

UCLA

Posters

Title

SYS 0: CENS Systems Research Overview

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Systems Research Overview

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Introduction

Deployments to Instruments

- Addressing challenges of field deployed systems
- Initial challenges: adaptive self configuration in communication sensing
 - Difficult environment, challenging connectivity issues, heterogeneity
- Future challenges: Multi-modal, multi-scale observing instruments
 - Architecture of observing systems, supporting rapid deployment and reconfiguration, and supporting multiple and mobile users

FROM...

Spatial redundancy
Planned long-term deployments
Self-configuring autonomy
Post-deployment analysis
Pre-calibration
Trusted communications
One user

TO ALSO INCLUDE...

Actuated placement
Rapid short-lived deployments
Interactive exploration
Live analysis feedback
Integrity monitoring
Safety and robustness
Multiple users

Selected Research in Posters

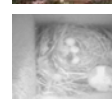
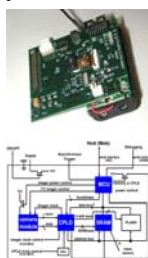
Distributed Acoustic Arrays

- Integrates CENS research in signal processing, localization, time synchronization, and hardware and software platforms
- Nodes self-localize (X, Y, Z, Θ) in difficult 3D terrains with foliage, background noise, adverse weather
- High accuracy acoustic source localization



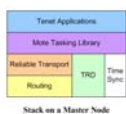
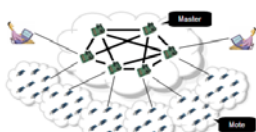
Distributed Image Sensing

- Vision is a rich sensing modality
 - Context, shape, motion, presence, color...
- Novel Cyclops platform for large-scale networks of low-power low-resolution cameras
 - Benefits of diverse perspectives and proximity
- Energy optimized algorithms, coordinated actuation, dynamic reconfiguration
- Deployment of vision network at James Reserve



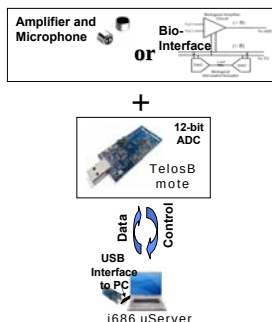
Programming and System Architecture

Architecting for Manageability and Robustness



Stack on a Master Node

Programming High-data Rate Applications



Macroprogramming Distributed Applications



High-Integrity Design

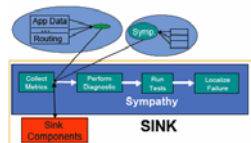
Sensor Networks in the Presence of Failures

software faults
resource ownership

node failures,
packet loss

calibration, drift,
outliers

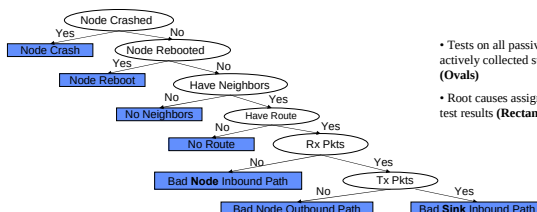
Platform & System Integrity (debugger, static checkers, run-time fault isolation)



Measurement & Data Integrity (detection, remediation, recalibration)



Network Integrity (network fault isolation)



- Tests on all passively and actively collected statistics (Ovals)
- Root causes assigned based on test results (Rectangles)