

Development of wireless stations for distributed field operations

T. Andrew Yang and Sadegh Davari

SUMMARY

Over the past year (2007), our work in distributed wireless networks focused on a few projects related to the development of wireless sensor networks (WSN) for detecting and/or tracking objects. A WSN is a network composed of wireless sensor nodes. Each sensor node is a small computer with three modules: the energy module, the radio module, and the sensor module. A WSN may be deployed to monitor a variety of phenomena, such as light, motion, humidity, moisture, or wind speed.

One of our projects involved extending the optimized communications and organization (OCO) method to handle cases in which some of the sensor nodes die or are damaged. The result is a set of reorganization algorithms that may be invoked during the tracking phase to reorganize the nodes into a working network again. To integrate our research findings with pedagogy, we have incorporated the reorganization algorithms as a case study in teaching wireless sensor networks. The result is a research paper accepted for publication in an upcoming issue of *The Journal of Computing Science in Colleges*.

Another of our projects is related to adding security into the OCO method in order to allow the sensors to authenticate each other to avoid attacks. The result of this project was submitted and is to be published as a chapter in an upcoming book on security in RFID and sensor networks.

Our work on developing a sensor network testbed has resulted in a working paper, “Emulation of Wireless Sensor Networks for Object Tracking.” The developed sensor network will be capable of tracking moving objects.

In 2007, the PIs were awarded a two-year federal grant (NSF) to develop courseware modules and a sensor network testbed for teaching and researching in wireless sensor networks. Currently, several UHCL student research assistants are at work on this project. The grant supports collaborative research among the PIs and faculty researchers at Lamar University, with UHCL leading the project.



T. Andrew Yang

PUBLICATIONS

- Sbrusch, R. and Yang, T.A. Message authentication in surveillance networks, a chapter in *Security in RFID and Sensor Networks*. Eds. Kitsos, P. and Zhang, J. Auerbach Publications, CRC Press, Taylor & Francis Group (2009) (*submitted in 2008; accepted*).
- Yang, T.A. and Gudibandi, D.R. Teaching wireless sensor networks by incorporating reorganization algorithms into the labs. *J. Computing Science in Colleges* (April 2008) (*accepted*).
- Yang, T.A., Jain, D., Davari, S., and Sun, B. Emulation of wireless sensor networks for object tracking. *Distributed Computing in Sensor Systems* (2008) (*submitted*).

FUNDING AND PROPOSALS

- Davari, S., Sun, B. (Lamar University), and Osborne, L. (Lamar). Collaborative research: Module-based courseware and laboratory development for teaching secure wireless sensor networks, National Science Foundation CCLI (Course, Curriculum, and Laboratory Instrumentations) Program (2007–2009).
- Yang, T.A. SOCO—Secure and optimized communication & organization for target tracking in wireless sensor networks, Advanced Research Programs (ARP), Texas Higher Education Coordination Board (THECB) (2006–2008).