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Proceedings of the 4th international conference on Embedded networked sensor systems

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[Lin Gu](#), [John A. Stankovic](#)

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doi> [10.1145/1182807.1182809](#)

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The development of a reliable large-scale wireless sensor network (WSN) is very difficult because of resource constraints, energy budget, and demanding application requirements. Three OS features-OS protection, virtual memory, and preemptive scheduling-can ... [expand](#)

[Run-time dynamic linking for reprogramming wireless sensor networks](#)

[Adam Dunkels](#), [Niclas Finne](#), [Joakim Eriksson](#), [Thiemo Voigt](#)

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doi> [10.1145/1182807.1182810](#)

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From experience with wireless sensor networks it has become apparent that dynamic reprogramming of the sensor nodes is a useful feature. The resource constraints in terms of energy, memory, and processing power make sensor network reprogramming a challenging ... [expand](#)

[Protothreads: simplifying event-driven programming of memory-constrained embedded systems](#)

[Adam Dunkels](#), [Oliver Schmidt](#), [Thiemo Voigt](#), [Muneeb Ali](#)

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doi> [10.1145/1182807.1182811](#)

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Event-driven programming is a popular model for writing programs for tiny embedded systems and sensor network nodes. While event-driven programming can keep the memory overhead down, it enforces a state machine programming style which makes many programs ... [expand](#)

SESSION: **Sensing and localization**

[Virtual high-resolution for sensor networks](#)

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The resolution at which a sensor network collects data is a crucial parameter of performance since it governs the range of applications that are feasible to be developed using that network. A higher resolution, in most situations, enables more applications ... [expand](#)

[StarDust: a flexible architecture for passive localization in wireless sensor networks](#)

[Radu Stoleru](#), [Pascal Vicaire](#), [Tian He](#), [John A. Stankovic](#)

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doi> [10.1145/1182807.1182814](#)

Full text: [Pdf](#)

The problem of localization in wireless sensor networks where nodes do not use ranging hardware, remains a challenging problem, when considering the required location accuracy, energy expenditure and the duration of the localization phase. In this paper ... [expand](#)

[The design and implementation of a self-calibrating distributed acoustic sensing platform](#)

[Lewis Girod](#), [Martin Lukac](#), [Vlad Trifa](#), [Deborah Estrin](#)

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doi> [10.1145/1182807.1182815](#)

Full text: [Pdf](#)

We present the design, implementation, and evaluation of the Acoustic Embedded Networked Sensing Box (ENSBox), a platform for prototyping rapid-deployable distributed acoustic sensing systems, particularly distributed source localization. Each ENSBox ... [expand](#)


SESSION: **Dissemination and routing**

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doi> [10.1145/1182807.1182817](#)

Full text:  [Pdf](#)


Varying interference levels make broadcasting an unreliable operation in low-power wireless networks. Many routing and resource discovery protocols depend on flooding (repeated per-node broadcasts) over the network. Unreliability at the broadcast-level ... [expand](#)

[Interest dissemination with directional antennas for wireless sensor networks with mobile sinks](#)

[Yihong Wu](#), [Lin Zhang](#), [Yiqun Wu](#), [Zhisheng Niu](#)

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doi> [10.1145/1182807.1182818](#)

Full text:  [Pdf](#)


Introducing mobile data sinks into wireless sensor networks (WSNs) improves the energy efficiency and the network lifetime, and is demanded for many application scenarios, such as battlefield vehicle security, mobile data acquisition, and cellular phone ... [expand](#)

[Lazy cross-link removal for geographic routing](#)

[Young-Jin Kim](#), [Ramesh Govindan](#), [Brad Karp](#), [Scott Shenker](#)

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doi> [10.1145/1182807.1182819](#)

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Geographic techniques promise highly scalable any-to-any routing in wireless sensor networks. In one thread of research on geographic routing, researchers have explored robust, distributed graph planarization. Arguing that such planarization techniques ... [expand](#)


SESSION: **Architecture**

[CarTel: a distributed mobile sensor computing system](#)

[Bret Hull](#), [Vladimir Bychkovsky](#), [Yang Zhang](#), [Kevin Chen](#), [Michel Goraczko](#), [Allen Miu](#), [Eugene Shih](#), [Hari Balakrishnan](#), [Samuel Madden](#)

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doi> [10.1145/1182807.1182821](#)

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CarTel is a mobile sensor computing system designed to collect, process, deliver, and visualize data from sensors located on mobile units such as automobiles. A CarTel node is a mobile embedded computer coupled to a set of sensors. Each node gathers ... [expand](#)

[Supporting concurrent applications in wireless sensor networks](#)

[Yang Yu](#), [Loren J. Rittle](#), [Vartika Bhandari](#), [Jason B. LeBrun](#)

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doi> [10.1145/1182807.1182822](#)

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It is vital to support concurrent applications sharing a wireless sensor network in order to reduce the deployment and administrative costs, thus increasing the usability and efficiency of the network. We describe Melete 1, a system that ... [expand](#)

[The Tenet architecture for tiered sensor networks](#)

[Omprakash Gnawali](#), [Ki-Young Jang](#), [Jeongyeup Paek](#), [Marcos Vieira](#), [Ramesh Govindan](#), [Ben Greenstein](#), [August Joki](#), [Deborah Estrin](#), [Eddie Kohler](#)

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doi> [10.1145/1182807.1182823](#)

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Most sensor network research and software design has been guided by an architectural principle that permits multi-node data fusion on small-form-factor, resource-poor nodes, or motes. We argue that this principle leads to fragile and unmanageable systems ... [expand](#)


SESSION: **Storage and abstractions**

[Abstractions for safe concurrent programming in networked embedded systems](#)

[William P. McCartney](#), [Nigamanth Sridhar](#)

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doi> [10.1145/1182807.1182825](#)

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Over the last several years, large-scale wireless mote networks have made possible the exploration of a new class of highly-concurrent and highly-distributed applications. As the horizon of what kinds of applications can be built on these networked embedded ... [expand](#)

[Scalable data aggregation for dynamic events in sensor networks](#)

[Kai-Wei Fan](#), [Sha Liu](#), [Prasun Sinha](#)

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doi> [10.1145/1182807.1182826](#)

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Computing and maintaining network structures for efficient data aggregation incurs high overhead for dynamic events where the set of nodes sensing an event changes with time. Moreover, structured approaches are sensitive to the waiting-time which is ... [expand](#)

[Capsule: an energy-optimized object storage system for memory-constrained sensor devices](#)

[Gaurav Mathur](#), [Peter Desnoyers](#), [Deepak Ganesan](#), [Prashant Shenoy](#)

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doi> [10.1145/1182807.1182827](https://doi.org/10.1145/1182807.1182827)

Full text:  [Pdf](#)

Recent gains in energy-efficiency of new-generation NAND flash storage have strengthened the case for in-network storage by data-centric sensor network applications. This paper argues that a simple file system abstraction is inadequate for realizing ... [expand](#)


SESSION: **Radio propagation and transport**

[Datalink streaming in wireless sensor networks](#)

[Raghu K. Ganti](#), [Praveen Jayachandran](#), [Haiyun Luo](#), [Tarek F. Abdelzaher](#)

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doi> [10.1145/1182807.1182829](https://doi.org/10.1145/1182807.1182829)

Full text:  [Pdf](#)


Datalink layer framing in wireless sensor networks usually faces a trade-off between large frame sizes for high channel bandwidth utilization and small frame sizes for effective error recovery. Given the high error rates of intermote communications, ... [expand](#)

[ATPC: adaptive transmission power control for wireless sensor networks](#)

[Shan Lin](#), [Jingbin Zhang](#), [Gang Zhou](#), [Lin Gu](#), [John A. Stankovic](#), [Tian He](#)

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doi> [10.1145/1182807.1182830](https://doi.org/10.1145/1182807.1182830)

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Extensive empirical studies presented in this paper confirm that the quality of radio communication between low power sensor devices varies significantly with time and environment. This phenomenon indicates that the previous topology control solutions, ... [expand](#)

[Experimental study of concurrent transmission in wireless sensor networks](#)

[Dongjin Son](#), [Bhaskar Krishnamachari](#), [John Heidemann](#)

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doi> [10.1145/1182807.1182831](https://doi.org/10.1145/1182807.1182831)

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We undertake a systematic experimental study of the effects of concurrent packet transmissions in low-power wireless networks. Our measurements, conducted with Mica2 motes equipped with CC1000 radios, confirm that guaranteeing successful packet reception ... [expand](#)


SESSION: **In-network processing**

[Target tracking with binary proximity sensors: fundamental limits, minimal descriptions, and algorithms](#)

[N. Shrivastava](#), [R. Mudumbai U. Madhow](#), [S. Suri](#)

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doi> [10.1145/1182807.1182833](https://doi.org/10.1145/1182807.1182833)

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We explore fundamental performance limits of tracking a target in a two-dimensional field of binary proximity sensors, and design algorithms that attain those limits. In particular, using geometric and probabilistic analysis of an idealized model, we ... [expand](#)

[Data compression algorithms for energy-constrained devices in delay tolerant networks](#)

[Christopher M. Sadler](#), [Margaret Martonosi](#)

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doi> [10.1145/1182807.1182834](https://doi.org/10.1145/1182807.1182834)

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Sensor networks are fundamentally constrained by the difficulty and energy expense of delivering information from sensors to sink. Our work has focused on garnering additional significant energy improvements by devising computationally-efficient lossless ... [expand](#)

[Capturing high-frequency phenomena using a bandwidth-limited sensor network](#)

[Ben Greenstein](#), [Christopher Mar](#), [Alex Pesterev](#), [Shahin Farshchi](#), [Eddie Kohler](#), [Jack Judy](#), [Deborah Estrin](#)

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doi> [10.1145/1182807.1182835](https://doi.org/10.1145/1182807.1182835)

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Small-form-factor, low-power wireless sensors-motes-are convenient to deploy, but lack the bandwidth to capture and transmit raw high-frequency data, such as human voices or neural signals, in real time. Local filtering can help, but we show that the ... [expand](#)


SESSION: **Media access control**

[Funneling-MAC: a localized, sink-oriented MAC for boosting fidelity in sensor networks](#)

[Gahng-Seop Ahn](#), [Se Gi Hong](#), [Emiliano Miluzzo](#), [Andrew T. Campbell](#), [Francesca Cuomo](#)

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doi> [10.1145/1182807.1182837](https://doi.org/10.1145/1182807.1182837)

Full text:  [Pdf](#)


Sensor networks exhibit a unique funneling effect which is a product of the distinctive many-to-one, hop-by-hop traffic pattern found in sensor networks, and results in a significant increase in transit traffic intensity, collision, congestion, packet ... [expand](#)

[X-MAC: a short preamble MAC protocol for duty-cycled wireless sensor networks](#)

[Michael Buettner](#), [Gary V. Yee](#), [Eric Anderson](#), [Richard Han](#)

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doi> [10.1145/1182807.1182838](https://doi.org/10.1145/1182807.1182838)

Full text:  Pdf


In this paper we present X-MAC, a low power MAC protocol for wireless sensor networks (WSNs). Standard MAC protocols developed for duty-cycled WSNs such as B-MAC, which is the default MAC protocol for TinyOS, employ an extended preamble and preamble sampling. ... [expand](#)

[Ultra-low duty cycle MAC with scheduled channel polling](#)

[Wei Ye](#), [Fabio Silva](#), [John Heidemann](#)

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doi> [10.1145/1182807.1182839](#)

Full text:  Pdf

Energy is a critical resource in sensor networks. MAC protocols such as S-MAC and T-MAC coordinate sleep schedules to reduce energy consumption. Recently, lowpower listening (LPL) approaches such as WiseMAC and B-MAC exploit very brief polling of channel ... [expand](#)


DEMONSTRATION SESSION: **Demonstration papers**

[A self-calibrating distributed acoustic sensing platform](#)

[Lewis Girod](#), [Martin Lukac](#), [Vlad Trifa](#), [Deborah Estrin](#)

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doi> [10.1145/1182807.1182841](#)

Full text:  Pdf


We will demonstrate the operation of the Acoustic Embedded Networked Sensing Box (ENSBox), a platform for prototyping rapid-deployable distributed acoustic sensing systems. The ENSBox is a Linux-based acoustic sensing system with and integrated, high ... [expand](#)

[A storage-centric camera sensor network](#)

[Gaurav Mathur](#), [Paul Chukiu](#), [Peter Desnoyers](#), [Deepak Ganesan](#), [Prashant Shenoy](#)

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doi> [10.1145/1182807.1182842](#)

Full text:  Pdf


Improved energy-efficiency and storage capacity of new-generation NAND flash memory makes a compelling case for storage-centric sensor networks. Such a storage-centric sensor network emphasizes the use of platforms with larger storage and more extensive ... [expand](#)

[Cascades: an extensible heterogeneous sensor networking framework](#)

[Phillip Sitbon](#), [Nirupama Bulusu](#), [Wu-Chi Feng](#)

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doi> [10.1145/1182807.1182843](#)

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This demonstration shows a powerful high-level, heterogeneous sensor networking framework, Cascades. We intend to demonstrate how, with this framework, application designers have great control over implementation designs without the requirement ... [expand](#)

[Data analysis tools for sensor-based science](#)

[Stuart Ozer](#), [Jim Gray](#), [Alex Szalay](#), [Andreas Terzis](#), [Razvan Musaloiu-E](#), [Katalin Szlavecz](#), [Randal Burns](#), [Josh Cogan](#)

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doi> [10.1145/1182807.1182844](#)

Full text:  Pdf


Science is increasingly driven by data collected automatically from arrays of inexpensive sensors. The collected data volumes require a different approach from the scientists' current Excel spreadsheet storage and analysis model. Spreadsheets work well ... [expand](#)

[Data collection in delay tolerant mobile sensor networks using SCAR](#)

[Cecilia Mascolo](#), [Mirco Musolesi](#), [Bence Pásztor](#)

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doi> [10.1145/1182807.1182845](#)


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[A funneling-MAC for high performance data collection in sensor networks](#)

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[A new embedded Web services approach to wireless sensor networks](#)

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[A unified architecture for flexible radio power management in wireless sensor networks](#)

[Kevin Klues](#), [Guoliang Xing](#), [Chenyang Lu](#)

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[An eventual consistent wireless light control system](#)

[Jeonghoon Kang, Junejae Yoo, Myunghyun Yoon, Alec Woo](#)

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doi> [10.1145/1182807.1182849](https://doi.org/10.1145/1182807.1182849)

Full text:  [Pdf](#)


We demonstrate a working system that utilizes an eventual consistent reliability model for wireless light control application. Initial results using only resource limited nodes, such as the popular mote platform, are promising; we achieve great end-to-end ... [expand](#)

[GRAIL: general real-time adaptable indoor localization](#)

[Yingying Chen, John-Austen Francisco, Konstantinos Kleisouris, Hongyi Xue, Richard P. Martin, Eiman Elnahrawy, Xiaoyan Li](#)

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doi> [10.1145/1182807.1182850](https://doi.org/10.1145/1182807.1182850)


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[Demonstrating distributed signal strength location estimation](#)

[Neal Patwari, Alfred O. Hero, III](#)

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doi> [10.1145/1182807.1182851](https://doi.org/10.1145/1182807.1182851)

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Distributed estimation of sensor location is a key enabling technology for sensor networks. This demonstration will provide an interactive display of distributed, cooperative localization, using wideband received signal-strength measurements, and the ... [expand](#)

[Flexible hardware/software platform for tracking applications](#)

[Junaid Ansari, José Sánchez, Marina Petrova, Janne Riihijärvi, Ossi Raivio, Krisakorn Rerkraj, Christine Jarak, Frank Oldewurtel, Matthias Wellens, Lili Wu, Petri Mähoenen](#)

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doi> [10.1145/1182807.1182852](https://doi.org/10.1145/1182807.1182852)

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In this demonstration paper we show and describe a flexible hardware and software platform for tracking applications. The architecture presented is extendible both on hardware and software sides, allowing for easy inclusion of sensors and signal processing ... [expand](#)

[Real-time volcanic earthquake localization](#)

[Geoffrey Werner-Allen, Patrick Swieskowski, Matt Welsh](#)

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doi> [10.1145/1182807.1182853](https://doi.org/10.1145/1182807.1182853)


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[eCAM: ultra compact, high data-rate wireless sensor node with a miniature camera](#)

[Chulsung Park, Pai H. Chou](#)

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doi> [10.1145/1182807.1182854](https://doi.org/10.1145/1182807.1182854)

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eCAM is an ultra-compact, high data-rate wireless sensor node (WSN) with a miniature camera. It is constructed by interfacing a VGA quality digital video camera with the Eco node. The purpose of this demo is to show that Eco is not only one of the world's ... [expand](#)

[liteOS: a lightweight operating system for C++ software development in sensor networks](#)

[Qing Cao, Tarek Abdelzaher](#)

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doi> [10.1145/1182807.1182855](https://doi.org/10.1145/1182807.1182855)


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[Low power, low cost, wireless camera sensor nodes For human detection](#)

[Jason Schlessman, Jaechang Shim, Ikdong Kim, Yun Cheol Baek, Wayne Wolf](#)

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doi> [10.1145/1182807.1182856](https://doi.org/10.1145/1182807.1182856)

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Our demonstration consists of sensor nodes suitable for imageintensive network applications. We developed nodes for stationary and mobile deployment, for face recognition and human detection applications, respectively. Both designs consist of a visible ... [expand](#)

[A hierarchical location directory service across sensor and IP networks](#)

[Sangeeta Bhattacharya, Chien-Liang Fok, Chenyang Lu, Gruia-Catalin Roman](#)

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doi> [10.1145/1182807.1182857](https://doi.org/10.1145/1182807.1182857)


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[Responsive and energy-efficient sensor networking for real time location tracking](#)

[Henoc Agbota, Mike Hazas](#)

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doi> [10.1145/1182807.1182858](https://doi.org/10.1145/1182807.1182858)

Full text:  [Pdf](#)


A large number of MAC protocols support energy efficiency in sensor networks by forming rigid sleep/wakeup schedules. This demonstration illustrates an energy-efficient protocol which adapts to changing sensor update rates, as required by certain application ... [expand](#)

[Sensing and reproducing the shapes of 3D objects using claytronics](#)

[Padmanabhan Pillai](#), [Jason Campbell](#)

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doi> [10.1145/1182807.1182859](https://doi.org/10.1145/1182807.1182859)

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This demonstration presents a novel mechanism for the electronic acquisition of shapes of arbitrary objects, and the the remote reproduction of these shapes: in essence a 3D fax machine. Our approach is based on Claytronics, a form of intelligent matter ... [expand](#)

[Mobility centric campus area sensor network for locality specific applications](#)

[Mukundan Sridharan](#), [Rajiv Ramnath](#), [Emre Ertin](#), [Anish Arora](#)

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doi> [10.1145/1182807.1182860](https://doi.org/10.1145/1182807.1182860)

Full text:  [Pdf](#)


Research in sensor networks has begun to address the use of mobility to improve the reachability of the network, but a number of network principles and application patterns remain to be explored in this context. We propose here a network architecture ... [expand](#)

[SensorMap: a Web site for sensors world-wide](#)

[Suman Nath](#), [Jie Liu](#), [Jessica Miller](#), [Feng Zhao](#), [Andre Santanche](#)

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doi> [10.1145/1182807.1182861](https://doi.org/10.1145/1182807.1182861)


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[SignetLab: deployable sensor network testbed and management tool](#)

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[Simple sensor syndication](#)

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[Step-wise context extraction in AoK mule system](#)

[Yuichi Uehara](#), [Masato Mori](#), [Nayuta Ishii](#), [Yoshito Tobe](#), [Yoh Shiraishi](#)

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doi> [10.1145/1182807.1182864](https://doi.org/10.1145/1182807.1182864)

Full text:  [Pdf](#)


Extracting human's health condition using wireless sensors impose a challenge in the balance between data storage and CPU power. Taking available resources on nodes into consideration, we apply Step-wise Context Extraction (SCE) to AoK mule system [4]. ... [expand](#)

[Software radio implementation of short-range wireless standards for sensor networking](#)

[Thomas Schmid](#), [Tad Dreier](#), [Mani B. Srivastava](#)

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doi> [10.1145/1182807.1182865](https://doi.org/10.1145/1182807.1182865)


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[The CarTel mobile sensor computing system](#)

[V. Bychkovsky](#), [K. Chen](#), [M. Goraczko](#), [H. Hu](#), [B. Hull](#), [A. Miu](#), [E. Shih](#), [Y. Zhang](#), [H. Balakrishnan](#), [S. Madden](#)

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doi> [10.1145/1182807.1182866](https://doi.org/10.1145/1182807.1182866)


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[A virtualizing OS kernel for wireless sensor networks](#)

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doi> [10.1145/1182807.1182867](https://doi.org/10.1145/1182807.1182867)


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[TOSDev: a rapid development environment for TinyOS](#)

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doi> [10.1145/1182807.1182868](https://doi.org/10.1145/1182807.1182868)


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[Using grid technologies to optimise a wireless sensor network for flood management](#)

[Danny Hughes](#), [Phil Greenwood](#), [Barry Porter](#), [Paul Grace](#), [Geoff Coulson](#), [Gordon Blair](#), [Francois Taiani](#), [Florian Pappenberger](#), [Paul Smith](#), [Keith Beven](#)

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doi> [10.1145/1182807.1182869](https://doi.org/10.1145/1182807.1182869)

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POSTER SESSION: **Posters**

[Routing and processing multiple aggregate queries in sensor networks](#)

[Niki Trigoni](#), [Alexandre Guitton](#), [Antonios Skordylis](#)

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doi> [10.1145/1182807.1182871](https://doi.org/10.1145/1182807.1182871)

Full text:  [Pdf](#)


