Appendix 2
LIDAR Data Test

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A profile was drawn along a known flat, uninterrupted surface in order to establish if there was an error in the dataset. The chosen surface was the N1 Highway. Although the road enters a dip in the section, the change in profile should remain constant. As seen in Figure A, the profile is not constant along the N1 Highway. In places the dataset has a noise factor of about 0.5 to 1m and at one particular point; the error is more than 3m.

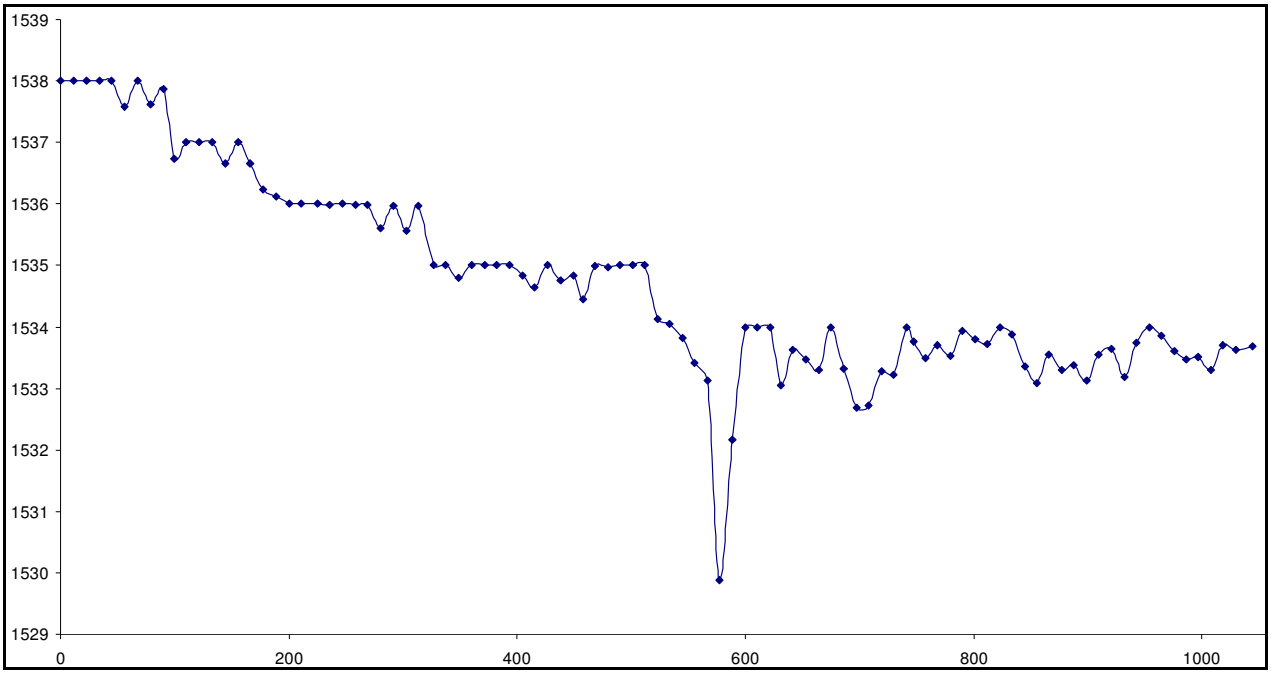

Figure A: A profile along the N1 Highway.

