



Quick Guide To Running A Gait Analysis

Disclaimer

This guide has been compiled from the information presented in AnyBody™ Tutorials Version 5.0.0, December 2010.

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This is a short tutorial on running and analyzing a gait analysis. For the purposes of this tutorial, a gait model comprising only the lower extremities is used rather than the full body. The reason for this is that, using the lower extremities greatly reduces loading time and computation time.

Procedure:

1. After installing AnyBody™, open the AnyScript™ Managed Model Repository
2. Open the Application folder -> then the Examples folder
3. Scroll down to find GaitLowerExtremity
4. Copy the entire folder and rename it and place it in a new directory. This ensures that the original folder will remain intact.
5. Browse through the folder and open the file GaitLowerExtremity.Main.any. Note: the model is driven with a C3D file. Therefore, to modify the model, import a different C3D file.
6. In the file, find the description:

```
//Set this to 1 if you want to run the motion and Parameter
Optimization identification
//*****
#define MotionAndParameterOptimizationModel 0

//Set this to 1 if you want to run the inverse dynamic analysis
#define InverseDynamicModel 1
//Usually only have one of the two switches active so set the
inactive analysis to 0
//*****
```

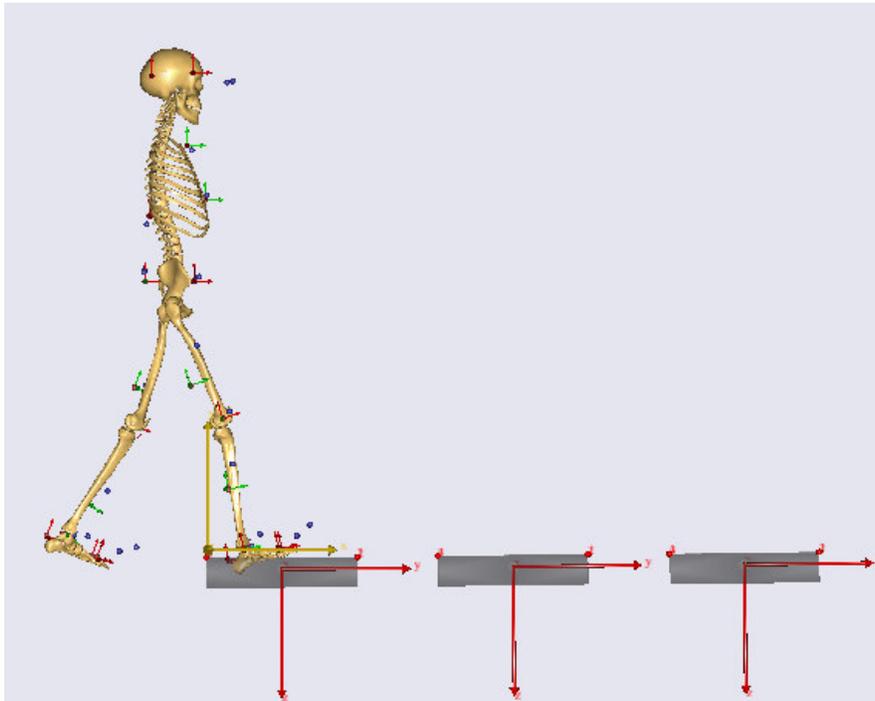
These lines define the model executions you need to perform to process a new data set. When MotionAndParameterOptimizationsModel is set to 1, the system performs an optimization of the model to fit the C3D data you recorded. It also optimizes the model parameters such as; segment lengths and marker placements. When InverseDynamicModel is set to 1, the system performs an analysis based on the parameters in the MotionAndParameterOptimization step.

