Short Bio:
Yan Huang received her B.S. degree in Computer Science from Beijing University, Beijing, China, in July 1997 and Ph.D. degree in Computer Science from University of Minnesota, Twin-cities, MN, USA, in July 2003. She is currently an assistant professor at the Computer Science and Engineering Department of University of North Texas, Denton, TX, USA. Her research interests include sensor networked databases, scientific databases, data mining, and geographic information systems (GIS). She has published over 20 technical papers in peer-reviewed journals and conference proceedings. She has served on the program committees for a number of conferences and workshops, and has been a reviewer for several journals. She is a recipient of a Ralph E. Powe Junior Faculty Enhancement Awards from ORNL Oak Ridge Associated Universities and is a member of the IEEE Computer Society, the ACM, and the ACM SIGMOD.

Abstract:
In-network aggregation has been proposed as one of the main mechanisms for reducing messaging cost (thus energy) in prior sensor network database research. However, aggregated values of a sensor field, such as SUM and AVERAGE, have limited usage in many natural science domains because many phenomena, e.g., temperature and soil moisture, are actually continuous and thus best represented as a continuous surface over the sensor fields. In this paper, we address the problem of interpolating maps from sensor fields.

We propose a spatial autocorrelation aware, energy efficient, and error bounded framework for interpolating maps from sensor fields. Our work is inspired by spatial autocorrelation based interpolation models commonly used in natural science domains, e.g., kriging, and brings together several innovations. First, in our framework both the sink and the sensor field are spatial autocorrelation aware which allows them to utilize the same spatial interpolation models to reduce communication costs. Second, our framework employs a simple and virtually overhead free in-network coordination among sensors for selecting reporting sensors so that the coordination overhead does not eclipse the communication savings. Third, we propose a graceful integration of temporal data suppression models with our proposed framework. This allows an adaptive utilization of spatial or temporal autocorrelation based on whichever is stronger in different regions of the sensor field. We conducted extensive experiments using data from a real-world sensor network deployment and a large Asian temperature dataset to show the effectiveness of our proposed framework.