Past and present work

Since the last progress report (issued on March 20, 2003), new statistical analysis techniques have been investigated. Basic techniques – such as computing the mean depth and standard deviation per GPS position – had proved successful in pinpointing the presence of severe spikes in the bathymetry profile. Yet, whereas such observation had been made possible by these techniques, no automatic method of spotting suspicious locations containing large woody debris is provided.

Consequently, it was necessary to explore results furnished by other, more sophisticated, techniques. In this respect, two new directions of research have been considered:

- The semi-variogram is definitely not able to yield valuable information on small length scales relevant to LWD identification purposes. It could, however, evaluate to what extent large-scale bathymetry features are effected by filtering techniques designed to remove spikes.

- A scale-space filtering technique (employed by [Bergeron, 1996] for the analysis of stream-bed roughness in gravel-bed streams) has been implemented in C. It consists in successive applications of a Gaussian filter, which gradually smoothens out the profile. The displacement of troughs and peaks with each level of smoothing allows for identifying so-called roughness elements. This method was unsuccessful to recognize very small-scale bathymetry characteristics, such as large woody debris.

Leaning toward nonlinear filtering techniques gave rise to a successful, systematic way of spotting spikes within a profile while preserving all sharp transitions. The median filter is widely used in image processing to filter out so-called “salt and pepper” noise (bits that are reversed with a certain probability) while preserving edges. A comparison of original and filtered bathymetries permits to identify spikes and regard them as being large woody debris if their relative height is larger than any user-specified value. The first version of a C program has been sent to Tim Osting. The former is able to read any kind of raw bathymetry data and output suspicious large woody debris locations.

Future work

A draft of a publication devised to account for statistical analysis techniques results should be completed quite soon. This would be a bridge for a second publication dedicated to presenting filtering techniques, focusing on median filtering. It would certainly be worthwhile to study in details the behavior of this filter on synthesized bathymetries, i.e. bathymetries containing artificially-added large woody debris. That would help establish its limitations.

Reference