Preface

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Biographical notes: Tsau Young Lin received his PhD in Mathematics from Yale University and is a Professor of Computer Science at San Jose State University and a Fellow in Berkeley Initiative in Soft Computing, University of California. He is the President of the International Granular Computing Society and Founding President of the International Rough Set Society. He shares the Editor-in-Chief with Xiaohua (Tony) Hu for the *International Journal of Granular Computing, Rough Sets and Intelligent Systems*. He has/had served on various roles in reputable international journals and conferences. His interests include data/text/web mining, data security and granular/rough/soft computing. He received the Best Contribution Awards from IEEE ICDM01 and International Rough Set Society (2005) and a Pioneer Award from IEEE GrC 2008.

Xiaohua (Tony) Hu is currently an Associate Professor and the Founding Director of the Data Mining and Bioinformatics Lab at the College of Information Science and Technology, one of the best information science schools in USA (ranked as #1 in 1999 and #3 in 2009 in information systems by US News & World Report). He is now also serving as the IEEE Computer Society Bioinformatics and Biomedicine Steering Committee Chair and the IEEE Computer Society Granular Computing Steering Committee Co-Chair. He is a Scientist, Teacher and Entrepreneur. He joined Drexel University in 2002, founded the *International Journal of Data Mining and Bioinformatics* (SCI indexed) in 2006 and *International Journal of Granular Computing, Rough Sets and Intelligent Systems* in 2008. Earlier, he worked as a Research Scientist in the world-leading R&D centres such as Nortel Research Center, GTE Labs and HP Labs. In 2001, he founded the DMW Software in Silicon Valley, California. His research ideas have been integrated into many commercial products and applications.

1   Introduction

In this preface, we will give some brief historical notes. We will address it from two views: academic and activities.

The term granular computing (GrC) was proposed by T.Y. Lin in the Fall of 1996 to label his research area (Zadeh, 1998), which was the computable part of Zadeh's granular mathematics (GrM). The essential idea was outlined in Zadeh (1997). A newer version will appear soon in the *Encyclopedia of Complexity and Systems Science*, Springer, 2009. However, the concept was much earlier; granularity was explored explicitly in Zadeh (1979). In an obvious way, the most influential words are his informal definition given at the keynote in Zadeh (1996): 'information granulation involves partitioning a class of objects (points) into granules, with a granule being a clump of objects (points) which are drawn together by indistinguishability, similarity or functionality'.

The last three notions have been abstracted and generalised to 'constraints or conceptual forces'. Observe that they may not exert uniformly on all objects. So the objects, which are drawn into a granule, may not be homogenous. Each object in the granule has its own role; in general, they cannot be swappable or commutative. Hence, a granule is a tuple, not necessarily a subset. Further, these granules (tuples) may be regrouped into a collection of relations, often with their roles as relational schema.

This observation leads to T.Y. Lin's (final) formal GrC model in category theory, which is the final stop of his incremental approach (Lin, 1992, 1997, 1998a, 1998b, 1999a, 1999b, 2003, 2006). We will illustrate the idea in two earlier models and one recent model.

The first GrC model, called neighbourhood system (NS), is a pre-GrC concept that was arisen from totally different context, namely, approximate retrieval (Lin, 1989a). This model formalises the ancient intuition, infinitesimals. In this model, each neighbourhood represents a unit of uncertainty.

The third GrC model, called binary neighbourhood system (BNS), was also a pre-GrC concept and arisen about the same time, but from different context, Chinese wall security policy (Lin, 1989b, 2003). In this particular context, a neighbourhood is a unit of knowledge (known information). BNS can also be viewed from another context, namely, Heisenberg uncertainty principle; in this case, a neighbourhood is a unit of uncertainty.

The last one is ninth GrC model that formalises ancient practices, which granulate daily objects into granules, such as human body into head, neck and so forth. This model defines granules, not by a type I fuzzy sets, but by qualitative fuzzy sets, each of which is characterised by a set (neighbourhood in first GrC model) of membership functions.

Next, we turn to the activities. To promote the concept, in 1997, T.Y. Lin organised and chaired the special interest group on GrC within BISC at UC-Berkeley (Berkeley Initiative in Soft Computing at the University of California-Berkeley). In the same year, he also started the RSDMGrC series of conference, which changed to RSFDGrC. Since then, many special sessions were organised, for example, in WCCI (1998, 2002, 2006), NAFIPS (nearly every year since 1999), etc. In 2005, Xiaohua (Tony) Hu joined the forces with T.Y. Lin and held the IEEE International Conference on Granular Computing in China with the help of Qing Liu. This is one of the major milestones in GrC. This series of conferences has been a very successful one. 'Noble laureates' are among the keynotes: L. Zadeh ('EE-Nobel'), S. Ohsuga (Japanese Fifth Generation Computing), S. Smale ('Math-Nobel') and R. Karp ('CS-Nobel' in BIBM-GrC-WI-IAT Joint Session). Many distinguished scientists and key industry persons, such as D. Quam (IBM's key person on cloud computing), are among the speakers. More recently, the multinational

GrC Society also has been established. In the light of these successes, we felt it is time to launch an international journal on GrC.

Acknowledgements

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