



# Problem Formulation

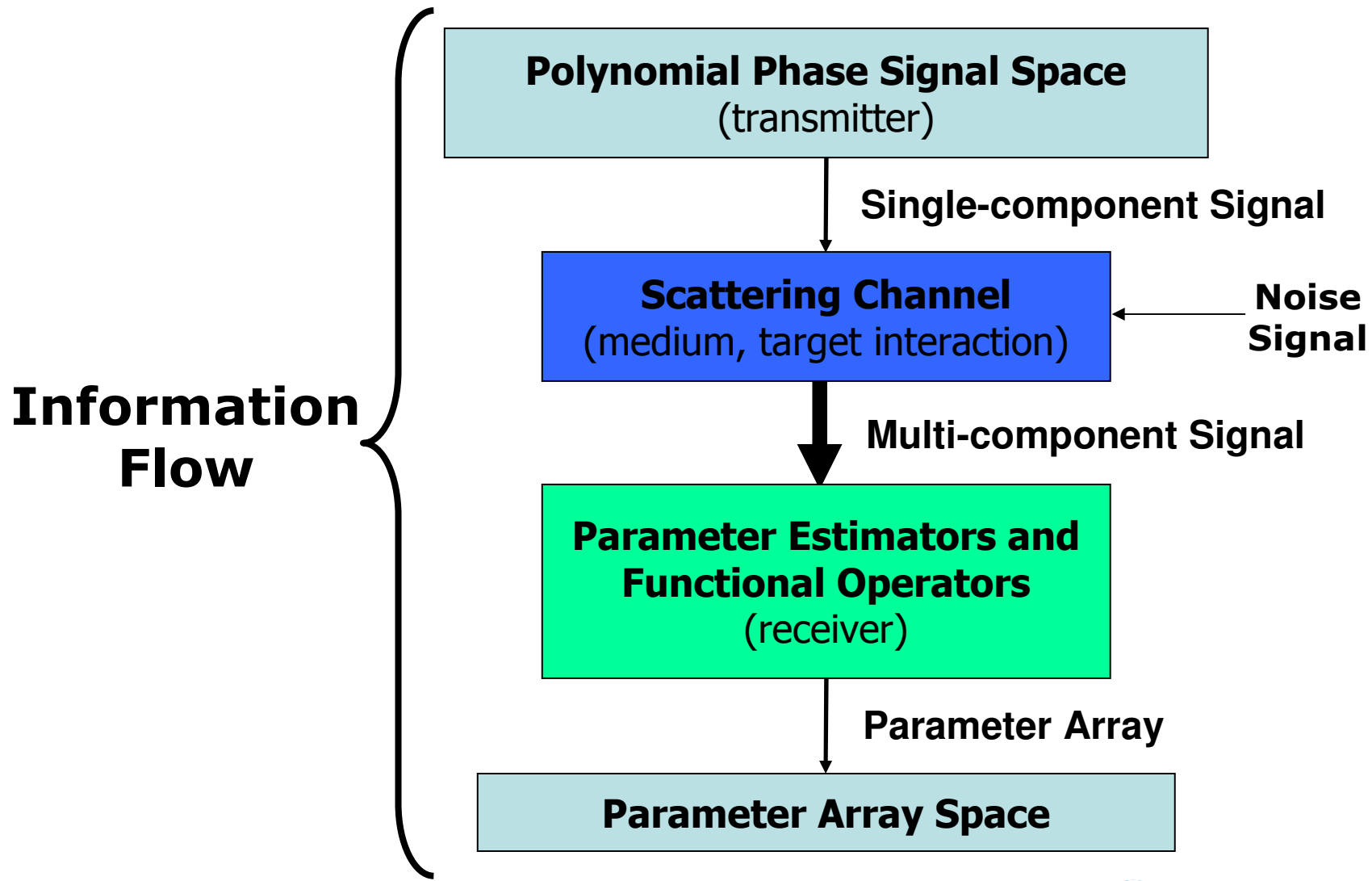
- How to characterize parameter estimators for multicomponent polynomial phase signals used as active sensing waveforms to study information processing aspects associated with the spatio-temporal dynamics of finite dimensional systems.

$$x[n] = \sum_{n=0}^{K-1} A_K e^{j \sum_{m=0}^{M-1} \alpha_{k,m} n^m}, \quad n \in \mathbf{Z}_N$$

- This is a discrete time formulation but we work with continuous signals too.



