Probabilistic Interpretation of non-probabilistic approaches to uncertainty: interval and fuzzy

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Traditionally, uncertainty was handled exclusively by probabilistic techniques. However, since the 1960s many non-probabilistic uncertainty-related approaches have appeared, such as interval and fuzzy approaches. On the positive side, these new approaches have led to many successful practical applications. On the other hand, on the not so positive side, there has been a lot of controversy related to these new approaches, controversy related to the presumed inconsistency between these new approaches and the traditional probabilistic viewpoint. In this talk, we show that a significant part of this controversy is caused by misunderstandings – misunderstandings both on behalf of promoters of new approaches and on behalf of the researchers pursuing probabilistic approach.

To clarify this situation, we recall that one of the main objectives of science and engineering is to make decisions, and that decision theory research has shown that a consistent approach to uncertainty is equivalent to assuming a – possibly subjective – probability distribution. It turns out that, in line with this general result, both interval and fuzzy approaches can be naturally interpreted in probabilistic terms. With such an interpretation in mind, these new approaches are *not* – as some researchers still think – alternatives to probabilistic approach to uncertainty. What these approaches do is they provide new *algorithms* for solving several important classes of practical problems, algorithms which are, for these problems, more efficient than the use of traditional generic probabilistic techniques.

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