

# SW스타랩

## ‘덤벨로우’ 동작 구현

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180726 김성훈

# 실험 목표

2개의 센서를 사용하여 '덤벨 로우' 동작을 수행하고 Euler데이터를 추출

1. 각 센서는 동그라미가 어깨 부위를 향하도록 일렬로 정렬시킨다.

2. 손등에 1번 센서, 팔꿈치로부터 1/3 떨어진 위치에 2번 센서, 팔꿈치와 어깨 중간 지점에 3번 센서를 부착

시작 자세에서 Alignment Reset으로 센서 축을 초기화 시키고, 목표 자세에 도달하여 다시 시작 자세로 돌아오는 동작을 1회, 총 5회 수행하였음

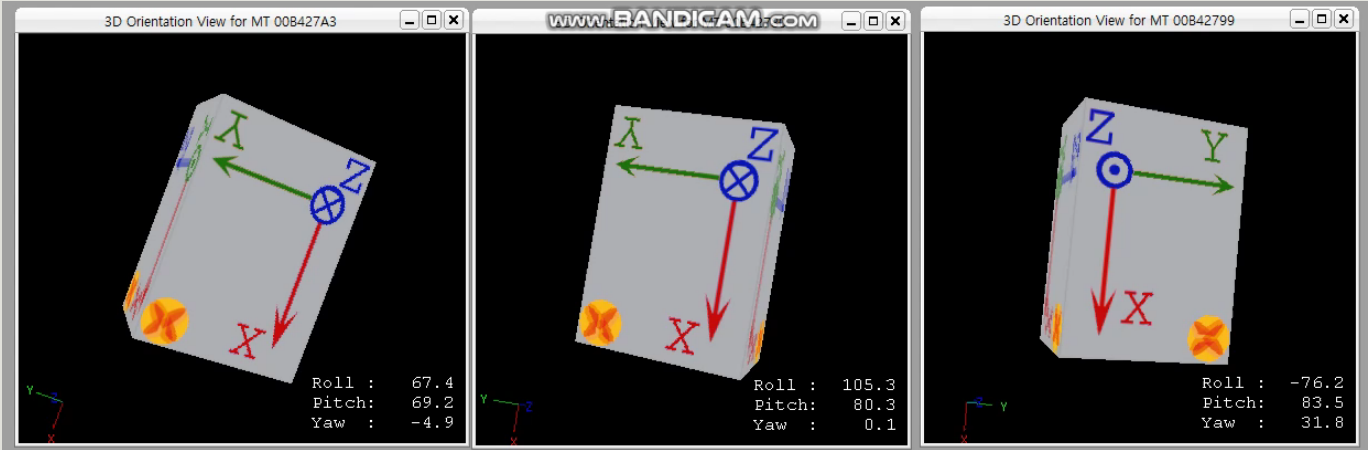


<센서 부착 위치>



<시작 자세>

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T
1	PacketCo	Acc_X	Acc_Y	Acc_Z	FreeAcc_X	FreeAcc_Y	FreeAcc_Z	Gyr_X	Gyr_Y	Gyr_Z	Vellnc_X	Vellnc_Y	Vellnc_Z	Orlinc_q0	Orlinc_q1	Orlinc_q2	Orlinc_q3	Roll	Pitch	Yaw
2	65367	-9.36652	1.472376	-0.97026	0	0	-0.28163	0.016785	0.060579	-0.02061	-0.09367	0.014734	-0.00967	1	0.000084	0.000303	-0.0000	123.2848	79.34302	7.359565
3	65368	-9.40124	1.430271	-0.98581	0	0	-0.25231	0.015752	0.068706	-0.00536	-0.09402	0.014306	-0.00983	1	0.000079	0.000344	-2.7E-06	124.4794	79.54126	8.511783
4	65369	-9.41251	1.43538	-0.97195	0.009572	-0.02035	-0.2419	0.019684	0.06856	-0.00122	-0.09413	0.014355	-0.00969	1	0.000098	0.000343	-6E-06	123.9658	79.4263	7.994225
5	65370	-9.44989	1.490926	-1.01589	-0.03079	0.022781	-0.1922	0.014457	0.068008	-0.00308	-0.0945	0.014911	-0.01013	1	0.000072	0.00034	-1.5E-06	124.1521	79.40594	8.175362
6	65371	-9.45207	1.587582	-1.05008	-0.07279	0.112068	-0.17179	-0.00142	0.061002	0.004636	-0.09452	0.015874	-0.01047	1	-7E-06	0.000305	0.000025	124.3007	79.38451	8.326672
7	65372	-9.49815	1.59117	-1.08334	-0.09468	0.103834	-0.12246	-0.02711	0.055233	0.007586	-0.09499	0.015907	-0.01081	1	-0.00014	0.000276	0.000038	124.4113	79.36307	8.455049
8	65373	-9.54486	1.519137	-1.03739	-0.02789	0.034744	-0.09228	-0.04004	0.048841	0.008132	-0.09545	0.015185	-0.01035	1	-0.0002	0.000244	0.00004	124.4969	79.34302	8.56547
9	65374	-9.61767	1.497589	-1.04834	-0.02228	0.00144	-0.02286	-0.04377	0.03602	0.008773	-0.09618	0.014969	-0.01047	1	-0.00022	0.00018	0.000045	124.547	79.32718	8.641958
10	65375	-9.65505	1.421039	-1.08086	-0.03465	-0.08453	0.005621	-0.03374	0.028119	0.003586	-0.09655	0.014207	-0.0108	1	-0.00017	0.000141	0.000018	124.5918	79.31584	8.707202
11	65376	-9.6311	1.372723	-1.08483	-0.0319	-0.12973	-0.02487	-0.02388	0.022924	0.008124	-0.09631	0.013722	-0.01084	1	-0.00012	0.000115	0.00004	124.6214	79.30455	8.751231
12	65377	-9.6188	1.367914	-1.10717	-0.05259	-0.13706	-0.03533	-0.0013	0.018192	0.004817	-0.09619	0.013677	-0.01106	1	-6E-06	0.000091	0.000025	124.6613	79.29623	8.792477
13	65378	-9.58381	1.370668	-1.06065	-0.00992	-0.12143	-0.0742	0.022455	0.022045	-0.00028	-0.09584	0.013708	-0.01059	1	0.000112	0.00011	-1E-06	124.7296	79.28917	8.848865
14	65379	-9.60444	1.456758	-1.04058	0.001547	-0.03611	-0.04289	0.033597	0.020399	0.007686	-0.09605	0.014566	-0.01039	1	0.000168	0.000102	0.000038	124.795	79.27938	8.895603
15	65380	-9.59031	1.54583	-0.97205	0.055542	0.064591	-0.05046	0.024211	0.023775	0.005955	-0.09591	0.015457	-0.00971	1	0.000121	0.000119	0.00003	124.8576	79.2688	8.945215
