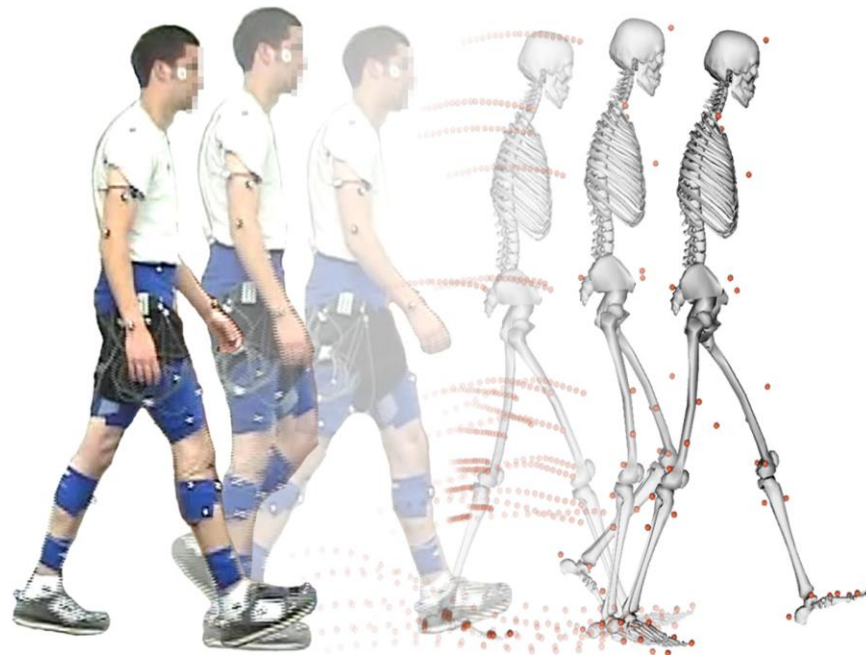


Importer des données dans OpenSim

OpenSim Workshop

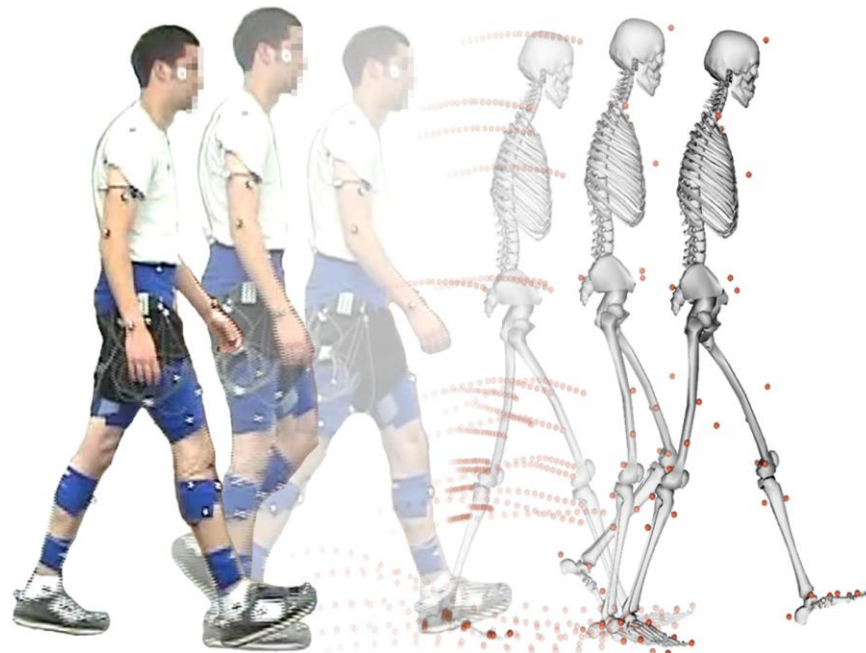
Les mauvaises nouvelles....

- Le pré-traitement des données expérimentales **n'est pas trivial**
- Les détails peuvent être spécifiques aux données, au modèle, et aux applications



Les bonnes nouvelles...

