Proposal for a Tutorial at FUZZ-IEEE 2013

Type-2 Fuzzy Sets and Systems
With an Application to Perceptual Computing

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Abstract
The main aim of this tutorial is to educate a new generation of type-2 fuzzy systems researchers.

Audience
The main audience of this tutorial will be graduate students, young researchers, engineers or researchers who would like to start working in the area of type-2 fuzzy systems.

Outline
This tutorial will be in three parts (only three hours are needed for the combined three parts):

• **Part 1**: Will concentrate on the theoretical bases and definitions of type-2 fuzzy sets and systems while giving a complete coverage of interval type-2 fuzzy systems.

• **Part 2**: Will explain Perceptual Computing (which is an aid to people making subjective judgments, as in hierarchical and distributed decision making) and demonstrate how type-2 fuzzy sets are used to implement a Perceptual Computer. It will include two case studies.

• **Part 3**: Will direct the attendees to *IEEE Computational Intelligence Magazine* articles (from 2007 and 2012) for excellent surveys of a multitude of applications for type-2 as well as articles with more details about type-2 fuzzy sets and systems as well as its history. A reading program will be provided so that attendees can choose publications based on how deeply they want to go into type-2. Available type-2 software will be briefly described. Finally, attendees will be pointed in the direction of research about general type-2 fuzzy sets and systems, because this is the hot area for research these days.

This tutorial will not go into detailed mathematical derivations, but instead will demonstrate how type-2 results can be obtained by using type-1 mathematics. This will expedite an attendee’s entry into the type-2 field because they will learn how to use what they already know, but in new and exciting ways.
Jerry M. Mendel received the Ph.D. degree in electrical engineering from the Polytechnic Institute of Brooklyn, Brooklyn, NY. Currently he is Professor of Electrical Engineering and Systems Architecting Engineering at the University of Southern California in Los Angeles, where he has been since 1974. He has published over 500 technical papers and is author and/or editor of nine books, including Uncertain Rule-based Fuzzy Logic Systems: Introduction and New Directions (Prentice-Hall, 2001) and Perceptual Computing: Aiding People in Making Subjective Judgments (Wiley & IEEE Press, 2010). His present research interests include: type-2 fuzzy logic systems and their applications to a wide range of problems, including smart oil field technology, computing with words, and fuzzy set qualitative comparative analysis. He is a Life Fellow of the IEEE, a Distinguished Member of the IEEE Control Systems Society, and a Fellow of the International Fuzzy Systems Association. He was President of the IEEE Control Systems Society in 1986. He is a member of the Administrative Committee of the IEEE Computational Intelligence Society and was Chairman of its Fuzzy Systems Technical Committee, and was Chairman of the Computing With Words Task Force of that TC. Among his awards are the 1983 Best Transactions Paper Award of the IEEE Geoscience and Remote Sensing Society, the 1992 Signal Processing Society Paper Award, the 2002 Transactions on Fuzzy Systems Outstanding Paper Award, a 1984 IEEE Centennial Medal, an IEEE Third Millenium Medal, and a Fuzzy Systems Pioneer Award (2008) from the IEEE Computational Intelligence Society.