We present a novel approach to processing continuous aggregate queries in sensor networks, which lifts the assumption of tree-based routing. Given a query workload and a special-purpose gateway node where results are expected, the query optimizer exploits ... [expand](#)

[Rateless codes for data dissemination in sensor networks](#)

[Andrew Hagedorn](#), [David Starobinski](#), [Ari Trachtenberg](#)

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doi> [10.1145/1182807.1182872](https://doi.org/10.1145/1182807.1182872)

Full text:  [Pdf](#)


This paper discusses the use of rateless codes to increase performance in wireless sensor networks. [expand](#)

[AMSecure: secure link-layer communication in TinyOS for IEEE 802.15.4-based wireless sensor networks](#)

[Anthony D. Wood](#), [John A. Stankovic](#)

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doi> [10.1145/1182807.1182873](https://doi.org/10.1145/1182807.1182873)


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[Virtual sensing range](#)

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[uScan: a lightweight two-tier global sensing coverage design](#)

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[Channel surfing: defending wireless sensor networks from jamming and interference](#)

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doi> [10.1145/1182807.1182877](https://doi.org/10.1145/1182807.1182877)


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[Energy adaptation techniques to optimize data delivery in store-and-forward sensor networks](#)

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doi> [10.1145/1182807.1182878](https://doi.org/10.1145/1182807.1182878)

Full text:  [Pdf](#)


Wireless sensor networks are severely-energy constrained devices. Energy-related issues are one of the common failure modes in sensor deployments. One challenge in systemwide energy management is that individual nodes in a sensor network often have widely ... [expand](#)

[A distributed reliable data transport strategy for event based wireless sensor networks](#)

[Yuyan Xue](#), [Byrav Ramamurthy](#), [Ying Lu](#)

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The scalability of a wireless sensor network has been of interest and importance. We use a constrained optimization framework to derive fundamental scaling laws for both unstructured sensor networks (which use blind sequential search for querying) and ... [expand](#)

[Understanding the causes of packet delivery success and failure in dense wireless sensor networks](#)

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We present empirical measurements of the packet delivery performance of the Telos and MicaZ sensor platforms. At a high level, their behavior is similar to that of earlier platforms. They exhibit a reception "grey region," and temporal variations in ... [expand](#)

[WaveScope: a signal-oriented data stream management system](#)

[Lewis Girod](#), [Kyle Jamieson](#), [Yuan Mei](#), [Ryan Newton](#), [Stanislav Rost](#), [Arvind Thiagarajan](#), [Hari Balakrishnan](#), [Samuel Madden](#)

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WaveScope is a data management and continuous sensor data system that integrates relational database and signal processing operations into a single system. WaveScope is motivated by a large number of signal-oriented streaming sensor applications, ... [expand](#)

[Comprehensive monitoring of CO₂ sequestration in subalpine forest ecosystems and its relation to global warming](#)

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Global warming is an increasing concern worldwide. Assessing the contribution of CO₂ to this phenomenon is an important issue. This project's goal is to improve understanding of CO₂ and H₂O transport in a mountainous terrain that confound current efforts ... [expand](#)

[TINX: a tiny index design for flash memory on wireless sensor devices](#)

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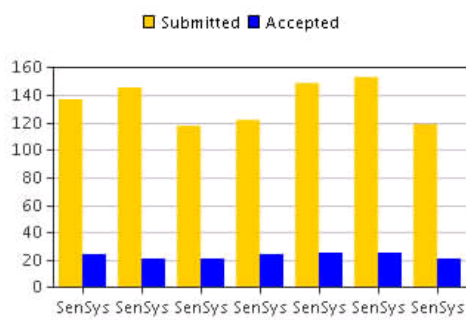
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We present the design, implementation, and evaluation of BeepBeep, a high-accuracy acoustic-based ranging system. It operates in a spontaneous, ad-hoc, and device-to-device context without leveraging any pre-planned infrastructure. It is a pure software-based ... [expand](#)

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doi> [10.1145/1322263.1322266](https://doi.org/10.1145/1322263.1322266)

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Wireless Sensor Networks have been proposed for use in many location-dependent applications. Most of these need to identify the locations of wireless sensor nodes, a challenging task because of the severe constraints on cost, energy and effective range ... [expand](#)

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doi> [10.1145/1322263.1322267](https://doi.org/10.1145/1322263.1322267)

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In this paper, we address the problem of tracking cooperative mobile nodes in wireless sensor networks. Aiming at a resource efficient solution, we advocate the use of sensors that maintain their location information and rely on the tracking service ... [expand](#)


SESSION: **Protocols**

[CountTorrent: ubiquitous access to query aggregates in dynamic and mobile sensor networks](#)

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doi> [10.1145/1322263.1322269](https://doi.org/10.1145/1322263.1322269)

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We study the problem of aggregate querying over sensor networks where the network topology is continuously evolving. We develop scalable data aggregation techniques that remain efficient and accurate even as nodes move, join or leave the network. We ... [expand](#)

[A component-based architecture for power-efficient media access control in wireless sensor networks](#)

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doi> [10.1145/1322263.1322270](https://doi.org/10.1145/1322263.1322270)

Full text:  Pdf


The diverse requirements of wireless sensor network applications necessitate the development of multiple media access control (MAC) protocols to meet their varying throughput, latency, and network lifetime needs. Building new MAC protocols has proven ... [expand](#)

[Visibility: a new metric for protocol design](#)

[Megan Wachs, Jung Il Choi, Jung Woo Lee, Kannan Srinivasan, Zhe Chen, Mayank Jain, Philip Levis](#)

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doi> [10.1145/1322263.1322271](https://doi.org/10.1145/1322263.1322271)

Full text:  Pdf

This paper proposes a new sensor network protocol design goal: visibility. Visibility into behaviors at the network level will simplify debugging and ease the development process. We argue that increasing visibility is the responsibility of the network protocols ... [expand](#)


SESSION: **Applications**

[The BikeNet mobile sensing system for cyclist experience mapping](#)

[S. B. Eisenman, E. Miluzzo, N. D. Lane, R. A. Peterson, G-S. Ahn, A. T. Campbell](#)

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doi> [10.1145/1322263.1322273](https://doi.org/10.1145/1322263.1322273)

Full text:  Pdf


We describe our experiences deploying BikeNet, an extensible mobile sensing system for cyclist experience mapping leveraging opportunistic sensor networking principles and techniques. BikeNet represents a multifaceted sensing system and explores personal, ... [expand](#)

[LUSTER: wireless sensor network for environmental research](#)

[L. Selavo, A. Wood, Q. Cao, T. Sookoor, H. Liu, A. Srinivasan, Y. Wu, W. Kang, J. Stankovic, D. Young, J. Porter](#)

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doi> [10.1145/1322263.1322274](https://doi.org/10.1145/1322263.1322274)

Full text:  Pdf


Environmental wireless sensor network (EWSN) systems are deployed in potentially harsh and remote environments where inevitable node and communication failures must be tolerated. LUSTER---Light Under Shrub Thicket for Environmental Research---is a system ... [expand](#)

[SensorFlock: an airborne wireless sensor network of micro-air vehicles](#)

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doi> [10.1145/1322263.1322275](https://doi.org/10.1145/1322263.1322275)

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An airborne wireless sensor network (WSN) composed of bird-sized micro aerial vehicles (MAVs) enables low cost high granularity atmospheric sensing of toxic plume behavior and storm dynamics, and provides a unique three-dimensional vantage for monitoring ... [expand](#)


SESSION: **Power management**

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doi> [10.1145/1322263.1322277](https://doi.org/10.1145/1322263.1322277)

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In this paper we present Levels, a programming abstraction for energy-aware sensor network applications. Unlike most previous work it does not try to maximize network lifetime but rather helps to meet user-defined lifetime goals while maximizing ... [expand](#)

[CargoNet: a low-cost micropower sensor node exploiting quasi-passive wakeup for adaptive asynchronous monitoring of exceptional events](#)

Mateusz Malinowski, Matthew Moskwa, Mark Feldmeier, Mathew Laibowitz, Joseph A. Paradiso

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doi> [10.1145/1322263.1322278](https://doi.org/10.1145/1322263.1322278)

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This paper describes CargoNet, a system of low-cost, micropower active sensor tags that seeks to bridge the current gap between wireless sensor networks and radio-frequency identification (RFID). CargoNet was aimed at applications in environmental monitoring ... [expand](#)

[Eon: a language and runtime system for perpetual systems](#)

Jacob Sorber, Alexander Kostadinov, Matthew Garber, Matthew Brennan, Mark D. Corner, Emery D. Berger

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doi> [10.1145/1322263.1322279](https://doi.org/10.1145/1322263.1322279)

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Embedded systems can operate perpetually without being connected to a power source by harvesting environmental energy from motion, the sun, wind, or heat differentials. However, programming these perpetual systems is challenging. In response to ... [expand](#)

SESSION: Programming

[The design and implementation of a declarative sensor network system](#)

David Chu, Lucian Popa, Arsalan Tavakoli, Joseph M. Hellerstein, Philip Levis, Scott Shenker, Ion Stoica

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doi> [10.1145/1322263.1322281](https://doi.org/10.1145/1322263.1322281)

Full text:  Pdf


Sensor networks are notoriously difficult to program, given that they encompass the complexities of both distributed and embedded systems. To address this problem, we present the design and implementation of a declarative sensor network platform, DSN: ... [expand](#)

[Clairvoyant: a comprehensive source-level debugger for wireless sensor networks](#)

Jing Yang, Mary Lou Soffa, Leo Selavo, Kamin Whitehouse

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doi> [10.1145/1322263.1322282](https://doi.org/10.1145/1322263.1322282)

Full text:  Pdf


Wireless sensor network (WSN) applications are notoriously difficult to develop and debug. This paper describes Clairvoyant which is a comprehensive source-level debugger for wireless, embedded networks. With Clairvoyant, a developer can ... [expand](#)

[Efficient memory safety for TinyOS](#)

Nathan Coopride, Will Archer, Eric Eide, David Gay, John Regehr

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doi> [10.1145/1322263.1322283](https://doi.org/10.1145/1322263.1322283)

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Reliable sensor network software is difficult to create: applications are concurrent and distributed, hardware-based memory protection is unavailable, and severe resource constraints necessitate the use of unsafe, low-level languages. Our work improves ... [expand](#)


SESSION: Utilities

[A framework for the automated generation of power-efficient classifiers for embedded sensor nodes](#)

Ari Y. Benbasat, Joseph A. Paradiso

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doi> [10.1145/1322263.1322285](https://doi.org/10.1145/1322263.1322285)

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This paper presents a framework for power-efficient detection in embedded sensor systems. State detection is structured as a decision tree classifier that dynamically orders the activation and adjusts the sampling rate of the sensors (termed groggy wakeup), ... [expand](#)

[Message-in-a-bottle: user-friendly and secure key deployment for sensor nodes](#)

Cynthia Kuo, Mark Luk, Rohit Negi, Adrian Perrig

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doi> [10.1145/1322263.1322286](https://doi.org/10.1145/1322263.1322286)

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Existing protocols for secure key establishment all rely on an unspecified mechanism for initially deploying secrets to sensor nodes. However, no commercially viable and secure mechanism exists for initial setup. Without a guarantee of secure ... [expand](#)

[Multi-user data sharing in radar sensor networks](#)

Ming Li, Tingxin Yan, Deepak Ganesan, Eric Lyons, Prashant Shenoy, Arun Venkataramani, Michael Zink

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doi> [10.1145/1322263.1322287](https://doi.org/10.1145/1322263.1322287)

Full text:  Pdf

In this paper, we focus on a network of rich sensors that are geographically distributed and argue that the design of such networks poses very different challenges from traditional "mote-class" sensor network design. We identify the need to handle the ... [expand](#)


SESSION: **Monitoring/simulation**

[Catching elephants with mice: sparse sampling for monitoring sensor networks](#)

[Sorabh Gandhi](#), [Subhash Suri](#), [Emo Welzl](#)

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doi> [10.1145/1322263.1322289](https://doi.org/10.1145/1322263.1322289)

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We propose a scalably efficient scheme for detecting large-scale physically-correlated events in sensor networks. Specifically, we show that in a network of n sensors arbitrarily distributed in the plane, a sample of $O(1/\epsilon \log 1/\epsilon)$... [expand](#)

[Simulation-based augmented reality for sensor network development](#)

[Ye Wen](#), [Wei Zhang](#), [Rich Wolski](#), [Navraj Chohan](#)

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doi> [10.1145/1322263.1322290](https://doi.org/10.1145/1322263.1322290)

Full text:  [Pdf](#)


Software development for sensor network is made difficult by resource constrained sensor devices, distributed system complexity, communication unreliability, and high labor cost. Simulation, as a useful tool, provides an affordable way to study algorithmic ... [expand](#)

[Exploring in-situ sensing irregularity in wireless sensor networks](#)

[Joengmin Hwang](#), [Tian He](#), [Yongdae Kim](#)

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doi> [10.1145/1322263.1322291](https://doi.org/10.1145/1322263.1322291)

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The circular sensing model has been widely used to estimate performance of sensing applications in existing analysis and simulations. While this model provides valuable high-level guidelines, the quantitative results obtained may not reflect the true ... [expand](#)


SESSION: **Communication**

[RCRT: rate-controlled reliable transport for wireless sensor networks](#)

[Jeongyeup Paek](#), [Ramesh Govindan](#)

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doi> [10.1145/1322263.1322293](https://doi.org/10.1145/1322263.1322293)

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Emerging high-rate applications (imaging, structural monitoring, acoustic localization) will need to transport large volumes of data concurrently from several sensors. These applications are also loss-intolerant. A key requirement for such applications, ... [expand](#)

[Data forwarding in extremely low duty-cycle sensor networks with unreliable communication links](#)

[Yu Gu](#), [Tian He](#)

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doi> [10.1145/1322263.1322294](https://doi.org/10.1145/1322263.1322294)

Full text:  [Pdf](#)

In extremely low duty-cycle sensor networks, end-to-end communications cannot afford to maintain an always-awake communication backbone. Low duty-cycle, accompanied by the unreliable nature of wireless communication, makes it essential to design a new ... [expand](#)

[An adaptive communication architecture for wireless sensor networks](#)

[Adam Dunkels](#), [Fredrik Österlind](#), [Zhitaio He](#)

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doi> [10.1145/1322263.1322295](https://doi.org/10.1145/1322263.1322295)

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As sensor networks move towards increasing heterogeneity, the number of link layers, MAC protocols, and underlying transportation mechanisms increases. System developers must adapt their applications and systems to accommodate a wide range of underlying ... [expand](#)

[Flush: a reliable bulk transport protocol for multihop wireless networks](#)

[Sukun Kim](#), [Rodrigo Fonseca](#), [Prabal Dutta](#), [Arsalan Tavakoli](#), [David Culler](#), [Philip Levis](#), [Scott Shenker](#), [Ion Stoica](#)

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doi> [10.1145/1322263.1322296](https://doi.org/10.1145/1322263.1322296)

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We present Flush, a reliable, high goodput bulk data transport protocol for wireless sensor networks. Flush provides end-to-end reliability, reduces transfer time, and adapts to time-varying network conditions. It achieves these properties using end-to-end ... [expand](#)


DEMONSTRATION SESSION: **Demo papers**

[A real-time sensor network visualization system using KVS: Kyoto visualization system](#)

[Norihsa Segawa](#), [Yukio Yasuhara](#), [Naohisa Sakamoto](#), [Tomoki Yoshihisa](#), [Yasuo Ebara](#), [Koji Koyamada](#)

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doi> [10.1145/1322263.1322298](https://doi.org/10.1145/1322263.1322298)

Full text:  [Pdf](#)


We report the system that collects the data from the sensor network and visualizes the data on real time by three dimensions on a computer. It becomes possible for this system to make a user make the measurement data on space intuitive. [expand](#)

[The national weather sensor grid](#)

[Hock Beng Lim](#), [Keck Voon Ling](#), [Wenqiang Wang](#), [Yuxia Yao](#), [Mudasser Iqbal](#), [Boyang Li](#), [Xiaonan Yin](#), [Tarun Sharma](#)

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doi> [10.1145/1322263.1322299](#)

Full text:  [Pdf](#)


With the rapid advances in technologies such as MEMS sensors, low-power embedded processing and wireless networking, sensor networks are becoming more powerful in terms of data acquisition and processing capabilities. Sensor networks can now be deployed ... [expand](#)

[A multi-channel MAC implementation for wireless sensor networks](#)

[Youngmin Kim](#), [Hyojeong Shin](#), [Hojung Cha](#)

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doi> [10.1145/1322263.1322300](#)

Full text:  [Pdf](#)


Sensor nodes are typically battery powered and operate in unattended environments. Minimizing the energy consumption of sensor nodes is, therefore, important to prolong the network life time. Since the radio is a main energy consumer, most of the Medium ... [expand](#)

[A high-density earthquake monitoring system using wireless sensor networks](#)

[Makoto Suzuki](#), [Shunsuke Saruwatari](#), [Narito Kurata](#), [Hiroyuki Morikawa](#)

Pages: 373 - 374

doi> [10.1145/1322263.1322301](#)

Full text:  [Pdf](#)


In this paper we present a high-density earthquake monitoring system using wireless sensor networks. For high-precision monitoring, we developed Pavenet OS, which is a hard-realtime operating system for sensor nodes, and acceleration sensor board. Sensor ... [expand](#)

[A 6LoWPAN application environment](#)

[Gilman Tolle](#)

Pages: 375 - 376

doi> [10.1145/1322263.1322302](#)

Full text:  [Pdf](#)


We are demonstrating a networking technology and application environment that connects highly-constrained low-power wireless embedded sensor networks with large-scale IP networks. This technology is based on the 6LoWPAN IPv6-over-802.15.4 adaption layer. [expand](#)

[Multi-user data sharing in radar sensor networks](#)

[Ming Li](#), [Tingxin Yan](#), [Deepak Ganesan](#), [Eric Lyons](#), [Prashant Shenoy](#), [Arun Venkataramani](#), [Michael Zink](#)

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doi> [10.1145/1322263.1322303](#)

Full text:  [Pdf](#)


The emerging of rich sensor networks poses very different design challenges from traditional "mote-class" sensor networks. One important challenge is that these networks are designed to handle the diverse requirements of multiple users. In this work, ... [expand](#)

[Navigation and interaction in physical spaces using RFID enabled spatial sensing](#)

[Muhammad Atif Mehmood](#), [Lars Kulik](#), [Egemen Tanin](#)

Pages: 379 - 380

doi> [10.1145/1322263.1322304](#)

Full text:  [Pdf](#)


In this demonstration we show how RFID technology can be used for sensing spatial information in indoor environments. In particular, we demonstrate how this sensed information can be used for navigation and interaction within an environment. [expand](#)

[An interactive UNIX shell for low-end sensor nodes with LiteOS](#)

[Qing Cao](#), [Tarek Abdelzaher](#), [John Stankovic](#), [Tian He](#)

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doi> [10.1145/1322263.1322305](#)

Full text:  [Pdf](#)


This demonstration highlights an interactive Unix-like shell for operating wireless sensor networks, where the user uses familiar Unix commands to complete tasks ranging from wireless installation of user applications to retrieval of data reports with ... [expand](#)

[A co-simulation platform for actuator networks](#)

[Ahmad Al-Hammouri](#), [Vincenzo Liberatore](#), [Huthaifa Al-Omari](#), [Zakaria Al-Qudah](#), [Michael S. Branicky](#), [Deepak Agrawal](#)

Pages: 383 - 384

doi> [10.1145/1322263.1322306](#)

Full text:  [Pdf](#)


Actuator networks will enable an unprecedented degree of distributed control of physical environments, and further progress will critically depend on the availability of a simulation platform that can capture both the physical and the communication dynamics. [expand](#)

[Sensor network programming with Flask](#)

[Geoffrey Mainland](#), [Greg Morrisett](#), [Matt Welsh](#), [Ryan Newton](#)

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doi> [10.1145/1322263.1322307](https://doi.org/10.1145/1322263.1322307)

Full text:  Pdf


A great deal of recent work has investigated new programming abstractions and models for sensor networks. However, the complexity of such systems demands a great deal of effort to develop appropriate compilers and runtime platforms to achieve good performance. ... [expand](#)

[Design and implementation of a PCO-based protocol for sensor networks](#)

[Roberto Pagliari](#), [Anna Scaglione](#)

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doi> [10.1145/1322263.1322308](https://doi.org/10.1145/1322263.1322308)

Full text:  Pdf


Sensor networks have been used in a wide range of applications. Considerable research effort is currently devoted to design protocols that allow networks of inexpensive sensors to perform reliable remote control and monitoring functions, in spite of ... [expand](#)

[Fountain reprogramming protocol \(FRP\): a reliable data dissemination scheme for wireless sensor networks using fountain codes](#)

[Riccardo Crepaldi](#), [Albert Harris, III](#), [Michele Rossi](#), [Giovanni Zanca](#), [Michele Zorzi](#)

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doi> [10.1145/1322263.1322309](https://doi.org/10.1145/1322263.1322309)

Full text:  Pdf


Wireless sensor network technologies enable a wide variety of applications (e.g., environmental monitoring). Such sensor networks are often deployed in regions that make it difficult to collect and redistribute the nodes for maintenance. However, there ... [expand](#)

[Acoustic sensor networks for environmental monitoring](#)

[Jinhai Cai](#), [Dominic Ee](#), [Andy Lau](#), [Richard Mason](#), [Binh Pham](#), [Paul Roe](#), [Jinglan Zhang](#), [Stuart Gage](#)

Pages: 391 - 392

doi> [10.1145/1322263.1322310](https://doi.org/10.1145/1322263.1322310)

Full text:  Pdf


In this demonstration, we will show how smartphones can be used as a platform for monitoring environmental change, particularly with respect to birdlife. We have researched and implemented a platform using Microsoft smartphones for remotely monitoring ... [expand](#)

