ECE 6310 – **Lab7** Name: **Atef Emran**

Motion Tracking

Summary

In this project motion using accelerometers and gyroscopes is calculated. The program is using the given accelerometer and the gyroscope data to calculate the distance and the angle.

Implementation and Results

The program executes these major steps:

1. Importing the data
2. smoothing the data using the mean filter with customizable window, the window used is 15
3. Calculating the variance and decide motion or not based on a threshold, the variance window used was 17,and the thresholds are as below:
   threshold_var_X = 0.00002
   threshold_var_Y = 0.00009
   threshold_var_Z_min = 0.0002
   threshold_var_Z_max = 0.013
   threshold_var_pitch = 0.002
   threshold_var_roll = 0.0006
   threshold_var_yaw = 0.02
   Based on the threshold value, the motion signal is determined.
4. Determine the rest periods and print them out, only if there is no motion detected at any of the accelerometer's or the gyroscope's axis.
5. Determine the motion periods
6. Calculate the motion in the motion periods for each of the axis, by integrating the gyroscope data and double integrating the acceleration data.

The results are as follows:

	start_time	end_time	start_index	end_index	distance_X	distance_Y	distance_Z	angle_roll	angle_pitch	angle_yaw
Rest	0.1	0.5	1	9	0	0	0	0	0	0
	3.05	5.25	60	104	0	0	0	0	0	0
	7.75	10	154	199	0	0	0	0	0	0
	12.6	14.05	251	280	0	0	0	0	0	0
	17.05	18.7	340	373	0	0	0	0	0	0
	20.95	21.75	418	434	0	0	0	0	0	0
	25.1	31.05	501	620	0	0	0	0	0	0
	33.7	36.9	673	737	0	0	0	0	0	0
	39.2	42.45	783	848	0	0	0	0	0	0
	45.1	47.55	901	950	0	0	0	0	0	0
	50.3	52.6	1005	1051	0	0	0	0	0	0
	55.1	57.65	1101	1152	0	0	0	0	0	0
	60.3	62.5	1205	1249	0	0	0	0	0	0
Motion	start_time	end_time	start_index	end_index	distance_X	distance_Y	distance_Z	angle_roll	angle_pitch	angle_yaw
	0.55	3	10	59	0.528869	-0.219612	-30.302788	-0.004765	-0.017544	-0.025708
	5.3	7.7	105	153	0.198315	0.692676	-29.103478	-0.022749	0.001331	0.021964
	10.05	12.55	200	250	-0.120253	0.204017	-31.516161	-0.015372	-0.003194	-0.026939
	14.1	17	281	339	0.924984	-0.038176	-42.184294	0.000765	-0.004724	0.041629
	18.75	20.9	374	417	1.119267	-0.512048	-23.845218	0.099531	0.162203	-0.0808
	21.8	25.05	435	500	7.728136	-5.106299	-51.443574	-0.149781	-0.169822	0.067898
	31.1	33.65	621	672	-0.217606	-0.140147	-32.791338	0.002405	0.045773	1.564504
	36.95	39.15	738	782	-0.141259	0.166534	-24.673743	-0.005741	-0.003723	-1.541229
	42.5	45.05	849	900	-1.293378	-12.015028	-24.125416	-0.088707	1.595438	-0.070334
	47.6	50.25	951	1004	-1.356679	-27.658382	-11.292899	0.055912	-1.578105	0.054057
	52.65	55.05	1052	1100	9.979256	-0.013738	-21.804981	1.676533	0.002095	-0.070931
	57.7	60.25	1153	1204	26.731808	-0.043932	-8.083586	-1.611297	-0.037634	0.045554

Instructions

No arguments are needed to run the executable file