- Des outils de pré-traitement des données existent
- Le pré-traitement des données **devient plus facile** après les premiers sujets



Importation de données: format des fichiers

- Format des fichiers importés:
 - .trc
 - .mot
 - .sto
 - Fichiers de configuration (xml)

Fichiers de marqueurs (.trc)

Microsoft Excel - subject01_walk1.trc

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100% Arial 10

PathFileType	4	(X/Y/Z)	subject01_walk1.trc											
DataRate	CameraRate	NumFrames	NumMarkers	Units	OrigDataRate	OrigDataStart	OrigNumFrames							
60	60	900	41	mm	60	1	900							
Frame#	Time	R.ASIS	L.ASIS	V.Sacral										
		X1	Y1	Z1	X2	Y2	Z2	X3	Y3	Z3	X4	Y4		
1	0	617.24762	1055.27502	170.782	639.60638	1044.25842	-88.9098	430.8698	1051.265	29.96675	517.3327	741.096		
2	0.017	617.99811	1053.21753	168.5132	641.23621	1042.27856	-90.9321	432.3406	1050.237	26.84679	516.6138	740.4259		
3	0.033	620.29224	1051.77124	165.8594	643.59692	1041.06079	-94.3072	434.0994	1049.341	23.81936	517.7789	739.6809		
4	0.05	621.54041	1050.55212	163.5325	646.75104	1040.35681	-96.8619	436.2799	1048.707	20.95202	519.1975	739.3258		
5	0.067	624.58844	1050.92834	161.2461	649.25415	1041.42517	-98.4846	438.8279	1048.451	18.27267	522.1685	738.2791		
6	0.083	628.15863	1051.42017	158.449	652.04126	1043.04651	-101.857	441.5721	1048.661	15.77033	526.8028	738.1261		
7	0.1	630.80774	1051.99683	155.2827	654.94336	1045.55249	-104.843	444.3065	1049.388	13.38743	535.1032	738.0898		
8	0.117	634.3573	1053.59898	151.4853	656.46411	1048.43481	-108.355	446.8308	1050.622	11.01402	544.723	738.2121		

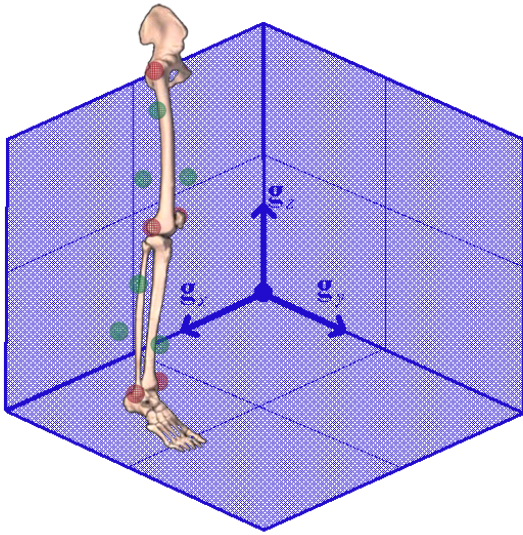
Les fichiers au format **.trc** spécifient la position des marqueurs à partir des enregistrements de capture de mouvement

- 3 premières lignes: **en-tête avec les info sur l'enregistrement**
- 4^{ème} ligne: en-tête des colonnes contenant les **noms des marqueurs**
- 5^{ème} ligne: **numéro du marqueurs et ses coordonnées**

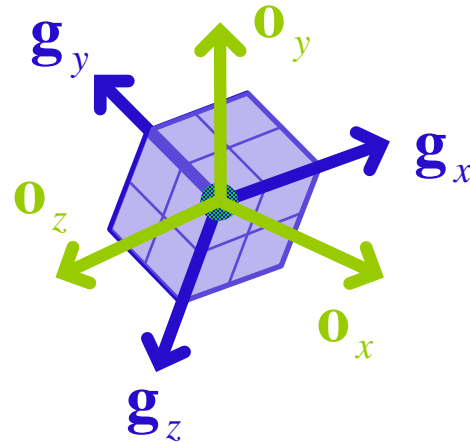
Ces fichiers peuvent être ouverts et modifiés avec Excel, Mokka, BTK, etc.

Systèmes de coordonnées

Système de coordonnées du labo



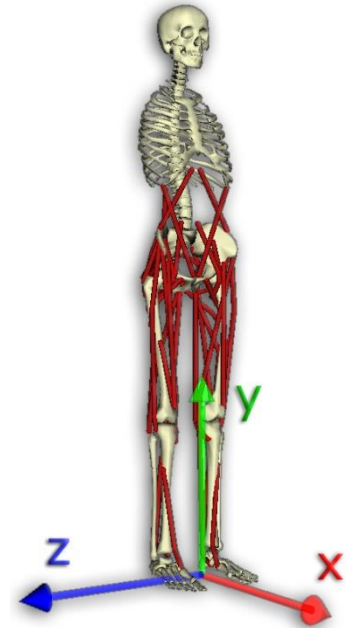
Repère g



Matrice de rotation

$${}^A\mathbf{R}^B = \begin{bmatrix} r_{xx} & r_{xy} & r_{xz} \\ r_{yx} & r_{yy} & r_{yz} \\ r_{zx} & r_{zy} & r_{zz} \end{bmatrix}$$

