NFIE-River--An Exploration of Continental Scale Hydraulic Modelling

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Introduction

The goal of National Flood Interoperability Experiment (NFIE) as a whole is to close the gap between national flood forecasting and local emergency response to demonstrate forecasting of flood impacts at “stream and street level”. To achieve that goal, the NFIE-Hydro component focuses on the field of hydrology. It tries to realize an unprecedented high spatial resolution real-time hydrologic forecasting at a continental scale, transferring meteorological information into flow information. Although discharge is one of the most essential decision variables in flood events, it alone is not enough to describe all the characters of flood, such as water elevation, velocity distribution, and to guide emergency response because it is too abstract for local community with no water resources background to realize the severity and affected area of a flood event. Hence, hydraulic study must be carried out to generate real-time flood inundation maps using the flow data produced by NFIE-Hydro process to direct further actions planned in NFIE-Response study. That is the main goal of NFIE-River component.

Content

The NFIE-River will address the following questions:

1. How to transform the spatial resolution data achieved by advanced measurement techniques into the geometric and hydraulic properties of river systems, which can be used for hydraulic modelling, using the latest research results from geomorphology?
2. What is the best information model for describing river channels?
3. Plenty of hydraulic models have been developed at local scale using the popular hydraulic computation software, HEC-RAS. However, HEC-RAS is not an appropriate selection for hydraulic modeling at continental scale. On the other hand, a lot of geometric and hydraulic data have been collected, evaluated and generated during HEC-RAS modelling processes. How to extract and integrate these valuable data from existing models and maximize the use of them in the cutting edge hydraulic models, such as Simulation Program for River Networks (SPRNT) is another issue we need to consider in NFIE-River research.
4. How to connect these hydraulic models to the NFIE-Hydro automated system so that they can be run, monitored, and managed in a regular manner?

According to these questions mentioned above, several tasks will be carried out as the goals of this term project.
1. GeoNet tools will be applied for extracting river channel features using the LIDAR dataset of Travis County as a study case.

2. The functionality of Arc River data model, a data model developed to store spatial and temporal attributes of river measurement and simulation data will be tested using the data applied in the Lower Mississippi region hydraulic study. Then Arc River will be modified according to its limitations found in this study case. Some automating tools will also be developed to speed up the process of fitting the data into this information model.

3. SPRNT model will be built for the Lower Mississippi River network system. The simulation result will be compared with the observation data and the result from HEC-RAS model.

4. The NFIE workflow will be extended from NFIE-Hydro component to NFIE-River component.