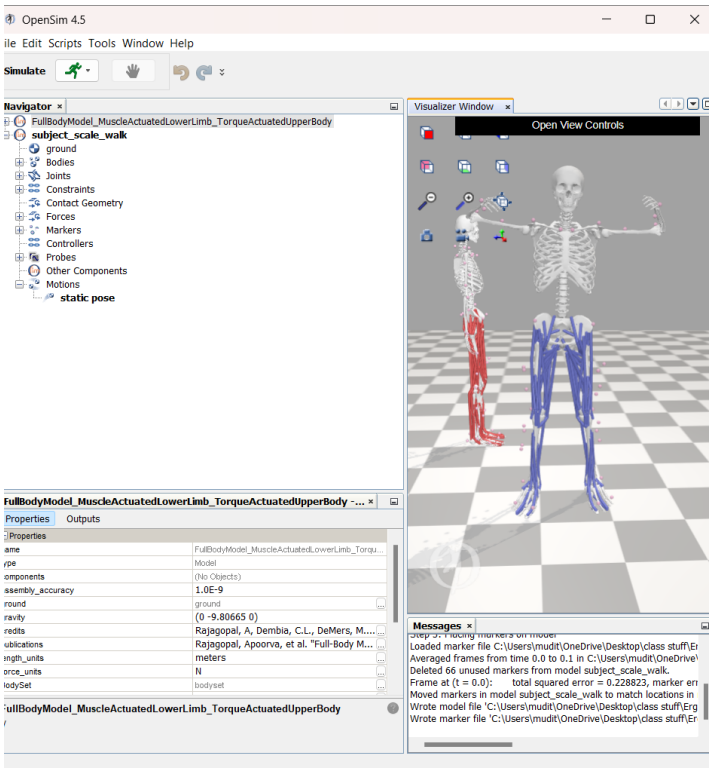
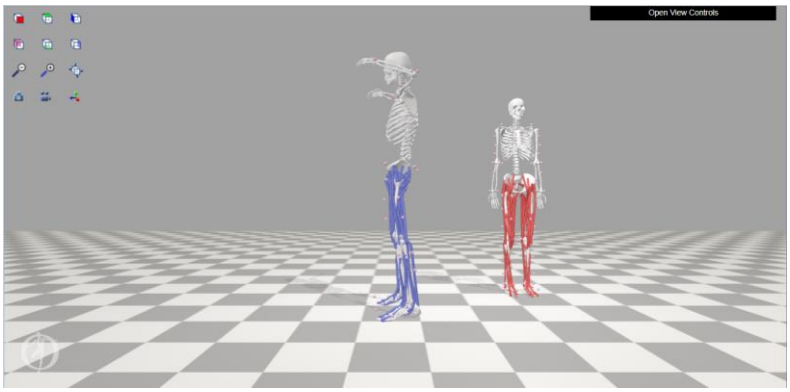
Weekly Report: Working with OpenSim

Dear Ma’am,

This week’s report would be outlining the process I followed to calculate the joint forces and moments. I took two instances, one with a man of 85KG and the other person with a 100KG weight and the femur being 70% slimmer on the Y axis.

For the first person, I took the weight of them to be 85KG, right femur scaling in xyz direction to be 0.958000.





given the weight and height of the model we can see that opensim generally modifies the musculoskeletal model and changes the generic model to a more appropriate approximation of the given data. In this example, the scaled model seems to be taller and wider than the generic model after performing the scaling operation.