[Programming wireless sensor networks with logical neighborhoods: a road tunnel use case](#)

[Luca Mottola](#), [Gian Pietro Picco](#)

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doi> [10.1145/1322263.1322311](https://doi.org/10.1145/1322263.1322311)

Full text:  Pdf


Wireless sensor networks (WSNs) involving actuation are increasingly envisioned in a range of fields. For instance, there is considerable interest in leveraging off WSNs to improve safety in road tunnels [3]. Researchers are envisioning ... [expand](#)

[Video surveillance patrol robot system in 3G, Internet and sensor networks](#)

[Fung Po Tso](#), [Lizhuo Zhang](#), [Weijia Jia](#)

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doi> [10.1145/1322263.1322312](https://doi.org/10.1145/1322263.1322312)

Full text:  Pdf


We propose to demo a ubiquitous surveillance patrol robot system which can patrol in a candidate site to perform events detection where a wireless sensor network may be deployed. We have enabled the 3G phone controlled patrol robot (over 3G circuit switched ... [expand](#)

[A BeepBeep ranging system on mobile phones](#)

[Chunyi Peng](#), [Guobin Shen](#), [Zheng Han](#), [Yongguang Zhang](#), [Yanlin Li](#), [Kun Tan](#)

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doi> [10.1145/1322263.1322313](https://doi.org/10.1145/1322263.1322313)

Full text:  Pdf


The demo, BeepBeep, shows a high-accuracy acoustic-based ranging system without relaying on any pre-planned infrastructure or inter-device time synchronization. Moreover, the BeepBeep is a pure software-based solution and readily applicable to many low-cost ... [expand](#)

[A traveling wave-based self-organizing communication mechanism for WSNs](#)

[Yoshiaki Taniguchi](#), [Naoki Wakamiya](#), [Masayuki Murata](#)

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doi> [10.1145/1322263.1322314](https://doi.org/10.1145/1322263.1322314)

Full text:  Pdf


We have proposed a simple and energy-efficient communication mechanism which can organize a variety of communication depending on dynamically changing application requirements. In this demonstration, we show that our mechanism can gather or diffuse information ... [expand](#)

[Micro-Blog: map-casting from mobile phones to virtual sensor maps](#)

[Shravan Gaonkar](#), [Romit Roy Choudhury](#)

Pages: 401 - 402

doi> [10.1145/1322263.1322315](https://doi.org/10.1145/1322263.1322315)

Full text:  Pdf

The synergy of phone sensors (microphone, camera, GPS, etc.), wireless capability, and ever-increasing device density can lead to novel people-


centric applications. Unlike traditional sensor networks, the next generation networks may be participatory, ... [expand](#)

[Multi-radio medium access control protocol for wireless sensor networks](#)

[Junaid Ansari](#), [Xi Zhang](#), [Petri Mähönen](#)

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doi> [10.1145/1322263.1322316](https://doi.org/10.1145/1322263.1322316)

Full text:  [Pdf](#)


In this demonstration paper, we present a multi-radio MAC protocol and a prototype sensor node platform which supports dual frequency bands of operation. The multi-radio MAC protocol combines the advantages of both high and low frequency bands to give ... [expand](#)

[Effective source-level debugging of wireless sensor networks](#)

[Jing Yang](#), [Mary Lou Soffa](#), [Kamin Whitehouse](#)

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doi> [10.1145/1322263.1322317](https://doi.org/10.1145/1322263.1322317)

Full text:  [Pdf](#)


Sensor network debugging is notoriously difficult because many bugs manifest themselves only when they encounter the real world -- exactly when most powerful debugging tools can no longer be applied. There are currently two common approaches to source ... [expand](#)

[Castalia: revealing pitfalls in designing distributed algorithms in WSN](#)

[Athanassios Boulis](#)

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doi> [10.1145/1322263.1322318](https://doi.org/10.1145/1322263.1322318)

Full text:  [Pdf](#)


We present Castalia, a simulator for WSN that models many aspects of the WSN system and uses advanced models especially in terms of the channel and radio behaviour. We show the effects of these features in distributed algorithms that work fine with simpler ... [expand](#)

[Software-based sensor node energy estimation](#)

[Adam Dunkels](#), [Fredrik Österlind](#), [Nicolas Tsiftes](#), [Zhitao He](#)

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doi> [10.1145/1322263.1322319](https://doi.org/10.1145/1322263.1322319)

Full text:  [Pdf](#)

Being able to estimate the energy consumption of sensor nodes is essential both for evaluating existing sensor network mechanisms and for constructing new energy-aware mechanisms. We present a software-based mechanism for estimating the energy consumption ... [expand](#)


POSTER SESSION: Poster papers

[Fair waiting protocol: achieving isolation in wireless sensor networks](#)

[Jung Il Choi](#), [Jung Woo Lee](#), [Zhe Chen](#), [Philip Levis](#)

Pages: 411 - 412

doi> [10.1145/1322263.1322321](https://doi.org/10.1145/1322263.1322321)

Full text:  [Pdf](#)


We present the Fair Waiting Protocol(FWP), which isolates the operations of competing protocols on CSMA networks. Utilizing layer 3 information, the grant-to-send mechanism prevents collisions on data paths. FWP enables the grant-to-send to be shared ... [expand](#)

[Secure multi-path in sensor networks](#)

[Feng Lu](#), [Lijuan Geng](#), [Liang-Tien Chia](#), [Ying-Chang Liang](#)

Pages: 413 - 414

doi> [10.1145/1322263.1322322](https://doi.org/10.1145/1322263.1322322)

Full text:  [Pdf](#)


Wireless sensor network has been identified as being useful in a variety of domains including the battlefield and perimeter defense. These mission critical applications raise the concern for security in sensor network. Typical security problems identified ... [expand](#)

[PrivaSense: providing privacy protection for sensor networks](#)

[Yi Ouyang](#), [Zhengyi Le](#), [James Ford](#), [Fillia Makedon](#)

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doi> [10.1145/1322263.1322323](https://doi.org/10.1145/1322263.1322323)

Full text:  [Pdf](#)


Sensor networks are used in a variety of applications such as battlefield reconnaissance, environmental monitoring, and traffic monitoring. Security and privacy become important concerns when people are participants in sensor network applications [1]. ... [expand](#)

[A framework for data quality and feedback in participatory sensing](#)

[Sasank Reddy](#), [Jeff Burke](#), [Deborah Estrin](#), [Mark Hansen](#), [Mani Srivastava](#)

Pages: 417 - 418

doi> [10.1145/1322263.1322324](https://doi.org/10.1145/1322263.1322324)

Full text:  [Pdf](#)


The rapid adoption of mobile phones by society over the last decade and the increasing ability to capture, classifying, and transmit a wide variety of data (image, audio, and location) have enabled a new sensing paradigm - where humans carrying mobile ... [expand](#)

[TomuDB: multi-resolution queries in heterogeneous sensor networks through overlay network](#)

[Yoh Shiraishi](#), [Niwat Thepvilojanapong](#), [Yosuke Tamura](#), [Tatsuro Endo](#), [Koichi Yamada](#), [Nayuta Ishii](#), [Hiroki Ishizuka](#), [Keisuke Kanai](#), [Yoshito Tobe](#)

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doi> [10.1145/1322263.1322325](https://doi.org/10.1145/1322263.1322325)

Full text:  [Pdf](#)


Querying in heterogeneous sensor networks is a challenging research issue due to a variety of real-world queries depending on users' preferences. Examples of queries are weather, nearby restaurants, navigation, etc. Users may ask for a breezy path starting ... [expand](#)

[A model-based routing protocol for a mobile, delay tolerant network](#)

[Tim Wark](#), [Wen Hu](#), [Pavan Sikka](#), [Lasse Klingbeil](#), [Peter Corke](#), [Chris Crossman](#), [Greg Bishop-Hurley](#)

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doi> [10.1145/1322263.1322326](https://doi.org/10.1145/1322263.1322326)

Full text:  [Pdf](#)


This short-paper presents the design and experimental validation of model-based, mobile routing protocol for a delay tolerant network (DTN), where herds of animals are utilised as message ferries. We develop a novel routing protocol that utilises knowledge ... [expand](#)

[A fault-tolerant node scheduling scheme to extend the lifetime of wireless sensor networks](#)

[Babak Pazand](#), [Amitava Datta](#), [Rachel Cardell-Oliver](#)

Pages: 423 - 424

doi> [10.1145/1322263.1322327](https://doi.org/10.1145/1322263.1322327)

Full text:  [Pdf](#)


In this paper, we propose a fault-tolerant node scheduling scheme to solve the coverage problem in sensor networks. [expand](#)

[Detection and tracking using wireless sensor networks](#)

[Nadeem Ahmed](#), [Yifei Dong](#), [Tatiana Bokareva](#), [Salil Kanhere](#), [Sanjay Jha](#), [Travis Bessell](#), [Mark Rutten](#), [Branko Ristic](#), [Neil Gordon](#)

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doi> [10.1145/1322263.1322328](https://doi.org/10.1145/1322263.1322328)

Full text:  [Pdf](#)


Target detection and tracking is a well-established area of research. However, a majority of proposed solutions in existing literature rely on expensive and specialized sensors, which often have limited coverage. Using low cost sensor nodes is an attractive ... [expand](#)

[An effective method for state-of-charge estimation in wireless sensor networks](#)

[Christian Behrens](#), [Ole Bischoff](#), [Steffen Paul](#), [Rainer Laur](#)

Pages: 427 - 428

doi> [10.1145/1322263.1322329](https://doi.org/10.1145/1322263.1322329)

Full text:  [Pdf](#)


This poster shows the work-in-progress results of an effective method for predicting the residual battery energy in WSN nodes including the battery behavior. This method uses a hybrid approach consisting of a deterministic part by counting credit points ... [expand](#)

[Adaptive sampling in the COLUMBIA RIVeR observation network](#)

[Thanh Dang](#), [Nirupama Bulusu](#), [Wu-chi Feng](#), [Sergey Frolov](#), [Antonio Baptista](#)

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doi> [10.1145/1322263.1322330](https://doi.org/10.1145/1322263.1322330)

Full text:  [Pdf](#)


The Columbia River (CoRie) Observation Network includes an extensive array of fixed stations monitoring the Columbia River estuary and nearby coastal ocean. At each station, variable combinations of in-situ sensors measure one or more physical properties ... [expand](#)

[SASSI: the sliverware architecture for sensor system integration](#)

[Seth Holloway](#), [Alexander Griffith](#), [Angela Dalton](#), [Drew Stovall](#), [Christine Julien](#)

Pages: 431 - 432

doi> [10.1145/1322263.1322331](https://doi.org/10.1145/1322263.1322331)

Full text:  [Pdf](#)

Recently, embedded sensor usage has increased thanks to the proliferation of hardware and software addressing resource constraints. While the increased usage is a good start, it is important to adopt good software engineering principles early for many ... [expand](#)

[On node isolation in directional sensor networks](#)

[Unoma Ndili Okorafor](#), [Deepa Kundur](#)

Pages: 433 - 434

doi> [10.1145/1322263.1322332](https://doi.org/10.1145/1322263.1322332)

Full text:  [Pdf](#)


Wireless ad-hoc sensor networks (WSNs) consist of randomly and densely deployed nodes which self-organize to cooperatively maintain multi-hop network connectivity [1]. The nodes act as both environmental sensors and network routers. The ability to set ... [expand](#)

[Application semantics in query optimization for WSNs](#)

[Egemen Tanin](#), [Songting Chen](#), [Junichi Tatemura](#), [Wang-Pin Hsiung](#)

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doi> [10.1145/1322263.1322333](https://doi.org/10.1145/1322263.1322333)

Full text:  [Pdf](#)


Efficient data acquisition in WSNs has attracted significant interest. For example, TinyDB [2] introduced query dissemination and data aggregation trees. Later, a probabilistic model of the physical world is used in [1]. Recently, [3] argues that probabilistic ... [expand](#)

[Distributed computation in wireless ad hoc grids with bandwidth control](#)

[Elisa Rondini](#), [Stephen Hailes](#)

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doi> [10.1145/1322263.1322334](https://doi.org/10.1145/1322263.1322334)

Full text:  [Pdf](#)


There are many situations in which information from a Wireless Sensor Network (WSN) must be processed to provide a meaningful summary to an external agency in the minimum amount of time, all within the constraints of the processing power and bandwidth ... [expand](#)

[An autonomic communication framework for sensor networks](#)

[Jingbo Sun](#), [Rachel Cardell-Oliver](#)

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doi> [10.1145/1322263.1322335](https://doi.org/10.1145/1322263.1322335)

Full text:  [Pdf](#)

A novel autonomic communication framework is proposed for two-tiered heterogeneous sensor networks. The framework consists of an autonomic data-link protocol, LADD, and a communication scheduler. Networks consist of both sensing nodes and more powerful ... [expand](#)

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Proceedings of the 6th ACM conference on Embedded network sensor systems

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[Yanjun Sun](#), [Omer Gurewitz](#), [David B. Johnson](#)

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doi> [10.1145/1460412.1460414](#)

Full text: Pdf

The problem of idle listening is one of the most significant sources of energy consumption in wireless sensor nodes, and many techniques have been proposed based on duty cycling to reduce this cost. In this paper, we present a new asynchronous ... [expand](#)

[IP is dead, long live IP for wireless sensor networks](#)

[Jonathan W. Hui](#), [David E. Culler](#)

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doi> [10.1145/1460412.1460415](#)

Full text: Pdf

A decade ago as wireless sensor network research took off many researchers in the field denounced the use of IP as inadequate and in contradiction to the needs of wireless sensor networking. Since then the field has matured, standard links have emerged, ... [expand](#)

[The \$\beta\$ -factor: measuring wireless link burstiness](#)

[Kannan Srinivasan](#), [Maria A. Kazandjieva](#), [Saatvik Agarwal](#), [Philip Levis](#)

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doi> [10.1145/1460412.1460416](#)

Full text: Pdf

Measuring 802.15.4 reception in three testbeds, we find that most intermediate links are bursty: they shift between poor and good delivery. We present a metric to measure this link burstiness and name it β . We find that link burstiness affects protocol ... [expand](#)

SESSION: Deployment and topology discovery

[The hitchhiker's guide to successful wireless sensor network deployments](#)

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doi> [10.1145/1460412.1460418](#)

Full text: Pdf

The successful deployment of a wireless sensor network is a difficult task, littered with traps and pitfalls. Even a functional network does not guarantee gathering meaningful data. In SensorScope, with its multiple campaigns in various environments ... [expand](#)

[Robust topology control for indoor wireless sensor networks](#)

[Gregory Hackmann](#), [Octav Chipara](#), [Chenyang Lu](#)

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doi> [10.1145/1460412.1460419](#)

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Topology control can reduce power consumption and channel contention in wireless sensor networks by adjusting the transmission power. However, topology control for wireless sensor networks faces significant challenges, especially in indoor environments ... [expand](#)

[Practical asynchronous neighbor discovery and rendezvous for mobile sensing applications](#)

[Prabal Dutta](#), [David Culler](#)

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doi> [10.1145/1460412.1460420](#)

Full text: Pdf

We present Disco, an asynchronous neighbor discovery and rendezvous protocol that allows two or more nodes to operate their radios at low duty cycles (e.g. 1%) and yet still discover and communicate with one another during infrequent, opportunistic encounters ... [expand](#)


SESSION: Debugging

[Declarative tracepoints: a programmable and application independent debugging system for wireless sensor networks](#)

[Qing Cao](#), [Tarek Abdelzaher](#), [John Stankovic](#), [Kamin Whitehouse](#), [Liqian Luo](#)

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doi> [10.1145/1460412.1460422](https://doi.org/10.1145/1460412.1460422)

Full text:  [Pdf](#)


Effective debugging usually involves watching program state to diagnose bugs. When debugging sensor network applications, this approach is often time-consuming and errorprone, not only because of the lack of visibility into system state, but also because ... [expand](#)

[Dustminer: troubleshooting interactive complexity bugs in sensor networks](#)

[Mohammad Maifi Hasan Khan](#), [Hieu Khac Le](#), [Hossein Ahmadi](#), [Tarek F. Abdelzaher](#), [Jiawei Han](#)

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doi> [10.1145/1460412.1460423](https://doi.org/10.1145/1460412.1460423)

Full text:  [Pdf](#)


This paper presents a tool for uncovering bugs due to interactive complexity in networked sensing applications. Such bugs are not localized to one component that is faulty, but rather result from complex and unexpected interactions between multiple often ... [expand](#)

[Passive diagnosis for wireless sensor networks](#)

[Kebin Liu](#), [Mo Li](#), [Yunhao Liu](#), [Minglu Li](#), [Zhongwen Guo](#), [Feng Hong](#)

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doi> [10.1145/1460412.1460424](https://doi.org/10.1145/1460412.1460424)

Full text:  [Pdf](#)

Network diagnosis, an essential research topic for traditional networking systems, has not received much attention for wireless sensor networks. Existing sensor debugging tools like sympathy or EmStar rely heavily on an add-in protocol that generates ... [expand](#)


SESSION: Selected problems in WSNs

[Spinning beacons for precise indoor localization](#)

[Ho-lin Chang](#), [Jr-ben Tian](#), [Tsung-Te Lai](#), [Hao-Hua Chu](#), [Polly Huang](#)

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doi> [10.1145/1460412.1460426](https://doi.org/10.1145/1460412.1460426)

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This work proposes the novel use of spinning beacons for precise indoor localization. The proposed "SpinLoc" (Spinning Indoor Localization) system uses "spinning" (i.e., rotating) beacons to create and detect predictable and highly distinguishable ... [expand](#)

[A measurement study of interference modeling and scheduling in low-power wireless networks](#)

[Ritesh Maheshwari](#), [Shweta Jain](#), [Samir R. Das](#)

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doi> [10.1145/1460412.1460427](https://doi.org/10.1145/1460412.1460427)

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Accurate interference models are important for use in transmission scheduling algorithms in wireless networks. In this work, we perform extensive modeling and experimentation on two 20-node TelosB motes testbeds -- one indoor and the other outdoor -- ... [expand](#)

[Distributed image search in camera sensor networks](#)

[Tingxin Yan](#), [Deepak Ganesan](#), [R. Manmatha](#)

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doi> [10.1145/1460412.1460428](https://doi.org/10.1145/1460412.1460428)

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Recent advances in sensor networks permit the use of a large number of relatively inexpensive distributed computational nodes with camera sensors linked in a network and possibly linked to one or more central servers. We argue that the full potential ... [expand](#)


SESSION: Data analysis

[Lance: optimizing high-resolution signal collection in wireless sensor networks](#)

[Geoffrey Werner-Allen](#), [Stephen Dawson-Haggerty](#), [Matt Welsh](#)

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doi> [10.1145/1460412.1460430](https://doi.org/10.1145/1460412.1460430)

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An emerging class of sensor networks focuses on reliable collection of high-resolution signals from across the network. In these applications, the system is capable of acquiring more data than can be delivered to the base station, due to severe limits ... [expand](#)

[Accurate localization of low-level radioactive source under noise and measurement errors](#)

[Jren-Chit Chin](#), [David K.Y. Yau](#), [Nageswara S.V. Rao](#), [Yong Yang](#), [Chris Y.T. Ma](#), [Mallikarjun Shankar](#)

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doi> [10.1145/1460412.1460431](https://doi.org/10.1145/1460412.1460431)

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The localization of a radioactive source can be solved in closed-form using 4 ideal sensors and the Apollonius circle in a noise- and error-free environment. When measurement errors and noise such as background radiation are considered, a larger number ... [expand](#)

[A methodology for in-network evaluation of integrated logical-statistical models](#)

[Anu Singh](#), [C R. Ramakrishnan](#), [I V. Ramakrishnan](#), [David S. Warren](#), [Jennifer L. Wong](#)

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doi> [10.1145/1460412.1460432](https://doi.org/10.1145/1460412.1460432)

Full text:  [Pdf](#)

Synthesizing high-level semantic knowledge from low-level sensor data is an important problem in many sensor network applications. Programming a network to perform such synthesis in situ is especially difficult due to the stringent resource constraints, ... [expand](#)


SESSION: **Architecture aspects of sensor networks**

[Resource aware programming in the Pixie OS](#)

[Konrad Lorincz](#), [Bor-rong Chen](#), [Jason Waterman](#), [Geoff Werner-Allen](#), [Matt Welsh](#)

Pages: 211-224

doi> [10.1145/1460412.1460434](https://doi.org/10.1145/1460412.1460434)

Full text:  [Pdf](#)


This paper presents Pixie, a new sensor node operating system designed to support the needs of data-intensive applications. These applications, which include high-resolution monitoring of acoustic, seismic, acceleration, and other signals, involve high ... [expand](#)

[MacroLab: a vector-based macroprogramming framework for cyber-physical systems](#)

[Timothy W. Hnat](#), [Tamim I. Sookoor](#), [Pieter Hooimeijer](#), [Westley Weimer](#), [Kamin Whitehouse](#)

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doi> [10.1145/1460412.1460435](https://doi.org/10.1145/1460412.1460435)

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We present a macroprogramming framework called MacroLab that offers a vector programming abstraction similar to Matlab for Cyber-Physical Systems (CPSs). The user writes a single program for the entire network using Matlab-like operations such ... [expand](#)

[Steady and fair rate allocation for rechargeable sensors in perpetual sensor networks](#)

[Kai-Wei Fan](#), [Zizhan Zheng](#), [Prasun Sinha](#)

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doi> [10.1145/1460412.1460436](https://doi.org/10.1145/1460412.1460436)

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Renewable energy enables sensor networks with the capability to recharge and provide perpetual data services. Due to low recharging rates and the dynamics of renewable energy such as solar and wind power, providing services without interruptions caused ... [expand](#)


