Accelerometer Filter Analysis Report

To select a filter to reduce the noise from the accelerometer, we logged the accelerometer data after passing it though different types of filters.

For each filter type, we used an android app called 'Acceleration Explorer' from the google play store : (https://play.google.com/store/apps/details?id=com.kircherelectronics.accelerationexplorer) to log the output and save the data in .csv files. The .csv files were then imported in Matlab and plotted to compare the responses when the phone was rotated about the z-axis from 90 degrees to 0 degrees (i.e. starting with phone standing on its side, with the screen facing the left hand side and ending with the phone facing directly upwards, such as when placed on a table). The rotation was made as fast as possible to mimic a sudden change or step response. The following plots were obtained and the z-axis (green line) was analyzed.

1. No filter

Without any filters, the following plot was obtained:

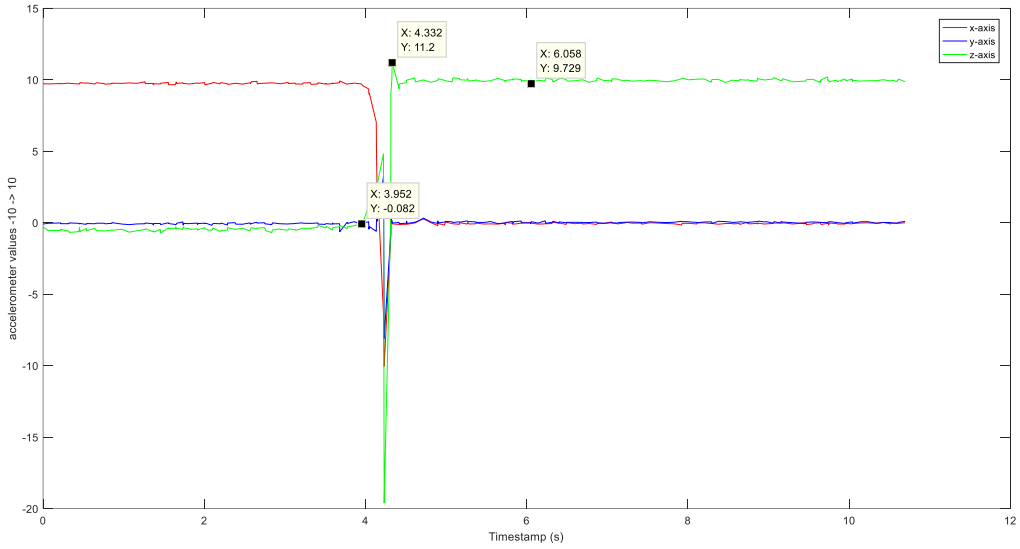

Fig1 – No filter

The results are as follows:

Time from start of movement to time at which z-axis is at a steady state value of 10 +/- 0.2.	6.058 – 3.952 = 2.106 seconds
Overshoot	11.2 – 10 = 1.2 => 20%

2. Lowpass Filter

With the LP filter, the following plot was obtained:

