Challenges to Worldwide Acceptance of Fuzzy Sets and Systems (panel presentation)

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1. Panel Topic: Reminder

- 2015 is the 50th anniversary of Lotfi Zadeh’s seminal paper on fuzzy sets.
- Fuzzy sets and systems seems well and thriving within the fuzzy community.
- However, fuzzy sets are still met with great hostility outside of this community.
- This panel will address the questions of:
  - why this is so and
  - what can be done to overcome this hostility.
2. Are Fuzzy Techniques Too Subjective to Be Reliable?

- The usual way to determine a membership function is to ask an expert to draw it.
- Are we confident enough to fly in a plane whose control is based on this drawing?
- Especially if we take into account that another expert would have drawn it differently?
- There are many techniques for checking stability etc. of the resulting control.
- However, these techniques are rarely used in papers proposing applications of fuzzy control.
3. Why Are Some Fuzzy Papers Still Using Zadeh’s Authority as a Main Justification?

- When Lotfi Zadeh developed his ideas 50 years ago, mostly it was his genius intuition.
- These ideas were raw, not yet applied, and Zadeh is not a professional mathematician.
- However, now we have a lot of mathematical and empirical justification for these techniques; so:
  - when some papers still use his 1965 paper as the only argument for using these techniques
  - this is not very convincing for other people.
- Fuzzy ideas are often described in terms which are closer to religion than to science.
- For example, resisting researchers are shamed instead of being convinced.
4. Aren’t We Ourselves Sometimes Too Hostile to Other Techniques (Often Unjustifiably So)?

- Fuzzy techniques are often promoted by people who are:
  - ignorant of other techniques, but
  - who nevertheless make outrageous false critical claims about these techniques.

- There are claims that:
  - probability theory is wrong,
  - control theory is not able to do this or that, etc.
5. To Be Practically Useful, Should Not We Go Beyond Our Focus on Formalizing Imprecise Expert Knowledge?

- The main objective of fuzzy techniques is to utilize expert knowledge.
- However, one can go only so far by simply describing expert knowledge.
- We need to improve on this.
- And it is often not clear how to combine:
  - the fuzzy-based approximate model
  - with techniques of optimal control and other improving techniques.
6. **Summary: Challenges to Acceptance of Fuzzy Techniques**

- **What is proposed:** formalizing expert knowledge, but should not we go beyond?

- **Why it is proposed:**
  - because other methods cannot do it (this is often a false statement caused by ignorance) and
  - because Zadeh said so (even less convincing).

- **How is it proposed that we do it:** in a very subjective way, which is not very convincing.

- **How to overcome these challenges:** most of these challenges are problems:
  - not of fuzzy techniques themselves,
  - but rather of the way how these techniques are packaged and presented.