Système de coordonnées du modèle OpenSim



Repère O

Fichiers de mouvement (.mot) & stockage (.sto)

The screenshot shows an Excel spreadsheet with the following content:

	A	B	C	D	E	F	G	H	I	J	K	L	M
1	first trial												
2	nRows=73												
3	nColumns=165												
4													
5	# SIMM Motion File Header:												
6	name first trial												
7	datacolumns 165												
8	datarows 73												
9	otherdata 1												
10	range 0.400000 1.600000												
11	endheader												
12	time	pelvis_tx	pelvis_ty	pelvis_tz	pelvis_tilt	pelvis_list	pelvis_rotation	hip_flexion_r	hip_adduction_r	hip_rotation_r	knee_angle_r	ankle_angle_r	subt.
13	0.4	0.601753	1.045448	-0.02168	5.187567	-1.909807	-0.86725865	19.7062325	-2.80884888	-6.54740153	-55.15546834	2.761035	-0.0
14	0.417	0.599035	1.044536	-0.02303	5.157588	-1.792258	-0.7236571	20.2072896	-3.00831405	-7.02617551	-50.29713658	2.776907	-0.0
15	0.433	0.596761	1.042959	-0.02317	5.064083	-1.461869	-0.78327228	20.5463083	-3.36283276	-7.5912862	-44.97494162	2.672808	-0.0
16	0.45	0.594618	1.041237	-0.0234	5.188658	-1.000601	-0.67185485	20.3760591	-3.85167959	-8.42235098	-39.19978619	2.405782	-0.0
17	0.467	0.592104	1.038641	-0.02344	5.043854	-0.30155	-0.63039364	20.3771431	-4.43779371	-9.13165683	-33.15344686	1.982285	-0.0
18	0.483	0.590794	1.036217	-0.02314	4.972303	0.001165	-0.19638489	19.7781886	-4.5226093	-10.16754949	-26.48875526	1.43268	-0.0
19	0.5	0.58979	1.033177	-0.02175	4.832282	0.445042	-0.19963425	19.2529617	-4.43056957	-10.25135445	-19.88552357	0.949129	-0.0
20	0.517	0.588488	1.02963	-0.02097	4.684311	1.006778	-0.11020466	18.7666946	-4.48039476	-9.70840018	-13.65740445	0.661179	-0.0
21	0.533	0.587453	1.025713	-0.02047	4.511122	1.571479	-0.20368285	18.2834215	-4.67314635	-8.8755172	-8.06488935	0.665563	-0.0

Les formats de fichiers **.mot** & **.sto** contiennent **plusieurs** types de données différentes, comme les angles et moments aux articulations, les excitations, les activations, et les efforts.

- les fichiers de mouvement (**.mot**) doivent avoir des pas de temps uniformes.
- Les en-têtes des colonnes peuvent être ambigus (il faut donc faire attention au type de fichier traité)
- Toutes les unités sont dans le système international (mètres, Newtons, etc...)

Données d'efforts de réaction du sol

Microsoft Excel - subject01_walk1_grf.mot

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A1 name subject01_walk1_grf.mot

	A	B	C	D	E	F	G	H
1	name subject01_walk1_grf.mot							
2	datacolumns 19							
3	datarows 9009							
4	range 0.000000 15.013300							
5	endheader							
6		ground_force_vx	ground_force_vy	ground_force_vz	ground_force_px	ground_force_py	ground_force_pz	ground_force_vx
7	0	101.5119767	745.4881142	-47.44670554	0.37636285	-0.0075	0.12774652	17.26936127
8	0.0017	103.2043876	743.0973413	-46.86966548	0.37809513	-0.0075	0.12810137	18.91380164
9	0.0033	104.8844976	740.7135492	-46.28801443	0.37719739	-0.0075	0.12845514	20.50537239
10	0.005	106.5399203	738.2996154	-45.70129774	0.37628513	-0.0075	0.1288046	21.99210933
11	0.0067	108.1584244	735.8401938	-45.10743176	0.37535383	-0.0075	0.12914662	23.32367317
12	0.0083	109.7278112	733.3196148	-44.50479585	0.37439896	-0.0075	0.12947833	24.45219084
13	0.01	111.2361372	730.7218514	-43.8924258	0.37341601	-0.0075	0.12979706	25.33324305
14	0.0117	112.6717298	728.0304566	-43.27004355	0.37240058	-0.0075	0.1301005	25.92666846
15	0.0133	114.0235159	725.2286088	-42.63818276	0.37134841	-0.0075	0.13038667	26.1974759
16	0.015	115.2810839	722.2991605	-41.99815198	0.37025539	-0.0075	0.13065393	26.11679042

subject01_walk1_grf

Ready








Les données d'efforts doivent être ordonnées dans un **ordre très spécifique**:

