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## Editorial

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### Ashutosh Tiwari\*, Elhadj Benkhelifa and Rajkumar Roy

Building 50, Decision Engineering Centre,  
Manufacturing Department,  
School of Applied Sciences,  
Cranfield University,  
Cranfield, Beds MK43 0AL, UK  
E-mail: a.tiwari@cranfield.ac.uk  
E-mail: e.benkhelifa@cranfield.ac.uk  
E-mail: r.roy@cranfield.ac.uk  
\*Corresponding author

**Biographical notes:** Ashutosh Tiwari is a Reader in Engineering Optimisation and the Head of Decision Engineering Centre at Cranfield University. Over the last ten years, he has established Cranfield as one of the centres of excellence in the application of evolutionary computing techniques to process and product design optimisation. He obtained his MSc in Manufacturing in 1999 and his PhD in Engineering Optimisation in 2002 from Cranfield University. He has published over 100 research papers in refereed journals, conferences and books. He was awarded the Institution of Mechanical Engineers (IMechE) Thatcher Bros Prize 2008/09 for the best paper in manufacturing.

Elhadj Benkhelifa is a Research Fellow and Project Manager within the Decision Engineering Centre at Cranfield University. He is an active Researcher in the area of applied soft computing with a particular interest in evolutionary computation and multi-disciplinary design optimisation. He received his PhD (2009) from Bristol Robotics Laboratory, where he researched the field of biologically inspired systems, with a particular focus in the application of evolutionary computation and artificial intelligence in hardware design. He has an active role in research supervision and in pursuit of a number of research grants and industrial sponsorships.

Rajkumar Roy is the Head of Manufacturing Department at Cranfield University, UK. He leads the research in competitive design. He is known for his qualitative cost modelling, requirements management and design optimisation research. He has his PhD in Design Optimisation using soft computing techniques. He is a Chartered Engineer and the Vice President and a Fellow of the Association of Cost Engineers (AcostE), a member of IEEE, IED and the Institution of Engineers (India), and an Associate Member of CIRP. He is the Editor in Chief of the *Applied Soft Computing Journal* from Elsevier.

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We are pleased to present this special issue of the *International Journal of Design Engineering*. This special issue includes original contributions to research with relevance to the application of evolutionary computing to engineering design. The selected papers highlight the state-of-the-art, emerging technologies and recent successes, and define major research challenges.

Research in evolutionary computing (EC) for engineering design has a long history. Early applications of EC in engineering design can be traced back to the 1960s in areas such as fluid mechanics, pipe design and structural engineering. This field has seen further significant advances in the last two decades. In this period, research in this area has been expanding to a large spectrum of engineering design problems from numerous disciplines. Having been successfully applied to solve several engineering design problems, EC has demonstrated some important advantages compared to conventional design and optimisation techniques. Different methods have been developed in EC to tackle different problem characteristics and domains.

This issue comprises of five original research papers that were selected by a double-blind peer-reviewing process. Each paper has been reviewed by at least two reviewers. The first paper in this special issue – ‘Evolutionary design using grammatical evolution and shape grammars: designing a shelter’ – proposes a new evolutionary design tool, which combines shape grammars and grammatical evolution for a design task. This tool proves successful in the design of a single-person shelter. Although this work presents only initial exploration of the tool, the authors demonstrate its future potential to becoming a viable tool for architects for use in their design process.

The second paper – ‘A new optimal Arabic keyboard layout using genetic algorithm’ – presents a new design of an Arabic keyboard layout for convenient typing and effective use. This novel layout is a result of a genetic algorithm based optimisation framework that considers a number of design characteristics and constraints. The new keyboard layout shows better ergonomic performance than the existing Arabic keyboard.

The third paper – ‘Design and optimisation of microelectromechanical systems: a review of the state-of-the-art’ – critically reviews the latest research in the area of design optimisation of microelectromechanical systems (MEMS). The authors review all known traditional approaches and discuss their limitations. The authors emphasise the importance of exploring mechanisms for automating the design of such systems using EC-based design tools. This review paper provides a valuable guide for researchers who are interested in the domain of MEMS design optimisation and wish to explore the opportunities offered by evolutionary computation.

The fourth paper – ‘Failure of infilled frames: a study using artificial neural network’ – presents the use of another biologically inspired soft computing technique artificial neural network (ANN) to solve an engineering problem. The authors develop a neural network model to determine the failure load and drift of infilled frames under lateral loading. The performance of this model is validated by conducting a number of experimental investigations.

The research findings reported in the fifth paper – ‘An evolutionary creative design approach for optimising the broadcasting trees in MANET’ – discuss design creativity through evolutionary computation. The case study that was experimented with was the optimisation of the broadcasting tree in mobile add-hoc network (MANET). The authors compare the performance of their proposed evolutionary design approach with three other algorithms. The experimental results demonstrate that proposed approach for the design task proved to be superior to the other techniques.

We would like to thank both the authors and reviewers who have been very cooperative throughout. We are also grateful to Professor Su Daizhong (Editor-in-Chief of *IJDE*) as well as Dr. Liz Harris for their help during the preparation of this special issue. It has been a great experience preparing this issue and a privilege to interact with everyone who have contributed to this issue.