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************************************************************
*     Summary of Mass Adjustments to Reduce Residuals      *
************************************************************
* Body adjusted: torso
* Mass Center (COM) adjustment: dx =0.0138137, dz =-0.00895761
* New COM location: ~[-0.0501176,0.376899,0.00895761]
************************************************************
* Recommended mass adjustments:
*  Total mass change: -23.1279
*  pelvis: orig mass = 13.298, new mass = 9.68255
*  femur_r: orig mass = 10.5027, new mass = 7.64722
*  tibia_r: orig mass = 4.18632, new mass = 3.04815
*  patella_r: orig mass = 0.0973328, new mass = 0.07087
*  talus_r: orig mass = 0.112915, new mass = 0.0822158
*  calcn_r: orig mass = 1.41144, new mass = 1.0277
*  toes_r: orig mass = 0.244574, new mass = 0.178079
*  femur_l: orig mass = 10.5027, new mass = 7.64722
*  tibia_l: orig mass = 4.18632, new mass = 3.04815
*  patella_l: orig mass = 0.0973328, new mass = 0.07087
*  talus_l: orig mass = 0.112915, new mass = 0.0822158
*  calcn_l: orig mass = 1.41144, new mass = 1.0277
*  toes_l: orig mass = 0.244574, new mass = 0.178079
*  torso: orig mass = 30.2913, new mass = 22.0557
*  humerus_r: orig mass = 2.295, new mass = 1.67104
*  ulna_r: orig mass = 0.685959, new mass = 0.499461
*  radius_r: orig mass = 0.685959, new mass = 0.499461
*  hand_r: orig mass = 0.516586, new mass = 0.376137
*  humerus_l: orig mass = 2.295, new mass = 1.67104
*  ulna_l: orig mass = 0.685959, new mass = 0.499461
*  radius_l: orig mass = 0.685959, new mass = 0.499461
*  hand_l: orig mass = 0.516586, new mass = 0.376137
************************************************************
* Note: Edit the model to make recommended adjustments to  *
*       mass properties.                                   *
************************************************************

* Average residuals before adjusting torso COM:
*  FX=-2.27318 FY=226.807 FZ=9.45618
*  MX=2.66091 MY=-1.31766 MZ=4.10343
************************************************************
* Average residuals after adjusting torso COM:
*  FX=-2.28064 FY=226.859 FZ=9.43337
*  MX=0.0862907 MY=-1.30824 MZ=0.0405398
************************************************************
```

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****************************************************************
*                  Final Average Residuals                     *
****************************************************************
* After torso COM and Kinematics adjustments:
*  FX=0.456012 FY=192.417 FZ=5.63878
*  MX=6.42114 MY=-1.25078 MZ=-8.49893
****************************************************************
```