In signal processing one often deals with obtaining an input signal and processing it into an output signal. At times the signal may be transmitted through a channel which corrupts it, resulting in a noisy output. As a consequence, the user at the output end has to attempt to reconstruct the original signal without the noise. Two filters (algorithms) were applied to the dataset in order to determine the best method to reduce this noise (Figure B):

- Non-linear
- Low pass

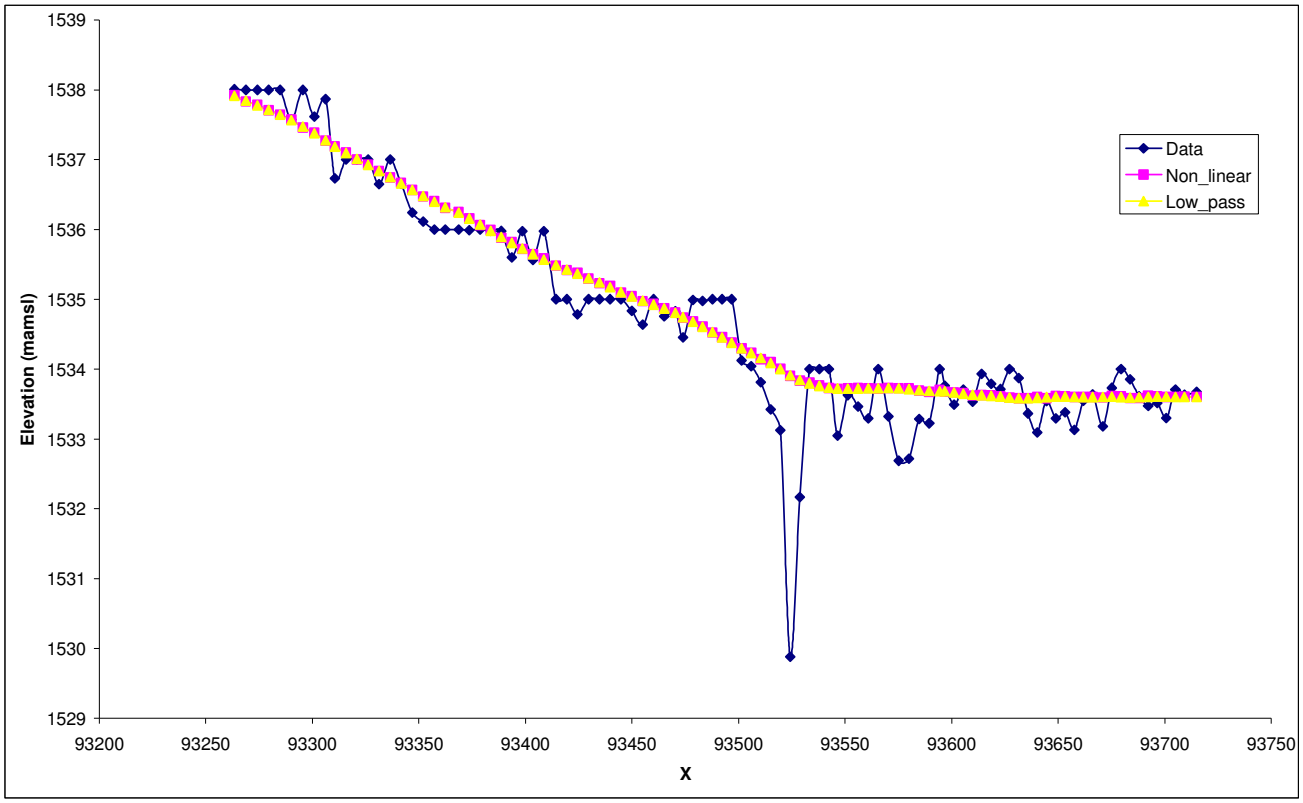

Figure B: A profile along the N1 Highway with the filtered datasets.

A low-pass filter is a filter that passes low-frequency signals but attenuates (reduces the amplitude of) signals with frequencies higher than the cutoff frequency. Non-linear filters remove high amplitude and short wavelength noise from data. The algorithm is 'non-linear' because it looks at each data point and decides if that data is noise or valid signal. If the point is noise, it is simply removed and replaced by an estimate based on surrounding data points, and parts of the data that are not considered noise are not modified at all. A non-linear filter can be followed by a linear low-pass filter to smooth any low-amplitude noise that may remain (Low-pass in Figure B). Therefore the non-linear filtered data followed by a linear low-pass filter are used for the analysis in this thesis.