BODY 1 FORCE (x , y , z)	BODY 1 COP (x , y , z)	BODY 2 FORCE (x , y , z)	BODY 2 COP (x , y , z)	BODY 1 TORQUE (x , y , z)	BODY 2 TORQUE (x , y , z)
------------------------------------	----------------------------------	------------------------------------	----------------------------------	-------------------------------------	-------------------------------------

NOTE: Les en-têtes des colonnes doivent être **exactement** comme dans cet exemple!


Les utilitaires OpenSim (du site web confluence)

- Dans la section "Tools for preparing motion data"

Package		Brief Description	Platform	Authors	License	Included Materials	Last Updated
MOtoNMS		MOtoNMS is a Matlab toolbox able to read motion data stored in C3D files and process markers trajectories, ground reaction forces, and EMG signals for OpenSim and CEINMS.	Matlab	Alice, Mantoan, Monica Reggiani	GNU General Public License	Extensive online documentation, example data	Ongoing
GaitExtractToolbox171		Matlab toolbox to assist in extracting kinematic, kinetic, and EMG information directly from a C3D file for use in OpenSim. The scripts can be configured for any laboratory configuration.	Matlab	Tim Dorn	MIT License	PDF Instructions and Example data	Jan, 2011
Matlab_Opensim_Tools_v2		Folder containing a number of functions for processing data from C3D files to OpenSim format and for generating setup files and running scale/ik/id from the matlab command line.	Matlab	Glen Lichtwark, Ayman Habib, Rod Barrett	MIT License	Readme instructions and example data	August, 2013
OpenSMAC1.0		This project contains a utility program (OpenSMAC) that converts motion files from a Motion Analysis Corp. system (TRB and ANB files) into a format supported by OpenSim (TRC/MOT). It can also convert C3D files if you have a valid license and hardware key for SIMM and the Motion Module.	Motion Labs C++ plugin	Peter Loan	Custom	PDF Instructions	Dec, 2009
Lee-Son's Toolbox		This toolbox converts VICON motion capture data into OpenSim inputs. Converts data into *.trc (marker trajectories) and *.mot (force plate data) files.	Binary (.exe) files	Sangjun Lee and Jinkyoun Son	MIT license	Manual, Example data	Sep, 2013
Preprocessing Utilities or Download here		A set of matlab scripts for preprocessing experimental data to put it in format expected by OpenSim. These scripts were developed by Ajay Seth to process C3D from Gillette Children's Specialty Healthcare.	Matlab	Ajay Seth	Custom		Aug, 2008
External load Utilities or Download here		A Matlab script, with examples, to generate GRF .mot files and an external loads setup file compatible with OpenSim 2.4. The script works with standard gait lab GRF data from pre-2.0. A README file with instructions is included with the download.	Matlab	Sam Hamner	Custom		Jan, 2012


Les utilitaires OpenSim (du site web SimTK)





- <https://simtk.org/projects/opensim-utils>



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OpenSim Utilities



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About

The purpose of this umbrella project is to provide a central repository of user-contributed OpenSim utilities and extensions.

Download Latest Releases ▾

License: **Neuromusculoskeletal Builder**

This collection is no longer being maintained through this project. To find OpenSim utilities, you now have two options:

- 1) Visit the summary table on the OpenSim documentation pages (<http://simtk-confluence.stanford.edu:8080/display/OpenSim/Tools+for+Preparing+Motion+Data>)
- 2) Conduct a search on SimTK. Click here (https://simtk.org/search/search.php?srch=opensim&type_of_search=soft) and then narrow your search to "Scripts, Plug-Ins, and Other Utilities" by checking the box on the left.