SESSION: **Sensor networks design issues**

[Tiny web services: design and implementation of interoperable and evolvable sensor networks](#)

[Nissanka B. Priyantha](#), [Aman Kansal](#), [Michel Goraczko](#), [Feng Zhao](#)

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doi> [10.1145/1460412.1460438](https://doi.org/10.1145/1460412.1460438)

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We present a web service based approach to enable an evolutionary sensornet system where additional sensor nodes may be added after the initial deployment. The functionality and data provided by the new nodes is exposed in a structured manner, so that ... [expand](#)

[A building block approach to sensornet systems](#)

[Prabal Dutta](#), [Jay Taneja](#), [Jaein Jeong](#), [Xiaofan Jiang](#), [David Culler](#)

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doi> [10.1145/1460412.1460439](https://doi.org/10.1145/1460412.1460439)

Full text:  [Pdf](#)


We present a building block approach to hardware platform design based on a decade of collective experience in this area, arriving at an architecture in which general-purpose modules that require expertise to design and incorporate commonly-used ... [expand](#)

[PoolView: stream privacy for grassroots participatory sensing](#)

[Raghu K. Ganti](#), [Nam Pham](#), [Yu-En Tsai](#), [Tarek F. Abdelzaher](#)

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doi> [10.1145/1460412.1460440](https://doi.org/10.1145/1460412.1460440)

Full text:  [Pdf](#)

This paper develops mathematical foundations and architectural components for providing privacy guarantees on stream data in grassroots participatory sensing applications, where groups of participants use privately-owned sensors to collectively measure ... [expand](#)


SESSION: **Applications**

[Model-based monitoring for early warning flood detection](#)

[Elizabeth A. Basha](#), [Sai Ravela](#), [Daniela Rus](#)

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doi> [10.1145/1460412.1460442](https://doi.org/10.1145/1460412.1460442)

Full text:  [Pdf](#)


Predictive environmental sensor networks provide complex engineering and systems challenges. These systems must withstand the event of interest, remain functional over long time periods when no events occur, cover large geographical regions of interest ... [expand](#)

[NAWMS: nonintrusive autonomous water monitoring system](#)

[Younghun Kim](#), [Thomas Schmid](#), [Zainul M. Charbiwala](#), [Jonathan Friedman](#), [Mani B. Srivastava](#)

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doi> [10.1145/1460412.1460443](https://doi.org/10.1145/1460412.1460443)

Full text:  Pdf


Water is nature's most precious resource and growing demand is pushing fresh water supplies to the brink of non-renewability. New technological and social initiatives that enhance conservation and reduce waste are needed. Providing consumers with fine-grained ... [expand](#)

[Nericell: rich monitoring of road and traffic conditions using mobile smartphones](#)

[Prashanth Mohan](#), [Venkata N. Padmanabhan](#), [Ramachandran Ramjee](#)

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doi> [10.1145/1460412.1460444](#)

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We consider the problem of monitoring road and traffic conditions in a city. Prior work in this area has required the deployment of dedicated sensors on vehicles and/or on the roadside, or the tracking of mobile phones by service providers. Furthermore, ... [expand](#)

[Sensing meets mobile social networks: the design, implementation and evaluation of the CenceMe application](#)

[Emiliano Miluzzo](#), [Nicholas D. Lane](#), [Kristóf Fodor](#), [Ronald Peterson](#), [Hong Lu](#), [Mirco Musolesi](#), [Shane B. Eisenman](#), [Xiao Zheng](#), [Andrew T. Campbell](#)

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doi> [10.1145/1460412.1460445](#)

Full text:  Pdf

We present the design, implementation, evaluation, and user experiences of the CenceMe application, which represents the first system that combines the inference of the presence of individuals using off-the-shelf, sensor-enabled mobile phones with sharing ... [expand](#)


DEMONSTRATION SESSION: **Demonstrations**

[Leakage-aware energy synchronization on twin-star nodes](#)

[Ziquo Zhong](#), [Ting Zhu](#), [Tian He](#), [Zhi-Li Zhang](#)

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doi> [10.1145/1460412.1460447](#)

Full text:  Pdf


Starting from the features and impact of energy leakage in ultra-capacitor powered systems, this demonstration highlights the design of a capacitor-only Twin-Star node, and a leakage-aware energy synchronization methodology. [expand](#)

[PCP: the personal commute portal](#)

[Hari Balakrishnan](#), [Nikolaus Correll](#), [Jakob Eriksson](#), [Sejoon Lim](#), [Samuel Madden](#), [Daniela Rus](#)

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doi> [10.1145/1460412.1460448](#)

Full text:  Pdf


The Personal Commute Portal (PCP) is a Web-based traffic information system that provides a good driving direction and personalized route recommendation using historical and real-time traffic data obtained by a vehicular sensor network. [expand](#)

[Creating greener homes with IP-based wireless AC energy monitors](#)

[Xiaofan Jiang](#), [Stephen Dawson-Haggerty](#), [Jay Taneja](#), [Prabal Dutta](#), [David Culler](#)

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doi> [10.1145/1460412.1460449](#)

Full text:  Pdf


A home where every major appliance can be monitored for energy consumption and individually controlled wirelessly has long been a dream of gadgeteers and the green-conscious alike. Research has shown that real-time, per-appliance electricity usage feedback ... [expand](#)

[Nericell: using mobile smartphones for rich monitoring of road and traffic conditions](#)

[Prashanth Mohan](#), [Venkata N. Padmanabhan](#), [Ramachandran Ramjee](#)

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doi> [10.1145/1460412.1460450](#)

Full text:  Pdf


We consider the problem of monitoring road and traffic conditions in a city. Prior work in this area has required the deployment of dedicated sensors on vehicles and/or on the roadside, or the tracking of mobile phones by service providers. Furthermore, ... [expand](#)

[Safety assurance for archeologists using sensor network](#)

[Shan Chang](#), [Qingxi Li](#), [Yong Qi](#), [Jizhong Zhao](#), [Yuan He](#), [Xue Liu](#)

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doi> [10.1145/1460412.1460451](#)


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[MEDiSN: medical emergency detection in sensor networks](#)

[JeongGil Ko](#), [Răzvan Musăloiu-Elefteri](#), [Jong Hyun Lim](#), [Yin Chen](#), [Andreas Terzis](#), [Tia Gao](#), [Walt Destler](#), [Leo Selavo](#)

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doi> [10.1145/1460412.1460452](#)

Full text:  Pdf


Staff shortages and an increasingly aging population are straining the ability of emergency departments to provide high-quality care. Moreover, there is a growing concern about the ability of hospitals to provide effective care during disaster events. ... [expand](#)

[Programming cyber-physical systems with MacroLab](#)

[Tamim I. Sookoor](#), [Timothy W. Hnat](#), [Kamin Whitehouse](#)

Pages: 363-364

doi> [10.1145/1460412.1460453](https://doi.org/10.1145/1460412.1460453)

Full text:  Pdf


We demonstrate MacroLab, which is a macroprogramming framework that offers a vector programming abstraction similar to Matlab for cyber-physical systems (CPSs). The user writes a single program for an entire network using Matlab like operations ... [expand](#)

[Wireless sensor network for substation monitoring: design and deployment](#)

Asis Nasipuri, Robert Cox, Hadi Alasti, Luke Van der Zel, Bienvenido Rodriguez, Ralph McKosky, Joseph A. Graziano

Pages: 365-366

doi> [10.1145/1460412.1460454](https://doi.org/10.1145/1460412.1460454)

Full text:  Pdf


We present the design and performance of a wireless sensor network that is deployed in a substation for monitoring the health of power subsystems such as circuit breakers, transformers and transformer bushings. The sensor network consists of 45 low power ... [expand](#)

[Transforming the social networking experience with sensing presence from mobile phones](#)

Andrew T. Campbell, Shane B. Eisenman, Kristóf Fodor, Nicholas D. Lane, Hong Lu, Emiliano Miluzzo, Mirco Musolesi, Ronald A. Peterson, Xiao Zheng

Pages: 367-368

doi> [10.1145/1460412.1460455](https://doi.org/10.1145/1460412.1460455)


Full text:  Pdf

[A Java compatible virtual machine for wireless sensor nodes](#)

Niels Brouwers, Peter Corke, Koen Langendoen

Pages: 369-370

doi> [10.1145/1460412.1460456](https://doi.org/10.1145/1460412.1460456)

Full text:  Pdf


The Java programming language has potentially significant advantages for wireless sensor nodes but there is currently no feature-rich, open source virtual machine available. In this paper we present Darjeeling, a system comprising offline tools and a ... [expand](#)

[Passive diagnosis for wireless sensor networks](#)

Kebin Liu, Mo Li, Xiaohui Yang, Mingxing Jiang

Pages: 371-372

doi> [10.1145/1460412.1460457](https://doi.org/10.1145/1460412.1460457)


Full text:  Pdf

[Distributed cut detection in sensor networks](#)

Harshavardhan Chenji, Prabir Barooah, Radu Stoleru, Tamás Kalmár-Nagy

Pages: 373-374

doi> [10.1145/1460412.1460458](https://doi.org/10.1145/1460412.1460458)

Full text:  Pdf


Loss of connectivity in deployed wireless sensor networks can be quite disastrous for the network. A "cut" (which separates the network into two or more components incapable of communicating with each other) is usually hard to detect. An algorithm which ... [expand](#)

[Using wireless sensor networks to develop pervasive multi-player games](#)

Orestis Akribopoulos, Marios Logaras, Nikos Vasilakis, Panagiotis Kokkinos, Georgios Mylonas, Ioannis Chatzigiannakis

Pages: 375-376

doi> [10.1145/1460412.1460459](https://doi.org/10.1145/1460412.1460459)

Full text:  Pdf


In this work we present two mobile, locative and collaborative distributed games that are played using wireless sensor devices. We briefly present the architecture of the two games and demonstrate their capabilities. The key characteristic of these games ... [expand](#)

[An efficient event detection scheme for wireless sensor networks](#)

Jing Yuan, Xue Liu, Gui Hai Chen

Pages: 377-378

doi> [10.1145/1460412.1460460](https://doi.org/10.1145/1460412.1460460)

Full text:  Pdf


Event detection is an essential task for wireless sensor networks. In this paper we present the design and implementation of MC-Detect, an efficient scheme for detecting and estimating events in the network. With sparse samples processed at the basestation, ... [expand](#)

[Bringing sensor networks underwater with low-power acoustic communications](#)

Muhammad Omar Khan, Affan A. Syed, Wei Ye, John Heidemann, Jack Wills

Pages: 379-380

doi> [10.1145/1460412.1460461](https://doi.org/10.1145/1460412.1460461)


Full text:  Pdf

[A complete wirelessHART network](#)

Jianping Song, Song Han, Xiuming Zhu, Aloysius K. Mok, Deji Chen, Mark Nixon

Pages: 381-382

doi> [10.1145/1460412.1460462](https://doi.org/10.1145/1460412.1460462)

Full text:  Pdf


WirelessHART is the first open wireless standard for the process control industry. Previously we demonstrated a three-node prototype network based on an early release of the protocol stack. In this demonstration we build a fully operational WirelessHART ... [expand](#)

[Integrating sensor presence into virtual worlds using mobile phones](#)

[Mirco Musolesi](#), [Emiliano Miluzzo](#), [Nicholas D. Lane](#), [Shane B. Eisenman](#), [T. Choudhury](#), [Andrew T. Campbell](#)

Pages: 383-384

doi> [10.1145/1460412.1460463](#)


Full text:  Pdf

[SIDnet-SWANS: a simulator and integrated development platform for sensor networks applications](#)

[Oliviu C. Ghica](#), [Goce Trajcevski](#), [Peter Scheuermann](#), [Zachary Bischof](#), [Nikolay Valtchanov](#)

Pages: 385-386

doi> [10.1145/1460412.1460464](#)

Full text:  Pdf


This work presents the SIDnet, a simulation-based environment for applications development in wireless sensor networks settings. It enables run-time interactions with the network for the purpose of observing the behavior of algorithms protocols in the ... [expand](#)

[In-network training and distributed event detection in wireless sensor networks](#)

[Georg Wittenburg](#), [Norman Dziengel](#), [Jochen Schiller](#)

Pages: 387-388

doi> [10.1145/1460412.1460465](#)

Full text:  Pdf


In order to avoid transmitting raw data to a base station, sensor nodes are trained to cooperatively recognize deployment-specific events based on the data sampled by their sensors. As both training and event detection are performed without the need ... [expand](#)

[Self-organizing service distribution](#)

[Martin Lipphardt](#), [Jana Neumann](#), [Christian Werner](#)

Pages: 389-390

doi> [10.1145/1460412.1460466](#)

Full text:  Pdf


In this demonstration we show how a sensor network application can be composed by different services. We demonstrate how the services dynamically distribute within the network and how this distribution automatically adapts to changes in topology or user ... [expand](#)

[Sensor network navigation without locations](#)

[Mo Li](#), [Jiliang Wang](#), [Zheng Yang](#), [Jingyao Dai](#)

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doi> [10.1145/1460412.1460467](#)


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[RFID sensor networks with the Intel WISP](#)

[Michael Buettner](#), [Richa Prasad](#), [Alanson Sample](#), [Daniel Yeager](#), [Ben Greenstein](#), [Joshua R. Smith](#), [David Wetherall](#)

Pages: 393-394

doi> [10.1145/1460412.1460468](#)

Full text:  Pdf


We demonstrate a simple RFID sensor network comprised of an Intel WISP and a commodity UHF RFID reader. WISPs are devices that gather their operating energy from RFID reader transmissions, in the manner of passive RFID tags, and further include ... [expand](#)

[SWAT: enabling wireless network measurements](#)

[Kannan Srinivasan](#), [Maria A. Kazandjieva](#), [Mayank Jain](#), [Edward Kim](#), [Philip Levis](#)

Pages: 395-396

doi> [10.1145/1460412.1460469](#)

Full text:  Pdf

Measuring low-level wireless network properties allows researchers to understand how protocols and applications perform in different environments. In this demo, we present SWAT - a software tool that automates gathering and analysis of network measurements. ... [expand](#)


POSTER SESSION: Posters

[NoSE: efficient initialization of wireless sensor networks](#)

[Andreas Meier](#), [Mischa Weise](#), [Jan Beutel](#), [Lothar Thiele](#)

Pages: 397-398

doi> [10.1145/1460412.1460471](#)

Full text:  Pdf


There are numerous possibilities to assemble a very resource-efficient and power-aware distributed sensor network tailored to a specific application. However, the task of initializing the network has not yet attracted much attention. This paper ... [expand](#)

[Introducing TakaTuka: a Java virtualmachine for motes](#)

[Faisal Aslam](#), [Christian Schindelhauer](#), [Gidon Ernst](#), [Damian Spyra](#), [Jan Meyer](#), [Mohannad Zalloom](#)

Pages: 399-400

doi> [10.1145/1460412.1460472](#)

Full text:  Pdf


We present TakaTuka, a tiny Java Virtual Machine (JVM) for wireless sensor motes. TakaTuka's preliminary version successfully runs on Crossbow's mica2 motes. Furthermore, TakaTuka also runs on Windows and Unix. [expand](#)

[Development of a long-lived, real-time automatic weather station based on WSN](#)

[Chin-Jung Liu](#), [Huang-Chen Lee](#), [Jung Yang](#), [Jen-Tse Huang](#), [Yao-Min Fang](#), [Bing-Jean Lee](#), [Chung-Ta King](#)

Pages: 401-402

doi> [10.1145/1460412.1460473](https://doi.org/10.1145/1460412.1460473)

Full text:  [Pdf](#)


The scale of weather monitoring is limited by the cost of the automatic weather stations (AWS), which is mainly the cost of high precision instruments and long-distance wireless telecommunication equipments. We propose a wireless sensor network ... [expand](#)

[Optimizing declarative sensornets](#)

[David Chu](#), [Joseph M. Hellerstein](#), [Tsung-te Lai](#)

Pages: 403-404

doi> [10.1145/1460412.1460474](https://doi.org/10.1145/1460412.1460474)

Full text:  [Pdf](#)


This work extends the declarative sensornet programming model with automated program optimizations that attempt to minimize energy expenditure at various points in the communication stack. [expand](#)

[Integrating multiple sensor modalities for environmental monitoring of marine locations](#)

[Edel O'Connor](#), [Alan F. Smeaton](#), [Noel E. O'Connor](#), [Dermot Diamond](#)

Pages: 405-406

doi> [10.1145/1460412.1460475](https://doi.org/10.1145/1460412.1460475)

Full text:  [Pdf](#)


In this paper we present preliminary work on integrating visual sensing with the more traditional sensing modalities for marine locations. We have deployed visual sensing at one of the Smart Coast WSN sites in Ireland and have built a software platform ... [expand](#)

[Using mobile wireless sensors for in-situ tracking of debris flows](#)

[Huang-Chen Lee](#), [Chin-Jung Liu](#), [Jung Yang](#), [Jen-Tse Huang](#), [Yao-Min Fang](#), [Bing-Jean Lee](#), [Chung-Ta King](#)

Pages: 407-408

doi> [10.1145/1460412.1460476](https://doi.org/10.1145/1460412.1460476)

Full text:  [Pdf](#)


Most debris flow monitoring systems deployed today use indirect means to track information regarding debris flows. In this work, we introduce a novel debris flow monitoring system for in-situ and direct tracking of debris flows in real-time. The core ... [expand](#)

[Exploiting the capture effect for low-latency flooding in wireless sensor networks](#)

[Jiakang Lu](#), [Kamin Whitehouse](#)

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doi> [10.1145/1460412.1460477](https://doi.org/10.1145/1460412.1460477)

Full text:  [Pdf](#)


In this paper, we present the Flash flooding protocol that exploits the capture effect to produce low-latency network floods. The capture effect is the ability of some radios to correctly receive one of several concurrently transmitted messages, ... [expand](#)

[Exploring diversity: evaluating the cost of frequency diversity in communication and routing](#)

[Jorge Ortiz](#), [David Culler](#)

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doi> [10.1145/1460412.1460478](https://doi.org/10.1145/1460412.1460478)

Full text:  [Pdf](#)


As the number of wireless devices increase, the frequency spectrum becomes further congested. Deployments of wireless devices in harsh radio environments (i.e. an industrial plant) also motivates the study of alternate communication protocols that offer ... [expand](#)

[TinyOS 2.1 adding threads and memory protection to TinyOS](#)

[TinyOS Alliance](#)

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doi> [10.1145/1460412.1460479](https://doi.org/10.1145/1460412.1460479)

Full text:  [Pdf](#)


The release of TinyOS 2.0 two years ago was motivated by the need for greater platform flexibility, improved robustness and reliability, and a move towards service oriented application development. Since this time, we have seen the community embrace ... [expand](#)

[RFID-based localization in heterogeneous mesh networks](#)

[Lasse Thiem](#), [Björn Riemer](#), [Marcus Witzke](#), [Thomas Luckenbach](#)

Pages: 415-416

doi> [10.1145/1460412.1460480](https://doi.org/10.1145/1460412.1460480)

Full text:  [Pdf](#)


This paper will describe current and ongoing developments of wireless-connected RFID reader systems for evaluation of a passive user localization system. A two-tier architecture of different wireless-connected RFID readers will be introduced. On the ... [expand](#)

[A quantitative error analysis of synchronized sampling on wireless sensor networks for earthquake monitoring](#)

[Makoto Suzuki](#), [Shunsuke Saruwatari](#), [Narito Kurata](#), [Masateru Minami](#), [Hiroyuki Morikawa](#)

Pages: 417-418

doi> [10.1145/1460412.1460481](https://doi.org/10.1145/1460412.1460481)


Full text:  Pdf

Efficient time synchronization for wireless sensor networks in an industrial setting

Marc Aoun, Anthony Schoofs, Peter van der Stok

Pages: 419-420

doi> [10.1145/1460412.1460482](https://doi.org/10.1145/1460412.1460482)

Full text:  Pdf


This paper outlines an efficient variation of the Flooding Time Synchronization Protocol (FTSP) on real hardware with an IEEE 802.15.4 MAC layer. The paper compares the performance of two clock drift estimation techniques: Least Squares Linear Regression ... [expand](#)

Making sensor networks IPv6 ready

Mathilde Durvy, Julien Abeillé, Patrick Wetterwald, Colin O'Flynn, Blake Leverett, Eric Gnoske, Michael Vidales, Geoff Mulligan, Nicolas Tsiftes, Niclas Finne, Adam Dunkels

Pages: 421-422

doi> [10.1145/1460412.1460483](https://doi.org/10.1145/1460412.1460483)

Full text:  Pdf


With emerging IPv6-based standards such as 6LoWPAN and ISA100a, full IPv6 sensor networks are the next major step. With millions of deployed embedded IPv6 devices, interoperability is of major importance, both within the sensor networks and between the ... [expand](#)

Emuli: model driven sensor stimuli for experimentation

Najla Alam, Thomas Clouser, Richie Thomas, Mikhail Nesterenko

Pages: 423-424

doi> [10.1145/1460412.1460484](https://doi.org/10.1145/1460412.1460484)

Full text:  Pdf


We describe Emuli - a method of replacing sensor data with a network-wide model of stimuli events. Sensor readings are generated on demand from the modeling data stored at each device. This approach allows for both repeatable and variable experimentation ... [expand](#)

KleeNet: automatic bug hunting in sensor network applications

Raimondas Sasnauskas, Jó Ágila Bitsch Link, Muhammad Hamad Alizai, Klaus Wehrle

Pages: 425-426

doi> [10.1145/1460412.1460485](https://doi.org/10.1145/1460412.1460485)

Full text:  Pdf


We present KleeNet, a Klee based bug hunting tool for sensor network applications before deployment. KleeNet automatically tests code for all possible inputs, ensures memory safety, and integrates well into TinyOS based application development life cycle, ... [expand](#)