16	65381	-9.63708	1.511134	-0.96378	0.078061	0.026178	-0.0107	0.002658	0.030089	0.005593	-0.09637	0.015109	-0.00962	1	0.000013	0.00015	0.000025	124.9309	79.25688	9.017999
17	65382	-9.57181	1.519321	-0.98874	0.046612	0.038513	-0.07093	-0.01164	0.028068	0.003149	-0.09572	0.015191	-0.00988	1	-5.8E-05	0.00014	0.000015	124.9882	79.24619	9.083127
18	65383	-9.52163	1.458445	-0.97432	0.066149	-0.01187	-0.13109	-0.03333	0.030255	0.0066	-0.09522	0.01458	-0.00973	1	-0.00017	0.000151	0.00003	125.0348	79.23395	9.149873
19	65384	-9.5381	1.429107	-1.03702	0.014461	-0.0538	-0.11269	-0.02938	0.039273	0.001708	-0.09538	0.014289	-0.01035	1	-0.00015	0.000196	0.000004	125.1118	79.22022	9.245389
20	65385	-9.61417	1.332068	-1.0293	0.050176	-0.15715	-0.05365	-0.0171	0.0313	0.005561	-0.09614	0.013317	-0.01028	1	-8.6E-05	0.000156	0.000025	125.1712	79.20876	9.315827
21	65386	-9.64571	1.367166	-1.06033	0.02158	-0.13292	-0.01396	-0.00148	0.032909	0.011215	-0.0946	0.013666	-0.01059	1	-7E-06	0.000165	0.000055	125.2318	79.19264	9.378287
22	65387	-9.66305	1.395561	-1.05205	0.030377	-0.10603	0.00652	0.015109	0.025149	0.011111	-0.09663	0.013951	-0.01051	1	0.000076	0.000126	0.000055	125.2907	79.18243	9.429193
23	65388	-9.73337	1.410636	-1.04177	0.050055	-0.09946	0.076762	0.026243	0.020629	0.013405	-0.09734	0.014101	-0.01041	1	0.000131	0.000103	0.00006	125.333	79.16934	9.456914
24	65389	-9.71258	1.420998	-1.03427	0.05479	-0.08506	0.057113	0.037007	0.010016	0.01243	-0.09713	0.014206	-0.01034	1	0.000185	0.00005	0.000062	125.3681	79.16496	9.470773
25	65390	-9.6395	1.406449	-0.98857	0.09351	-0.08218	-0.02189	0.038573	0.005828	0.011349	-0.0964	0.014061	-0.00988	1	0.000193	0.000029	0.000057	125.3848	79.15773	9.465229
26	65391	-9.5785	1.39763	-0.92181	0.152511	-0.07088	-0.09042	0.026748	-4.4E-05	0.013647	-0.09579	0.013971	-0.00922	1	0.000134	0	0.000063	125.3876	79.15768	9.452146
27	65392	-9.54846	1.36567	-0.95398	0.122716	-0.10459	-0.12134	0.02669	0.003906	0.013881	-0.09549	0.013651	-0.00954	1	0.000133	0.00002	0.000069	125.3884	79.1499	9.437371
28	65393	-9.50736	1.385489	-0.93583	0.131974	-0.07625	-0.16064	0.005386	0.006454	0.009207	-0.09508	0.013851	-0.00936	1	0.000027	0.000032	0.000045	125.3992	79.15223	9.444838
29	65394	-9.49515	1.380629	-0.95693	0.111194	-0.08365	-0.1711	0.00018	0.00592	0.007319	-0.09495	0.013803	-0.00957	1	0.000001	0.00003	0.00003	125.4011	79.14684	9.446656
30	65395	-9.50339	1.366118	-0.98765	0.084078	-0.10317	-0.16186	-0.00295	0.011416	0.0038	-0.09504	0.013659	-0.00987	1	-1.5E-05	0.000057	0.000019	125.4243	79.15266	9.472038
31	65396	-9.53475	1.305175	-1.04838	0.039089	-0.17755	-0.1338	-0.00115	0.006325	0.004121	-0.09535	0.01305	-0.01048	1	-6E-06	0.000032	0.00002	125.4319	79.14864	9.480448
32	65397	-9.5341	1.343649	-1.08766	-0.00658	-0.1453	-0.12423	0.002706	-0.00476	0.006165	-0.09534	0.013434	-0.01088	1	0.000014	-2.4E-05	0.00003	125.422	79.16069	9.468016
