

Beyond the GUM: variance-based sensitivity analysis in metrology

Lira, I. (2016). Beyond the GUM: variance-based sensitivity analysis in metrology. *Measurement Science and Technology*, 27(7), 075006. <10.1088/0957-0233/27/7/075006> Accessed 29 Nov 2020.

Abstract

Variance-based sensitivity analysis is a well established tool for evaluating the contribution of the uncertainties in the inputs to the uncertainty in the output of a general mathematical model. While the literature on this subject is quite extensive, it has not found widespread use in metrological applications. In this article we present a succinct review of the fundamentals of sensitivity analysis, in a form that should be useful to most people familiarized with the Guide to the Expression of Uncertainty in Measurement (GUM). Through two examples, it is shown that in linear measurement models, no new knowledge is gained by using sensitivity analysis that is not already available after the terms in the so-called 'law of propagation of uncertainties' have been computed. However, if the model behaves non-linearly in the neighbourhood of the best estimates of the input quantities—and if these quantities are assumed to be statistically independent—sensitivity analysis is definitely advantageous for gaining insight into how they can be ranked according to their importance in establishing the uncertainty of the measurand.