

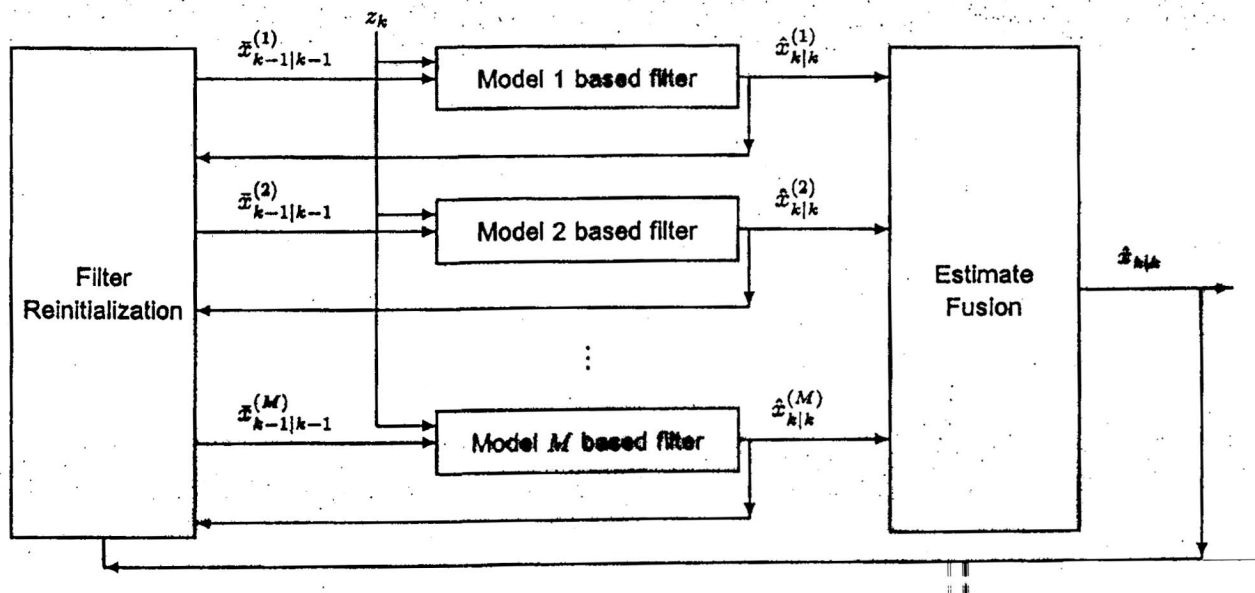
Summary

- Hybrid estimation deals with process/parameter estimation compounded by structural uncertainties
- Hybrid estimation techniques are powerful for many inference problems involving structural uncertainties
- MM estimation method is a powerful approach to hybrid estimation
- MM estimation method has four essential ingredients:
 - Model-set determination
 - Filter selection
 - Filter reinitialization
 - Estimate fusion
- MM estimation method has three generations:
 - First generation: fused output
 - Second generation: interacting mechanism
 - Third generation: variable structure
- Major Research Directions:
 - Model-set design
 - Development of better variable structures
 - Innovative applications

- Model-Set Design (All Generations)
- Better Variable Structures (Third Generation)
- Other Types of Interaction (Second Generation)
- Recursive Non-MMSE MM Estimators

“A good model is worth a thousand pieces of data.”

“Are multiple models worth many thousand pieces of data?”



Interacting Multiple Model (IMM) Based FDD Approach

- The Structure of IMM-Based FDD Approach

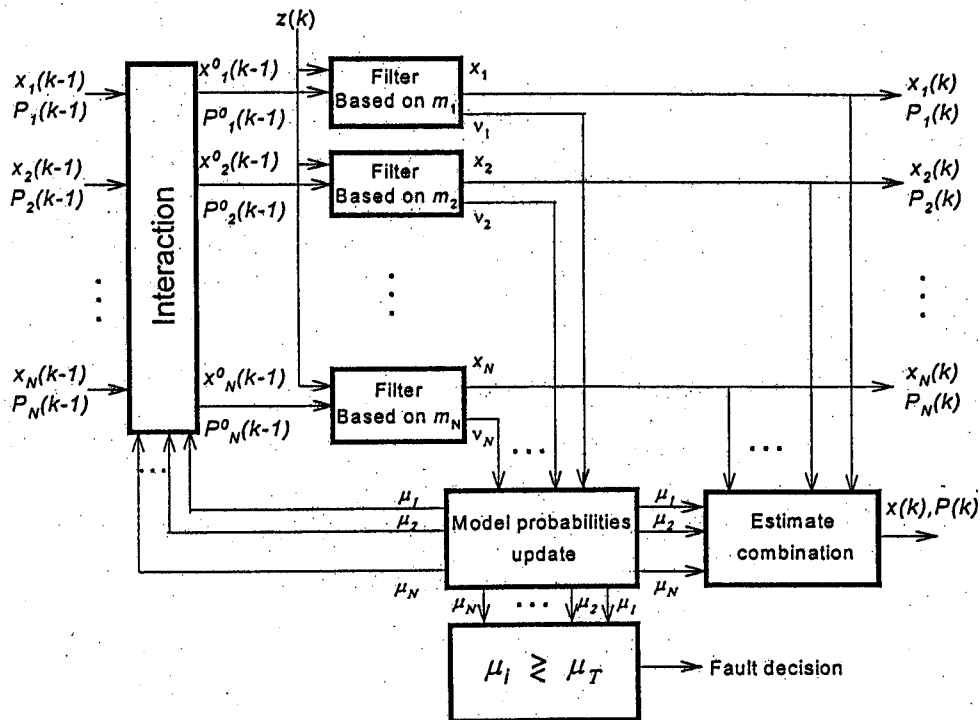


Fig. 1. Block diagram of the IMM-based FDD approach.

- Fault Detection and Diagnosis Logic

$$\mu_j(k+1) = \max_i \mu_i(k+1) \begin{cases} > \mu_T \Rightarrow H_j : \text{model } j \text{ fault} \\ < \mu_T \Rightarrow H_1 : \text{no fault} \end{cases}$$

- Algorithm Structure of IMM-Based FDD scheme
- Numerically Robust Implementation of MM Estimator Algorithms

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Books:

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4. Y. Bar-Shalom and X. R. Li. *Estimation and Tracking: Principles, Techniques, and Software*. Artech House, 1993. (Reprinted by YBS Publishing, 1998).
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