33	65398	-9.54828	1.350788	-1.12612	-0.0442	-0.14735	-0.10503	0.019099	-0.01558	0.004442	-0.09548	0.013507	-0.01127	1	0.000095	-7.8E-05	0.000025	125.3872	79.1638	9.421459
34	65399	-9.51021	1.332939	-1.12627	-0.04941	-0.1579	-0.14512	0.021569	-0.02231	0.003523	-0.0951	0.013329	-0.01127	1	0.000108	-0.00011	0.000018	125.3599	79.18417	9.379949
35	65400	-9.49574	1.364456	-1.12383	-0.05611	-0.12544	-0.15479	0.02414	-0.03408	0.007828	-0.09496	0.013642	-0.01125	1	0.000121	-0.00017	0.000039	125.2767	79.19182	9.281171
36	65401	-9.48975	1.381147	-1.15057	-0.08963	-0.11142	-0.15525	0.018557	-0.03783	0.00836	-0.0949	0.013809	-0.01152	1	0.000093	-0.00019	0.000042	125.2143	79.21508	9.205261
37	65402	-9.56652	1.417794	-1.14366	-0.08178	-0.08585	-0.07501	-0.00052	-0.03823	0.007051	-0.09566	0.014175	-0.01146	1	-3E-06	-0.00019	0.000035	125.1077	79.22442	9.097048
38	65403	-9.66081	1.386222	-1.15656	-0.08202	-0.12983	0.01416	-0.0193	-0.04636	0.001239	-0.09661	0.013861	-0.01159	1	-9.7E-05	-0.00023	0.000005	125.0248	79.25354	9.02197
39	65404	-9.68456	1.340134	-1.18154	-0.10117	-0.18324	0.033068	-0.03057	-0.04884	-0.00291	-0.09684	0.013401	-0.01184	1	-0.00015	-0.00024	-1.5E-05	124.8913	79.27097	8.90395
40	65405	-9.71109	1.256938	-1.22713	-0.13457	-0.27363	0.051289	-0.02524	-0.04419	-0.00485	-0.09711	0.01257	-0.01229	1	-0.00013	-0.00022	-2.4E-05	124.8343	79.30038	8.858984
41	65406	-9.69669	1.192139	-1.25455	-0.15765	-0.33984	0.030103	0.002858	-0.04125	-0.00844	-0.09696	0.011926	-0.01257	1	0.000014	-0.00021	-4.2E-05	124.7477	79.31785	8.769197
42	65407	-9.65055	1.188093	-1.22298	-0.13543	-0.32793	-0.01909	0.039619	-0.0361	-0.00882	-0.0965	0.011888	-0.01225	1	0.000198	-0.00018	-4.4E-05	124.7851	79.34841	8.781322
43	65408	-9.65636	1.246189	-1.26952	-0.19154	-0.27858	0.000346	0.078393	-0.02097	-0.01062	-0.09656	0.012472	-0.0127	1	0.000392	-0.00011	-5.3E-05	124.796	79.36028	8.746665
44	65409	-9.58659	1.420809	-1.21922	-0.17758	-0.08355	-0.04696	0.118896	-0.00699	-0.01185	-0.09587	0.014221	-0.01219	1	0.000594	-3.5E-05	-5.9E-06	124.9845	79.38333	8.864468
45	65410	-9.57539	1.603999	-1.17831	-0.1656	0.106354	-0.03462	0.111811	0.004376	-0.00813	-0.09575	0.01605	-0.01177	1	0.000559	0.000022	-4.1E-05	125.0738	79.38572	8.890142
46	65411	-9.60823	1.693486	-1.13847	-0.13222	0.203303	0.006845	0.093787	0.017567	-0.01645	-0.09608	0.016948	-0.01137	1	0.000469	0.000088	-8.2E-05	125.3265	79.40055	9.084857
47	65412	-9.62909	1.777294	-1.11967	-0.12091	0.28847	0.037891	0.04021	0.025079	-0.01717	-0.09629	0.017783	-0.01118	1	0.000201	0.000125	-8.6E-05	125.4427	79.40026	9.179613
48	65413	-9.65531	1.787686	-1.14165	-0.13639	0.296822	0.067469	-0.01776	0.037429	-0.0192	-0.09655	0.017885	-0.0114	1	-8.9E-05	0.000187	-9.6E-05	125.6555	79.40322	9.405082
49	65414	-9.78415	1.713379	-1.17119	-0.13425	0.204325	0.186167	-0.04859	0.046098	-0.0159	-0.09784	0.017139	-0.01169	1	-0.00024	0.00023	-7.9E-05	125.7707	79.39522	9.550542



