
Editorial

Wei Huang

Department of Computer Science and Technology,
University of Bedfordshire,
Park Square, Luton,
Bedfordshire, LU1 3JU, UK
E-mail: wei.huang@beds.ac.uk

Carsten Maple

Institute for Research in Applicable Computing,
University of Bedfordshire,
Park Square, Luton,
Bedfordshire, LU1 3JU, UK
E-mail: carsten.maple@beds.ac.uk

Hongji Yang

Centre for Creative Computing,
Bath Spa University,
Bath, BA2 9BN, UK
E-mail: h.yang@bathspa.ac.uk

Paul Sant

Department of Computer Science and Technology,
University of Bedfordshire,
Park Square, Luton,
Bedfordshire, LU1 3JU, UK
E-mail: paul.sant@beds.ac.uk

Biographical notes: Wei Huang is currently a Principal Lecturer in the Department of Computer Science and Technology at the University of Bedfordshire. He received his BSc and MSc from South China University of Technology and his PhD from Loughborough University in the UK. He has multi-disciplinary and inter-disciplinary research interests in computer science and optimisation, operations research/industrial engineering, software/web engineering, and network planning and optimisation. He supervised and involved in a number of externally funded research projects including UK EPSRC funded project and UK KEEP project. He supervises research students and has near 40 peer-reviewed publications.

Carsten Maple is the Pro Vice Chancellor for Research & Enterprise at the University of Bedfordshire. He has published over 150 peer-reviewed articles in the field of information processing, information security, optimisation and graph theory. He has been awarded millions of pounds to fund his research activities and speaks regularly to academic audiences, government agencies and to the boards of blue-chip companies. He is an elected executive member of the Council of Professors and Heads of Computing in the UK. Also, he is a Fellow of the British Computer Society, the Chartered Institute for IT, and is a Chartered IT Professional.

Hongji Yang has published five books and well over 300 research papers in the area of software evolution, distributed computing and Creative Computing. He served as a Programme Chair at IEEE International Conference on Software Maintenance 1999 and the Programme Chair for IEEE International Computer Software and Application Conference 2002. He is editing the *International Journal of Creative Computing*.

Paul Sant is currently Associate Dean of University Campus Milton Keynes (a campus of The University of Bedfordshire). He received his BSc from The University of Liverpool and his PhD from Kings College London. His research interests lie in the area of algorithm design and analysis and its applications to real-world problems. He has successfully supervised research students in the area of mobile network optimisation and is currently supervising six students

covering areas such as computer forensics, The Internet of Things, big data analysis, recommender systems and smart vehicle technology. He has published over 20 research papers and is currently involved in a number of international research and enterprise projects. He is a Fellow of the British Computer Society and a Member of the IEEE.

Computational optimisation techniques are widely used to address complex real-world problems in the fields of process engineering, telecommunication and network engineering, control engineering, system engineering, industrial engineering, operations research and economics. Due to the nature of these problems, the selection of best solutions from some set of available alternatives is required in many cases. With the rapid development of computer and networking technology in recent years, many complex real-world problems can now be solved using a combination of increased computational power and advanced optimisation techniques.

The scope of this special issue covers a broad spectrum of areas with multi-disciplinary interests in optimisation concepts, techniques and applications. We believe that the series of works in this special issue provide a useful reference for understanding and application of advanced optimisation techniques to solve engineering problems and evaluating their effectiveness and efficiency.

In total, nine papers have been selected and the contents of these studies are briefly described as follows:

The paper, 'TGSR: the great salmon run optimisation algorithm', presents a novel heuristic natural inspired optimisation algorithm based on the annual migration of salmon and common menaces that may lay behind their pathways. This proposed approach provides a powerful tool for optimising complex multi-dimensional and multi-modal problems. It has been compared with other well-known optimisation techniques and the results demonstrate the high performance of the proposed method in both robustness and quality for a variety of optimisation problems.

