Reflection

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"Combining a Physics-based Model and Spatial Interpolation of Scarce Bed Topography Data in Meandering Alluvial Rivers"

This thesis addresses the problem of scarce bed topography data in meandering alluvial rivers. It proposes a method for combining a physics-based model with spatial interpolation methods in order to acquire a better riverbed prediction than that of conventional methods. The research was conducted from November 2014 to October 2015, along with an internship done on the same topic at Deltares Independent Institute of Research. The initial planning included timeslots for literature study, studying of spatial interpolations and their implementation, understanding of river flow dynamics and the physics-based model use, data handling and processing, and finally evaluation and results analysis. The research period was extended to include further experiments and analysis.

The field of Geomatics Engineering includes practices concerned with the collection, manipulation and representation of the natural environment. River data contain geographical information that, depending on the application, play an important role in activities such as environmental monitoring, management of land and marine resources, and real-estate transactions. The thesis focused on problem cases of limited bed topography data of river bends, where the most interesting features are often evident. As such, the results hold a high interest for river navigability applications, where a rapid assessment is required.

The methodical line of approach in Geomatics involves data capture, storage, analysis and visualization, along with quality control. In this thesis the first steps are excluded, as the data were readily available for analysis. In this sense, the largest part of implementation revolved around Python programming and the use of QGIS tools. Through both, ideas were explored on spatial interpolation methods, modeling of physics-based concepts and the way of coupling both, which resulted in the "Fusion" method proposed. The results were assessed in terms of a number of evaluators and the conclusions drawn showed a definite direction towards an actual use of the products and recommendations made throughout the research.

In a wider context, the research and the results are directed towards a fast first assessment of river channel areas where limited information are available, but the need for ship navigability is present. Expeditions that monitor the overall riverbed are expensive and often not possible due to crew and equipment unavailability. On the other hand, the handling of any scarce data available towards a general understanding of the riverbed can be quite demanding in both human and time resources. The procedure followed in this thesis allows for a quick assessment, minimizing the work required from a matter of weeks to some minutes. Therefore, there are evident benefits in both economic and time-related terms.

The final product of this thesis is the Fusion method proposed and the code implementation of all intermediate and finalizing steps. The prospect for continuation of the research is open, as it will become part of the Rapid Assessment Tool for Inland Navigation (RAT-IN), currently under development at Deltares.