Special issue on “Type-2 fuzzy systems and granular computing”

Oscar Castillo¹ · Pranab K. Muhuri²

Published online: 23 November 2018
© Springer Nature Switzerland AG 2018

1 Introduction

The paradigm of Granular Computing (GC) offers quite an important role to type 2 fuzzy sets (T2 FSs) as the latter is capable to represent uncertain information. The objective of this special issue is to explore the theoretical and pragmatic overview of the intersection of two well-connected disciplines, Granular Computing and type-2 fuzzy sets. The special issue has accommodated five papers on a wide variety of topics ranging from reliability optimization, to student's strategy evaluation, to fuzzy controllers, to classification problem and modular granular neural networks.

In the first paper titled, *type-2 fuzzy reliability–redundancy allocation problem and its solution using particle-swarm optimization algorithm*, Ashraf et al. proposed a novel formation of the fuzzy multi-objective reliability–redundancy allocation problem which maximizes the reliability of manufacturing systems while simultaneously minimizing the system cost. This optimization problem is solved using particle swarm optimization with uncertain parameters modelled as interval type-2 fuzzy sets.

Gupta and Muhuri present the paper *computing with words for student strategy evaluation in an examination* which introduced a computing with words' framework for investing the student strategy evaluation system. The interval type-2 fuzzy set-based perceptual computing approach is utilized in the paper. The recommendations from various CWW approaches are also presented for the comparison purpose.

Lagunes et al. introduced a novel method to generate and test information granules for fuzzy controllers of autonomous mobile robots in *optimization of granulation for fuzzy controllers of autonomous mobile robots using the firefly algorithm*.

This method is based on an optimal granularity allocation for fuzzy system design implemented using firefly algorithm. The desired path of the robots is compared with the actual trajectory generated by the fuzzy controller of the robots.

Amezcuca and Melin introduced a novel Fuzzy Learning Vector Quantization (FuzzLVQ) method for complex classification problems in their paper *a new fuzzy learning vector quantization method for classification problems based on a granular approach*. This is a hybrid approach based on LVQ neural networks and fuzzy inference systems.

In the last paper, *optimization of type-1, interval type-2, and general type-2 fuzzy inference systems using a hierarchical genetic algorithm for modular granular neural networks*, Melin and Sánchez proposed a fuzzy inference system optimization method modelled with the help of hierarchical genetic algorithm. Three fuzzy inference systems are presented such as type-1, interval type-2, and general type-2 fuzzy inference systems and applied to human recognition application.

It is hoped that the special issue will offer new directions and interests to the research community, especially to those with interest in type-2 fuzzy systems and granular computing.

We are really indebted to all the contributors who have responded to our requests and submitted such high-quality papers which has made the special issue a huge success. All the reviewers who have given their valuable time in reviewing the works deserve special applause. We are forward our sincere thankfulness to Editors in Chief, Prof. W. Pedrycz and Prof. Shyi-Ming Chen for giving us the opportunity to organize the special issue. We most humbly acknowledge their kind guidance and support, which has been very instrumental in bring this special issues to light.

Oscar Castillo
Pranab K. Muhuri

✉ Oscar Castillo
ocastillo@tectijuana.mx

¹ Division of Graduate Studies and Research, Tijuana Institute of Technology, Tijuana, Mexico

² Department of Computer Science, South Asian University, New Delhi 110021, India