Exploiting Cyber Infrastructure for Computational GeoInformatics: A Position Paper

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Geoinformatics is a multidisciplinary subject encompassing several domain sciences that use geospatial data to study one or more aspects related to the planet Earth. Geoinformation plays a critical role in our day to day life, whether it is to understand the human implications of global environmental changes, responding to natural disasters, or simply finding alternate routes in case of an emergency. However, extracting geoinformation from more than 5 terabytes of remote sensing data that is being generated per day, or several terabytes of dynamic spatiotemporal data generated by billions of human sensors, in a timely manner is impossible without resorting to modern computing infrastructure. We are working on several research issues in the area of computational geoinformatics. Specifically we are developing innovative solutions that exploit modern computing infrastructures, such as, multicores, GPGPUs, Grids, and high-end supercomputers for spatiotemporal pattern mining and geoinformation extraction from terabytes of remote sensing images, geodatabases, and text corpus. The solutions we are developing are targeted towards large scale geospatial applications of national importance, such as, the critical infrastructure protection, image characterization, biomass monitoring, rapid response to emerging situations, and threat anticipation. I will bring to the table some of the open research issues for discussion. At present we are developing a research proposal for NSF DataNet call and interested to explore other collaborative opprotunities in this area.

I have over 15 years of research experience in the area of spatial and sptiotemporal databases, data mining, distributed and WebGIS, highperformance and grid computing. I made several research contributions in the area of distributed geoprocessing [1,2,3], spatial and spatiotemporal data mining [4,5,6]. I lead a project that designed one of the first parallel soft-copy photogrammetry system for IRS 1C/1D satellite. I received MS and PhD in computer science from the University of Minnesota. Before joining as research scientist at Oak Ridge National Laboratory in 2006, I worked at IBM-Research (2004-2006) in the area of autonomic computing and the Center for Development of Advanced Computing (C-DAC: 1995-1998) in the area of high-performance geoinformatics.

Relevant Publications:

[1] Ranga Raju Vatsavai, Shashi Shekhar, Thomas E. Burk, Stephen Lime: UMN-MapServer: A High-Performance, Interoperable, and Open Source Web Mapping and Geo-spatial Analysis System. GIScience 2006: 400-417
[2] Shashi Shekhar, Ranga Raju Vatsavai, Namita Sahay, Thomas E. Burk, Stephen Lime: WMS and GML based Interoperable Web Mapping System. ACM-GIS 2001: 106-111
[3] Ranga Raju Vatsavai, Thomas E. Burk, Shashi Shekhar, Mark H. Hansen: An efficient query strategy for integrated Remote Sensing and inventory (Spatial) Databases. SSDBM 2001
[4] Shashi Shekhar, Paul R. Schrater, Ranga Raju Vatsavai, Weili Wu, Sanjay Chawla: Spatial contextual classification and prediction models for mining geospatial data. IEEE Transactions on Multimedia 4(2): 174-188 (2002)
[5] Ranga Raju Vatsavai, Shashi Shekhar, Thomas E. Burk: A Semi-Supervised Learning Method for Remote Sensing Data Mining. ICTAI 2005: 207-211
[6] Ranga Raju Vatsavai, Shashi Shekhar, Thomas E. Burk: An efficient spatial semi-supervised learning algorithm. Parallel Algorithms Appl. 22(6): 427-437 (2007)