Integrated Fusion, Performance Prediction, and Sensor Management for Automatic Target Exploitation

Summary

MURI Annual Review Meeting

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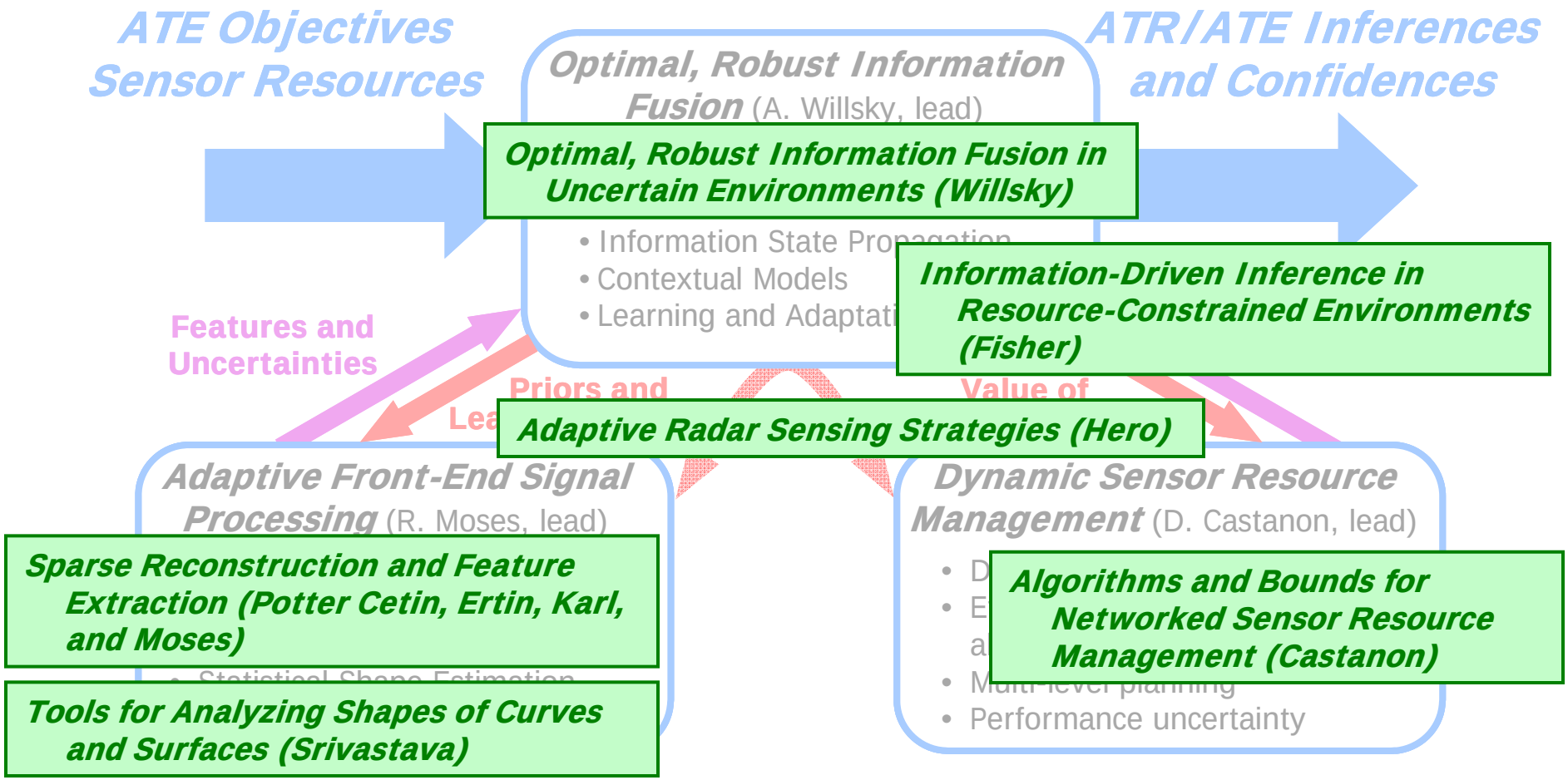
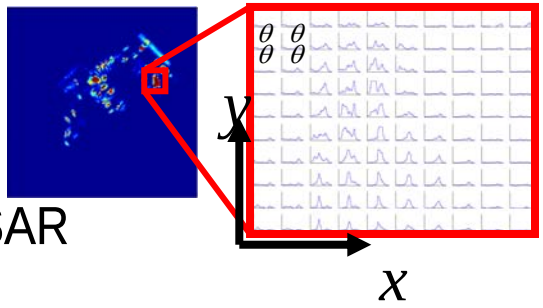
Today's Presentations

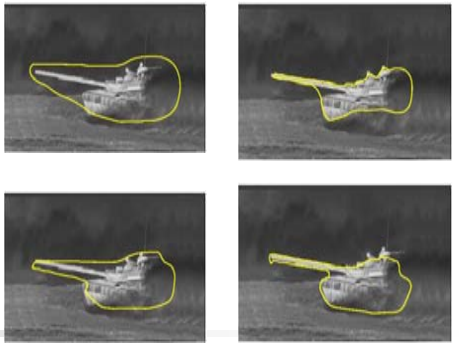


Year 1 Advances I

- Regularized Tomography for Sparse reconstruction
  - Sparse apertures
  - Sparse 'objects' (targets or scenes)
  - Anisotropy characterization
  - Reconstruction for wide angle and circular SAR
  - Decision-directed reconstruction