Resulting data for 85KG model after performing RRA

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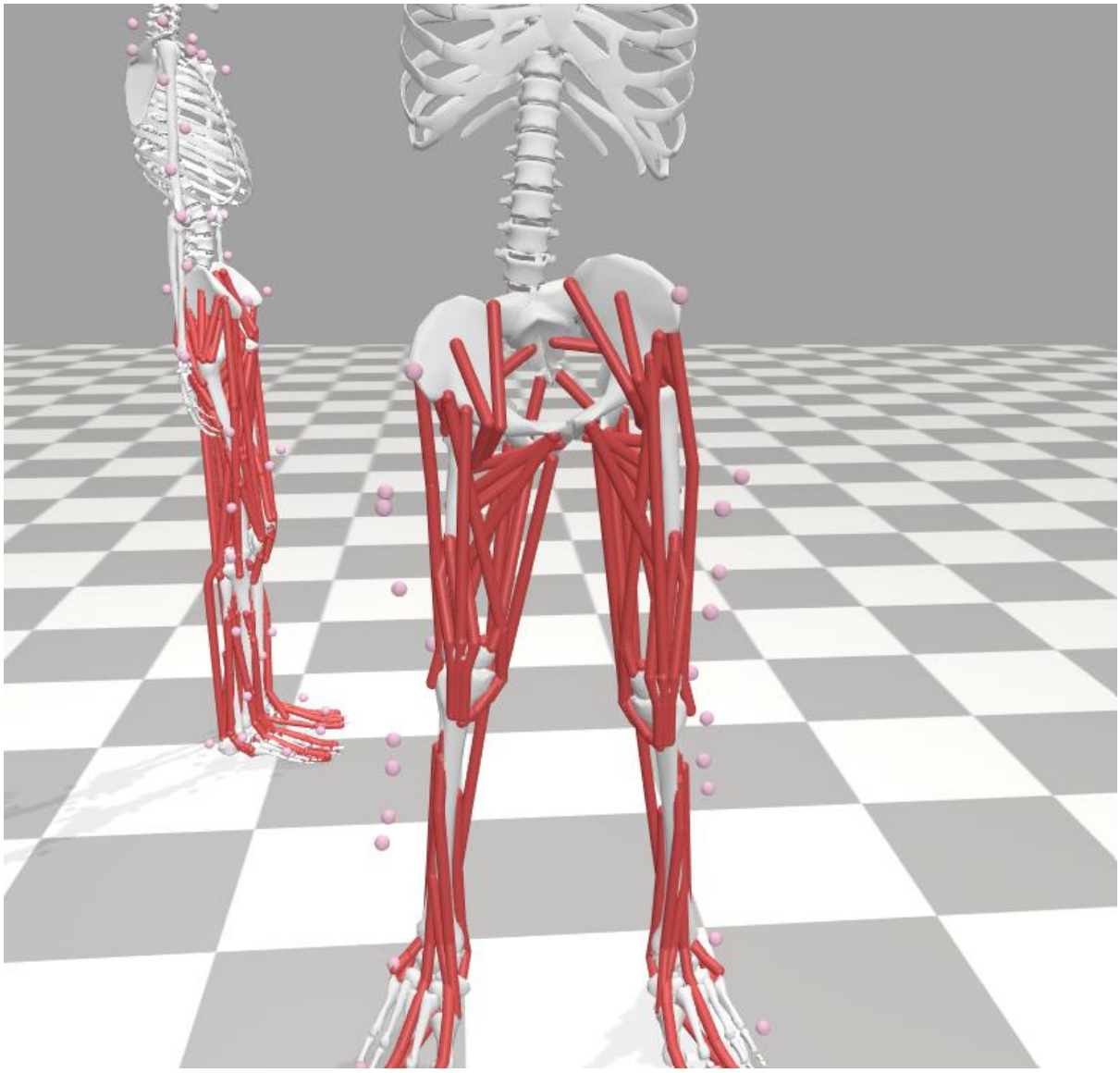
Weekly Report: Working with OpenSim



The flex the pelvis can be seen clearly for the second man weighing 100KG.

