Round table Uncertainty modeling

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Introduction

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Panelists

- Giulianella Coletti (Italy)
- Janusz Kacprzyk (Poland)
- Boris Kovalerchuk (USA), moderator
- Marie-Jeanne Lesot (France)
- Germano Resconi (Italy)
- Roman Slowinski (Poland)
- Peter Wakker (Netherlands) absent

- The panelists presented their views on multiple UM domains, topics, and perspectives that include decision under uncertainty, axiomatic Kolmogorov's probability theory, De Finetti's subjective probability, fuzzy sets, and rough sets.
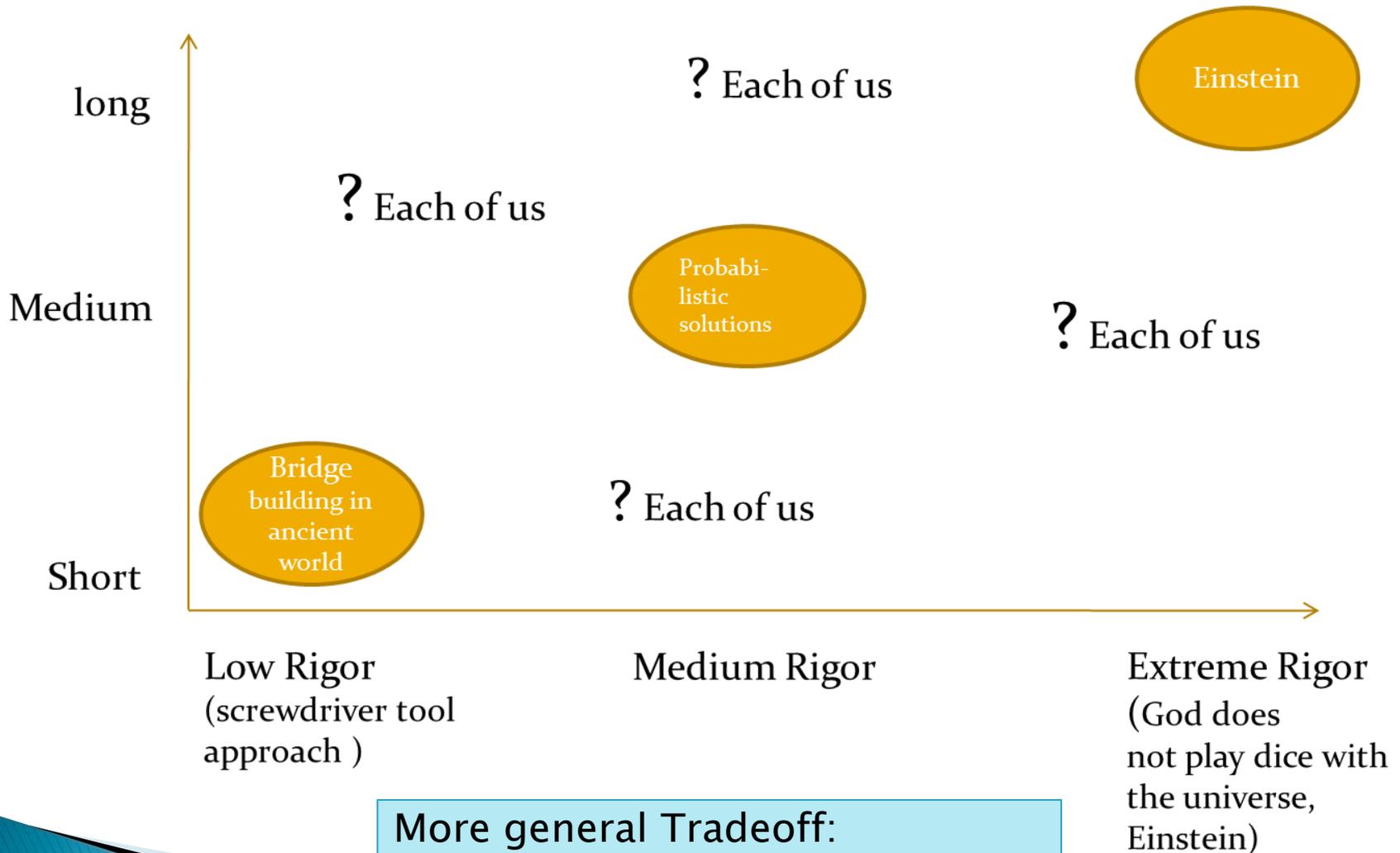
History and Motivation

