Threshold Region Performance Prediction for Adaptive Matched Field Localization

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The MFP Localization Problem

Shallow-Water Multipath Propagation:

- **Goal:** quantify what SNR's are required for acceptable MFP localization
- **Approach:** accurate MFP mean-squared error prediction that accounts for
  - Ambiguities in MFP output
  - Signal model mismatch
  - Colored noise (discrete interferers)
  - Adaptive training effects
- **Challenge:** previously no way to achieve above for specific adaptive beamformers

Matched field processing (MFP) models acoustic multipath propagation to enable 3-D source localization

MFP Beampattern for Horizontal Array, Endfire
( bibliography)

MFP Beampattern for Vertical Array
(good aperture for MFP)

manageable ambiguities

MFP Beampattern for Horizontal Array, Endfire
(poor aperture for MFP)

severe ambiguities
Mean-Squared Error (MSE) Performance Prediction

- Boundary for acceptable MFP performance often occurs in threshold region ⇒ must predict threshold region accurately

- How?
  - Beamformers: Capon-MVDR (adaptive) CBF (non-adaptive)
  - Method of Interval Errors
  - Pairwise Error Probabilities
  - Accurate MFP Threshold Region Performance Prediction

Typical Mean-Squared Error (MSE) Performance vs. SNR

- No Information Region
- Threshold Region
- Asymptotic Region
- Driven by Global Errors
- Driven by Local Errors
- Local Error Bounds
- Too optimistic
- More accurate

MFP Range-Depth Beampattern

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