Visit to Binghamton University

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INVESTICE DO ROZVOJE VZDĚLÁVÁNÍ

Basic Information

- institution: Department of Systems Science and Industrial Engineering, Binghamton University — SUNY
- location: Vestal, New York, USA
- date: July 14th - October 6th, 2011
- guarantee: prof. George J. Klir

BU – SUNY

SUNY (State University of New York)

- system of public institutions of higher education in the State of New York, USA

BU (Binghamton University)

- one of the university centers in the SUNY system
- established in 1946, located in Town of Vestal
- classified by Carnegie Foundation as RU/H (Research Universities with high research activity)
- undergraduate students: 11,706
- graduate students: 3,007
- average SAT score: 1,299
- average ACT score: 29
- international studnets: 10%

Binghamton Library

- three parts: Bartle Library, Science Library, a University Downtown Center Library
- Binghamton library:
  - 2,409,043 volumes, 350,000 volumes in library of infrequently used books in Conklin
  - 93,414 papers
  - 1,869,980 mikrofilms
  - 118,948 music records
  - 120,959 maps
  - 234 elektronic databases
- many services: for instance, ILL (Interlibrary Loan)

Prof. George J. Klir

- distinguished professor emeritus at Systems Science and Industrial Engineering Department
- current research interests:
  - intelligent systems
  - generalized information theory
  - fuzzy set theory and fuzzy logic
  - theory of generalized measures
- author of over 300 articles, 16 books
- editor of the International Journal of General Systems since 1974 and the International Book Series on Systems Science and Systems Engineering since 1985
- president of SGSR (1981-82), IFSR (1980-84), NAFIPS (1988-1991) and IFSA (1993-1995)
- five honorary doctoral degrees, the Gold Medal of Bernard Bolzano, the Lotfi A. Zadeh Best Paper Award, the Kaufmann's Gold Medal, the SUNY Chancellor's Award for Excellence in Research and the IFSA Award for Outstanding Achievement

The main topic

Fuzzy relational equations

- let X, Y and Z be (ordinary) sets, $\langle \mathbf{L}_1, \mathbf{L}_2, \mathbf{L}_3, \Box \rangle$ be an aggregation structure, where $\mathbf{L}_i = \langle L_i, \leq_i \rangle$ ($i = 1, 2, 3$) are complete lattices, $R \in L_1^{X \times Y}$, $S \in L_2^{Y \times Z}$, $T \in L_3^{X \times Z}$ be fuzzy relations, and $\boxdot : L^{X \times Y} \times L^{Y \times Z} \to L^{X \times Z}$ be a composition operation defined by

$$(R \boxdot S)(x, z) = \bigvee_{3\, y \in Y} (R(x, y) \,\Box\, S(y, z))$$

  for all $R \in L_1^{X \times Y}$, $S \in L_2^{Y \times Z}$
- expression

$$R \boxdot S = T,$$

  where one of the fuzzy relations R, S, T is unknown, is called *fuzzy relational equation*

The main topic

Fuzzy relational equations

- for special case, where $\mathbf{L}_1 = \langle L, \leq \rangle$, $\mathbf{L}_2 = \langle L, \leq \rangle$, $\mathbf{L}_3 = \langle L, \leq \rangle$, $\square$ be $\otimes$, we get well-known sup-t-norm fuzzy relational equation

$$R \circ S = T$$

- set of all solutions of $R \circ S = T$ forms **complete convex join-semilattice**

computation of the greatest solution is easy
computation of all minimal solution is not so easy

- we focused on:
  1. methodology of resolution of fuzzy relational equations
  2. problem of finding all minimal solutions of constrained fuzzy relational equations

Results

- E. Bartl, G. J. Klir: Solution Methods of Fuzzy Relational Equations (working title)
- E. Bartl: Solution structure of constrained fuzzy relational equations