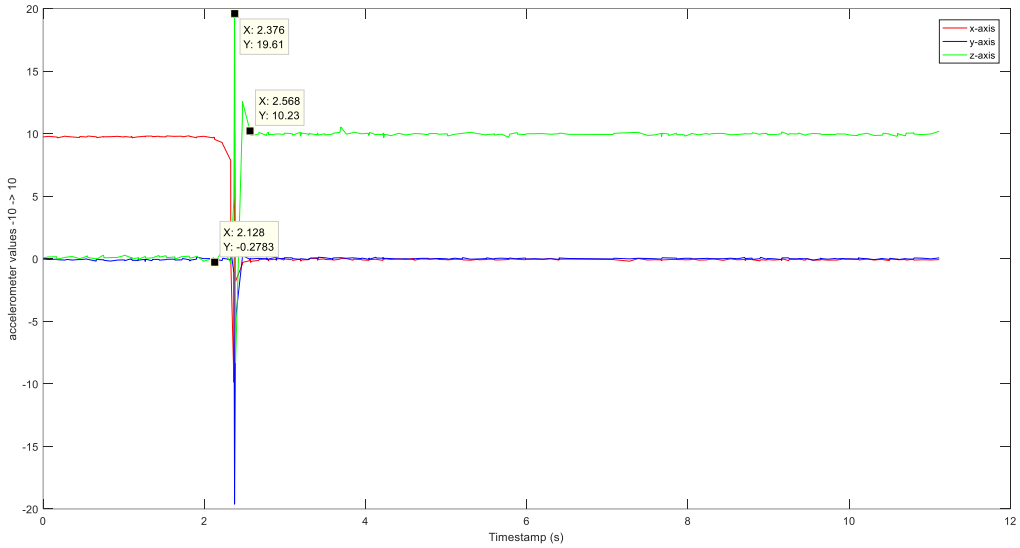

Fig2 – LP filter

The results are as follows:

Time from start of movement to time at which z-axis is at a steady state value of 10 +/- 0.2.	2.568 – 2.128 = 0.44 seconds
Overshoot	19.61 – 10 = 9.61 => 96.1%

3. Median Filter

With the Median filter, the following plot was obtained:

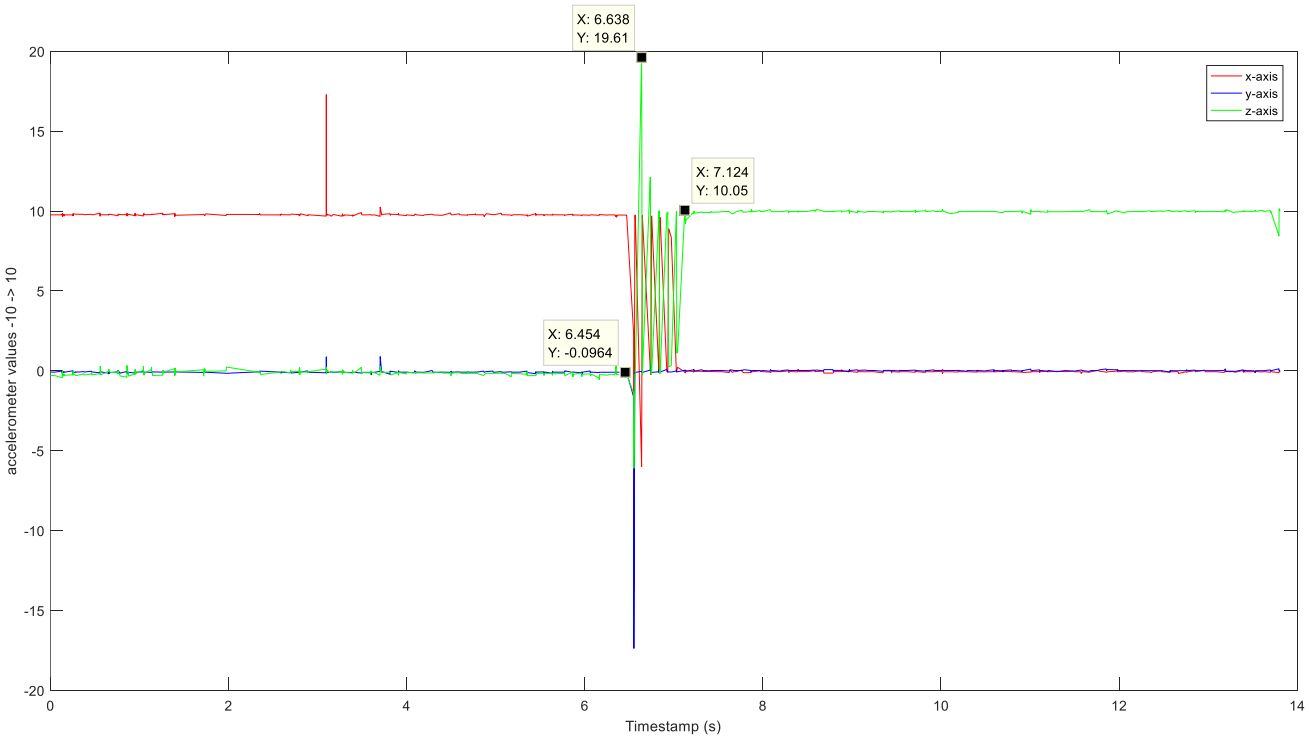

Fig3 – Median filter

The results are as follows:

Time from start of movement to time at which z-axis is at a steady state value of 10 +/- 0.2.	7.124 – 6.454 = 0.67 seconds
Overshoot	19.61 – 10 = 9.61 => 96.1%

4. Mean Filter

With the Mean filter, the following plot was obtained:

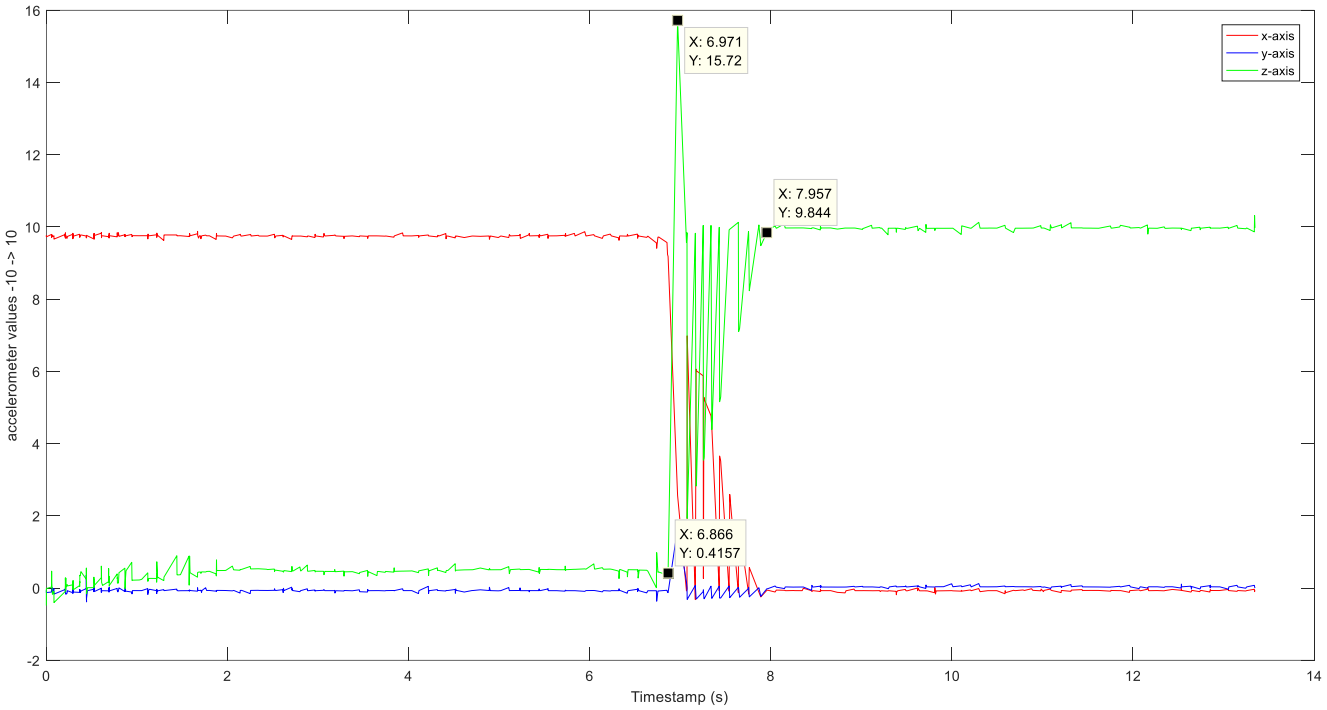

Fig2 – Mean filter

The results are as follows:

Time from start of movement to time at which z-axis is at a steady state value of 10 +/- 0.2.	7.957 – 6.866 = 1.091 seconds
Overshoot	15.72 – 10 = 5.72 => 57.2%

Conclusion:

	No filter	LP filter	Median filter	Mean filter
Time from start of movement to time at which z-axis is at a steady state value of 10 +/- 0.2.	2.106 seconds	0.44 seconds	0.67 seconds	1.091 seconds
Overshoot	20 %	96.1%	96.1%	57.2%

From the results obtained, we decided to use the Mean filter, since it gives a fast response, with half the overshoot of the mean or LP filters.