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# InterGrid testbed for flood monitoring

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New intelligent method for flood monitoring and its implementation in InterGrid environment are described in this abstract. One of the important problems associated with flood monitoring is flood extent mapping, since it is impractical to acquire the flood area through field observations. Proposed method is based on data fusion of remote sensing data both in radar and optical electromagnetic range. Additional information is provided by Digital Elevation Model (DEM).

Traditionally threshold methods are used for flood extent mapping from SAR (synthetic aperture radar) images. But they are not robust and require human intervention for threshold adoption. To overcome this weakness and provide automatic product generation we have developed new method of flood extent estimation based on self-organizing Kohonen's maps (SOMs). SOMs provide efficient way for discovering of statistically salient features of pattern vectors in data set, and allow to find clusters in training data pattern space. The workflow for flood extent extraction based on SAR data consists of the following tasks: (1) Transformation of raw data to lat/long projection; (2) Image calibration; (3) Co-registration; (4) Image segmentation using SOMs. (5) Flood extent extraction. (6) Topographic correction: shadowing effects removal using SRTM DEM. Within the 5-th step each neuron (cluster) is assigned flood extent/not flood extent class using additional data from Landasat-7 ETM+ and Corine 2000 Land Cover (for European territory).

The developed method has been successfully tested for different case-study areas, in particular for flooding on Tisza river (Ukraine, Hungary) in 2001 and for flooding on Huaihe river (China) in 2007. For Ukrainian case-study we use ERS-2/SAR data and for Chinese case-study we use Envisat/ASAR and Radarsat data. Additional informa-

tion on flood events was also acquired from MODIS instrument for cloudless days in order to analyze dynamics of flooding.

Taking into account heterogeneous nature of the data used and resource consuming computations required for data processing it makes sense to use Grid environment for implementation of flood extent mapping service. Moreover, some components of workflow are implemented on the basis of Grid, for example in ESA G-POD environment and Ukrainian Earth Observation Grid-system. Multi-source data for the problem solving, as a rule, are stored at different distributed archives, most of which are also running in Grid environments. So, to provide flood monitoring service for any region of the world, for example within the International Charter “Space and Major Disasters”, it is necessary to use InterGrid system. Such kind of InterGrid environment is being developed in the framework of ESA Category-1 project “Wide Area Grid Testbed for Flood Monitoring using Spaceborne SAR and Optical Data”.

Parallel version of neural network method for flood extent extraction has been developed and tested in the InterGrid testbed integrating Grid systems of ESA, National Space Agency of Ukraine (NSAU) (Ukraine), and RSGS (China). GridFTP was chosen to provide data transfer between Grid systems. In order to submit jobs in InterGrid environment two possible approaches have been evaluated: (1) Grid portal solution supporting different middleware; (2) High-level Grid scheduler that supports different middleware and provides some standard interface. Grid portal solution is easy to deploy and maintain, but it does not provide application interface and scheduling capabilities. In turn, metascheduler approach is much more difficult to maintain comparing with portal, however, it provides APIs with advanced scheduling and load-balancing capabilities.

Developed testbed could be considered as a pilot version of Wide Area Grid (WAG), initiated by CNES within CEOS (WGISS). Further work should be focused on creation of user friendly interface and InterGrid productivity investigation.