7. Make the following changes to run the optimization:

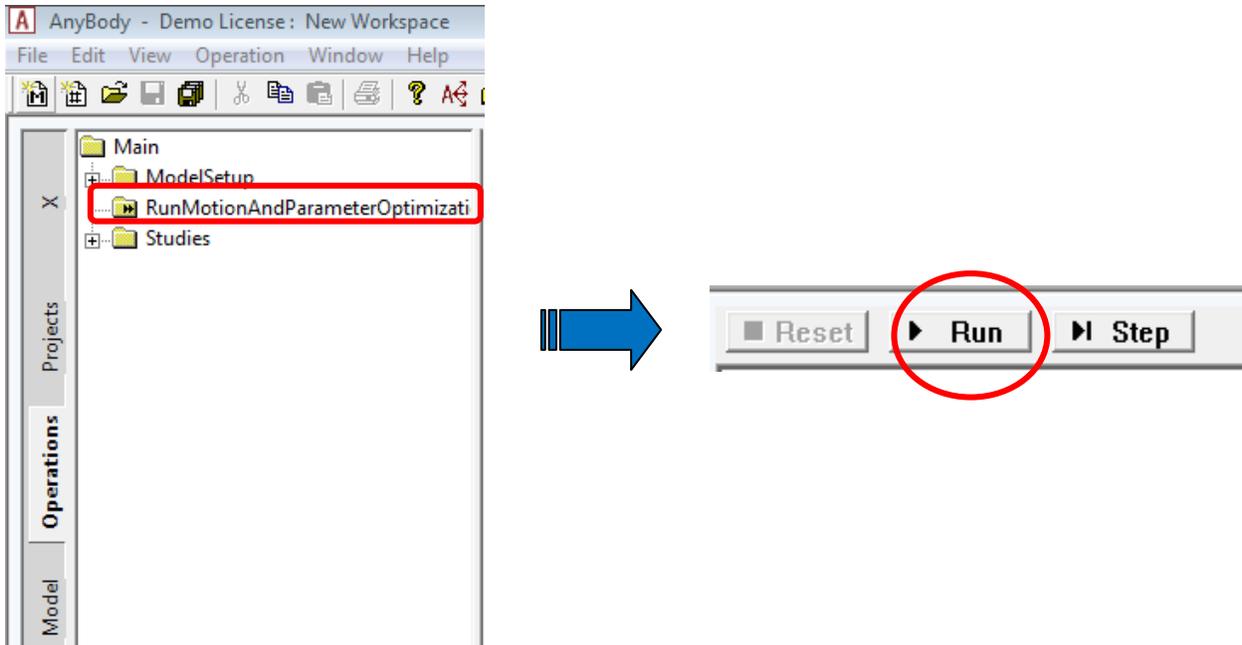
```
//Set this to 1 if you want to run the motion and Parameter
Optimization identification
//*****
#define MotionAndParameterOptimizationModel 1

//Set this to 1 if you want to run the inverse dynamic analysis
#define InverseDynamicModel 0
//Usually only have one of the two switches active so set the
inactive analysis to 0
//*****
```

8. Load the model and open a new Model View. You should see the following:



9. In the Operation Tree -> click MotionAndParameterOptimization Sequence -> click Run



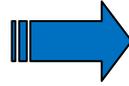
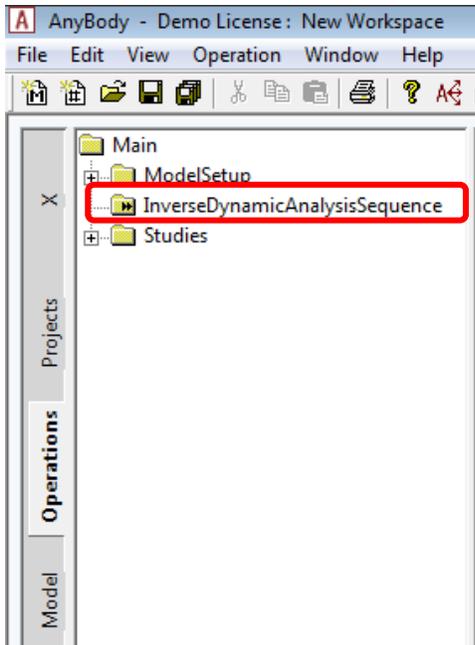
Note: Optimization will take a few minutes to complete. You can switch the Model View update off to speed up process. Click  to do this function.

10. Make the following changes to run the inverse dynamic analysis:

```
//Set this to 1 if you want to run the motion and Parameter
Optimization identification
//*****
#define MotionAndParameterOptimizationModel 0

//Set this to 1 if you want to run the inverse dynamic
analysis
#define InverseDynamicModel 1
//Usually only have one of the two switches active so set the
inactive analysis to 0
//*****
```

