Editorial

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Biographical notes: S. Quan (Shane) Xie received his PhD from Huazhong University of Science and Technology (China), and the University of Canterbury (New Zealand). He is a Senior Lecturer at the University of Auckland, New Zealand. His research interests include intelligent mechatronics systems, vision techniques and applications, smart sensors and actuators, biomechatornics and biomedical robotics. He is the editor of the *International Journal of Biomechatronics and Biomedical Robotics*, and is the reviewer of 14 international journals and on the editorial boards of several journals. He has published six book chapters and has more than 100 scientific papers published in the international journals and conference proceedings.

J. Paulo Davim received his PhD in Mechanical Engineering from the University of Porto in 1997 and the Aggregation from University of Coimbra in 2005. Between 1986 and 1996, he was a Lecturer in University of Porto. Currently, he is Aggregate Professor in Department of Mechanical Engineering of the University of Aveiro and Head of MACTRIB – Machining and Tribology Research Group. He has more 20 years of teaching and research experience in machining, tribology and manufacturing processes. He is the editor of three international journals, guest editor, editorial board member, reviewer and Scientific Advisory for many international journals and conferences. He has also published more than 250 papers in refereed international journals and conferences.

The term 'mechatronics' has been used for about 40 years. It is derived from the observation of the synergy achieved through the integration of mechanical, electronic, control and information technologies. It forms the basis of an ever growing list of products and techniques of great technical and commercial value. Mechatronics design leads to products which are much simpler, smarter, cheaper, and more reliable. In recent years, advanced intelligent mechatronic systems are developed in many fields, such as manufacturing automation, advanced machining, and robotics, etc. New technologies are also emerged to produce intelligent devices and systems for the purposes of solving

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real-world problems that require the ability to process incomplete, imprecise, vague or uncertain information.

Researchers worldwide are active and keen to explore the new research fronts in order to develop advanced mechatronic and manufacturing systems. This special issue presents their recent research results that emphasise new trends and innovations in modern manufacturing, production control, and mechatronics. A total of 12 papers are collected and are divided into two groups.

The first group of papers are focused in developing new manufacturing technologies. Xu et al. introduced a CNC system developed based on STEP-NC and Function Block architecture. The use of STEP-NC provides with a high-level data model and enables feature-based machining and the layered Function Block architecture simplifies the design of a CNC controller with the architecture layers responsible for data processing, data storage and execution. Xie et al. proposed a new optimal process planning algorithm for maximising the utilisation of costly raw material resources, improving machining efficiency, and reducing product cost. Chen et al. presented a hybrid method of reconstructing 3D airfoil profile from incomplete and corrupted optical scans. Zhou et al. reviewed the research progress and the concept of digital manufacturing, an in-depth discussion of the research progress of DMS was given including the research of sharing and integration of Grid-based manufacturing resources, the intelligent manufacturing system based on agent technology and industrial communication technology. Peng et al. presented a two-stage mathematical approach for the design of Virtual Manufacturing Cells. A new mathematical model which automatically optimises the number of part families is given to form part families in the first stage, and a novel mathematical formulation was proposed in the second stage with new variables added which defines more accurately the number of shared machines in virtual cells.

The second group of papers is more mechatronics or control oriented. Prince and Agrawal proposed an *n*-digit alphanumeric coding scheme for evaluation, comparison, and optimum selection of Microelectromechanical products. Wang et al. presented image processing algorithms for cell structure recognition, which provides the desired deposition destinations without human interference for an automated cell injection system. Dai et al. developed a direct adaptive fuzzy controller that approximates an ideal optimal controller for adaptive control of a class of nonlinear systems. All parameters of the fuzzy controller are tuned online. Tan and Xie proposed an integrated method for modelling, simulation and motion control of a multi-axis ASEA robot. Liu and Lu developed an anemotaxis plume-tracing algorithm and a wall-following collision avoidance algorithm for a robot to trace plumes in an obstructed environment. Sogalad and Udupa described the details of failure analysis of interference fitted assemblies. Manley et al. discussed a mechatronic platform for supporting the teaching of mechatronics at the University of Auckland.

It is a pleasure to acknowledge the people who have helped to make this special issue on ‘Advanced Mechatronics and Manufacturing’ possible. We are also grateful to the many authors who submitted their manuscripts to the issue. Finally, the anonymous reviewers, who unselfishly devoted significant time out of their busy schedules to review the manuscripts and respond with constructive suggestions, deserve mention. The high-quality reviews and the timely completion of the revised manuscripts by the authors have certainly helped to make this a successful Special Issue.