On Structure of Uncertainties

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Abstract. As a conventional concept of uncertainty, we are familiar with the 'probability' of a phenomenon. Also we often discuss the 'uncertainty' of knowledge. Recently, Fuzzy Theory has brought a hidden uncertainty, 'fuzziness', to light. Reflections on these ideas lead to a fundamental question: What kinds of uncertainty are we aware of? Motivated by this question, this study aims to explore categories and modalities of uncertainty. For instance, we have found that:

(i)   'form' is a category of uncertainty;
(ii)   'inconsistency' is a modality of uncertainty;
(iii)   the inconsistency of form is one of the major uncertainties.

Through the classification of adjectives implying various uncertainties, we elucidate seven uncertainties (or nine if subcategories are counted) and identify three essential ones among them, such as the fuzziness of wording. Finally the structure of uncertainty will be shown. The obtained structure is verified by psychological experiments, while the validity of three essential uncertainties is examined by linguistic analysis.

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Short biography

After graduating from the Department of Physics, The University of Tokyo, Michio Sugeno worked at Mitsubishi Atomic Power Industry. Then, he served the Tokyo Institute of Technology as Research Associate, Associate Professor and Professor

from 1965 to 2000. After retiring from the Tokyo Institute of Technology, he worked as Laboratory Head at the Brain Science Institute, RIKEN from 2000 to 2005, and then, as Distinguished Visiting Professor at Doshisha University from 2005 to 2010. He is currently Emeritus Professor at the Tokyo Institute of Technology, Japan, and Emeritus Researcher at the European Centre for Soft Computing, Spain.

He was President of the Japan Society for Fuzzy Theory and Systems from 1991 to 1993, and also President of the International Fuzzy Systems Association from 1997 to 1999. He is the first recipient of the IEEE Pioneer Award in Fuzzy Systems with Zadeh in 2000. He also received the 2010 IEEE Frank Rosenblatt Award.