LiquidEarth - River: A Satellite Based Operational River Height Forecasting System for Bangladesh

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ABSTRACT

Most of the world's population lives near a freshwater source or on the coast and are thus vulnerable to the rise in water level. There are around 260 trans-boundary water bodies that cover more than 40% of the Earth's land surface and account for 60% of global freshwater flow [1] [2]. Most developing countries located at the downstream end of a large river basin are often plagued with flooding problems that are trans-boundary because the flood waters are generated upstream in other nations. However, many large river basins in the developing world are mostly ungauged as they lack the necessary in-situ measurements required for the setting up of flood forecasting models. For such basins, using data from satellite may be the only alternative to overcome the lack of in-situ data.

LiquidEarth-River [3] is a client-server based framework that aims to deliver surface-water relevant information such as river height, flood inundation, and reservoir storage directly to the user. LiquidEarth-River version 1.0 provides 8 days river height forecast at two in-situ points (Hardinge Bridge and Bahadurabad Ghat) in Bangladesh using satellite data at upstream locations in India where in-situ data is unavailable. The river levels in upstream locations are obtained from Jason-2 altimetry data (joint NASA-French Satellite). The value of LiquidEarth-River is in better understanding of the future (an 8 day lead time) of potential water levels near rivers, in light of the societal implications for water encroachment into homesteads and farmlands.

LiquidEarth-River uses recent innovations in computer science such as multicore and GPU based desktops to solve computationally intensive problems such as river height forecasting. Typically, these problems are solved using traditional cluster or supercomputers. The server side of the application runs on a desktop that downloads Jason-2 data daily, and runs a forecasting scheme to provide the forecast. The client side of the application is a smart phone or a web app that provides a river height forecast to the user. The application has scope for expansion in two areas: 1) integration of new and multiple satellite altimeters, 2) addition of a more intuitive communication format that converts the information to knowledge (such as converting river level forecast to inundation and impact on villagers, houses, roads etc.). For example, farmers of Bangladesh need early warning of monsoonal floods to decide on early harvest or delayed sowing. Providing a visual map of what an X meter of river level means to a farmer, an 8 day forecast can provide a greater sense of empowerment for saving lives, and economic decision making. Currently, the warnings that farmers receive in most developing countries are not only lead-time limited, but are available only to highly skilled users, and are not so intuitive that makes it easy for a layman to understand the value of the warnings. LiquidEarth attempts to remove these barriers to interpretation by creating a highly intuitive and visual format readily accessible to the average farmer who has little time to get training or read a complicated manual.

ACM Categories & Descriptors:
K.4.2 [Computer and Society]: Social Issues

Keywords: River height forecasting; satellite altimetry; flood forecasting app.

1. REFERENCES

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