

WENZHAN SONG

## Advancing the Cyberinfrastructure for Volcano Monitoring

Dr. Song's research focuses primarily on distributed systems, networking, and mobile computing. He is working to design efficient communication systems to enable ubiquitous information gathering and sharing in real time. Wireless technology has developed rapidly in the past

few years; an ad hoc wireless network can be built anywhere with minimal preparation, providing a flexible way to share information immediately. The integration of wireless networking and sensor technologies to create a wireless sensor network enables ubiquitous information gathering and sharing. In addition, the emerging data-centric routing over these distributed networks (including the Internet) enables researchers to search and locate data in real-time. This promising future poses significant research challenges today.

Currently Dr. Song, in collaboration with USGS geologists, is developing a real-time data acquisition network for volcano monitoring in Mount St. Helens. It will characterize dynamic volcano environments at an unprecedented fine scale at low cost, and will enable faster responses by scientists and public officials to mitigate

volcano hazards. Most volcanoes in the world are inadequately monitored. Volcanoes are very complex geophysical systems, and geologists need a variety of geophysical, geochemical, and geospatial monitoring systems to collect



data for analysis. Geologists require the volcano monitoring networks to provide high-fidelity, continuous data in real time. Missed or corrupted data can invalidate an entire record. Each observatory-related data center collects on the order of 10 gigabytes of data every day, and that is still far from adequate. Robust data transmission infrastructure is necessary to carry data reliably from the various instruments at the volcanoes to the observatories. Real-time information management and analysis are also in high demand. In the meantime, the methods for environmental monitoring have remained conventional, costly, and not in real time, while the technologies in wireless communications, sensors, and information management have advanced tremendously. This research will demonstrate the integration of wireless networks and information management with environmental applications, and will show the profound impact this technology could have on the future of environmental monitoring.



**Dr. WenZhan Song** received his Ph.D. in computer science from the Illinois Institute of Technology in 2005, completing his dissertation in the area of localized topology optimization problems in wireless ad hoc and sensor networks. That same year, he was honored as one of "40 Excellent Chinese Oversea Students in the U.S." by the Ministry of Education of the People's

Republic of China. Dr. Song's research, designing distributed communication systems to enable efficient information retrieval and sharing, has led to a series of publications and conference presentations. He is in the process of developing an interdisciplinary research program to build a real-time environmental monitoring network for erupting volcanoes. That research will integrate wireless networks and information management with environmental applications, and will profoundly impact the future of environmental monitoring.

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