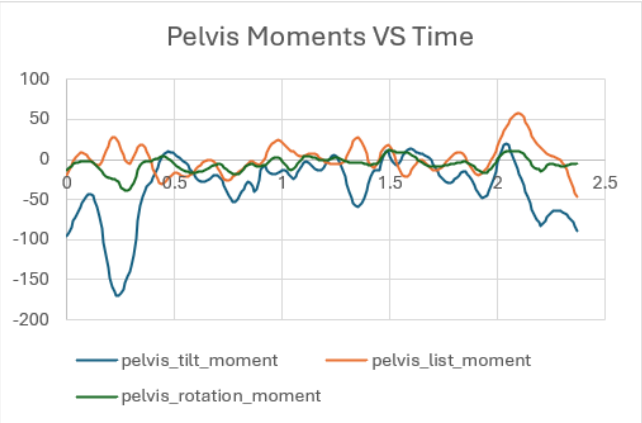
Weekly Report: Working with OpenSim

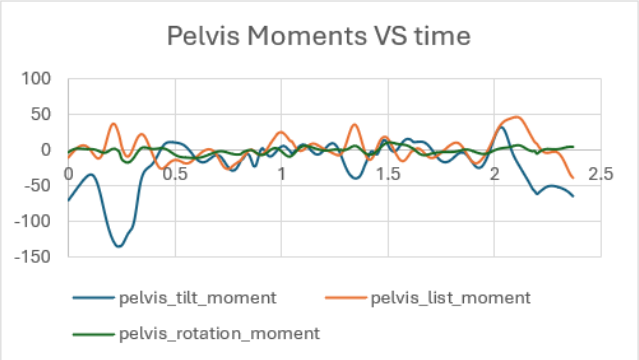
```
************************************************************
*     Summary of Mass Adjustments to Reduce Residuals      *
************************************************************
* Body adjusted: torso
* Mass Center (COM) adjustment: dx =0.0162007, dz =-0.0146693
* New COM location: ~[-0.0525046,0.376899,0.0146693]
************************************************************
* Recommended mass adjustments:
*  Total mass change: -37.8895
*  pelvis: orig mass = 15.6324, new mass = 9.70937
*  femur_r: orig mass = 12.3464, new mass = 7.6684
*  tibia_r: orig mass = 4.92122, new mass = 3.05659
*  patella_r: orig mass = 0.114419, new mass = 0.0710663
*  talus_r: orig mass = 0.132737, new mass = 0.0824435
*  calcn_r: orig mass = 1.65921, new mass = 1.03054
*  toes_r: orig mass = 0.287508, new mass = 0.178573
*  femur_l: orig mass = 12.3464, new mass = 7.6684
*  tibia_l: orig mass = 4.92122, new mass = 3.05659
*  patella_l: orig mass = 0.114419, new mass = 0.0710663
*  talus_l: orig mass = 0.132737, new mass = 0.0824435
*  calcn_l: orig mass = 1.65921, new mass = 1.03054
*  toes_l: orig mass = 0.287508, new mass = 0.178573
*  torso: orig mass = 35.6088, new mass = 22.1168
*  humerus_r: orig mass = 2.69788, new mass = 1.67566
*  ulna_r: orig mass = 0.806377, new mass = 0.500844
*  radius_r: orig mass = 0.806377, new mass = 0.500844
*  hand_r: orig mass = 0.607271, new mass = 0.377179
*  humerus_l: orig mass = 2.69788, new mass = 1.67566
*  ulna_l: orig mass = 0.806377, new mass = 0.500844
*  radius_l: orig mass = 0.806377, new mass = 0.500844
*  hand_l: orig mass = 0.607271, new mass = 0.377179
************************************************************
* Note: Edit the model to make recommended adjustments to  *
*       mass properties.                                   *
************************************************************

* Average residuals before adjusting torso COM:
*  FX=-3.0803 FY=371.569 FZ=9.77073
*  MX=5.12257 MY=-1.29224 MZ=5.65735
************************************************************
```

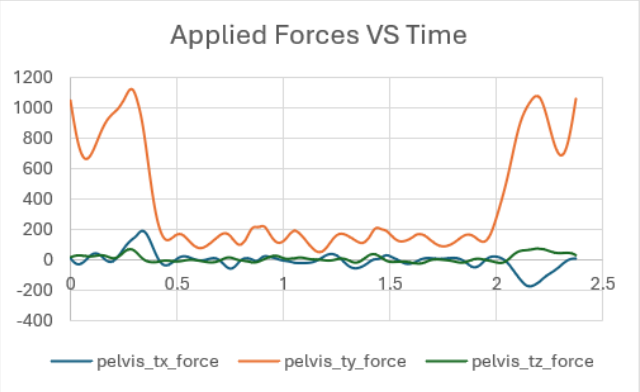
```
************************************************************
* Note: Edit the model to make recommended adjustments to  *
*       mass properties.                                   *
************************************************************

* Average residuals before adjusting torso COM:
*  FX=-3.0803 FY=371.569 FZ=9.77073
*  MX=5.12257 MY=-1.29224 MZ=5.65735
************************************************************
* Average residuals after adjusting torso COM:
*  FX=-3.10004 FY=371.65 FZ=9.73454
*  MX=0.127642 MY=-1.27462 MZ=0.0529485
************************************************************



************************************************************
*                Final Average Residuals                   *
************************************************************
* After torso COM and Kinematics adjustments:
*  FX=0.765039 FY=323.327 FZ=4.96534
*  MX=1.96934 MY=-0.811022 MZ=-19.0899
************************************************************
```