Deployments of wide and local area wireless sensor networks for environmental studies

Rian Bogle, Miguel Velasco, John Vogel

Pages: 427-428

doi> [10.1145/1460412.1460486](https://doi.org/10.1145/1460412.1460486)

Full text:  Pdf


Remote sensing at high temporal resolutions, via satellite or airborne imaging systems, is often technically difficult and prohibitively expensive. This frequently results in the need for low cost, high availability field-based instrumentation and data ... [expand](#)

Dyser: towards a real-time search engine for the web of things

Benedikt Ostermaier, B. Maryam Elahi, Kay Römer, Michael Fahrmaier, Wolfgang Kellerer

Pages: 429-430

doi> [10.1145/1460412.1460487](https://doi.org/10.1145/1460412.1460487)

Full text:  Pdf


The increasing penetration of the real world with embedded and globally networked sensors enables the formation of a Web of Things (WoT), where high-level state information derived from sensors is embedded into Web representations of real-world ... [expand](#)

An RFID based system for monitoring free weight exercises

Rohit Chaudhri, Jonathan Lester, Gaetano Borriello

Pages: 431-432

doi> [10.1145/1460412.1460488](https://doi.org/10.1145/1460412.1460488)

Full text:  Pdf


In this paper we present preliminary results and future directions of work for a project in which we are building an RFID based system to sense and monitor free weight exercises. [expand](#)

Application-specific trace compression for low bandwidth trace logging

Roy S. Shea, Young H. Cho, Mani B. Srivastava

Pages: 433-434

doi> [10.1145/1460412.1460489](https://doi.org/10.1145/1460412.1460489)

Full text:  Pdf


This poster introduces an application-specific trace log compression mechanism targeted for execution on wireless sensor network nodes. Trace logs capture sequences of significant events executed on a node to provide visibility into the system. The application-specific ... [expand](#)

Considering real world issues for delivering data in multi-robot sensor networks

[Ryohei Suzuki, Yoshito Tobe, Kaoru Sezaki](#)

Pages: 435-436

doi> [10.1145/1460412.1460490](#)

Full text:  Pdf


Sensor networks using mobile robots have recently been proposed to provide more flexible and efficient sensing. However, mobile robots in a practical world have many accidents with actuator or communication devices especially in their traveling to the ... [expand](#)

[WI-HTest: testing suite for diagnosing wirelesshart devices and networks](#)

[Song Han, Jianping Song, Xiuming Zhu, Aloysius K. Mok, Deji Chen, Mark Nixon, Wally Pratt, Veena Gondhalekar](#)

Pages: 437-438

doi> [10.1145/1460412.1460491](#)

Full text:  Pdf


WirelessHART was released in September 2007 and is the first open wireless communication standard specifically designed for process control applications. As an optional part of the HART® Communication Protocol, WirelessHART is designed to the same ... [expand](#)

[A sensor network for compression and streaming of GPS trajectory data](#)

[Tim Wark, Chris Crossman, Philip Valencia, Peter Corke, Greg Bishop-Hurley, Dave Swain](#)

Pages: 439-440

doi> [10.1145/1460412.1460492](#)

Full text:  Pdf


We present the design and deployment results for PosNet - a large-scale, long-duration sensor network that gathers summary position and status information from mobile nodes. The mobile nodes have a fixed-sized memory buffer to which position data ... [expand](#)

[On the scaling properties of low power wireless links](#)

[Tal Rusak, Philip A. Levis](#)

Pages: 441-442

doi> [10.1145/1460412.1460493](#)

Full text:  Pdf


We study the time-scaling characteristics of low-power wireless communication at the physical and link layers. We observe that links are bursty at many time scales: the packet reception rate (PRR) varies regardless of the length of the time scale considered. ... [expand](#)

[Accurate, fast fall detection using posture and context information](#)

[Qiang Li, Gang Zhou, John A. Stankovic](#)

Pages: 443-444

doi> [10.1145/1460412.1460494](#)

Full text:  Pdf


Traditional fall detection is only based on acceleration analysis. In this work we present a novel fall detection method that also utilizes posture and context information. This information can help reduce both false positives and negatives. Our solution ... [expand](#)

[Satellite based wireless sensor networks: global scale sensing with nano- and pico-satellites](#)

[Walter Colitti, Kris Steenhaut, Nicolas Descouvemont, Adam Dunkels](#)

Pages: 445-446

doi> [10.1145/1460412.1460495](#)

Full text:  Pdf


Space and Earth monitoring is the next step for sensor networks. Distributed systems of small sensor-equipped satellites improve the cost efficiency and the missions' performance. This abstract discusses the characteristics of satellite Wireless Sensor ... [expand](#)

[A public key technology platform for wireless sensor networks](#)

[Wen Chan Shih, Wen Hu, Peter Corke, Leslie Overs](#)

Pages: 447-448

doi> [10.1145/1460412.1460496](#)

Full text:  Pdf


Communication security for wireless sensor networks (WSN) is a challenge due to the limited computation and energy resources available at nodes. We describe the design and implementation of a public-key (PK) platform based on a standard Trusted Platform ... [expand](#)

[Rateless erasure codes for bulk transfer in asymmetric wireless sensor networks](#)

[Anthony D. Wood, John A. Stankovic](#)

Pages: 449-450

doi> [10.1145/1460412.1460497](#)


Full text:  Pdf

[MODEL: moving object detection and localization in wireless networks based on small-scale fading](#)

[Qingming Yao, Hui Gao, Bin Liu, Fei-Yue Wang](#)

Pages: 451-452

doi> [10.1145/1460412.1460498](#)

Full text:  Pdf

This paper presents a new Moving Object Detection and Localization (MODEL) system, which is based on the smallscale fading of RF signal strength and independent from the salient characteristics of both the device and the sensor. We first validated the ... [expand](#)

[Achieving stable network performance for wireless sensor networks](#)

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Proceedings of the 7th ACM Conference on Embedded Networked Sensor Systems

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SESSION: Data collection

[Collection tree protocol](#)

[Omprakash Gnawali](#), [Rodrigo Fonseca](#), [Kyle Jamieson](#), [David Moss](#), [Philip Levis](#)

Pages: 1-14

doi> [10.1145/1644038.1644040](#)

Full text: [Pdf](#)

This paper presents and evaluates two principles for wireless routing protocols. The first is datapath validation: data traffic quickly discovers and fixes routing inconsistencies. The second is adaptive beaconing: extending the Trickle algorithm to ... [expand](#)

[RACNet: a high-fidelity data center sensing network](#)

[Chieh-Jan Mike Liang](#), [Jie Liu](#), [Liqian Luo](#), [Andreas Terzis](#), [Feng Zhao](#)

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doi> [10.1145/1644038.1644041](#)

Full text: [Pdf](#)

RACNet is a sensor network for monitoring a data center's environmental conditions. The high spatial and temporal fidelity measurements that RACNet provides can be used to improve the data center's safety and energy efficiency. RACNet overcomes the network's ... [expand](#)

[Explicit and precise rate control for wireless sensor networks](#)

[Avinash Sridharan](#), [Bhaskar Krishnamachari](#)

Pages: 29-42

doi> [10.1145/1644038.1644042](#)

Full text: [Pdf](#)

The state of the art congestion control algorithms for wireless sensor networks respond to coarse-grained feedback regarding available capacity in the network with an additive increase multiplicative decrease mechanism to set source rates. Providing ... [expand](#)

SESSION: Networking

[ADB: an efficient multihop broadcast protocol based on asynchronous duty-cycling in wireless sensor networks](#)

[YanJun Sun](#), [Omer Gurewitz](#), [Shu Du](#), [Lei Tang](#), [David B. Johnson](#)

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doi> [10.1145/1644038.1644044](#)

Full text: [Pdf](#)

The use of asynchronous duty-cycling in wireless sensor network MAC protocols is common, since it can greatly reduce energy consumption and requires no clock synchronization. However, existing systems using asynchronous duty-cycling do not efficiently ... [expand](#)

[M&M: multi-level Markov model for wireless link simulations](#)

[Ankur Kamthe](#), [Miguel Á. Carreira-Perpiñán](#), [Alberto E. Cerpa](#)

Pages: 57-70

doi> [10.1145/1644038.1644045](#)

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802.15.4 links experience different level of dynamics at short and long time scales. This makes the design of a suitable model that combines the different dynamics at different timescales a non-trivial problem. In this paper, we propose a novel multilevel ... [expand](#)

[Bursty traffic over bursty links](#)

[Muhammad Hamad Alizai](#), [Olaf Landsiedel](#), [Jó Ágila Bitsch Link](#), [Stefan Götz](#), [Klaus Wehrle](#)

Pages: 71-84

doi> [10.1145/1644038.1644046](#)

Full text: [Pdf](#)

Accurate estimation of link quality is the key to enable efficient routing in wireless sensor networks. Current link estimators focus mainly on identifying long-term stable links for routing. They leave out a potentially large set of intermediate links ... [expand](#)


SESSION: Data processing

[VTrack: accurate, energy-aware road traffic delay estimation using mobile phones](#)

[Arvind Thiagarajan](#), [Lenin Ravindranath](#), [Katrina LaCurts](#), [Samuel Madden](#), [Hari Balakrishnan](#), [Sivan Toledo](#), [Jakob Eriksson](#)

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doi> [10.1145/1644038.1644048](https://doi.org/10.1145/1644038.1644048)

Full text:  Pdf


Traffic delays and congestion are a major source of inefficiency, wasted fuel, and commuter frustration. Measuring and localizing these delays, and routing users around them, is an important step towards reducing the time people spend stuck in traffic. ... [expand](#)

[Canopy closure estimates with GreenOrbs: sustainable sensing in the forest](#)

[Lufeng Mo](#), [Yuan He](#), [Yunhao Liu](#), [Jizhong Zhao](#), [Shao-Jie Tang](#), [Xiang-Yang Li](#), [Guojun Dai](#)

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doi> [10.1145/1644038.1644049](https://doi.org/10.1145/1644038.1644049)

Full text:  Pdf


Motivated by the needs of precise forest inventory and real-time surveillance for ecosystem management, in this paper we present GreenOrbs [2], a wireless sensor network system and its application for canopy closure estimates. Both the hardware and software ... [expand](#)

[Experiences with a high-fidelity wireless building energy auditing network](#)

[Xiaofan Jiang](#), [Minh Van Ly](#), [Jay Taneja](#), [Prabal Dutta](#), [David Culler](#)

Pages: 113-126

doi> [10.1145/1644038.1644050](https://doi.org/10.1145/1644038.1644050)

Full text:  Pdf

We describe the design, deployment, and experience with a wireless sensor network for high-fidelity monitoring of electrical usage in buildings. A network of 38 mote-class AC meters, 6 light sensors, and 1 vibration sensor is used to determine and audit ... [expand](#)

SESSION: Programming

[TOSThreads: thread-safe and non-invasive preemption in TinyOS](#)

[Kevin Klues](#), [Chieh-Jan Mike Liang](#), [Jeongyeup Paek](#), [Răzvan Musăloiu-E](#), [Philip Levis](#), [Andreas Terzis](#), [Ramesh Govindan](#)

Pages: 127-140

doi> [10.1145/1644038.1644052](https://doi.org/10.1145/1644038.1644052)


Many threads packages have been proposed for programming wireless sensor platforms. However, many sensor network operating systems still choose to provide an event-driven model, due to efficiency concerns. We present TOS-Threads, a threads package for ... [expand](#)

[Macrodebugging: global views of distributed program execution](#)

[Tamim Sookoor](#), [Timothy Hnat](#), [Pieter Hooimeijer](#), [Westley Weimer](#), [Kamin Whitehouse](#)

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doi> [10.1145/1644038.1644053](https://doi.org/10.1145/1644038.1644053)

Full text:  Pdf


Creating and debugging programs for wireless embedded networks (WENs) is notoriously difficult. Macroprogramming is an emerging technology that aims to address this problem by providing high-level programming abstractions. We present MDB, ... [expand](#)

[Evaluating a BASIC approach to sensor network node programming](#)

[J. Scott Miller](#), [Peter A. Dinda](#), [Robert P. Dick](#)

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doi> [10.1145/1644038.1644054](https://doi.org/10.1145/1644038.1644054)

Full text:  Pdf

Sensor networks have the potential to empower domain experts from a wide range of fields. However, presently they are notoriously difficult for these domain experts to program, even though their applications are often conceptually simple. We address ... [expand](#)


SESSION: Platforms

[Darjeeling, a feature-rich VM for the resource poor](#)

[Niels Brouwers](#), [Koen Langendoen](#), [Peter Corke](#)

Pages: 169-182

doi> [10.1145/1644038.1644056](https://doi.org/10.1145/1644038.1644056)

Full text:  Pdf

The programming and retasking of sensor nodes could benefit greatly from the use of a virtual machine (VM) since byte code is compact, can be loaded on demand, and interpreted on a heterogeneous set of devices. The challenge is to ensure good programming ... [expand](#)

[Mercury: a wearable sensor network platform for high-fidelity motion analysis](#)

[Konrad Lorincz](#), [Bor-rong Chen](#), [Geoffrey Werner Challen](#), [Atanu Roy Chowdhury](#), [Shyamal Patel](#), [Paolo Bonato](#), [Matt Welsh](#)

Pages: 183-196

doi> [10.1145/1644038.1644057](https://doi.org/10.1145/1644038.1644057)


This paper describes Mercury, a wearable, wireless sensor platform for motion analysis of patients being treated for neuromotor disorders, such as Parkinson's Disease, epilepsy, and stroke. In contrast to previous systems intended for short-term ... [expand](#)

[Suelo: human-assisted sensing for exploratory soil monitoring studies](#)

[Nithya Ramanathan](#), [Thomas Schoellhammer](#), [Eddie Kohler](#), [Kamin Whitehouse](#), [Thomas Harmon](#), [Deborah Estrin](#)

Pages: 197-210

doi> [10.1145/1644038.1644058](https://doi.org/10.1145/1644038.1644058)

Full text:  Pdf

Soil contains vast ecosystems that play a key role in the Earth's water and nutrient cycles, but scientists cannot currently collect the high-resolution data required to fully understand them. In this paper, we present Suelo, an embedded networked ... [expand](#)


SESSION: **Synchronization**

[Low-power clock synchronization using electromagnetic energy radiating from AC power lines](#)

[Anthony Rowe](#), [Vikram Gupta](#), [Ragunathan \(Raj\) Rajkumar](#)

Pages: 211-224

doi> [10.1145/1644038.1644060](https://doi.org/10.1145/1644038.1644060)

Full text:  [Pdf](#)


Clock synchronization is highly desirable in many sensor networking applications. It enables event ordering, coordinated actuation, energy-efficient communication and duty cycling. This paper presents a novel low-power hardware module for achieving global ... [expand](#)

[Optimal clock synchronization in networks](#)

[Christoph Lenzen](#), [Philipp Sommer](#), [Roger Wattenhofer](#)

Pages: 225-238

doi> [10.1145/1644038.1644061](https://doi.org/10.1145/1644038.1644061)

Full text:  [Pdf](#)


Having access to an accurate time is a vital building block in all networks; in wireless sensor networks even more so, because wireless media access or data fusion may depend on it. Starting out with a novel analysis, we show that orthodox clock synchronization ... [expand](#)

[A tale of two synchronizing clocks](#)

[Jinkyu Koo](#), [Rajesh K. Panta](#), [Saurabh Bagchi](#), [Luis Montestruque](#)

Pages: 239-252

doi> [10.1145/1644038.1644062](https://doi.org/10.1145/1644038.1644062)

Full text:  [Pdf](#)

A specific application for wastewater monitoring and actuation, called CSOnet, deployed city-wide in a mid-sized US city, South Bend, Indiana, posed some challenges to a time synchronization protocol. The nodes in CSOnet have a low duty cycle (2% in ... [expand](#)


SESSION: **Reliability and robustness**

[FIND: faulty node detection for wireless sensor networks](#)

[Shuo Guo](#), [Ziguo Zhong](#), [Tian He](#)

Pages: 253-266

doi> [10.1145/1644038.1644064](https://doi.org/10.1145/1644038.1644064)

Full text:  [Pdf](#)


Wireless Sensor Networks (WSN) promise researchers a powerful instrument for observing sizable phenomena with fine granularity over long periods. Since the accuracy of data is important to the whole system's performance, detecting nodes with faulty readings ... [expand](#)

[The case for a network protocol isolation layer](#)

[Jung Il Choi](#), [Maria A. Kazandjieva](#), [Mayank Jain](#), [Philip Levis](#)

Pages: 267-280

doi> [10.1145/1644038.1644065](https://doi.org/10.1145/1644038.1644065)

Full text:  [Pdf](#)


Network protocols are typically designed and tested individually. In practice, however, applications use multiple protocols concurrently. This discrepancy can lead to failures from unanticipated interactions between protocols. In this paper, we argue ... [expand](#)

[Achieving range-free localization beyond connectivity](#)

[Ziguo Zhong](#), [Tian He](#)

Pages: 281-294

doi> [10.1145/1644038.1644066](https://doi.org/10.1145/1644038.1644066)

Full text:  [Pdf](#)

Wireless sensor networks have been proposed for many location-dependent applications. In such applications, the requirement of low system cost prohibits many range-based methods for sensor node localization; on the other hand, range-free localization ... [expand](#)


DEMONSTRATION SESSION: **Demo abstracts**

[YETI: an Eclipse plug-in for TinyOS 2.1](#)

[Nicolas Burri](#), [Roland Flury](#), [Silvan Nellen](#), [Benjamin Sigg](#), [Philipp Sommer](#), [Roger Wattenhofer](#)

Pages: 295-296

doi> [10.1145/1644038.1644068](https://doi.org/10.1145/1644038.1644068)

Full text:  [Pdf](#)


We present YETI, an Eclipse plug-in providing support for TinyOS development. YETI provides features well-known from development environments for other languages such as syntax highlighting, code completion and error detection. Furthermore, it includes ... [expand](#)

[ASSERT: <u>A</u>dvanced wirele<u>SS</u> <u>E</u>nvironment <u>R</u>esearch <u>T</u>estbed](#)

[Paul Johnson](#), [Ehsan Nourbakhsh](#), [Ryan Burchfield](#), [Jeff Dix](#), [Ravi Prakash](#), [S. Venkatesan](#), [Neeraj Mittal](#)

Pages: 297-298

doi> [10.1145/1644038.1644069](https://doi.org/10.1145/1644038.1644069)

Full text:  [Pdf](#)


Software simulation has often been used to evaluate proposed protocols for wireless devices. Simulation allows for rapid development and testing, but does not provide a realistic RF environment. To compensate for this, field experiments are performed. ... [expand](#)

[Distributed energy measurements in wireless sensor networks](#)

[Anton Hergenröder](#), [Jens Horneber](#), [Detlev Meier](#), [Patrick Armbruster](#), [Martina Zitterbart](#)

Pages: 299-300

doi> [10.1145/1644038.1644070](#)

Full text:  Pdf


Energy efficiency is a common requirement for most WSN applications. We present our approach utilizing precise distributed monitoring of energy consumption to support the development of energy efficient protocols. There-fore we designed dedicated energy ... [expand](#)

[Generation of controllable radio interference for protocol testing in wireless sensor networks](#)

[Carlo Alberto Boano](#), [Kay Römer](#), [Zhitao He](#), [Thiemo Voigt](#), [Marco Antonio Zúñiga](#), [Andreas Willig](#)

Pages: 301-302

doi> [10.1145/1644038.1644071](#)

Full text:  Pdf


Radio interference plays a central role for the performance of Wireless Sensor Networks (WSN). Interference not only leads to packet loss, but it also affects the function of MAC and routing protocols. Hitherto, testing the impact of interference on ... [expand](#)

[A wireless sensor network for border surveillance](#)

[Denise Dudek](#), [Christian Haas](#), [Andreas Kuntz](#), [Martina Zitterbart](#), [Daniela Krüger](#), [Peter Rothenpieler](#), [Dennis Pfisterer](#), [Stefan Fischer](#)

Pages: 303-304

doi> [10.1145/1644038.1644072](#)

Full text:  Pdf


We will demonstrate a wireless sensor network system for the surveillance of critical areas and properties -- e.g. borders. The system consists of up to 10 sensor nodes that monitor a small border area. The protocols we show focus on detecting trespassers ... [expand](#)

[Macrodebugging with MDB](#)

[Timothy W. Hnat](#), [Tamim I. Sookoor](#), [Kamin Whitehouse](#)

Pages: 305-306

doi> [10.1145/1644038.1644073](#)

Full text:  Pdf


Macroprogramming abstractions provide abstract distributed data structures to simplify the programming of wireless embedded networks. However, none of the current macroprogramming systems provide debugging support for application development. We have ... [expand](#)

[HONS \(hybrid open networking stack\) for diverse wireless sensor networks](#)

[Jeonghoon Kang](#), [Sukun Kim](#), [Wonsik Ko](#), [Taejoon Choi](#), [Pilman Jeong](#), [Jin-Yeop Chang](#)

Pages: 307-308

doi> [10.1145/1644038.1644074](#)

Full text:  Pdf


HONS (Hybrid Open Networking Stack) is a system which can service diverse types of sensor nodes as a single network. By defining open packet format of IEEE 802.15.4 standard, it can form low-power multi-hop network of diverse sensors. HONS system is ... [expand](#)

[A service-oriented operating system and an application development infrastructure for wireless sensor networks](#)

[Martin Lipphardt](#), [Nils Glombitza](#), [Jana Neumann](#), [Christian Werner](#)

Pages: 309-310

doi> [10.1145/1644038.1644075](#)

Full text:  Pdf


Due to the highly distributed nature and special basic conditions such as limited resources, implementing and maintaining a sensor network application is a tedious task. In this demonstration we present a service-oriented operating system for sensor ... [expand](#)

[A navigation system based on a sensor network without exit and locations](#)

