Efficient Sensor Web Communication Strategies Based on Jointly Optimized Distributed Wavelet Transform and Routing

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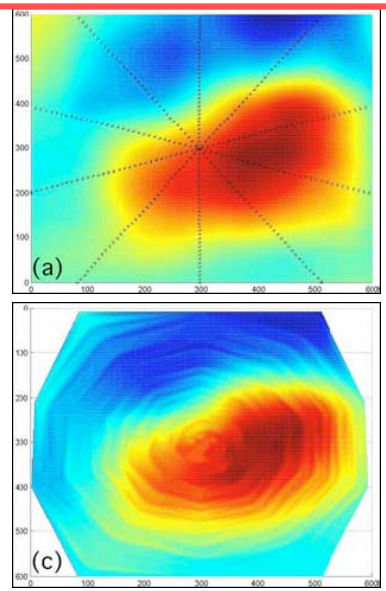
Objective

- Design algorithms for configuring a sensor network topology and for efficiently compressing the correlated measurements as data is shipped toward the central node, so as to minimize energy consumption while reproducing the underlying field as accurately as possible
- Enable the nodes to reconfigure the network automatically, taking into account variations in the node characteristics (node mobility, power consumption, addition of new sensors, deletion of other sensors)



Example of a 2D field measured by a sensor web: (a) true field, and reconstructed field using (b) distributed wavelets or (c) quantized data with the same energy consumption as in (b).

Approach

- Implement advances in compression including entropy coding, filter optimization, path merging, joint compression and routing, and temporal coding
- Implement advances in networking and routing including node selection, network initialization, routing optimization, link quality robustness, inclusion of broadcast nodes, and automatic reconfigurability
- Test these new capabilities in the lab, and in a sensor web of about 100 nodes in an outdoor realistic environment for an extended period of time

Co-I's/Partners

- Sam Dolinar, Aaron Kiely / JPL
- Bhaskar Krishnamachari / USC

Key Milestones

• Entropy Coding/Node Selection Algorithm	July 2007
• Compression & Network/Routing Designed	Sept. 2008
• Spatial-temporal compression design	May 2009
• System Demonstration	July 2009

TRL_{in} = 2