A Unified Distributed Spatiotemporal Signal Processing Framework for Structural Health Monitoring

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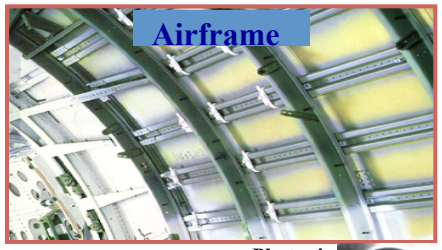

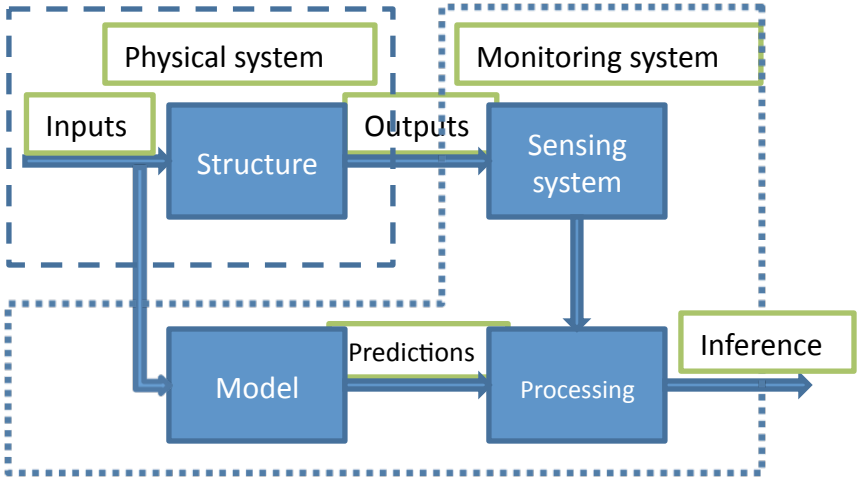

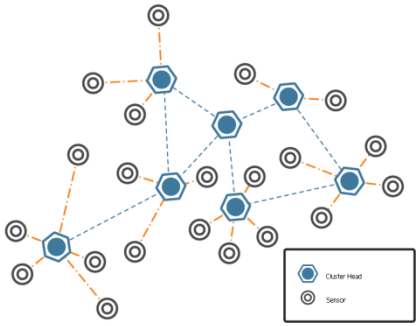

Motivation:

• This research is motivated by the current inability to accurately detect, diagnose or prognose structural anomalies/damages at an early stage.
•The critical gap from prior domain knowledge of physical systems and large amount/diverse sensor observations to the improved accuracy and confidence in health state assessment should be addressed.

Objective:

To develop a collaborative signal processing framework by coupling sensing data with physics-based and data-driven models to detect and diagnose degradation and damages.

Technical Approach:

• Model identification based on the domain information and Markov random field modeling;
•Distributed and localized inference by taking advantage of spatiotemporal information represented by the model;
•Design of a cyber-physical system for structural health monitoring through optimizing the sensing system, including what/where/how to sense.