

Wireless Sensor Networks: Applied Research, Hardware Challenges, and System Applications

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Abstract

Wireless sensor network designs are based on application specific requirements and environment characteristics. A large gap exists between sensor network research and implementation. Analysis generally focuses on homogenous networks with specific environment assumptions. However, fielded systems are often heterogeneous and encounter complex sensing and communication environments. A sensor network framework that incorporates realistic hardware models, system constraints, and role management logic enhances sensor network design and reduces implementation complexities. Designing, implementing, and fielding a sound system framework requires a set of engineering design rules to guide the development of application requirements based on known system design constraints.

This talk addresses a few of the diverse wireless networking projects at Sandia National Laboratories. The projects range from applied research relating to algorithm development, system modeling and simulations, hardware development, and fielding robust, high consequence wireless networks. The wireless network architectures include Ad Hoc networks for signal detection and classification, low power sensor networks for environmental characterization, cluster networks with multiple SATCOM gateways, and exoatmospheric wireless networks. The current array of applications provides a wide ranging base for applied research. System requirements, algorithm complexities, hardware limitations, and RF environments drive SNL's R&D activities. The challenge is focusing the independent efforts on the goal of developing a complex set of design rules and analytical tools for network optimization. The design rules and optimization steps are imperative for successful hardware implementations leading to functional, robust wireless networks.

Bio

Judd A. Rohwer is a Senior Member of the Technical Staff at Sandia National Laboratories in Albuquerque, New Mexico. He is currently involved with wireless network research, system architecture, and algorithm development. His research interests include wireless communications, wireless networks, machine learning, signal and image processing, and system engineering. Past projects include analog design, embedded system design, and R&D focused on system applications. He received his BS degree in electrical engineering from GMI Engineering & Management Institute, Flint, MI and his MS and Ph.D. degrees in electrical engineering from University of New Mexico. Dr Rohwer is a member of IEEE and is actively involved in the Albuquerque Section.