Resulting data for 85KG model after performing RRA

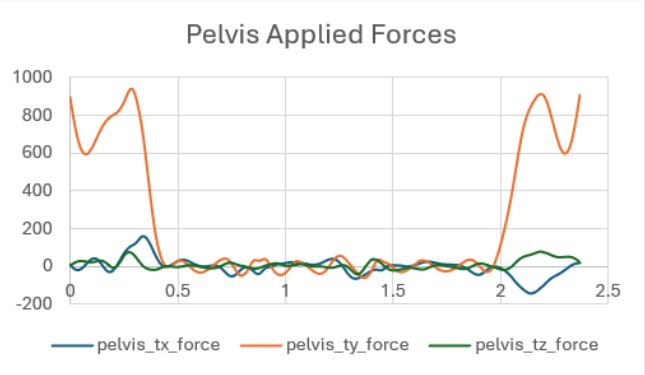
Weekly Report: Working with OpenSim







For 100KG Man



For 85KG Man

Pelvis forces and moments produced in each model.

G3

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U
1	Inverse Dynamics Generalized Forces																				
2	version=1																				
3	nRows=238																				
4	nColumns=40																				
5	inDegrees=no																				
6	endheader																				
7	time	pelvis_tilt_	pelvis_list_	pelvis_rota	pelvis_tx_f	pelvis_ty_f	pelvis_tz_f	hip_flexior	hip_adduc	hip_rotatic	hip_flexior	hip_adduc	hip_rotatic	lumbar_ex	lumbar_be	lumbar_ro	knee_angl	knee_angl	knee_angl	knee_angl	arm_flex_r
8	0	-96.2428	-19.1049	-14.0492	13.21729	1053.753	16.83136	3.369741	1.36136	-1.80216	-1.72475	24.60875	-2.24183	4.105292	7.521019	0.125699	16.97645	-0.03209	4.949583	-0.05479	1.165734
9	0.01	-90.2105	-12.9603	-10.8266	-3.80595	966.1068	22.53806	4.168534	0.695182	-1.67954	-2.05706	20.60421	-1.58401	2.432357	7.713675	2.318474	11.74761	-0.02577	4.616782	-0.05283	1.376784
10	0.02	-83.81	-7.02593	-8.02852	-17.0543	883.5297	27.02286	5.163044	0.317672	-1.82243	-2.17457	16.78192	-1.02888	1.071956	7.684428	4.266586	7.005608	-0.01972	4.245453	-0.05078	1.605343
11	0.03	-77.3989	-1.67074	-5.86409	-24.979	811.0021	29.76716	6.395164	0.348348	-2.28577	-2.15123	13.3748	-0.60115	0.105408	7.346833	5.755924	2.998764	-0.01438	3.867359	-0.04883	1.839569
12	0.04	-71.188	2.78885	-4.36951	-26.8686	752.0708	30.66722	7.899283	0.796037	-3.03895	-2.04524	10.56007	-0.31059	-0.38907	6.704633	6.665796	-0.13946	-0.01008	3.503694	-0.04713	2.059027
13	0.05	-65.2519	6.113492	-3.44531	-22.8547	708.6285	29.96318	9.687512	1.570574	-3.97769	-1.88518	8.442826	-0.15303	-0.34871	5.836929	6.974052	-2.39169	-0.00698	3.161855	-0.0458	2.243359
14	0.06	-59.612	8.118287	-2.91204	-13.878	681.0875	28.19736	11.71137	2.468723	-4.92562	-1.66892	7.044518	-0.11227	0.262246	4.882122	6.747763	-3.83241	-0.00512	2.837291	-0.0449	2.382376