A repository of tools written by members of the OpenSim community to support their usage of the

1,883
downloads

3
forum posts

Last updated
Mar 21, 2017

Project Statistics



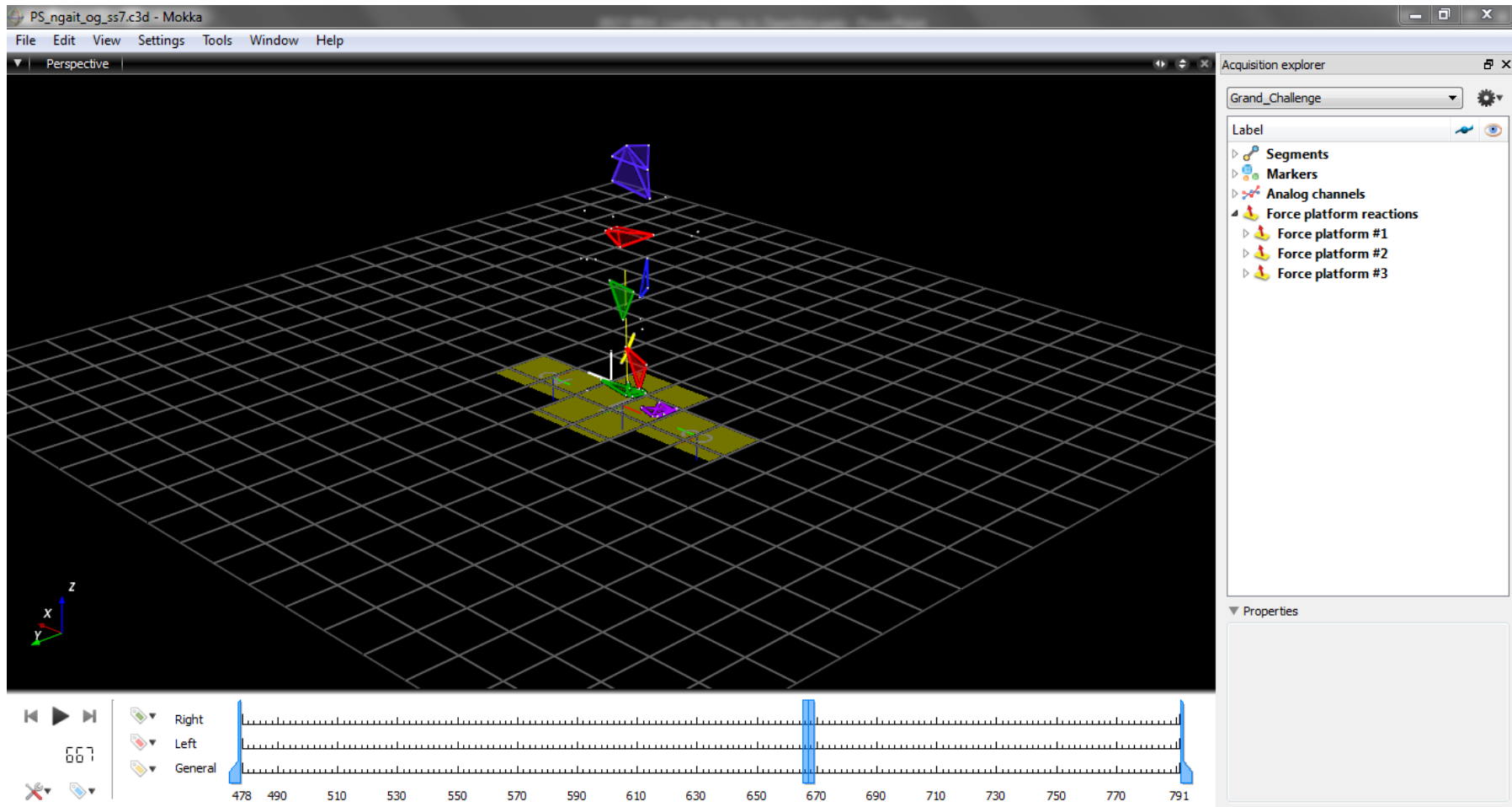
Jennifer Hicks

Les librairies BTK / l'outil Mokka



<http://biomechanical-toolkit.github.io>

- Plusieurs boîtes à outils utilisent les fonctions BTK.



Barre' et al. Comp Meth Prog Med, 2014

Les ressources BTK et MOKKA en ligne

- MOKKA est téléchargeable ici:
<http://biomechanical-toolkit.github.io/mokka/>
- BTK est disponible ici:
<https://code.google.com/archive/p/b-tk/>
et les packages ici:
<https://code.google.com/archive/p/b-tk/downloads>
- Une nouvelle version de BTK est en cours:
<http://www.openma.org>

