Nature-Inspired Optimization of Type-2 Fuzzy Logic Controllers

Prof. Oscar Castillo, Ph.D., D.Sc.
Tijuana Institute of Technology,
Tijuana, Mexico

Abstract. The design of Type-2 fuzzy logic systems is a complex task and in general achieving an optimal configuration of structure and parameters is time consuming and rarely found. For this reason the use of nature-inspired meta-heuristics offer a good hybrid solution to find near optimal design of type-2 fuzzy logic systems in real world applications. In particular, type-2 fuzzy control offers a real challenge because the problems in this area require very efficient and accurate solutions; in particular this is the case for robotic applications. In this talk we present a general scheme for optimizing type-2 fuzzy controllers with nature-inspired optimization techniques, like the chemical reaction algorithm, bee colony optimization and others.

Oscar Castillo holds the Doctor in Science degree (Doctor Habilitatus) in Computer Science from the Polish Academy of Sciences (with the Dissertation "Soft Computing and Fractal Theory for Intelligent Manufacturing"). He is a Professor of Computer Science in the Graduate Division, Tijuana Institute of Technology, Tijuana, Mexico. In addition, he is serving as Research Director of Computer Science and head of the research group on Hybrid Fuzzy Intelligent Systems. Currently, he is President of HAFSA (Hispanic American Fuzzy Systems Association) and Past President of IFSA (International Fuzzy Systems Association). Prof. Castillo is also Chair of the Mexican Chapter of the Computational Intelligence Society (IEEE). He also belongs to the Technical Committee on Fuzzy Systems of IEEE and to the Task Force on "Extensions to Type-1 Fuzzy Systems". He is also a member of NAFIPS, IFSA and IEEE. He belongs to the Mexican Research System (SNI Level 3). His research interests are in Type-2 Fuzzy Logic, Fuzzy Control, Neuro-Fuzzy and Genetic-Fuzzy hybrid approaches. He has published over 300 journal papers, 7 authored books, 30 edited books, 250 papers in conference proceedings, and more than 350 chapters in edited books. He has been Guest Editor of several successful Special Issues in the past, like in the following journals: Applied Soft Computing, Intelligent Systems, Information Sciences, Non-Linear Studies, Fuzzy Sets and Systems, JAMRIS and Engineering Letters. He is currently Associate Editor of the Information Sciences Journal, Applied Soft Computing Journal, Granular Computing Journal and Fuzzy Information and Engineering. He has been elected IFSA Fellow in 2015 and MICAI Fellow member last year. Finally, he has been named Highly Cited Researcher 2017 in Web of Science by Clarivate Analytics, which list the most influential people in science around the world.