

Steps Required to Validate New POD Approaches

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Motivation

- Various software implementations of the same approach
 - Hit/miss
 - \hat{A} versus A
 - Kraft paper on comparison of software
- Conceptually different approaches
 - Recent example, “Directed Design of Experiments (DOE) for Determining Probability of Detection (POD) Capability of NDE Systems (DOEPOD), Generazio, QNDE, 2007

Issue

- The “bottom line” question
 - How to establish which one is “right”?
- A more subtle view
 - How to determine properties of the approaches, e.g. what kind of “filtering” is implied.

Some Perspectives of Meeker

- View a POD approach as a procedure
- Some procedures can be justified in terms of statistical theory
 - This can be straightforward when the procedure is simple enough that that basic mathematical statistics can be used as the basis for an analytical justification
 - Basis for 1823 lies in the large sample approximation of maximum likelihood estimators that say that such estimators have optimum properties, in large samples, *under the assumed model*

Some Perspectives of Meeker

- Other procedures are so complicated that the properties will have to be evaluated in a carefully conducted Monte Carlo simulation experiment
 - Assume a statistical model (ground truth)
 - Simulate data
 - Analyze with the procedure
 - Compare to ground truth
 - Common practice in statistics today, given current computational power

Some Perspectives of Meeker

- Any evaluation of a procedure based in Monte Carlo simulations should include data simulated under different models, which do and don't correspond to the assumptions of the procedure.
 - Flaw response depending monotonically on size with simple relationship
 - More complex situation
 - Non-monotonic
 - Saturation
 - Other complexities