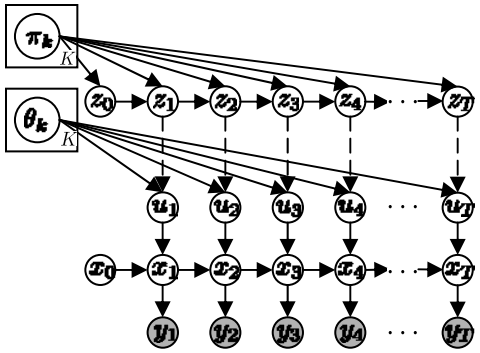


- Shape Statistics for Curves and Surfaces
  - Shape Analysis
  - Bayesian Classification from Shapes

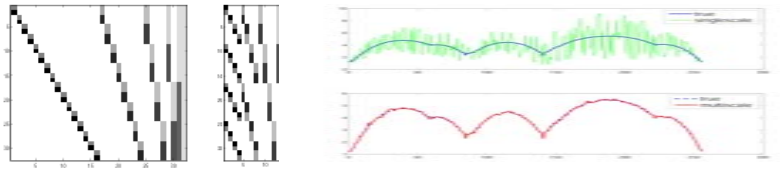


Year 1 Advances II

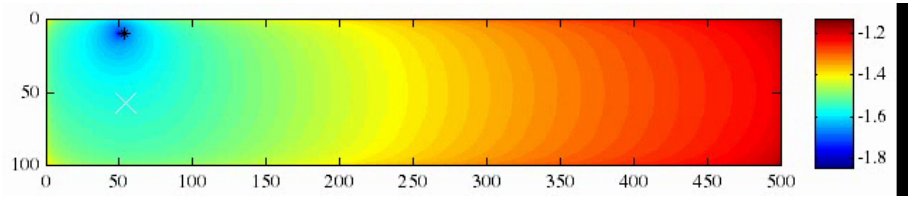
- Scalable, flexible inference
  - Low-rank uncertainty estimation in graphical models
  - GM-based Tracking
  - Learning Model structure



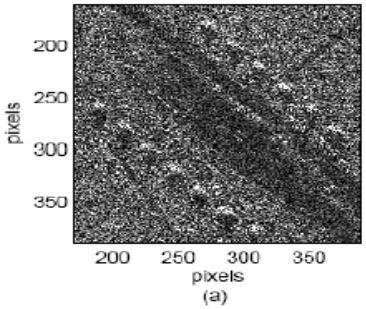
- Distributed Estimation and Management
  - MIMO radar fusion with calibration errors
  - Distributed estimation with unreliable communications



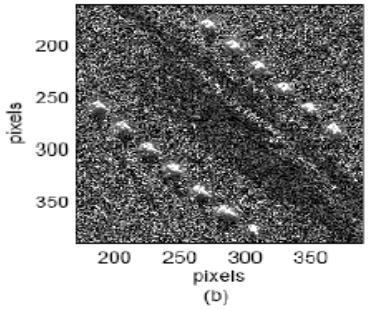
Year 1 Advances III



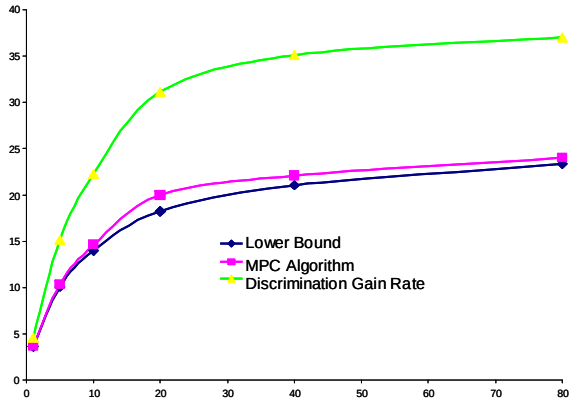
- Sensor Management:
  - Adaptive data fusion
  - Adaptive waveform scheduling
  - Real-time SM algorithms and performance bounds



Wide area SAR acquisition



Optimal two step SAR acquisition



What's next – Signal Processing

- Regularized linear inversion
  - Automatic hyperparameter choice
  - Errors in sensing model parameters
  - Learn scattering functions from data
  - Design dictionary from target hypotheses
  - Anisotropic penalties in 3D
- Radar sensor degrees of freedom for unambiguous signal representation
- Regularized linear inversion for nonlinear regression problems
  - Unifying parametric and nonparametric processing techniques
- Shape estimation features for ATE
  - One-Shot Learning of Shapes
  - Graphical Models for Studying Configurations of Shapes

What's next – Information Fusion

- More on learning behavioral models and multi-target tracking
- More on learning tractable models for fusion and discrimination
  - E.g., introducing hidden variables to capture hidden causes
- More on informing resource management
  - Which data should be gathered and fused
  - How to do this efficiently
- Integrated learning of embedded graphical models
  - Joint clustering/classification and manifold learning
  - Distributed topological inference

What's next – Sensor Management

- More on scalable algorithms
- More on performance bounds
- Integration of graphical fusion models and performance estimates into algorithms
- Algorithms for unknown target classes
- Integrated SM and front end processing for imaging
  - SM driven by info theoretic imaging criteria
  - Incorporating inverse scattering models
  - Image priors e.g., sparsity, smoothness, shape

Questions or Comments?