

STATISTICAL APPROACH TO MODEL VALIDATION USING WAVELETS

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ABSTRACT

Model validation is a critical component in the simulation development process that ensures a model is truly representative of the system that it is meant to model. Although there are numerous validation techniques described in the literature, many of these techniques still require subjective analysis in order to assess validity, particularly when validating a dynamical system model. To reduce or eliminate this subjectivity, we propose a validation process that uses wavelets as part of a statistical test to accept or reject a model as valid. This validation process performs statistical inference in the time-frequency domain to take advantage of wavelet sparsity and decorrelation. The validation technique is illustrated using a simulation study and empirical data. This validation method will be used to aid the Air Force Research Laboratory's (AFRL) Integrated Vehicle and Energy Technology (INVENT) program, which seeks to develop a robust model-based design method for next generation aircraft.

Keywords: Validation, wavelets, thresholding, WANOVA