

Improving model accuracy using 'Optical Bathymetry' techniques

Matthew Gardner

ABSTRACT

When building models of any river, stream or lake, one of the key pieces of essential data is the waterway bathymetry. Whilst this data is often critical for the accuracy of the model, it is not usually captured by LiDAR, and for rivers and streams is often only surveyed physically at widely spaced cross sections and ultimately limits the accuracy of the model.

Over the last four years, Land River Sea Consulting Ltd based in Christchurch have been developing a range of techniques for improving the representation of river / stream bathymetry in models by utilising aerial imagery in conjunction with depth calibration data. We have now developed a range of reliable / automated techniques for converting aerial imagery into detailed and accurate DEMs of depth. Whilst initially we were only using data captured from drones, in the past year we have been applying our techniques to large aerial imagery datasets captured from aeroplanes as well as high resolution satellite imagery. This has now opened the potential to use these techniques for large scale modelling projects. We regularly use these techniques ourselves when building models for clients as it allows us to significantly improve the quality and reliability of our model results. We have tested our techniques on a wide range of waterways around the country, from shallow clear braided rivers, deep / silty single channel rivers as well as on lakes and estuaries. Using our latest techniques which incorporate machine learning into our processes we are yet to find a waterway in New Zealand for which this technique will not work for. We have surveyed down to depths of 8-10 metres in rivers and have even achieved good results down to depths of 50m in a pristine lake using high resolution drone imagery.

This presentation will cover the basic theory around the techniques we are now deploying and then work through a number of case studies where we have applied these techniques for clients around New Zealand including major councils and power companies. The presentation will also discuss the limitations to these techniques and discuss potential future improvements in the techniques.