15	0.07	-54.3267	8.719436	-2.58915	-1.50803	668.7256	26.0615	13.84747	3.225281	-5.68275	-1.37564	6.301307	-0.16301	1.433898	4.016587	6.122607	-4.58694	-0.00445	2.519469	-0.04443	2.477708
16	0.08	-49.579	7.938708	-2.36141	12.32045	670.0431	24.2762	15.87751	3.554599	-6.06301	-0.98437	6.077588	-0.27513	3.097034	3.425591	5.269237	-4.78358	-0.00482	2.199389	-0.04434	2.534851
17	0.09	-45.7084	5.964846	-2.23001	25.57889	683.0207	23.37769	17.49867	3.251456	-5.95561	-0.49088	6.190969	-0.41805	5.12303	3.273725	4.359447	-4.51063	-0.00607	1.876114	-0.04458	2.554724
18	0.1	-43.2332	3.093712	-2.30653	36.35011	705.2855	23.68625	18.31412	2.211388	-5.32741	0.083382	6.446646	-0.56416	7.328116	3.675964	3.546136	-3.78319	-0.00832	1.560244	-0.04505	2.53237
19	0.11	-42.8206	-0.31713	-2.78366	43.02622	734.2567	25.28315	17.85597	0.460403	-4.22418	0.690303	6.6772	-0.69077	9.485913	4.677732	2.951988	-2.53297	-0.01147	1.273887	-0.04569	2.4614
20	0.12	-45.1318	-3.66033	-3.8848	44.58634	767.3111	27.72939	15.7169	-1.65371	-2.82695	1.259108	6.773668	-0.78084	11.35823	6.256079	2.659428	-0.62597	-0.01502	1.047539	-0.04643	2.339527
21	0.13	-50.6959	-6.21009	-5.76647	40.74476	801.9466	30.23731	11.61675	-3.54979	-1.36758	1.706606	6.698182	-0.82296	12.72882	8.326812	2.705477	2.094079	-0.018	0.913616	-0.04722	2.173433
22	0.14	-59.7709	-7.32979	-8.44171	32.04243	835.9177	31.93262	5.469788	-4.59138	-0.04369	1.956193	6.474703	-0.8113	13.42188	10.74374	3.081515	5.745121	-0.02044	0.897253	-0.04802	1.981901
23	0.15	-72.0609	-6.27098	-11.6868	20.14225	867.4384	31.64803	-2.39003	-3.95069	0.942703	1.957679	6.16908	-0.74594	13.31473	13.31224	3.733417	10.35287	-0.02309	1.008617	-0.04884	1.794852
24	0.16	-86.8733	-2.85818	-15.1077	7.402559	895.3075	28.95506	-11.4326	-1.25405	1.566422	1.696702	5.864137	-0.63285	12.3635	15.83544	4.567325	15.81189	-0.02619	1.241054	-0.04968	1.64694

