What is the Role of Context (panel presentation)

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1. Panel Topic: Reminder

- In every practical problem, there is context, there are specific constraints.
- If we simply apply generic techniques:
  - then we, in effect, *ignore the context*,
  - as a result, we get lousy sub-optimal not-very-good solutions.
- On the other hand, if we *use all the context:*
  - the resulting solution is perfect for this application,
  - but useless if situations changed even a little bit.
- The problem is that there are no good recommendations on how much context to use, this more of an art.
- It is time to transform it into science, to develop techniques that help decide how much context to use.

2. What Shall We Do While Theory Is Being Developed

- It would be nice to have theoretical recommendations for using context.
- But what shall we do while they are being developed?
- The ultimate goal of fuzzy – and Computer Science in general – is to solve problems, so:
  - if the user is happy with a generic solution, great;
  - if the user is unhappy since some constraints are not satisfied, let us add them and re-solve.
- This is how we solve optimization problem:
  - we first just find the optimum,
  - and if it turns out to be non-physical, then we add constraints.
- Sounds simple, so why don't we do it?

3. First Reason: Solution Looking for a Problem

- Our models are approximate. If we add one more parameter, we get a more adequate description.
- We have seen 2nd order, intuitionistic 2nd order, 3rd order, dozens of generalizations. Some work well.
- However, some generalizations are too subtle for current applications:
  - we spend more time computing, but
  - we do not improve the quality of, e.g., control.
- Alas, there are many papers like that:
  - there is a successful application of $[0, 1]$-based fuzzy,
  - but 3rd order is more adequate,
  - so we used 3rd order in this application,
  - results are not better, but we hope they will be some day.

4. Second Reason: We Are in Academe

- Most research in academe is done by PhD students.
- A student is afraid that a solution to a problem will be too simple, not enough for a PhD.
- So useless complexities are added.
- My experience: there is no need to *add* complexities.
- Simple methods rarely work, complications appear naturally, there is no need to invent them.
- Just take a non-trivial problem, solve it, and there is usually enough ingenuity for a PhD.
- Sometimes, the problem turns out to be too hard.
- So, it is good to have several similar problems; one of them will be solvable.
- Even if we do not get a *complete* solution, a *progress* is good enough for a PhD and for a publication.

5. Let Us Go Back to Solving Problems

- In 1965, Lotfi Zadeh started with a real-life problem:
  - some expert knowledge is formulated in imprecise ("fuzzy") natural-language terms like "small";
  - how can we incorporate this knowledge into, e.g., a control system?
- There are many important real-life problems that are waiting for our solution.
- Where can we get these problems? Engineers, scientists have them all the time, just ask them.
- We solve these problems, we are happy, users are happy, fuzzy technique are recognized and praised.
- And if meanwhile theoreticians will help us decide how much context to use, great!