Introduction to Computer Vision
Motion Tracking

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ECE 631
Lab 7 Report

November 28, 2017

1 Introduction

This lab deals with estimating the motion of an object, by processing readings from accelerometers and gyroscopes .

2 Setup

To determine the motion of an Iphone, we have data from accelerometers (one for each axis X, Y and Z) and from gyroscopes (each calculating pitch, roll and yaw).

The algorithm first detects periods of motion from periods of rest. This is done across all sensors. Then during periods of motion, linear acceleration is determined by double-integrating the accelerometer values. The rotation/orientation is determined by integrating gyroscope values.

3 Results

Figure 1 Shows various plots of the sensors. The first subplot in the figure, shows the motion-detection-algorithm. This variable is '1' when motion is detected, and '0' otherwise. From this variable, start and end times are determined during which integration is done to determine linear distance and orientation.

The below table summarizes the net accelerations and/or degrees estimated by processing the data. This is run only on instances where a motion was detected. Here the distances are measured in meters and the angles in degrees. Here we see that the most prominent motion is the motion with highest magnitude. This corresponds with the experiment conducted.

Motion	Sample Numbers	Time Window seconds	DistX	DIstY meters	DistZ	Pitch	Roll degrees	Yaw	Most Prominent Motion
1	22-58	1.05-2.85	0.56	**1.09**	0.18	2.98	1.93	11.47	AccY
2	116-148	5.75-7.35	0.54	**1.02**	0.14	2.43	2.83	12.39	AccY
3	222-244	11.05-12.15	**0.29**	0.11	0.06	1.25	3.18	7.48	AccX
4	294-335	14.65-16.7	**1.01**	0.34	0.25	1.87	5.96	6.88	AccX
5	386-411	19.25-20.5	0.54	0.39	**1.22**	12.64	14.96	12.25	AccZ
6	456-496	22.75-24.75	2.91	1.11	**1.40**	15.17	14.71	11.70	AccZ
7	628-669	31.35-34.40	1.02	0.46	0.34	3.13	4.59	**89.58**	Yaw
8	735-772	37.60-38.55	0.22	0.09	0.03	0.84	1.88	**75.71**	Yaw
9	864-899	34.15-44.90	1.02	9.89	7.18	**91.10**	9.37	12.84	Pitch
10	974-1001	48.65-50.00	0.43	3.95	1.87	**68.30**	5.40	5.85	Pitch
11	1069-1091	53.40-54.50	3.78	0.07	2.22	6.21	**92.90**	7.77	Roll
12	1170-1201	58.45-60.00	7.77	0.10	5.02	2.54	**90.47**	4.65	Roll

Table 1: Motion Detection and Estimation

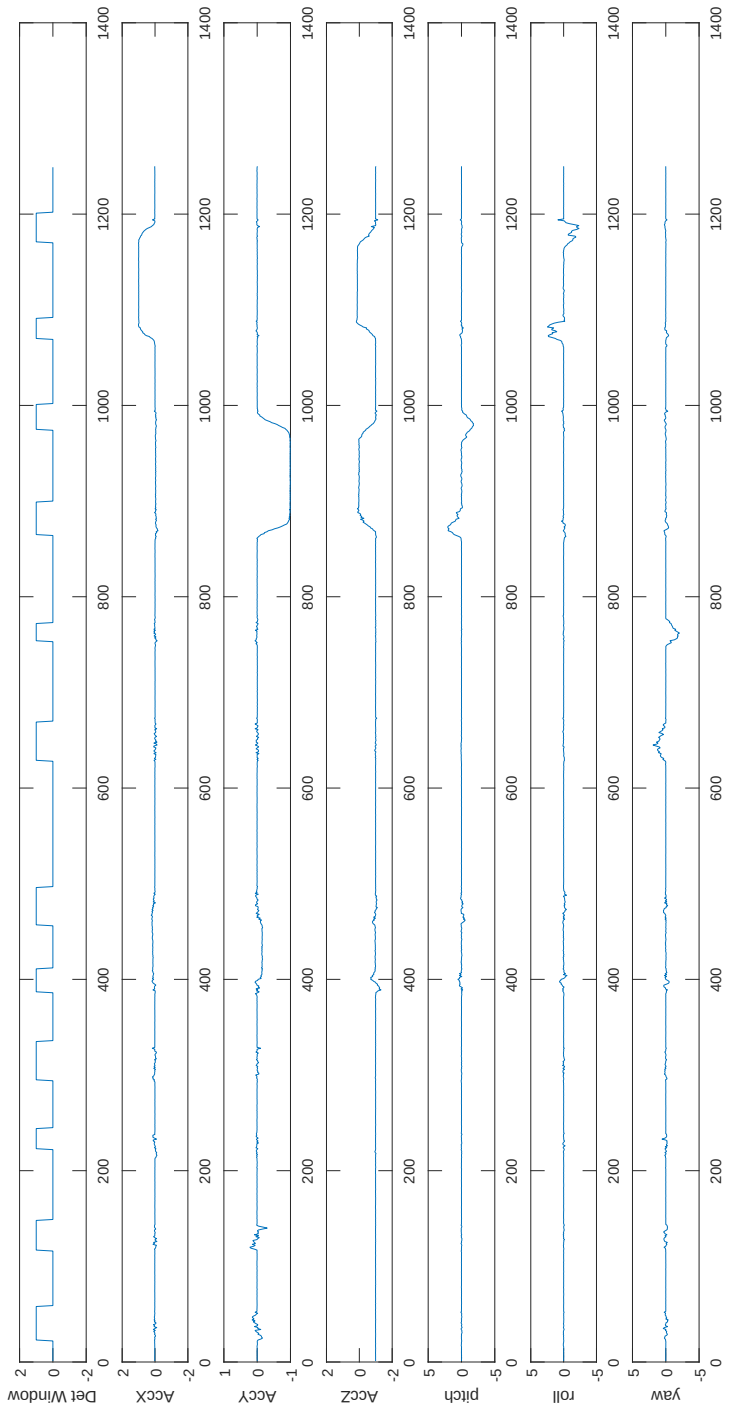

Figure 1: Sensors and Window Detecting Algorithm