# Methodology (Operator Algebras)



# Application Tools

C



Parallel implementation



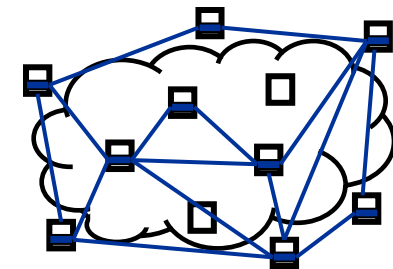
MPI Cluster (Komolongma)



Distributed implementation



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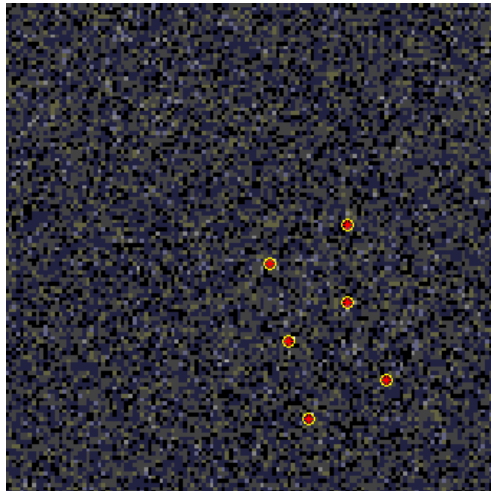


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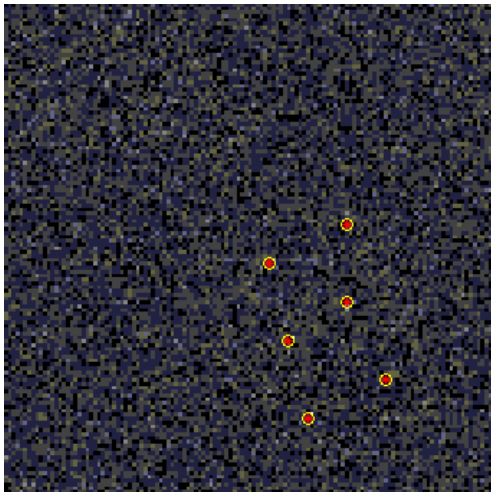
# RESEARCH RESULTS

UNSUCCESSFUL EST.

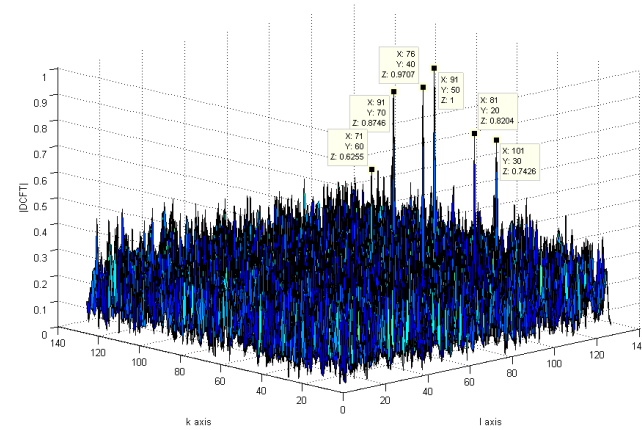


6-component chirp signal estimation  
(3 dB SNR)

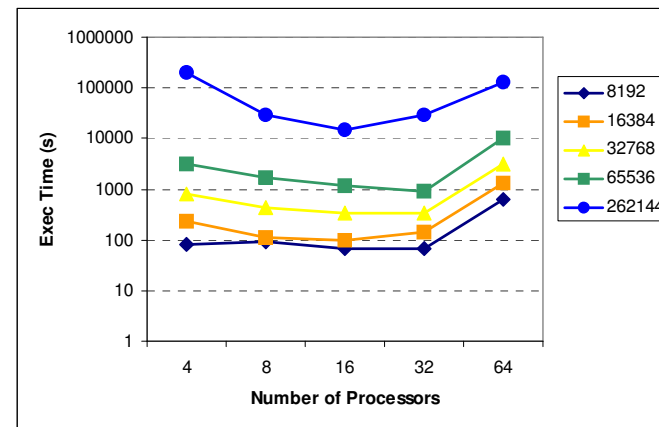
SUCCESSFUL EST.



6-component chirp signal estimation  
(6 dB SNR)



DCFT estimator output  
3-component chirp signal



Comparison for DCFT Multi-processor

# Publications

- [1] D. Rodriguez, Y. Yunes, C. A. Aceros-Moreno, J. Jimenez, and Y. Mendez, “Beamforming characterization of acoustic signals in wireless sensor networks,” Submitted to IEEE Global Telecommunications Conference, Nov 2007.
- [2] C. A. Aceros-Moreno, D. Rodriguez, and N. Santiago, “Performance measures for parameter extraction of sensor array point targets using operator group algebra and signal transforms,” Submitted to Supercomputing 2007 Conference, Nov 2007.
- [3] D. Rodriguez, C. A. Aceros-Moreno, and A. B. Ramirez, “Operator group algebra methods in chirp Fourier implementations for multi-component radar signal analysis,” Submitted to IEEE Transactions on Aerospace and Electronic Systems.
- [4] D. Rodriguez, C. A. Aceros-Moreno, and H. Parsiani, “A theoretical formulation for subsurface radar waveform design using harmonic analysis on the Heisenberg group,” Submitted to Military Communications Conference 2007, Oct 2007.



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