

COMBINING INTERVAL AND PROBABILISTIC UNCERTAINTY IN ENGINEERING APPLICATIONS

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In many practical application, we process measurement results and expert estimates. Measurements and expert estimates are never absolutely accurate, their result are slightly different from the actual (unknown) values of the corresponding quantities. It is therefore desirable to analyze how this measurement and estimation inaccuracy affects the results of data processing.

There exist numerous methods for estimating the accuracy of the results of data processing under different models of measurement and estimation inaccuracies: probabilistic, interval, and fuzzy. To be useful in engineering applications, these methods should provide accurate estimate for the resulting uncertainty, should not take too much computation time, should be understandable to engineers, and should be sufficiently general to cover all kinds of uncertainty.

In this thesis, on several case studies, we show how we can achieve these four objectives. We show that we can get more accurate estimates by properly taking model inaccuracy into account. We show that we can speed up computations by processing different types of uncertainty differently. We show that we can make uncertainty-estimating algorithms more understandable by explaining the need for non-realistic Monte-Carlo simulations. We also analyze how general uncertainty-estimating algorithms can be.