## <Unity> 사용된 모델링 초기 상태



공통 모델링에서 허리와 팔만 회전시켜 시작 자세와 비슷하게 위치시킴



팔 윗부분, 아랫부분, 손목 계층구조에 직접 회전 값을 변경시키는 방식으로 적용



좌표계 일치를 위해 직접 각을 변경하다 보니 정말하게  
일치하지는 않음



```
angle = new Vector3(-float.Parse(fields[18]), -float.Parse(fields[17]), float.Parse(fields[19]));
target = Quaternion.Euler(angle);

//transform.rotation = target;    //회전 각 변경
Debug.Log("Roll : " + angle.x + " Pitch : " + angle.y + " Yaw : " + angle.z + "\n");
transform.rotation = initRotation;    //초기 위치로 돌린 후 회전시키기
transform.Rotate(angle);
transform.Rotate(new Vector3(0, 0, -90), Space.Self);
transform.Rotate(new Vector3(90, 0, 0), Space.Self);
```

Roll과 Pitch 데이터를 교환하고 -부호를 적용

initRotation에 모델링의 초기 회전 값을 저장해 두었다가  
rotation에 할당하여 초기화

변경되는 회전 값으로 모델링을 회전시키고

초기 좌표에 맞도록 축을 추가로 회전시킴

## 동작 매트릭스

<https://docs.google.com/document/d/1vKmf2ujYnmZpAWHYzlqYbi3LGJew8zyNcD1ShkSNj3I/edit?usp=sharing>