



The Center for Information and Systems Engineering

CISE

SN Research Update

Fusion and Sensor Management for Automatic Target Exploitation

- David Castanon, Principal Investigator; Clement Karl, Co- Principal Investigator
- Multi-University Research Initiative (MURI); Ohio State is lead
- Next generation ATE systems must:
 - Actively manage sensor resources
 - Aggregate sensed information across multiple platforms and diverse signaling modalities
 - Adapt to increasingly agile adversaries and operating conditions
- Key research objective: **Provide the systematic theory, analysis, and design tools to develop end-to-end ATE Systems, to include:**
 - Techniques for optimal, robust information fusion in uncertain environments
 - Consistent fusion of disparate sources
 - Robust, decision-directed imaging and reconstruction methods that can adapt to context and to changing inference objectives
 - Processing of raw sensor data
 - Fusion from multiple sensors
 - Sensor management and control

Architecting Next Generation Video-Based Sensor Networks

- Prakash Ishwar, Principal Investigator
- Vision: Architect the next generation video-based sensor networks capable of real-time “super resolution imaging” using a large distributed network of poor-resolution wireless cameras
 - Information-scaling laws
 - Bit-conservation principles
 - Robust Coding
- Introduce new paradigms for distributed sampling and video coding that lie in the frontier of signal processing and network information theory
- Influence the architecture and evolution of large-scale wireless sensor networks and advance the state-of-the-art
- Applications requiring active monitoring of telemetry data such as surveillance, homeland security, intelligent transportation, and environmental monitoring

Networked Sensing Systems for Urban Target Recognition

- Venkatesh Saligrama, Principal Investigator
- Future advances in sensor integration technology will make these sensor systems cheaper, smaller and capable of deployment in large numbers
- Extensions to missions in urban scenarios involving large numbers of sensors pose formidable technical challenges:
 - Cluttered and obstructed environments
 - Signal blocking by buildings
 - Interfering signals
 - Overall density of vehicles, personnel, and manmade structures
- Key research objective: To generate robust, persistent target recognition in dynamic, uncertain urban environments via
 - Distributed information fusion
 - Information dissemination over ad hoc networks

Distributed Wireless Sensor Networks for Long-Term Deployment

- Yannis Paschalidis, Principal Investigator; Christos Cassandras, Co- Principal Investigator
- Key research objective: **Optimize and Control Sensor Networks to achieve long-term large-scale stealthy deployments for national security surveillance missions.**
- Addressing fundamental issues in Distributed Wireless Sensor Networks:
 - Novel optimization-based control approaches
 - Localization and target tracking capabilities
 - Strategies for coverage control
- Collaboration with Los Alamos National Laboratory (DOE lab).