[Kui Zhang](#), [Qian Zhang](#), [Tao Jiang](#), [Peng Guo](#)

Pages: 311-312

doi> [10.1145/1644038.1644076](#)

Full text:  Pdf


In the paper, we design a navigation system based on sensor network to guide a robot to walk out of event region. The navigation system does not require any exit or locations. [expand](#)

[NISAT: a zero-side-effect testbed for wireless sensor networks](#)

[Wei Huangfu](#), [Limin Sun](#), [Xinyun Zhou](#)

Pages: 313-314

doi> [10.1145/1644038.1644077](#)

Full text:  Pdf


The NISAT testbed consists of a center server and many test units. The test units probe the internal interconnected signals inside the motes with extra hardware sniffers. The server gathers, parses and analyzes all data from test units to obtain the ... [expand](#)

[iLight: device-free passive tracking by wireless sensor networks](#)

[Xufei Mao](#), [Xiang-Yang Li](#), [Xingfa Shen](#), [Fang Chen](#)

Pages: 315-316

doi> [10.1145/1644038.1644078](https://doi.org/10.1145/1644038.1644078)

Full text:  Pdf


In this work, we study indoor passive tracking problem in wireless sensor networks (WSNs), in which we assume the target being tracked is "clean", i.e., there is no any equipment carried by the target and the tracking procedure is considered to ... [expand](#)

[Physicalnet: a middleware for programming concurrent, across administrative domain sensor and actuator networks](#)

[Pascal A. Vicaire](#), [Zhiheng Xie](#), [Enamul Hoque](#), [John A. Stankovic](#)

Pages: 317-318

doi> [10.1145/1644038.1644079](https://doi.org/10.1145/1644038.1644079)

Full text:  Pdf


Physicalnet is a fully implemented middleware for wireless networks of sensors and actuators (WNSAs). Based on a lightweight service oriented architecture (SOA), Physicalnet allows the users to create administrative domains, in which owners of the nodes ... [expand](#)

[A virtualization framework for heterogeneous sensor network platforms](#)

[Hock Beng Lim](#), [Mudasser Iqbal](#), [Teng Jie Ng](#)

Pages: 319-320

doi> [10.1145/1644038.1644080](https://doi.org/10.1145/1644038.1644080)

Full text:  Pdf


At present, the sensor node platforms from different vendors cannot easily interoperate with each other due to their heterogeneous programming environments, communication stacks and data management protocols. In this work, we develop a sensor network ... [expand](#)

[An implementation of a wireless sensor network-based meter reading system](#)

[Kook-Hee Han](#), [Seung-Woo Choi](#), [Byung-Chul Park](#), [Jung-Jun Lee](#)

Pages: 321-322

doi> [10.1145/1644038.1644081](https://doi.org/10.1145/1644038.1644081)

Full text:  Pdf


This demonstration shows the actual application of our wireless AMI[1] system, AMR Xpider. This system consists of a sink node and multiple relay nodes. Hundreds of sensing nodes, which are connected to the relay node, transfer metering data to the MDMS ... [expand](#)

[Towards power transformer condition monitoring](#)

[Shaun Kaplan](#), [Daniel de Villiers](#), [Leon Steenkamp](#), [Gerhard de Jager](#), [Jevon Davies](#), [Richardt Wilkinson](#)

Pages: 323-324

doi> [10.1145/1644038.1644082](https://doi.org/10.1145/1644038.1644082)

Full text:  Pdf


We present ongoing work to develop a power transformer condition monitoring system. Energy harvesting will be used to power the sensor nodes measuring the vibration of the transformer. A subset of this work will be demonstrated. [expand](#)

[Measuring foot pronation using RFID sensor networks](#)

[Varick Erickson](#), [Ankur U. Kamthe](#), [Alberto E. Cerpa](#)

Pages: 325-326

doi> [10.1145/1644038.1644083](https://doi.org/10.1145/1644038.1644083)

Full text:  Pdf


Running efficiency is an important factor to consider in order to avoid injury. In particular, foot pronation, the angle of the foot as it hits the ground, is a common cause for many types of injuries among runners. Though pronation is common, diagnosing ... [expand](#)

[SensorFly: a controlled-mobile aerial sensor network](#)

[Aveek Purohit](#), [Pei Zhang](#)

Pages: 327-328

doi> [10.1145/1644038.1644084](https://doi.org/10.1145/1644038.1644084)

Full text:  Pdf


The SensorFly system is a novel, low-cost, miniature controlled-mobile aerial sensor network. Mobility permits the network to be autonomous in deployment, maintenance and adapting to the environment, overcoming the reliance of traditionally fixed networks ... [expand](#)

[TransitGenie: a context-aware, real-time transit navigator](#)

[James Biagioni](#), [Adrian Agresta](#), [Tomas Gerlich](#), [Jakob Eriksson](#)

Pages: 329-330

doi> [10.1145/1644038.1644085](https://doi.org/10.1145/1644038.1644085)

Full text:  Pdf


A transit navigation system is described that integrates real-time transit and user tracking with existing transit schedules to improve the transit riding experience. [expand](#)

[Hallway monitoring with sensor networks](#)

[Tobias Baumgartner](#), [Sándor P. Fekete](#), [Alexander Kröller](#)

Pages: 331-332

doi> [10.1145/1644038.1644086](https://doi.org/10.1145/1644038.1644086)

Full text:  Pdf

We present a sensor network that monitors a hallway. It consists of 180 load sensors connected to 30 wireless sensor nodes, where the setup is of


extremely low cost and easily transferred to other settings. Our network serves as a testbed for in-network ... [expand](#)

[Whac-A-Bee: a sensor network game](#)

[Eugen Berlin](#), [Kristof Van Laerhoven](#), [Bernt Schiele](#), [Pablo Guerrero](#), [Arthur Herzog](#), [Daniel Jacobi](#), [Alejandro Buchmann](#)

Pages: 333-334

doi> [10.1145/1644038.1644087](https://doi.org/10.1145/1644038.1644087)

Full text:  [Pdf](#)


This paper illustrates both challenges and benefits found in expanding a traditional game concept to a situated environment with a distributed set of wireless sensing modules. Our pervasive game equivalent of the Whac-A-Mole game, Whac-A-Bee, retains ... [expand](#)

[Radio information management for distributed spectrum sensing](#)

[Junichi Naganawa](#), [Hojun Kim](#), [Kosuke Nishimura](#), [Shunsuke Saruwatari](#), [Makoto Suzuki](#), [Masateru Minami](#), [Hiroyuki Morikawa](#)

Pages: 335-336

doi> [10.1145/1644038.1644088](https://doi.org/10.1145/1644038.1644088)

Full text:  [Pdf](#)


Radio spectrum has turned into a precious natural resource from free goods due to the rapid development of wireless communication technology. In order to efficiently utilize radio spectrum, a spectrum policy should be enough appropriate to create new ... [expand](#)

[Low-power high-precision timing hardware for sensor networks](#)

[Thomas Schmid](#), [Dustin Torres](#), [Mani B. Srivastava](#)

Pages: 337-338

doi> [10.1145/1644038.1644089](https://doi.org/10.1145/1644038.1644089)

Full text:  [Pdf](#)


In this demonstration, we will present three key technologies we recently developed to improve time synchronization accuracy in sensor networks: (1) Temperature Driven Time Synchronization, (2) Low-Power Sub-μSecond Time Synchronization, and (3) Low-Power ... [expand](#)

[SNORES: towards a less-intrusive home sleep monitoring system using wireless sensor networks](#)

[Jun Han](#), [Jae Yoon Chong](#), [Sukun Kim](#)

Pages: 339-340

doi> [10.1145/1644038.1644090](https://doi.org/10.1145/1644038.1644090)

Full text:  [Pdf](#)


In modern society, a large portion of the population suffers from sleep disorder. Some sleep disorders are serious enough to interfere with functioning of daily lives. Therefore knowing how well one sleeps is an important health indicator that can lead ... [expand](#)

[A wake-on sensor network](#)

[Gang Lu](#), [Debraj De](#), [Mingsen Xu](#), [Wen-Zhan Song](#), [Behrooz Shirazi](#)

Pages: 341-342

doi> [10.1145/1644038.1644091](https://doi.org/10.1145/1644038.1644091)

Full text:  [Pdf](#)


This paper present a wake-on sensor network formed with the wake-on motes, TelosW. Our wake-on hardware and software design enable lower power operations and longer network lifetime. [expand](#)

[WIA-PA network and its interconnection with legacy process automation system](#)

[Wei Liang](#), [Xiaoling Zhang](#), [Miao Yang](#), [Peng Zeng](#), [Jinchao Xiao](#), [Haibin Yu](#)

Pages: 343-344

doi> [10.1145/1644038.1644092](https://doi.org/10.1145/1644038.1644092)

Full text:  [Pdf](#)


WIA-PA is one of two IEC open wireless standards for the industrial process automation. In this demonstration we build a fully operational WIA-PA network and illustrate how to interconnect WIA-PA network with PLC system. We show the construction of the ... [expand](#)

[Hybrid-powered RFID sensor networks](#)

[Shane S. Clark](#), [Jeremy Gummesson](#), [Kevin Fu](#), [Deepak Ganesan](#)

Pages: 345-346

doi> [10.1145/1644038.1644093](https://doi.org/10.1145/1644038.1644093)

Full text:  [Pdf](#)


RFID sensor networks comprising batteryless devices that are passively powered by RFID readers present exciting possibilities for ubiquitous computing applications. They require minimal maintenance, are cheap to manufacture and have small form factor. ... [expand](#)

[mCrowd: a platform for mobile crowdsourcing](#)

[Tingxin Yan](#), [Matt Marzilli](#), [Ryan Holmes](#), [Deepak Ganesan](#), [Mark Corner](#)

Pages: 347-348

doi> [10.1145/1644038.1644094](https://doi.org/10.1145/1644038.1644094)

Full text:  [Pdf](#)


Crowdsourcing is a new paradigm for utilizing the power of "crowds" of people to facilitate large scale tasks that are costly or time consuming with traditional methods. Crowdsourcing has enormous potential that can be truly unleashed when extended to ... [expand](#)

[Common Sense: participatory urban sensing using a network of handheld air quality monitors](#)

[Prabal Dutta](#), [Paul M. Aoki](#), [Neil Kumar](#), [Alan Mainwaring](#), [Chris Myers](#), [Wesley Willett](#), [Allison Woodruff](#)

Pages: 349-350

doi> [10.1145/1644038.1644095](https://doi.org/10.1145/1644038.1644095)

Full text:  [Pdf](#)


Poor air quality is a global health issue, causing serious problems like asthma, cancer, and heart disease around the world. Earlier this decade, the World Health Organization estimated that three million people die each year from the effects of air ... [expand](#)

[An affordable, long-lasting, and autonomous theft detection and tracking system](#)

[Somnath Mitra](#), [Zizhan Zheng](#), [Santanu Guha](#), [Animikh Ghosh](#), [Prabal Dutta](#), [Bhagavathy Krishna](#), [Kurt Plarre](#), [Santosh Kumar](#), [Prasun Sinha](#)

Pages: 351-352

doi> [10.1145/1644038.1644096](#)

Full text:  [Pdf](#)


The AutoWitness project aims to deter, detect, and track theft of everyday objects using a combination of ultra low-power mobile tags and a wide-area network of static anchors. Key research challenges include dramatically driving down the ... [expand](#)

[A human probe for measuring walkability](#)

[Kazumasa Oshima](#), [Yasuyuki Ishida](#), [Shin'ichi Konomi](#), [Niwat Thepvilojanapong](#), [Yoshito Tobe](#)

Pages: 353-354

doi> [10.1145/1644038.1644097](#)

Full text:  [Pdf](#)


Recent mobile devices are integrated with various kinds of sensors, thereby allowing people to capture what stationary sensing devices cannot easily acquire. We term the systems that exploit the ubiquity of the users of such devices Human Probes. ... [expand](#)

[Integrated GPS-denied localization, tracking and automatic personal identification](#)

[S. Tennina](#), [L. Pomante](#), [F. Graziosi](#), [M. Di Renzo](#), [R. Alesii](#), [F. Santucci](#)

Pages: 355-356

doi> [10.1145/1644038.1644098](#)

Full text:  [Pdf](#)


The demonstration proposal focuses on presenting the capabilities of a wireless biometric badge, which integrates a localization and tracking service along with an automatic personal identification mechanism, to control the access to restricted areas ... [expand](#)

[Application of geosensor nodes in low-rate networks](#)

[Joni Jämsä](#), [Mika Luimula](#), [Pertti Verronen](#), [Mika Pahkasalo](#), [Juha Yli-Hemminki](#), [Joni Heikkilä](#)

Pages: 357-358

doi> [10.1145/1644038.1644099](#)

Full text:  [Pdf](#)

In this demonstration paper we will present our test application which has been designed for using geosensor network (GSN) nodes with low-rate communication. Our demonstration will show how GSN nodes can be used in low-rate networks based standardized ... [expand](#)

POSTER SESSION: Poster abstracts

[Live photo mosaic with a group of wireless image sensors](#)

[Fulu Li](#), [James Barabas](#), [Ana L. Santos](#)

Pages: 359-360

doi> [10.1145/1644038.1644101](#)


Full text:  [Pdf](#)

Photo tourism [5] is a platform that allows users to transform unstructured online digital photos into a 3D experience. Nowadays, image sensors are being extensively used to allow images to be taken automatically and remotely, which facilitates the opportunity ... [expand](#)

[Analysis of an omni-directional narrowband ultrasonic receiver and CSS-based broadband transmission](#)

[Prasant Misra](#), [Sanjay Jha](#), [Diet Ostry](#)

Pages: 361-362

doi> [10.1145/1644038.1644102](#)

Full text:  [Pdf](#)


Ultrasound (US) based Cricket indoor location system has limited range when the transmitter and receiver motes are not in the line-of-sight (LOS) positions. It uses narrowband US transducers which are unidirectional and require tilting of the motes in ... [expand](#)

[ANN-based non-linearity compensator of LVDT sensor for structural health monitoring](#)

[Prasant Misra](#), [Santoshini Kumari Mohini](#), [Saroj Kumar Mishra](#)

Pages: 363-364

doi> [10.1145/1644038.1644103](#)

Full text:  [Pdf](#)


Linear Variable Differential Transformer (LVDT) based sensing systems are effective in structural health monitoring. However, the usable range and accuracy of these sensors are severely affected due to the non-linearity exhibited in their input-output ... [expand](#)

[Teaching wireless sensor networks through testbed development](#)

[Anna Förster](#), [Mehdi Jazayeri](#)

Pages: 365-366

doi> [10.1145/1644038.1644104](#)

Full text:  [Pdf](#)


The rapid development of wireless sensor networks (WSNs) and the increasing complexity of the deployed applications force researchers to turn to testbeds to test their communication and application related algorithms and protocols. On the other side, ... [expand](#)

[Run time assurance of application-level requirements in wireless sensor networks](#)

[Jingyuan Li](#), [Yafeng Wu](#), [Krasimira Kapitanova](#), [John A. Stankovic](#), [Kamin Whitehouse](#), [Sang H. Son](#)

Pages: 367-368

doi> [10.1145/1644038.1644105](#)

Full text:  [Pdf](#)


The current rapid development and deployment of wireless sensor networks (WSNs) and their application in mission critical systems are exacerbating the need for high confidence WSNs. Achieving high confidence WSNs will require new assurance technologies. ... [expand](#)

[Prototyping a software factory for wireless sensor networks](#)

[Tomasz Naumowicz](#), [Benjamin Schröter](#), [Jochen Schiller](#)

Pages: 369-370

doi> [10.1145/1644038.1644106](#)

Full text:  [Pdf](#)


Wireless sensor networks (WSNs) are often advertised with high sensing accuracy, long lifetime, and easy deployment. However, they are still not widely used in environmental research due to of poor tool support and high complexity. A wider use of WSNs ... [expand](#)

[Wildlife and environmental monitoring using RFID and WSN technology](#)

[Vladimir Dyo](#), [Stephen A. Ellwood](#), [David W. Macdonald](#), [Andrew Markham](#), [Cecilia Mascolo](#), [Bence Pásztor](#), [Niki Trigoni](#), [Ricklef Wohlers](#)

Pages: 371-372

doi> [10.1145/1644038.1644107](#)

Full text:  [Pdf](#)


Wireless Sensor Networks enable scientists to collect information about the environment with a granularity unseen before, while providing numerous challenges to software designers. Since sensor devices are often powered by small batteries, which take ... [expand](#)

[Characterization of link asymmetry in wireless sensor networks](#)

[Nadeem Ahmed](#), [Prasant Misra](#), [Sanjay Jha](#), [Diet Ostry](#)

Pages: 373-374

doi> [10.1145/1644038.1644108](#)

Full text:  [Pdf](#)


Recent experimental studies in wireless sensor networks (WSNs) have confirmed that asymmetry in the wireless links has a significant effect on the performance of WSN network protocols. Protocols which work in simulation studies often fail when link asymmetry ... [expand](#)

[PipeProbe: mapping hidden water pipelines](#)

[Tsung-te \(Ted\) Lai](#), [Yu-han \(Tiffany\) Chen](#), [Hao-hua Chu](#), [Polly Huang](#)

Pages: 375-376

doi> [10.1145/1644038.1644109](#)

Full text:  [Pdf](#)


We propose PipeProbe, a mobile sensor system for mapping hidden water pipelines inside cement walls or under floor coverings. PipeProbe works by dropping a sensor capsule into the source of the water pipelines. As the PipeProbe capsule traverses the ... [expand](#)

[On building mobility models for floating objects](#)

[Huang-Chen Lee](#), [Chun-Yu Lin](#), [Shang-Wen Hsu](#), [Chung-Ta King](#)

Pages: 377-378

doi> [10.1145/1644038.1644110](#)

Full text:  [Pdf](#)


We present a general framework for building mobility models for floating objects. Such models are useful for studying the behavior of wireless sensors that are deployed to drift along rivers, lakes, oceans, or debris flows. These sensors may be used ... [expand](#)

[An efficient operating system abstraction layer for portable applications in the domain of wireless sensor networks](#)

[Ramon Serna Oliver](#), [Ivan Shcherbakov](#), [Gerhard Fohler](#)

Pages: 379-380

doi> [10.1145/1644038.1644111](#)

Full text:  [Pdf](#)


Portability is a major concern in developing applications for embedded devices such as Wireless Sensor Networks (WSN). Abstractions of the hardware platform which are introduced by the operating system (OS) make possible to develop code independent of ... [expand](#)

[Integrated distributed energy awareness for wireless sensor networks](#)

[Geoffrey Werner Challen](#), [Jason Waterman](#), [Matt Welsh](#)

Pages: 381-382

doi> [10.1145/1644038.1644112](#)

Full text:  [Pdf](#)


Energy in sensor networks is distributed and non-transferable. Over time, differences in energy availability across the network are likely to arise. Protocols such as routing engines can concentrate energy load at certain nodes. Variations in incident ... [expand](#)

[Learning from sensor network data](#)

[Matthias Keller](#), [Jan Beutel](#), [Andreas Meier](#), [Roman Lim](#), [Lothar Thiele](#)

Pages: 383-384

doi> [10.1145/1644038.1644113](#)

Full text:  [Pdf](#)


Within the PermaSense project, two wireless sensor networks have been deployed for a long-term operation in the Swiss Alps. For enabling state-of-the-art permafrost research based on the collected data, highest possible data quality and yield have to ... [expand](#)

[Heuristics for scheduling periodic real-time streams in wireless sensor networks](#)

[S. M. Shahriar Nirjon](#), [John A. Stankovic](#), [Kamin Whitehouse](#)

Pages: 385-386

doi> [10.1145/1644038.1644114](#)

Full text:  [Pdf](#)


Simultaneous transmissions in the same radio range of a wireless sensor network causes interference and packets are lost. Knowing the interference pattern in advance, the transmission links can be scheduled so that no packet is lost due to interference ... [expand](#)

[Recovering network topology with binary sensors](#)

[Eunjoon Cho](#), [Ian Downes](#), [Martin Wicke](#), [Branislav Kusy](#), [Leonidas Guibas](#)

Pages: 387-388

doi> [10.1145/1644038.1644115](#)

Full text:  [Pdf](#)


We present a method to extract topology information from detection events of mobile entities moving through a network of binary sensors. We extract the topological structure of possible paths in the network by analyzing the time correlation of events ... [expand](#)

[A wireless routing protocol in \$d\$ -dimensional spaces](#)

[Chen Qian](#), [Simon S. Lam](#), [Vinod Venkataraman](#)

Pages: 389-390

doi> [10.1145/1644038.1644116](#)

Full text:  [Pdf](#)


We present simulation results of a wireless routing protocol as well as join, leave, failure, and maintenance protocols, for nodes in a d -dimensional Euclidean space ($d \geq 2$). [expand](#)

[Wireless link simulations using multi-level Markov models](#)

[Ankur U. Kamthe](#), [Miguel Á. Carreira-Perpiñán](#), [Alberto E. Cerpa](#)

Pages: 391-392

doi> [10.1145/1644038.1644117](#)

Full text:  [Pdf](#)


Modeling the behavior of 802.15.4 links is a non-trivial problem because of the widespread heterogeneity in the quality of any given link over short and long time scales. We propose a novel multilevel approach involving Hidden Markov Models (HMMs) and ... [expand](#)

[A wireless pedestrian tracking network](#)

[Lun Jiang](#), [Ankur Kamthe](#), [Alberto E. Cerpa](#)

Pages: 393-394

doi> [10.1145/1644038.1644118](#)

Full text:  [Pdf](#)


The ease of deploying wireless camera sensor nodes has grown with the reduction of manufacturing costs of low power, high resolution cameras. Although current wireless sensor network platforms have limited on-board resources for solving highly complex ... [expand](#)