Inverse dynamic generalized forces and moments calculated after performing the method

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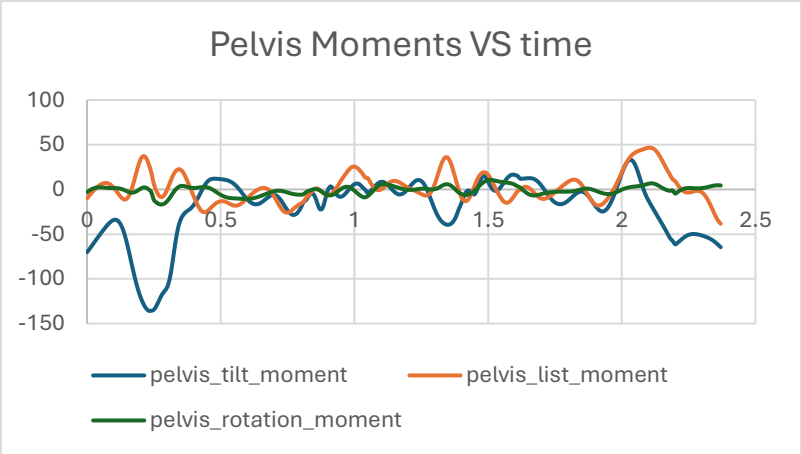
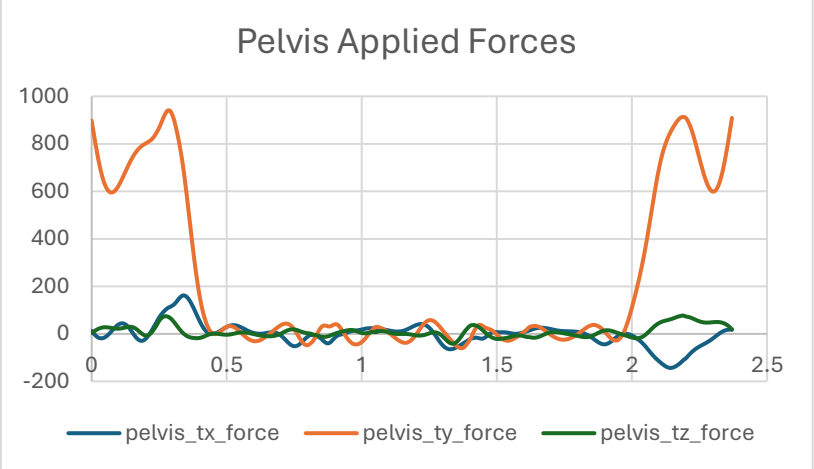
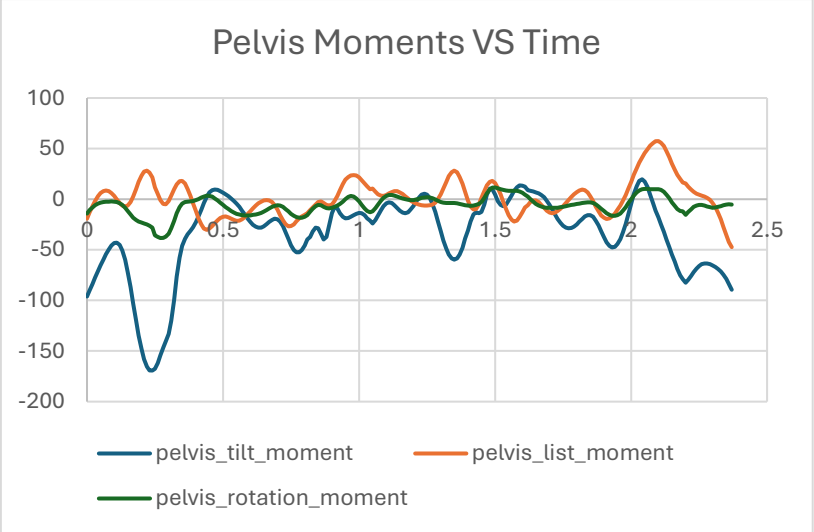
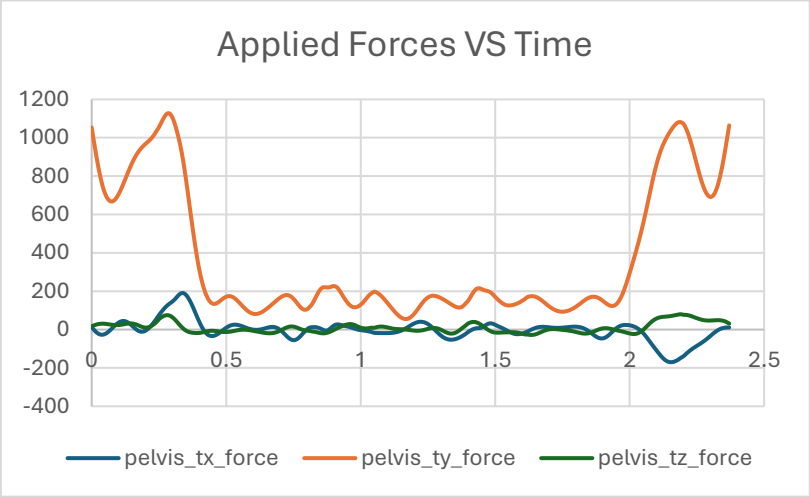




For 85KG Man

Weekly Report: Working with OpenSim





For 100KG Man