Uncertainty estimation of mechanical testing properties using sensitivity analysis and stochastic modelling

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Abstract: This paper is concerned with a method for uncertainty evaluation of mechanical properties in metal testing. This method uses a combined approach based on Monte Carlo simulationand Markov Chain (MCMC) as a computing procedure of different uncertainties of mechanical metallurgical parameters such as stress, and elongation. The MCMC is a stochasticmethod that computes the statistical properties of the considered states such as the probability distribution function (PDF) according to the initial state and the target distributionusing Metropolis-Hasting (MH) algorithm. Conventional approach is based on the Guide of Uncertainty Measurement (GUM), the uncertainty budget is established for the stress and elongation parameters respectively. A comparative study between the conventional procedure and the proposed method is given. This kind of approaches is applied for constructing accurate computing procedure of uncertainty measurement of mechanical and metallurgical parameters.

Keywords : Markov Chain Monte Carlo (MCMC) Metropolis-Hasting (MH) algorithm Mechanical and metallurgical testing Stress, elongation and hardness measurement Guide of Uncertainty Measurement (GUM)