

WORLD AUTOMATION CONGRESS

Soft Computing Track

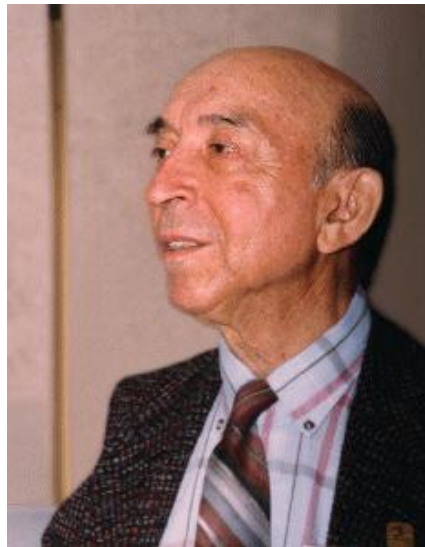
KEYNOTE Mon-1

Monday July 24, 2006

Chair: Matthias Reuter

Cutec Institut GmbH, Germany

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**From Search Engines to Question-Answering Systems—The
Problems of World Knowledge, Relevance, Deduction and
Precision**

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ABSTRACT

Existing search engines, with Google at the top, have many truly remarkable capabilities. Furthermore, constant progress is being made in improving their performance. But what is not widely recognized is that there is a basic capability which existing search engines do not have: deduction capability—the capability to synthesize an answer to a query by drawing on bodies of information which reside in various parts of the knowledge base. By definition, a question-answering system is a system, which has deduction capability. Can a search engine be upgraded to a question-answering system through the use of existing tools—tools that are based on bivalent logic and probability theory? A view, which is articulated in the following is that, the answer is: No.

There are three major obstacles: (a) world knowledge; (b) relevance; and (c) deduction. The problem with world knowledge is that in large measure it is perception-based and hence is intrinsically imprecise. Example: Usually it does not rain in San Francisco in midsummer. Perception-based information is not available to manipulation through the use of bivalent logic and probability theory.

The problem with relevance is that existing approaches to assessment of relevance attempt to deal with relevance in a statistical framework, with no consideration of semantics. The results leave much to be desired.

The problem with deduction is that in realistic settings the premises are generally imprecise, uncertain and partially true. In such settings, conventional methods of deduction do not work.

To deal with the problems of world knowledge, assessment of relevance and deduction, new tools are needed. The new tools, which are outlined in my lecture, are Precisiated Natural Language (PNL), Protoform Theory (PFT) and Generalized Theory of Uncertainty (GTU). The centerpiece of these tools is the concept of a generalized constraint. The concept of a generalized constraint is what makes us possible to deal effectively with information which is permanently imprecise, uncertain and partially true.

ABOUT THE SPEAKER:

Lotfi A. Zadeh is a Professor in the Graduate School, Computer Science Division, Department of EECS, University of California, Berkeley, USA. In addition, he is serving as the Director of BISC (Berkeley Initiative in Soft Computing).

Lotfi Zadeh is an alumnus of the University of Tehran, MIT and Columbia University. He held visiting appointments at the Institute for Advanced Study, Princeton, NJ; MIT;

IBM Research Laboratory, San Jose, CA; SRI International, Menlo Park, CA; and the Center for the Study of Language and Information, Stanford University. His earlier work was concerned in the main with systems analysis, decision analysis and information systems. His current research is focused on fuzzy logic, computing with words and soft computing, which is a coalition of fuzzy logic, neurocomputing, evolutionary computing, probabilistic computing and parts of machine learning.

Lotfi Zadeh is a Fellow of the IEEE, AAAS, ACM, AAAI, and IFSA. He is a member of the National Academy of Engineering and a Foreign Member of the Russian Academy of Natural Sciences and the Finnish Academy of Sciences. He is a recipient of the IEEE Education Medal, the IEEE Richard W. Hamming Medal, the IEEE Medal of Honor, the ASME Rufus Oldenburger Medal, the B. Bolzano Medal of the Czech Academy of Sciences, the Kampe de Feriet Medal, the AACC Richard E. Bellman Control Heritage Award, the Grigore Moisil Prize, the Honda Prize, the Okawa Prize, the AIM Information Science Award, the IEEE-SMC J. P. Wohl Career Achievement Award, the SOFT Scientific Contribution Memorial Award of the Japan Society for Fuzzy Theory, the IEEE Millennium Medal, the ACM 2001 Allen Newell Award, the Norbert Wiener Award of the Systems, Man and Cybernetics Society, Civitate Honoris Causa by Budapest Tech (BT) Polytechnical Institution, Budapest, Hungary, the V. Kaufmann Prize, International Association for Fuzzy-Set Management and Economy (SIGEF), other awards and twenty-three honorary doctorates. He has published extensively on a wide variety of subjects relating to the conception, design and analysis of information/intelligent systems, and is serving on the editorial boards of over fifty journals.