11. Reload the model. In the Operation Tree -> Click InverseDynamic AnyalysisSequence -> Run

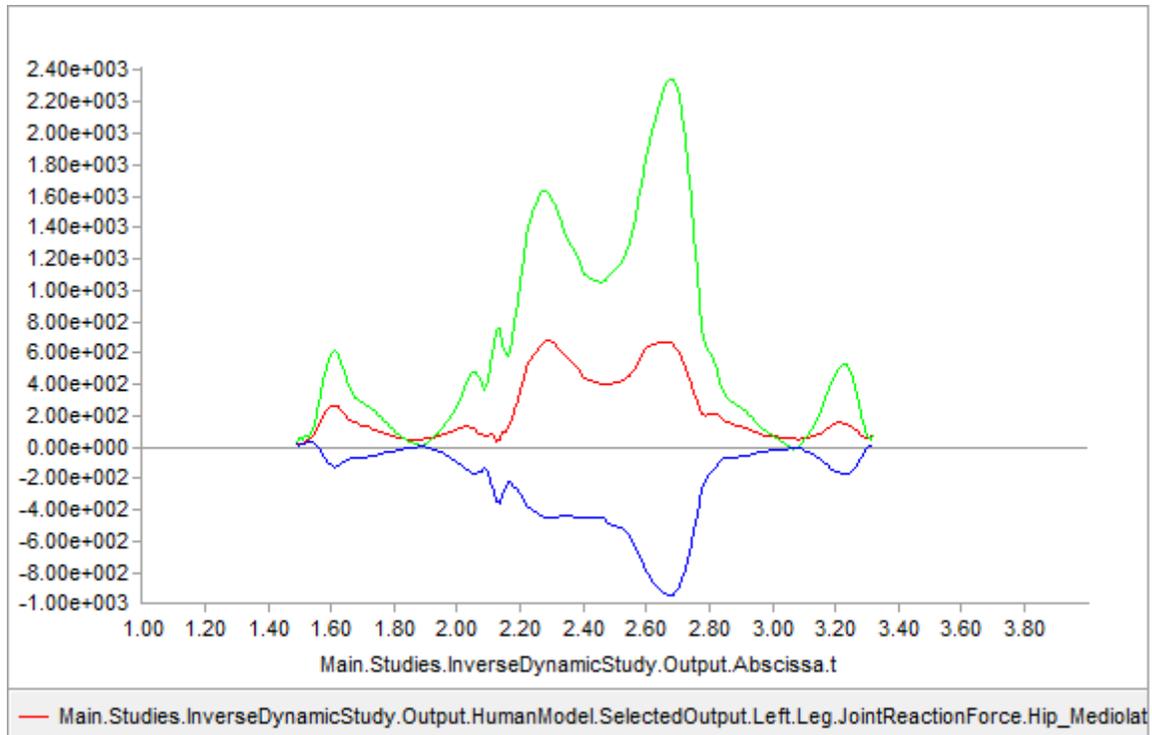


12. Now, you can investigate the results. For example you can analyze the hip joint reaction forces on the left leg:

Open a new ChartFX -> expand Studies -> expand LoadParametersOptimizationResults -> expand Study -> expand Output -> expand HumanModel -> expand SelectedOutput -> expand Left -> expand Leg -> expand JointReactionForce -> click Hip_MediolateralForce node -> In Y: remove "MediolateralForce" and replace with *:



13. The * graphs all the hip reactions forces (3 plots in this case) and should get the following:



Plot A: Joint Reaction Force of Normal Gait Pattern

14. There is also a way to modify the model’s movement pattern. This is done by importing new motion data by replacing the C3D file containing the motion data. In the Main file, scroll down until you reach the following line:

```
#include "TrialSpecificData.any"
```

15. The file titled “TrialSpecificData,” contains the settings that you can change. Double-click the TrialSpecificData.any file name. A new window will open. Scroll down until you reach the following line:

```
//Name of the C3D file to be analyzed
AnyString NameOfFile = "GaitNormal0003-processed"; //Write
the name of the file here
```

16. Make the following changes:

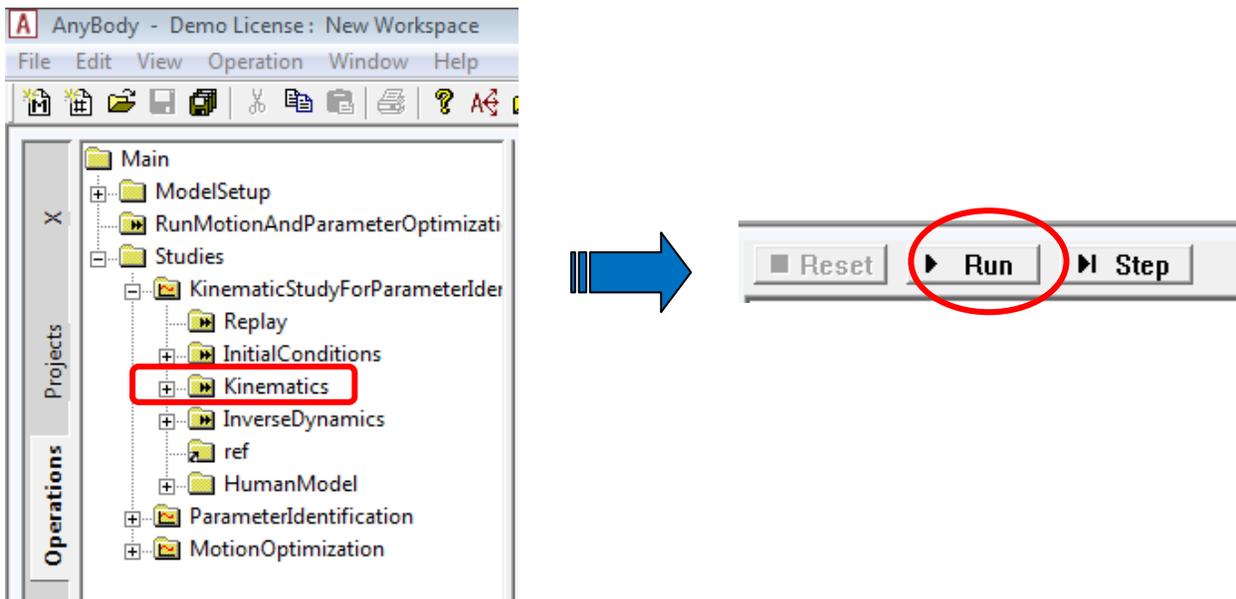
```
//Name of the C3D file to be analyzed
AnyString NameOfFile = "GaitFast0001-processed"; //Write the
name of the file here
```

