How to Gauge a Combination of Uncertainties of Different Type: General Foundations

Ingo Neumann[1], Vladik Kreinovich[2], and Thach Ngoc Nguyen[3]

[1]Geodaetisches Institut
Leibniz Universitaet Hannover
Nienburger Strasse 1
30167 Hannover, Germany
neumann@gih.uni-hannover.de
[2]Department of Computer Science
University of Texas at El Paso
500 W. University
El Paso, TX 79968, USA
vladik@utep.edu
[3]Banking University of Ho Chi Minh City
56 Hoang Dieu 2, Quan Thu Duc, Thu Duc
Ho Chi Minh City, Vietnam, Thachnn@buh.edu.vn

In many practical situations, for some components of the uncertainty (e.g., of the measurement error) we know the corresponding probability distribution, while for other components, we know only upper bound on the corresponding values. To decide which of the algorithms or techniques leads to less uncertainty, we need to be able to gauge the combined uncertainty by a single numerical value – so that we can select the algorithm for which this values is the best. There exist several techniques for gauging the combination of interval and probabilistic uncertainty. In this paper, we consider the problem of gauging the combination of different types of uncertainty from the general fundamental viewpoint. As a result, we develop a general formula for such gauging – a formula whose particular cases include the currently used techniques.