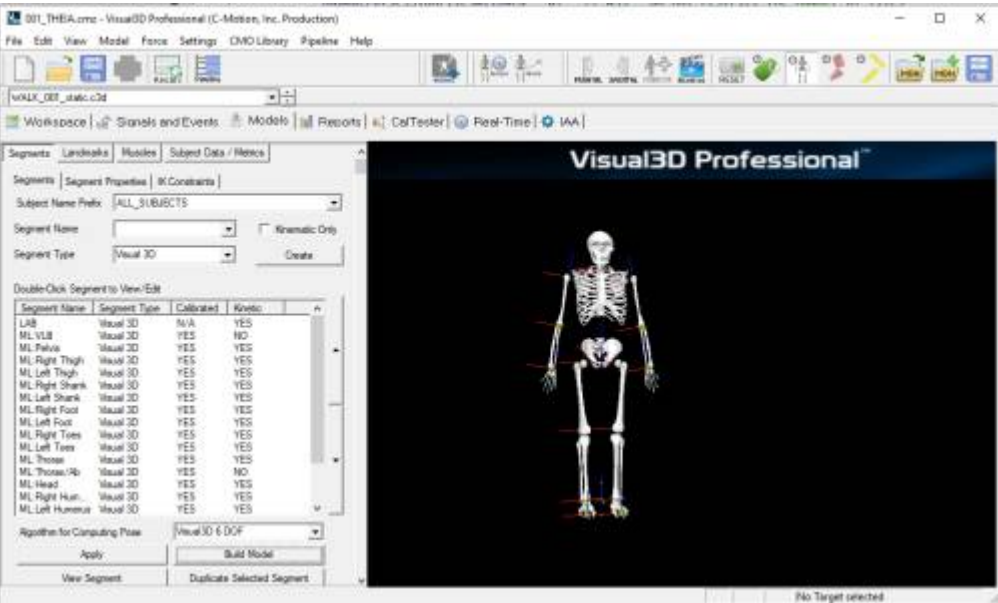
After executing this command the workspace will have one motion file associated with two model files



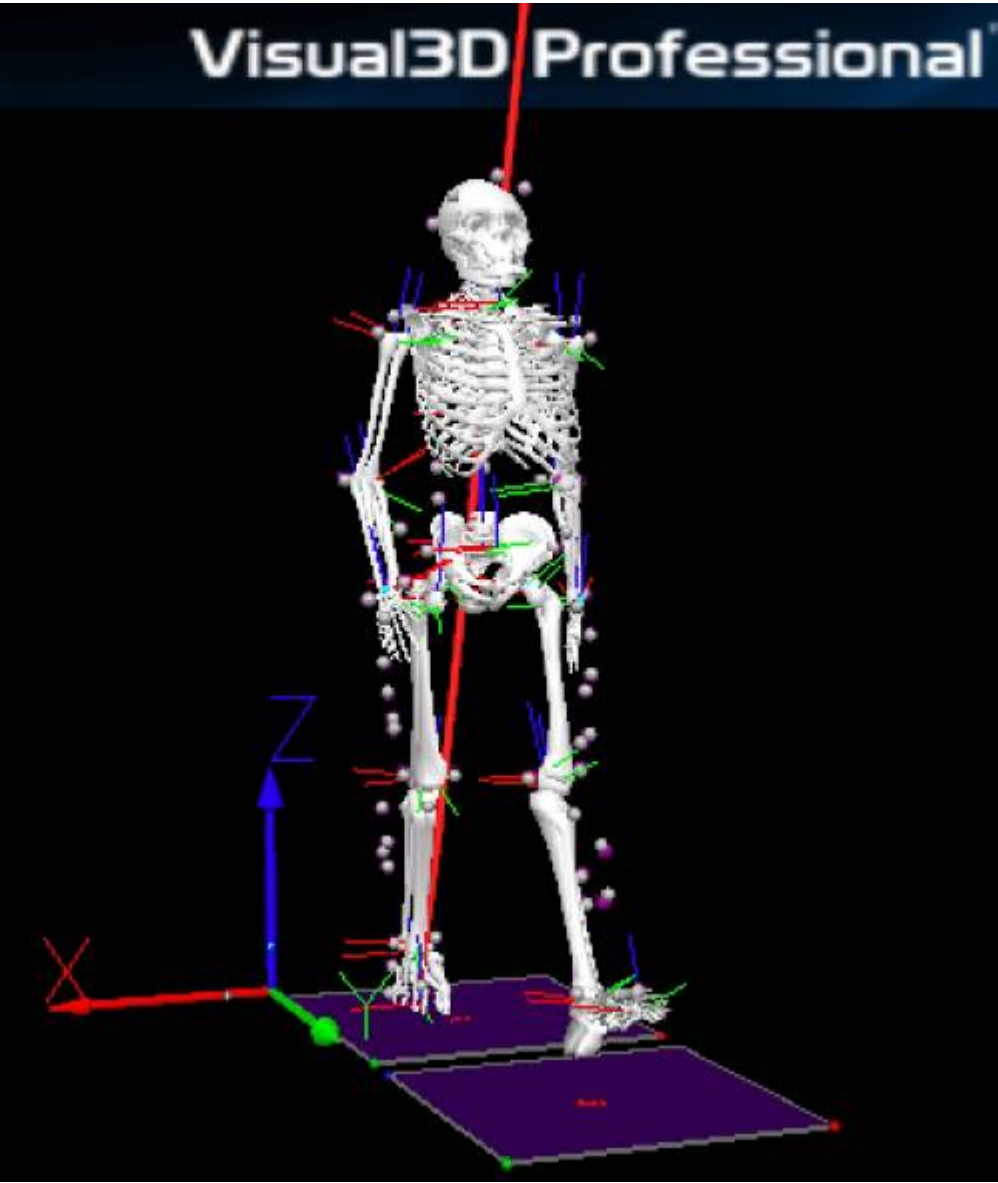
One model file is for the marker data Note the prefix M: on the marker names



One model file is for the Theia3D data Note the prefix ML: on the rotation names



The resulting animation will display both models.



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