17. Since this is a new C3D file from a new trial, we need to run the kinematic optimization again. Make the following changes in the main file:

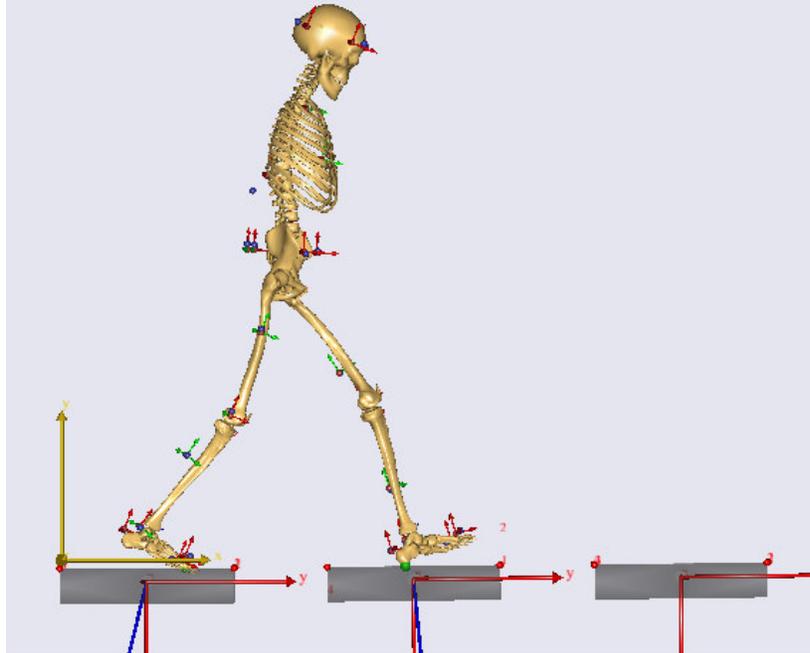
```
//Set this to 1 if you want to run the motion and Parameter
Optimization identification
//*****
#define MotionAndParameterOptimizationModel 1

//Set this to 1 if you want to run the inverse dynamic
analysis
#define InverseDynamicModel 0
//Usually only have one of the two switches active so set the
inactive analysis to 0
//*****
```

18. Reload the model. To see the model move, in the Operation tree -> expand Studies -> expand KinematicStudyForParameterIdentification -> select and run Kinematics



You will notice that this gait pattern is a little different from the previous one. In this case, the steps are longer and the posture indicates that the model is in a hurry.

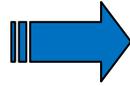
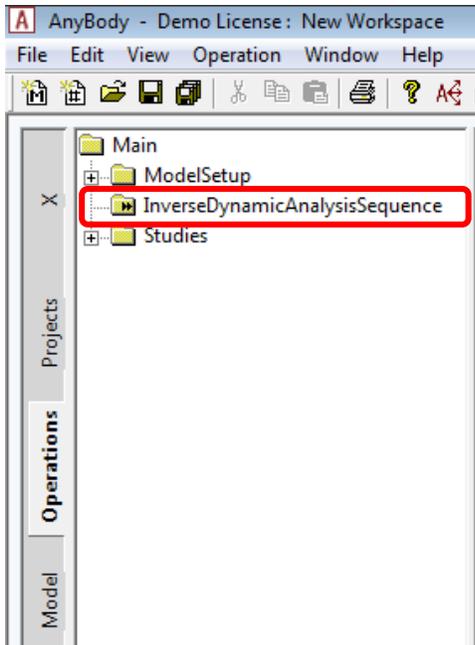