[Ear-Phone assessment of noise pollution with mobile phones](#)

[Rajib Kumar Rana](#), [Chun Tung Chou](#), [Salil Kanhere](#), [Nirupama Bulusu](#), [Wen Hu](#)

Pages: 395-396

doi> [10.1145/1644038.1644119](#)

Full text:  [Pdf](#)


Noise map can provide useful information to control noise pollution. We propose a people-centric noise collection system called the Ear-Phone. Due to the voluntary participation of people, the number and location of samples cannot be guaranteed. We propose ... [expand](#)

[Design of a low-cost sensor node for distributed spectrum sensing](#)

[Hojun Kim](#), [Makoto Suzuki](#), [Shunsuke Saruwatari](#), [Kousuke Nishimura](#), [Masateru Minami](#), [Hiroyuki Morikawa](#)

Pages: 397-398

doi> [10.1145/1644038.1644120](#)

Full text:  [Pdf](#)


In distributed spectrum sensing, we deploy ten thousands of sensor nodes, and a low-cost sensor node is necessary. In this work, we design the sensor node specialized in power level measurement for distributed spectrum sensing, and we discuss 3 components ... [expand](#)

[TinyVM, an efficient virtual machine infrastructure for sensor networks](#)

[Kirak Hong](#), [Jiin Park](#), [Taekhoon Kim](#), [Sungho Kim](#), [Hwangho Kim](#), [Yousun Ko](#), [Jongtae Park](#), [Bernd Burgstaller](#), [Bernhard Scholz](#)

Pages: 399-400

doi> [10.1145/1644038.1644121](#)

Full text:  [Pdf](#)


We present TinyVM, a Virtual Machine (VM) for nesC and C applications on sensor motes. TinyVM executes compressed bytecode on-the-fly to conserve memory. To facilitate creation of application-specific VMs, partitioning of applications into bytecode, ... [expand](#)

[A cyber-physical middleware framework for continuous monitoring of water distribution systems](#)

[Mudasser Iqbal](#), [Hock Beng Lim](#)

Pages: 401-402

doi> [10.1145/1644038.1644122](https://doi.org/10.1145/1644038.1644122)

Full text:  Pdf


The middleware for a cyber-physical system is crucial as it tightly integrates computation with physical processes to achieve better reliability, distributed coordination, higher precision and efficiency, and better autonomous control. In this work, ... [expand](#)

[Exploiting the tradeoff between fast wakeup and long standby in event-monitoring WSN](#)

[Huang-Chen Lee](#), [Chuan-Yu Cho](#), [Yao-Min Fang](#), [Bing-Jean Lee](#), [Chung-Ta King](#)

Pages: 403-404

doi> [10.1145/1644038.1644123](https://doi.org/10.1145/1644038.1644123)

Full text:  Pdf


In an event-monitoring wireless sensor network (WSN), the sensors must be waked up fast to engage in active and high-rate sensing when events of interest occur. However, to prolong the lifetime of the network, the sensors should be put into the standby ... [expand](#)

[A stolen object detection and tracing system for mobile valuables](#)

[Yu-Wei Su](#), [Chun-Chieh Chuang](#), [Yueh-Feng Lee](#), [Chung-Chou Shen](#)

Pages: 405-406

doi> [10.1145/1644038.1644124](https://doi.org/10.1145/1644038.1644124)

Full text:  Pdf


The proposed system provides a mechanism of detecting the stealing of valuables, and integrates wireless sensor networks with a location service to trace stolen valuables through deployed cameras in an indoor environment. Compared with traditional surveillance ... [expand](#)

[Energy profiling for mPlatform](#)

[Yaohua Sun](#), [Ting Zhu](#), [Ziguo Zhong](#), [Tian He](#)

Pages: 407-408

doi> [10.1145/1644038.1644125](https://doi.org/10.1145/1644038.1644125)

Full text:  Pdf


The ability to accurately profile energy consumption is of great importance for energy management in low-power devices. This work presents a novel energy profiling architecture by combining the high-speed CPLD bus signaling capability of mPlatform with ... [expand](#)

[Energy-efficient management of wireless sensor networks](#)

[Jochen Furthmüller](#), [Stephan Kessler](#)

Pages: 409-410

doi> [10.1145/1644038.1644126](https://doi.org/10.1145/1644038.1644126)

Full text:  Pdf


The energy-efficient management of wireless sensor networks is a demanding task: It has to trade off the need for a detailed insight into the network internals against the energy consumption of the management system itself. We demonstrate a management ... [expand](#)

[SensorTrust: a resilient trust model for WSNs](#)

[Guoxing Zhan](#), [Weisong Shi](#), [Julia Deng](#)

Pages: 411-412

doi> [10.1145/1644038.1644127](https://doi.org/10.1145/1644038.1644127)

Full text:  Pdf


We present SensorTrust, a trust model to evaluate the trustworthiness of nodes in hierarchical wireless sensor networks, focusing on data integrity. [expand](#)

[SolarMote: a low-cost solar energy supplying and monitoring system for wireless sensor networks](#)

[Xingfa Shen](#), [Cheng Bo](#), [Jianhui Zhang](#), [Guojun Dai](#), [Xufei Mao](#), [Xiang-Yang Li](#)

Pages: 413-414

doi> [10.1145/1644038.1644128](https://doi.org/10.1145/1644038.1644128)

Full text:  Pdf


Using solar panels to power wireless sensor nodes is feasible in most of WSNs applications. We present an efficient solar-charging system and a remote energy-profile monitoring system which can monitor the dynamic charging procedure of wireless sensor ... [expand](#)

[The FlockLab testbed architecture](#)

[Jan Beutel](#), [Roman Lim](#), [Andreas Meier](#), [Lothar Thiele](#), [Christoph Walser](#), [Matthias Woehrle](#), [Mustafa Yuceel](#)

Pages: 415-416

doi> [10.1145/1644038.1644129](https://doi.org/10.1145/1644038.1644129)

Full text:  Pdf


A vital factor for a successful deployment of sensor nodes is testing of all system aspects in a realistic setup. This work presents a testbed architecture which allows for detailed monitoring and stimulation of a wireless sensor node. In particular, ... [expand](#)

[Implementation of the low power performance analysis system for WSN](#)

[Han-Jong Ryu](#), [Seung-Min Lee](#), [Jun-Soo Jeon](#), [Sang-Chul Shin](#)

Pages: 417-417

doi> [10.1145/1644038.1644130](https://doi.org/10.1145/1644038.1644130)

Full text:  Pdf

Low power performance is a key feature for WSN systems. Current commercial WSN products are lack of low power description how long WSN

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Proceedings of the 8th ACM Conference on Embedded Networked Sensor Systems

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SESSION: **Network measurement**

[Design and evaluation of a versatile and efficient receiver-initiated link layer for low-power wireless](#)

Prabal Dutta, Stephen Dawson-Haggerty, Yin Chen, Chieh-Jan Mike Liang, Andreas Terzis

Pages: 1-14

doi> [10.1145/1869983.1869985](https://doi.org/10.1145/1869983.1869985)

Full text: [Pdf](#)

We present A-MAC, a receiver-initiated link layer for low-power wireless networks that supports several services under a unified architecture, and does so more efficiently and scalably than prior approaches. A-MAC's versatility stems from layering unicast, ... [expand](#)

[PIP: a connection-oriented, multi-hop, multi-channel TDMA-based MAC for high throughput bulk transfer](#)

Bhaskaran Raman, Kameswari Chebrolu, Sagar Bijwe, Vijay Gabale

Pages: 15-28

doi> [10.1145/1869983.1869986](https://doi.org/10.1145/1869983.1869986)

Full text: [Pdf](#)

In this paper, we consider the goal of achieving high throughput in a wireless sensor network. Our work is set in the context of those wireless sensor network applications which collect and transfer bulk data. We present PIP (Packets in Pipe), a MAC ... [expand](#)

SESSION: **Mobile sensing & tracking**

[AutoWitness: locating and tracking stolen property while tolerating GPS and radio outages](#)

Santanu Guha, Kurt Plarre, Daniel Lissner, Somnath Mitra, Bhagavathy Krishna, Prabal Dutta, Santosh Kumar

Pages: 29-42

doi> [10.1145/1869983.1869988](https://doi.org/10.1145/1869983.1869988)

Full text: [Pdf](#)

We present AutoWitness, a system to deter, detect, and track personal property theft, improve historically dismal stolen property recovery rates, and disrupt stolen property distribution networks. A property owner embeds a small tag inside the asset ... [expand](#)

[SensLoc: sensing everyday places and paths using less energy](#)

Donnie H. Kim, Younghun Kim, Deborah Estrin, Mani B. Srivastava

Pages: 43-56

doi> [10.1145/1869983.1869989](https://doi.org/10.1145/1869983.1869989)

Full text: [Pdf](#)

Continuously understanding a user's location context in colloquial terms and the paths that connect the locations unlocks many opportunities for emerging applications. While extensive research effort has been made on efficiently tracking a user's raw ... [expand](#)

[Adaptive GPS duty cycling and radio ranging for energy-efficient localization](#)

Raja Jurdak, Peter Corke, Dhinesh Dharman, Guillaume Salagnac

Pages: 57-70

doi> [10.1145/1869983.1869990](https://doi.org/10.1145/1869983.1869990)

Full text: [Pdf](#)

This paper addresses the tradeoff between energy consumption and localization performance in a mobile sensor network application. The focus is on augmenting GPS location with more energy-efficient location sensors to bound position estimate uncertainty ... [expand](#)

SESSION: **Participatory sensing**

[The Jigsaw continuous sensing engine for mobile phone applications](#)

Hong Lu, Jun Yang, Zhigang Liu, Nicholas D. Lane, Tanzeem Choudhury, Andrew T. Campbell

Pages: 71-84

doi> [10.1145/1869983.1869992](https://doi.org/10.1145/1869983.1869992)

Full text: [Pdf](#)


Supporting continuous sensing applications on mobile phones is challenging because of the resource demands of long-term sensing, inference and communication algorithms. We present the design, implementation and evaluation of the Jigsaw continuous ... [expand](#)

[Cooperative transit tracking using smart-phones](#)

Arvind Thiagarajan, James Biagioni, Tomas Gerlich, Jakob Eriksson

Pages: 85-98

doi> [10.1145/1869983.1869993](https://doi.org/10.1145/1869983.1869993)

Full text:  Pdf


Real-time transit tracking is gaining popularity as a means for transit agencies to improve the rider experience. However, many transit agencies lack either the funding or initiative to provide such tracking services. In this paper, we describe a crowd-sourced ... [expand](#)

[Privacy-aware regression modeling of participatory sensing data](#)

Hossein Ahmadi, Nam Pham, Raghu Ganti, Tarek Abdelzaher, Suman Nath, Jiawei Han

Pages: 99-112

doi> [10.1145/1869983.1869994](https://doi.org/10.1145/1869983.1869994)

Full text:  Pdf

Many participatory sensing applications use data collected by participants to construct a public model of a system or phenomenon. For example, a health application might compute a model relating exercise and diet to amount of weight loss. While the ultimately ... [expand](#)


SESSION: **Applications**

[PipeProbe: a mobile sensor droplet for mapping hidden pipeline](#)

Tsung-te (Ted) Lai, Yu-han (Tiffany) Chen, Polly Huang, Hao-hua Chu

Pages: 113-126

doi> [10.1145/1869983.1869996](https://doi.org/10.1145/1869983.1869996)

Full text:  Pdf


This paper presents PipeProbe, a mobile sensor system for determining the spatial topology of hidden water pipelines behind walls. PipeProbe works by dropping a tiny wireless sensor capsule into the source of the water pipelines. As the PipeProbe capsule ... [expand](#)

[Evolution and sustainability of a wildlife monitoring sensor network](#)

Vladimir Dyo, Stephen A. Ellwood, David W. Macdonald, Andrew Markham, Cecilia Mascolo, Bence Pásztor, Salvatore Scellato, Niki Trigoni, Ricklef Wohlers, Kharsim Yousef

Pages: 127-140

doi> [10.1145/1869983.1869997](https://doi.org/10.1145/1869983.1869997)

Full text:  Pdf


As sensor network technologies become more mature, they are increasingly being applied to a wide variety of applications, ranging from agricultural sensing to cattle, oceanic and volcanic monitoring. Significant efforts have been made in deploying and ... [expand](#)

[Meeting ecologists' requirements with adaptive data acquisition](#)

Marcus Chang, Philippe Bonnet

Pages: 141-154

doi> [10.1145/1869983.1869998](https://doi.org/10.1145/1869983.1869998)

Full text:  Pdf


Ecologists instrument ecosystems to collect time series representing the evolution in time and space of relevant abiotic and biotic factors. Sensor networks promise to improve on existing data acquisition systems by interconnecting stand-alone measurement ... [expand](#)

[Reliable clinical monitoring using wireless sensor networks: experiences in a step-down hospital unit](#)

Octav Chipara, Chenyang Lu, Thomas C. Bailey, Gruia-Catalin Roman

Pages: 155-168

doi> [10.1145/1869983.1869999](https://doi.org/10.1145/1869983.1869999)

Full text:  Pdf

This paper presents the design, deployment, and empirical study of a wireless clinical monitoring system that collects pulse and oxygen saturation readings from patients. The primary contribution of this paper is an in-depth clinical trial that assesses ... [expand](#)


SESSION: **Systems and web services**

[Efficient diagnostic tracing for wireless sensor networks](#)

Vinaitheerthan Sundaram, Patrick Eugster, Xiangyu Zhang

Pages: 169-182

doi> [10.1145/1869983.1870001](https://doi.org/10.1145/1869983.1870001)

Full text:  Pdf


Wireless sensor networks (WSNs) are hard to program due to unconventional programming models used to satisfy stringent resource constraints. The common event-driven concurrent programming model and lack of kernel protection in these systems introduce ... [expand](#)

[Enix: a lightweight dynamic operating system for tightly constrained wireless sensor platforms](#)

Yu-Ting Chen, Ting-Chou Chien, Pai H. Chou

Pages: 183-196

doi> [10.1145/1869983.1870002](https://doi.org/10.1145/1869983.1870002)

Full text:  Pdf


Enix is a lightweight dynamic operating system for tightly constrained platforms for wireless sensor networks (WSN). Enix provides a cooperative threading model, which is applicable to event-based WSN applications with little run-time overhead. Virtual ... [expand](#)

[sMAP: a simple measurement and actuation profile for physical information](#)

Stephen Dawson-Haggerty, Xiaofan Jiang, Gilman Tolle, Jorge Ortiz, David Culler

Pages: 197-210

doi> [10.1145/1869983.1870003](https://doi.org/10.1145/1869983.1870003)

Full text:  [Pdf](#)

As more and more physical information becomes available, a critical problem is enabling the simple and efficient exchange of this data. We present our design for a simple RESTful web service called the Simple Measuring and Actuation Profile (sMAP) ... [expand](#)


SESSION: **Sensing in cyber physical systems**

[The smart thermostat: using occupancy sensors to save energy in homes](#)

Jiakang Lu, Tamim Sookoor, Vijay Srinivasan, Ge Gao, Brian Holben, John Stankovic, Eric Field, Kamin Whitehouse

Pages: 211-224

doi> [10.1145/1869983.1870005](https://doi.org/10.1145/1869983.1870005)

Full text:  [Pdf](#)


Heating, ventilation and cooling (HVAC) is the largest source of residential energy consumption. In this paper, we demonstrate how to use cheap and simple sensing technology to automatically sense occupancy and sleep patterns in a home, and how to use ... [expand](#)

[Estimating building consumption breakdowns using ON/OFF state sensing and incremental sub-meter deployment](#)

Deokwoo Jung, Andreas Savvides

Pages: 225-238

doi> [10.1145/1869983.1870006](https://doi.org/10.1145/1869983.1870006)

Full text:  [Pdf](#)


This paper considers the problem of estimating the power breakdowns for the main appliances inside a building using a small number of power meters and the knowledge of the ON/OFF states of individual appliances. First we solve the breakdown estimation ... [expand](#)

[eShare: a capacitor-driven energy storage and sharing network for long-term operation](#)

Ting Zhu, Yu Gu, Tian He, Zhi-Li Zhang

Pages: 239-252

doi> [10.1145/1869983.1870007](https://doi.org/10.1145/1869983.1870007)

Full text:  [Pdf](#)


The ability to move energy around makes it feasible to build distributed energy storage systems that can robustly extend the lifetime of networked sensor systems. eShare supports the concept of energy sharing among multiple embedded sensor ... [expand](#)

[Adaptive decentralized control of underwater sensor networks for modeling underwater phenomena](#)

Carrick Detweiler, Marek Doniec, Mingshun Jiang, Mac Schwager, Robert Chen, Daniela Rus

Pages: 253-266

doi> [10.1145/1869983.1870008](https://doi.org/10.1145/1869983.1870008)

Full text:  [Pdf](#)

Understanding the dynamics of bodies of water and their impact on the global environment requires sensing information over the full volume of water. We develop a gradient-based decentralized controller that dynamically adjusts the depth of a network ... [expand](#)


SESSION: **Location and TimeSync**

[A case against routing-integrated time synchronization](#)

Thomas Schmid, Zainul Charbiwala, Zafeiria Anagnostopoulou, Mani B. Srivastava, Prabal Dutta

Pages: 267-280

doi> [10.1145/1869983.1870010](https://doi.org/10.1145/1869983.1870010)

Full text:  [Pdf](#)


To achieve more accurate global time synchronization, this paper argues for decoupling the clock distribution network from the routing tree in a multihop wireless network. We find that both flooding and routing-integrated time synchronization rapidly ... [expand](#)

[Revealing the hidden lives of underground animals using magneto-inductive tracking](#)

Andrew Markham, Niki Trigoni, Stephen A. Ellwood, David W. Macdonald

Pages: 281-294

doi> [10.1145/1869983.1870011](https://doi.org/10.1145/1869983.1870011)

Full text:  [Pdf](#)


Currently, there is no existing method for automatically tracking the location of burrowing animals when they are underground, consequently zoologists only have a partial view of their subterranean behaviour and habits. Conventional RF based methods ... [expand](#)

[Locating sensors in the wild: pursuit of ranging quality](#)

Wei Xi, Yuan He, Yunhao Liu, Jizhong Zhao, Lufeng Mo, Zheng Yang, Jiliang Wang, Xiangyang Li

Pages: 295-308

doi> [10.1145/1869983.1870012](https://doi.org/10.1145/1869983.1870012)

Full text:  [Pdf](#)

Localization is a fundamental issue of wireless sensor networks that has been extensively studied in the literature. The real-world experience from GreenOrbs, a sensor network system in the forest, shows that localization in the wild remains very challenging ... [expand](#)


SESSION: **Network stack**

[Surviving wi-fi interference in low power ZigBee networks](#)

Chieh-Jan Mike Liang, Nissanka Bodhi Priyantha, Jie Liu, Andreas Terzis

Pages: 309-322

doi> [10.1145/1869983.1870014](https://doi.org/10.1145/1869983.1870014)

Full text:  [Pdf](#)


Frequency overlap across wireless networks with different radio technologies can cause severe interference and reduce communication reliability. The circumstances are particularly unfavorable for ZigBee networks that share the 2.4 GHz ISM band with WiFi ... [expand](#)

[Mapping the urban wireless landscape with Argos](#)

Ian Rose, Matt Welsh

Pages: 323-336

doi> [10.1145/1869983.1870015](#)

Full text:  [Pdf](#)


Passive monitoring is an important tool for measuring, troubleshooting, and protecting modern wireless networks. To date, WiFi monitoring has focused primarily on indoor settings or ephemeral outdoor studies though wardriving. We present Argos, ... [expand](#)

[Practical 3D geographic routing for wireless sensor networks](#)

Jiangwei Zhou, Yu Chen, Ben Leong, Pratibha Sundar Sundaramoorthy

Pages: 337-350

doi> [10.1145/1869983.1870016](#)

Full text:  [Pdf](#)

Geographic routing is of interest for sensor networks because a point-to-point primitive is an important building block for data-centric applications. While there is a significant body of work on geographic routing algorithms for two-dimensional (2D) ... [expand](#)


DEMONSTRATION SESSION: **Demo abstracts**

[Proposal for a sensor network application development with ActionScript](#)

Kazuhi Asakawa, Norihisa Segawa, Jun Sawamoto

Pages: 351-352

doi> [10.1145/1869983.1870018](#)

Full text:  [Pdf](#)


In recent years, the research of sensor networks has advanced. They are anticipated for use in a wide variety of fields such as traceability systems of products, environmental monitoring, health care, etc. However, developers must develop applications to ... [expand](#)

[Enabling flexible MAC protocol design for wireless sensor networks](#)

Obaid Salikeen, Junaid Ansari, Xi Zhang, Petri Mähönen

Pages: 353-354

doi> [10.1145/1869983.1870019](#)

Full text:  [Pdf](#)


Wireless Sensor Networks (WSNs) have been deployed in a wide range of applications with different sensing and communication requirements. As a consequence, various MAC solutions have been proposed suiting to different application characteristics [1]. ... [expand](#)

[The Lorien dynamic component based OS](#)

Barry Porter, Utz Roedig, François Taiani, Geoff Coulson

Pages: 355-356

doi> [10.1145/1869983.1870020](#)

Full text:  [Pdf](#)


In this demo we show how the Lorien operating system [5] supports lightweight, efficient and safe online changes to any aspect of the software running on sensor nodes - and how this promotes reuse of deployed sensor networks through run-time software ... [expand](#)

[A multi-view visual surveillance system based on angle coverage](#)

Po-Yu Chen, Hsi-Min Lin, Wen-Tsuen Chen, Yu-Chee Tseng

Pages: 357-358

doi> [10.1145/1869983.1870021](#)

Full text:  [Pdf](#)