- This round table continues the round tables that B. Bouchon-Meunier, B. Kovalerchuk, and V. Kreinovich organized recently at WCSC 2011 and WCCI 2012. Zadeh participated in the first one in SF.
- One of the specific flavors of the round table is the analysis of different approaches from the multiple perspectives keeping a neutral "denominational" stance.
- A unifying "denominational" perspective is the analysis of the scientific rigor of UM approaches.
- All of us are scientists and scientific rigor is our concern in all "denominations". We should try to do more than generating potentially useful heuristics and proving "technical" theorems that link two heuristics.
- The optimistic view is that scientific rigor is compatible with the high uncertainty and the combination can provide useful results, while
- The pessimistic view is popular too ("Impossibility principle" –Zadeh).
- At least some panelists accept the optimistic view.

Uncertainty Modeling Topics

- **Meta uncertainty issues**:
- Uncertainty and Scientific Rigor.
  - How would you comment on the statement that a perpetual debate of advantages and disadvantages of different UM techniques is in large part a <u>hidden discussion about the scientific rigor</u> (or lack of it) in the UM techniques.
  - How do modern UM approaches fit the idea of scientific rigor?
  - How far can we go from the established scientific rigor concepts in UM techniques? (Einstein: "God does not play dice.").
  - What are the criteria of scientific rigor for dealing with the uncertainty?
  - Would you accept the "engineering" approach that rigor is not important as far as something useful is produced? Is this a main stream of paper review process?

- **Uncertainty concepts**:
  - Nature of uncertainty (numerical/symbolic, objective/subjective...)
  - Causes of uncertainty (random events, incompleteness, system complexity, natural language...)
  - How is uncertainty meant in various areas? How and to what extent do we respond to the needs?
  - Detection of uncertain events (weak signals, risk factors, machine learning, data mining...)
  - Tools to manage uncertainty (entropy, statistics, probabilities, fuzzy sets, possibilities, rough sets, modal logics, granular computing, ...)

Tradeoff: Scientific Rigor goals vs. Time to get a solution

long — ? Each of us — Einstein

? Each of us

Medium — Probabi-listic solutions — ? Each of us

Bridge building in ancient world — ? Each of us

Short

Low Rigor (screwdriver tool approach)

Medium Rigor

Extreme Rigor (God does not play dice with the universe, Einstein)

More general Tradeoff:
Rigor, Time and Task importance

Talks

- Giulianella Coletti:
  - De Finetti's heritage: a unifying tool for handling uncertainty due to different causes.
- Janush Kacprzyk:
  - How is uncertainty meant in various areas? How and to what extent do we respond to the needs? Uncertainty and application issues.
- Marie-Jeanne Lesot:
  - Relations between uncertainty and information quality.
- Boris Kovalerchuk:
  - Uncertainty in Computing with Words (CWW), Linguistic Context Spaces (LCS), its analogy to the Kolmogorov's probability space, and meta-uncertainty issues in uncertainty modeling.
- Germano Resconi:
  - Agent-based Uncertainty Theory (AUT), active sets, and irrational agents in relation with uncertainty modeling.
- Roman Slowinski :
  - Joint consideration of vagueness and coarseness through a combination of fuzzy and rough sets, and rough set approach to decision under uncertainty, how rough sets can be combined with the uncertainty considered by economists.