19. Now we can run the actual analysis. After the operation comes to an end, make the following changes:

```
//Set this to 1 if you want to run the motion and Parameter
Optimization identification
//*****
#define MotionAndParameterOptimizationModel 0

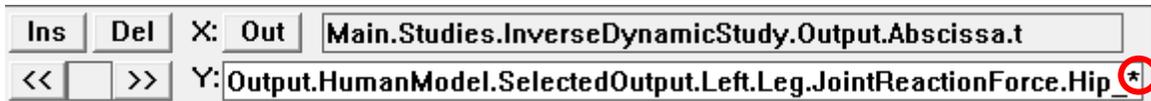
//Set this to 1 if you want to run the inverse dynamic
analysis
#define InverseDynamicModel 1
//Usually only have one of the two switches active so set the
inactive analysis to 0
//*****
```

20. Reload the model. In the Operation Tree -> Click InverseDynamic AnyalysisSequenc -> Run

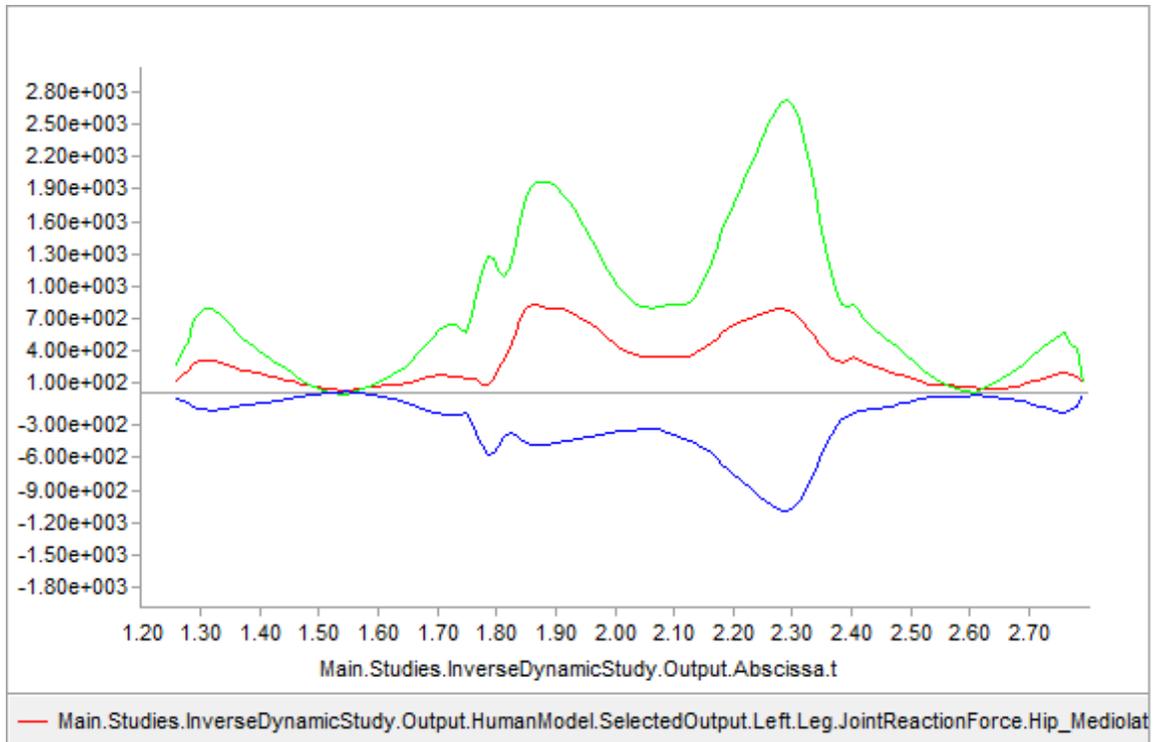


21. Let's investigate the hip joint reaction forces on the left leg and compare the results to the one done earlier.

Open a new ChartFX -> expand Studies -> expand LoadParametersOptimizationResults -> expand Study -> expand Output -> expand HumanModel -> expand SelectedOutput -> expand Left -> expand Leg -> expand JointReactionForce -> click Hip_MediolateralForce node -> In Y: remove "MediolateralForce" and replace with *:



22. You should get the following plots:



Plot B: Joint Reaction Force of Fast Gait Pattern

When comparing the plots for the normal gait pattern and fast gait pattern, we see that the faster gait yields a higher joint reaction force profile, which is expected.