One important goal of surveillance systems is to collect information about the behavior and position of interested targets in the sensing environment. Traditional video surveillance systems usually cannot provide complete information of interested targets ... [expand](#)

[Whistle: synchronization-free TDOA for localization](#)

Ran Yu, Bin Xu, Guodong Sun, Zheng Yang

Pages: 359-360

doi> [10.1145/1869983.1870022](#)

Full text:  [Pdf](#)


We demonstrate a synchronization-free localization system, called Whistle, for wireless sensor networks. The system is tested in several realistic environments on commercial off-the-shelf(COTS) devices and the mean error is 10~20 centimeters in a 9 x ... [expand](#)

[A wifi-based low-cost mobile video surveillance system for dynamic police force deployment and real-time guard for public security](#)

Yang Wang, Liusheng Huang, Hongli Xu, Kai Xing, Wei Yang, Gang Liu

Pages: 361-362

doi> [10.1145/1869983.1870023](#)

Full text:  [Pdf](#)


This demonstration presents a mobile surveillance system that is developed at the University of Science and Technology of China and undergoing a technology transition. The goal of this project is to develop a low-cost, promptly-deployable, mobility manageable, ... [expand](#)

[RF sounding](#)

C. Rinaldi, L. Pomante, R. Alesii, F. Graziosi

Pages: 363-364

doi> [10.1145/1869983.1870024](https://doi.org/10.1145/1869983.1870024)

Full text:  Pdf


The demo we propose represents a first step toward RF Sounding [1]. Such a project is an open space installation which comprises both artistic and technological innovations; its aim is to provide the user, while entering a specifically defined area, ... [expand](#)

[Magneto-inductive tracking of underground animals](#)

Andrew Markham, Niki Trigoni, Stephen A. Ellwood, David W. Macdonald

Pages: 365-366

doi> [10.1145/1869983.1870025](https://doi.org/10.1145/1869983.1870025)

Full text:  Pdf


Existing sensor network deployments for wildlife tracking (e.g. ZebraNet [1]) have concentrated on monitoring animal behaviour above-ground. However, a wide variety of animals create underground tunnels for shelter and protection whilst the animal ... [expand](#)

[A shared sensor network infrastructure](#)

Christos Efstratiou, Ilias Leontiadis, Cecilia Mascolo, Jon Crowcroft

Pages: 367-368

doi> [10.1145/1869983.1870026](https://doi.org/10.1145/1869983.1870026)

Full text:  Pdf


An increasing number of sensor networks have been deployed to monitor a variety of conditions and situations. At the same time, more and more applications are starting to rely on the data from sensor networks to provide users with (near) real-time information ... [expand](#)

[RealSSim: a simulator for indoor sensor network systems](#)

Yu-Seung Ma, Junkeun Song, Ji-Young Kwak, Misun Yu, Duk-Kyun Woo, Pyungsoo Mah

Pages: 369-370

doi> [10.1145/1869983.1870027](https://doi.org/10.1145/1869983.1870027)

Full text:  Pdf


Existing sensor network simulators are not appropriate for indoor sensor network systems. We present RealSSim, the sensor network simulator especially developed for indoor sensor networks. RealSSim considers the structure of buildings and the quality ... [expand](#)

[A MAC contest between LPL \(the champion\) and Reins-MAC \(the challenger, an anarchic TDMA scheduler providing QoS\)](#)

Matteo Ceriotti, Amy L. Murphy

Pages: 371-372

doi> [10.1145/1869983.1870028](https://doi.org/10.1145/1869983.1870028)

Full text:  Pdf


LPL [5], or BoX-MAC in its TinyOS implementation, is arguably the most common MAC protocol for WSNs. Its extensive use in real world deployments is justified by a simple implementation, available online, that meets the requirements of a vast majority ... [expand](#)

[Traffic related observations by line sensing techniques](#)

Mangesh Chitnis, Claudio Salvadori, Matteo Petracca, Giuseppe Lipari, Paolo Pagano

Pages: 373-374

doi> [10.1145/1869983.1870029](https://doi.org/10.1145/1869983.1870029)

Full text:  Pdf


The use of Wireless Multimedia Sensor Networks (WMSNs) in Intelligent Transportation Systems (ITS) can offer cost effective solutions for gathering data on urban traffic, vehicle velocity, parking, etc. These applications demand real-time image acquisition ... [expand](#)

[TinyTune, a collaborative sensor network musical instrument](#)

Blake Newman, Joshua Sanders, Riley Hughes, Raja Jurdak

Pages: 375-376

doi> [10.1145/1869983.1870030](https://doi.org/10.1145/1869983.1870030)

Full text:  Pdf


This paper demonstrates the implementation of TinyTune, a collaborative musical instrument using sensor motes. The system implementation is distributed across multiple nodes and supports the basic elements of a musical instrument, such as pitch and octave ... [expand](#)

[Kitokito: supporting impromptu collaboration in participatory sensing using smart camera phones](#)

Hiroki Ishizuka, Shun Fukumoto, Tatsuhiro Nishimoto, Ryo Fukuhara, Tatsuya Morita, Keiji Sugo, Niwat Thepvilojanapong, Shin'ichi Konomi, Kaoru Sezaki, Ryosuke Shibasaki, Yoshito Tobe

Pages: 377-378

doi> [10.1145/1869983.1870031](https://doi.org/10.1145/1869983.1870031)

Full text:  Pdf


To seek and collect useful sensor data in a participatory sensing environment, participants should be able to coordinate their activities in a timely manner. However, existing systems deal separately with the "preparation time" to define the goal and ... [expand](#)

[Fast alarm broadcasting in critical event monitoring using wireless sensor networks](#)

Kui Zhang, Nirvana Meratnia, Paul Havinga, Peng Guo

Pages: 379-380

doi> [10.1145/1869983.1870032](https://doi.org/10.1145/1869983.1870032)

Full text:  Pdf


In mission-critical applications such as battlefield reconnaissance or industrial safety and security, a large number of sensor nodes are deployed in a large area to detect and report event related information to the end-users. When a critical event ... [expand](#)

[CASINO: creating alea with a sensor-based interactive network](#)

Julien Beaudaux, Antoine Gallais, Romain Kuntz, Julien Montavont, Thomas Noël, Damien Roth, Fabrice Theoleyre, Erkan Valentin

Pages: 381-382

doi> [10.1145/1869983.1870033](https://doi.org/10.1145/1869983.1870033)

Full text:  [Pdf](#)


In this paper, we briefly describe an interactive roulette game enabled over a wireless sensor network platform. It basically consists in a train speeding in one way (the spinning roulette) and in a message hopping along some deployed sensors in the ... [expand](#)

[Integrating symbolic execution with sensornet simulation for efficient bug finding](#)

Fredrik Österlind, Adam Dunkels, Raimondas Sasnauskas, Oscar Soria Dustmann, Klaus Wehrle

Pages: 383-384

doi> [10.1145/1869983.1870034](https://doi.org/10.1145/1869983.1870034)

Full text:  [Pdf](#)


High-coverage testing of sensornet applications is vital for pre-deployment bug cleansing, but has previously been difficult due to the limited set of available tools. We integrate the KleeNet symbolic execution engine with the COOJA network simulator ... [expand](#)

[Cooja TimeLine: a power visualizer for sensor network simulation](#)

Fredrik Österlind, Joakim Eriksson, Adam Dunkels

Pages: 385-386

doi> [10.1145/1869983.1870035](https://doi.org/10.1145/1869983.1870035)

Full text:  [Pdf](#)


Power consumption is one of the most important factors in wireless sensor network research, but most simulators do not provide support for visualizing the power consumption of an entire sensor network. This makes it hard to develop, debug, and understand ... [expand](#)

[A versatile heterogeneous sensor networks testbed](#)

Qiang Liu, Ze Zhao, Li Cui

Pages: 387-388

doi> [10.1145/1869983.1870036](https://doi.org/10.1145/1869983.1870036)

Full text:  [Pdf](#)


This demonstration shows our versatile heterogeneous sensor networks testbed. This testbed supports high speed embedded WLAN node, medium speed IEEE802.15.4 node, wired computer and so on with powerful supervision platform. The unique features of the ... [expand](#)

[Hijacking power and bandwidth from the mobile phone's audio interface](#)

Ye-Sheng Kuo, Thomas Schmid, Prabal Dutta

Pages: 389-390

doi> [10.1145/1869983.1870037](https://doi.org/10.1145/1869983.1870037)

Full text:  [Pdf](#)


The mobile phone is the most pervasive personal communications and computing platform ever created and yet, among its various analog interfaces, only one is open, standardized, and widely accessible: the headset port. In this demo, we augment the mobile ... [expand](#)

[Enhancing wi-fi coverage through ZigBee mesh network of energy scan devices](#)

Flavio Fabbri, Chiara Buratti, Cengiz Gezer, Paolo Toppan, Andrea Toppan, Roberto Verdone

Pages: 391-392

doi> [10.1145/1869983.1870038](https://doi.org/10.1145/1869983.1870038)

Full text:  [Pdf](#)


In this demo we present a solution for detailed coverage assessment and failures recovery in an IEEE 802.11 Wi-Fi network deployed in highly dynamical environment (e.g., where signal propagation is impacted by frequent topological changes). Monitoring ... [expand](#)

[DisCord: discovering and coordinating data exchange protocol in opportunistic wireless sensor networks](#)

Steven Mudda, Alessandro Puiatti, Silvia Giordano

Pages: 393-394

doi> [10.1145/1869983.1870039](https://doi.org/10.1145/1869983.1870039)

Full text:  [Pdf](#)


We propose DisCord, an opportunistic protocol for neighbor discovery and data exchange coordination in sensor networks. DisCord allows multiple low-end nodes within radio range to discover each other, self-organize into a network, and exchange data in ... [expand](#)

[Visualizing sensor network data with Powertron](#)

Maria Kazandjieva, Omprakash Gnawali, Philip Levis

Pages: 395-396

doi> [10.1145/1869983.1870040](https://doi.org/10.1145/1869983.1870040)

Full text:  [Pdf](#)


Powertron is a web-based application that visualizes wireless sensor network deployment data. In this particular demo, we use Powertron to show application-level power data collected from more than 250 sensor nodes. In addition, we expose the routing ... [expand](#)

[Energy transference for sensornets](#)

Affan A. Syed, Young Cho, John Heidemann

Pages: 397-398

doi> [10.1145/1869983.1870041](https://doi.org/10.1145/1869983.1870041)

Full text:  Pdf


In many cases, sensornets require continuous monitoring, 24x7, at remote, inaccessible locations making energy management a critical part of most sensornets. The sensornet research community has explored energy conservation and energy harvesting ... [expand](#)

[BSMX: message exchange between unassociated WLAN devices](#)

Sascha Schnauffer, Thomas Haenselmann, Wolfgang Effelsberg

Pages: 399-400

doi> [10.1145/1869983.1870042](https://doi.org/10.1145/1869983.1870042)

Full text:  Pdf


Beacon-based Short Message eXchange (BSMX) is a system to exchange small-sized messages between unassociated WLAN devices. We implemented BSMX for the Android operating system and developed several applications to demonstrate the potential of ... [expand](#)

[iAssist: rapid deployment and maintenance of tiny sensing systems](#)

Matthias Keller, Guido Hungerbuehler, Oliver Knecht, Suhel Sheikh, Jan Beutel, Stefanie Gubler, Joel Fiddes, Stephan Gruber

Pages: 401-402

doi> [10.1145/1869983.1870043](https://doi.org/10.1145/1869983.1870043)

Full text:  Pdf


Commercial, coin-sized iButton temperature logger devices are well-suited for densely instrumenting large outdoor areas. An efficient workflow for deploying and maintaining those devices is necessary when striving to deploy and operate several hundreds ... [expand](#)

[The SpiderBat ultrasound positioning system](#)

Georg Oberholzer, Philipp Sommer, Roger Wattenhofer

Pages: 403-404

doi> [10.1145/1869983.1870044](https://doi.org/10.1145/1869983.1870044)

Full text:  Pdf


Having access to accurate position information is a key requirement for many wireless sensor network applications. We present SpiderBat, an ultrasound-based ranging platform for wireless sensor networks. It is designed to extend existing node platforms ... [expand](#)

[Touchable: a camera-based multitouch system](#)

Lin-Shung Huang, Feng-Tso Sun, Pei Zhang

Pages: 405-406

doi> [10.1145/1869983.1870045](https://doi.org/10.1145/1869983.1870045)

Full text:  Pdf


Touchscreens enable users to interact directly and intuitively with computers by simply touching the display area without requiring any intermediate devices. There are various touchscreen technologies that generally utilize resistive or capacitive panels. ... [expand](#)

[Code in the air: simplifying sensing on smartphones](#)

Tim Kaler, John Patrick Lynch, Timothy Peng, Lenin Ravindranath, Arvind Thiagarajan, Hari Balakrishnan, Sam Madden

Pages: 407-408

doi> [10.1145/1869983.1870046](https://doi.org/10.1145/1869983.1870046)

Full text:  Pdf


Modern smartphones are equipped with a wide variety of sensors including GPS, WiFi and cellular radios capable of positioning, accelerometers, magnetic compasses and gyroscopes, light and proximity sensors, and cameras. These sensors have made smartphones ... [expand](#)

[ADACEM: automatic daily activity and calorie expenditure monitor on mobile phones](#)

Jun Yang, Zhigang Liu

Pages: 409-410

doi> [10.1145/1869983.1870047](https://doi.org/10.1145/1869983.1870047)

Full text:  Pdf


With increasingly powerful mobile devices, user context information can be derived from a variety of sensing components embedded inside, such as accelerometer, GPS, microphone, Bluetooth, camera, etc. Mobile phones can build continuous sensing systems ... [expand](#)

[Fine-scale tracking by fusing phase profiles from multiple low-power Doppler radars](#)

Kenneth W. Parker, Anish Arora, Sandip Bapat

Pages: 411-412

doi> [10.1145/1869983.1870048](https://doi.org/10.1145/1869983.1870048)

Full text:  Pdf


Using phase information from medium bandwidth Doppler Radars, it is possible to obtain motion information corresponding to changes in target range on the order of a wavelength. Comparable range resolution from ranging radars would require much wider ... [expand](#)

[Open sensor network interface for U-City service platform](#)

Jaechul Kim, Sik Yu, Youngjoon Kim, Sukun Kim, Jeonghoon Kang, Hojung Lim, Hyungseok Kim

Pages: 413-414

doi> [10.1145/1869983.1870049](https://doi.org/10.1145/1869983.1870049)

Full text:  Pdf

U-City is a city where diverse public information is provided through IT technology. In the past, IT infrastructure for public information was not


considered in city planning. However, in recent construction of new cities, this kind of infrastructure ... [expand](#)

[NOMAD: networked-observation and mobile-agent-based scene abstraction and determination](#)

Lin Zhang, Wenzhu Zhang, Xinyu Mao, Jiantao Jiao, Shijie Zheng, Linglong Li, Yujie Liu, Teng Wang, Ming Gu

Pages: 415-416

doi> [10.1145/1869983.1870050](https://doi.org/10.1145/1869983.1870050)

Full text:  [Pdf](#)

With the advancement of the sensor network technology and cyber physical systems [2], the merging between the virtual cyber space and the real physical world is bound to happen, which will impact the lifestyle of the human being. The metropolitan area ... [expand](#)


POSTER SESSION: **Poster abstracts**

[Long range wireless sensor networks using transmit-only nodes](#)

Christof Huebner, Stefan Hanelt, Tino Wagenknecht, Rachel Cardell-Oliver, Alvaro Monsalve

Pages: 417-418

doi> [10.1145/1869983.1870052](https://doi.org/10.1145/1869983.1870052)

Full text:  [Pdf](#)


Wireless sensor networks for environmental monitoring and agricultural applications often face long-range requirements at low bit-rates together with large numbers of nodes. Most existing wireless sensor networks use nodes with a short-range radio and ... [expand](#)

[END: a topology-aware collection metric for sensor networks](#)

Daniele Puccinelli, Omprakash Gnawali, SunHee Yoon, Silvia Giordano, Leonidas Guibas

Pages: 419-420

doi> [10.1145/1869983.1870053](https://doi.org/10.1145/1869983.1870053)

Full text:  [Pdf](#)


The performance of sensor network protocols is greatly affected by the network topology: the network layout, the link dynamics, and the sink placement. We propose the Expected Network Delivery (END), a protocol-independent collection metric that captures ... [expand](#)

[Reliable and energy-efficient bulk-data dissemination in wireless sensor networks](#)

David Gugelmann, Philipp Sommer, Roger Wattenhofer

Pages: 421-422

doi> [10.1145/1869983.1870054](https://doi.org/10.1145/1869983.1870054)

Full text:  [Pdf](#)


Data gathering is one of the most common applications of wireless sensor networks. Such networks are an extremely useful tool for researchers in various domains since they allow for measurements in inaccessible locations, e.g., on mountains, glaciers ... [expand](#)

[If you have time, save energy with pull](#)

David Hasenfratz, Andreas Meier, Matthias Woehrle, Marco Zimmerling, Lothar Thiele

Pages: 423-424

doi> [10.1145/1869983.1870055](https://doi.org/10.1145/1869983.1870055)

Full text:  [Pdf](#)


We analyze push and pull for data collection in wireless sensor networks. Most applications to date use the traditional push approach, where nodes transmit sensed data immediately to the sink. Using a pull approach, nodes store the data in their local ... [expand](#)

[A wireless MEMS-sensor network concept for the condition monitoring of ball screw drives in industrial plants](#)

Johannes Schmid, Tobias Gädeke, Wilhelm Stork, Heiko Hennrich, Thomas Blank

Pages: 425-426

doi> [10.1145/1869983.1870056](https://doi.org/10.1145/1869983.1870056)

Full text:  [Pdf](#)


An important factor for the success of industrial manufacturers is a cost-efficient, robust and thus failsafe production. In this context a topic of increasing interest is the continuous monitoring of machine tools to be able to proactively react to ... [expand](#)

[MansOS: easy to use, portable and resource efficient operating system for networked embedded devices](#)

Girts Strazdins, Atis Elsts, Leo Selavo

Pages: 427-428

doi> [10.1145/1869983.1870057](https://doi.org/10.1145/1869983.1870057)

Full text:  [Pdf](#)


Often software for wireless sensor networks (WSNs) is developed using a specific event based operating system (OS) such as TinyOS. However, this requires steep learning curve for the new developers. Other operating systems for embedded devices have limited ... [expand](#)

[TinyOS meets wireless mesh networks](#)

Muhammad Hamad Alizai, Bernhard Kirchen, Jó Ágila Bitsch Link, Hanno Wirtz, Klaus Wehrle

Pages: 429-430

doi> [10.1145/1869983.1870058](https://doi.org/10.1145/1869983.1870058)

Full text:  [Pdf](#)


We present TinyWifi, a nesC code base extending TinyOS to support Linux powered network nodes. It enables developers to build arbitrary TinyOS applications and protocols and execute them directly on Linux by compiling for the new TinyWifi platform. Using ... [expand](#)

[Towards a life without link estimation](#)

Olaf Landsiedel, Mikael Johansson

Pages: 431-432

doi> [10.1145/1869983.1870059](https://doi.org/10.1145/1869983.1870059)

Full text:  [Pdf](#)


Link estimation provides a long-term estimate of the quality of a link based on its past history. However, this need for a history of past packets is also its main drawback: First, most link estimators only adapt slowly to changing link conditions, being ... [expand](#)

[SantArray: passive element array antenna for wireless sensor networks](#)

Karlis Prieditis, Ivars Drikis, Leo Selavo

Pages: 433-434

doi> [10.1145/1869983.1870060](https://doi.org/10.1145/1869983.1870060)

Full text:  [Pdf](#)


Energy saving and reliable long distance wireless communication are essential problems in wireless sensor networks (WSN) because of limited energy availability in the wireless sensors and application-specific requirements for faster, farther, and more ... [expand](#)

[Balancing visibility and resource consumption for long-term monitoring of sensornets](#)

Junyan Ma, Kay Römer

Pages: 435-436

doi> [10.1145/1869983.1870061](https://doi.org/10.1145/1869983.1870061)

Full text:  [Pdf](#)


Limited visibility of node states makes debugging deployed sensor networks very difficult. Higher visibility usually implies more resource consumption. As sensor networks are resource-constrained and need to operate unattended for long periods, a balance ... [expand](#)

[Data-enriched simulation of data management applications for wireless sensor networks](#)

Liu Yu, Jianzhong Li, Hong Gao, Shengfei Shi

Pages: 437-438

doi> [10.1145/1869983.1870062](https://doi.org/10.1145/1869983.1870062)

Full text:  [Pdf](#)


Simulation is an essential means for evaluating WSN applications. As many WSN applications embrace in-network data processing functionalities, more sophisticated simulation tools with data-enriched test case scenarios, such as extensive environment ... [expand](#)

[Network-wide energy profiling of CTP](#)

Marcelo Martins, Rodrigo Fonseca, Thomas Schmid, Prabal Dutta

Pages: 439-440

doi> [10.1145/1869983.1870063](https://doi.org/10.1145/1869983.1870063)

Full text:  [Pdf](#)


We present our experiences evaluating the power-performance tradeoffs of a sensornet network protocol on a power-aware testbed. We characterize the power draw of the entire network while running the Collection Tree Protocol (CTP), as a function of low-power-listening ... [expand](#)

[When ultra low power meets high performance: the WiseMAC high availability protocol](#)

Jérôme Rousselot, Jean-Dominique Decotignie

Pages: 441-442

doi> [10.1145/1869983.1870064](https://doi.org/10.1145/1869983.1870064)

Full text:  [Pdf](#)

This poster presents an innovative dual-mode medium access control scheme that combines the ultra low power MAC protocol WiseMAC with the wireless sensor networking standard IEEE 802.15.4. Each network device can independently and autonomously switch ... [expand](#)

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