

A CyberGIS Roadmap for Tackling Big Data Challenges

Shaowen WANG

University of Illinois at Urbana-Champaign

Email: shaowen@illinois.edu

An infrastructure often provides fundamental services to members of a society. Human infrastructures have grown from basic living services, such as transportation networks introduced in early days of civilization to more advanced services such as electricity and telephony introduced during the 20th century. Computing, information, and communication technologies have advanced toward cyberinfrastructure – arguably the most sophisticated infrastructure of human beings conceived to date. As a spatial data deluge takes place across numerous domains, both cyberinfrastructure and geographic information systems (GIS) play increasingly essential roles in addressing grand challenges of scientific and engineering disciplines and improving decision-making practices with significant societal impacts. Yet, fulfilling such roles requires the development of cyberinfrastructure-based GIS (CyberGIS) for effectively synthesizing cyberinfrastructure, GIScience, and spatial analysis and modeling. To address the opportunities and challenges to achieve the integrated CyberGIS vision, this presentation focuses on basic principles for the development and use of CyberGIS while illustrating particular CyberGIS components and applications. A CyberGIS implementation has been established within several national and international cyberinfrastructure environments. Multiple case studies of domain applications based on this implementation demonstrate a CyberGIS roadmap for synthesizing computational and spatial studies toward a paradigm shift of geospatial fields in an age of big data.