The paper, 'Bio-inspired algorithms for multilevel image thresholding', proposes a differential evolution (DE) based algorithm using Tsallis entropy as the objective function to perform multilevel image thresholding. Its potential to select the optimal threshold values has been investigated along with two other algorithms namely artificial bees colony (ABC) and particle swarm optimisation (PSO). Two entropy-based measures have been used as objective functions to be maximised by the three global optimisation algorithms and a comparative study is provided. Experimental results demonstrate that ABC and DE are much better than PSO in terms of robustness. DE and ABC achieve the same quality of solutions in terms of peak signal to noise ratio (PSNR) value and uniformity value. Furthermore, DE has been shown to be the most stable and ABC the fastest with an advantage of employing few control parameters.

The paper, 'Scheduling and optimisation of batch plants: model development and comparison of approaches', proposes a scheduling model in batch plants, considering

complex real-world constraints that were seldom addressed together. Two optimisation approaches, genetic algorithm (GA) and constraint programming (CP), are applied to solve the complex batch plant scheduling problem. A case study and scalability tests are conducted to investigate the performance of GA and CP in the problem to prepare for further research applications. It is found that the CP approach has better performance in solving batch plant scheduling problems with complex constraints although it needs a longer time to converge.

The paper, 'Improving production quality of a hot-rolling industrial process via genetic programming model', develops three mathematical models, based on a genetic programming (GP) approach, for the force, torque and slab temperature in the hot-rolling industrial process. A frequency based analysis using GP is performed to provide an insight into the process significant factors. The performance of the GP developed models is evaluated with respect to the known soft computing models explored in the literature. Experimental data were collected from the Ereğli Iron and Steel Factory in Turkey and used to test the performance of the GP based models. Genetic programming shows better performance modelling capabilities compared to models based on artificial neural networks and fuzzy logic.

The paper, 'Taxonomy of optimisation techniques and applications', presents a review of recent advances in optimisation techniques. It concentrates on application areas of the different optimisation techniques in particular, with the objective to establish a practical taxonomy based on the combination of heuristic or non-heuristic nature of algorithms, nature of design variables and nature of equations. A number of research works at the University of Bedfordshire are also given to highlight the contributions made towards optimising different industrial and engineering problems exemplifying the latest trends and research arenas.

The paper, 'Two novel sweep-based heuristics for the vehicle routing problem', presents two novel heuristics based on a new density distance which uses the polar coordinates of the sweep algorithm and the customer demand. The proposed algorithms use the ratio between the customer demands and the polar coordinates as ordering criteria. The proposed heuristics are based on three steps. In the first step, a giant tour is constructed by using two new criteria as ordering criteria. In the second step, the split procedure is applied on the giant tour in order to get feasible routes subject to the vehicles' capacities. Finally, each route of the constructed solution is improved by the application of the nearest neighbour heuristic. The results of the experiment indicate that the proposed heuristics

are encouraging. Moreover, the proposed algorithms can easily be used to generate initial solutions for a wide variety of VRP algorithms.

The paper, 'The sub-pixel efficacy region of the bivariate linear interpolation function', reports on a methodology to improve the approximation properties of the bivariate linear interpolation function when faced with the problem of sampling the signal at the intra-pixel misplacement (x_0, y_0) . The energy measure, called Intensity-Curvature Functional, is purposely designed yielding a polynomial system in which zeros are the spatial set of points called sub-pixel efficacy region (SRE) of the interpolation function. The SRE uses empirically validated mathematical processes to determine the novel re-sampling locations (x^0, y^0) where the signal is sampled (calculated with the bivariate linear interpolation function) showing the optimisation of the interpolation error, which becomes smaller than the interpolation error obtained when sampling at the misplacement (x_0, y_0) . The methodology employed shows capabilities for developing a unifying theory for the improvement of the interpolation error.

The paper, 'QoS routing and rerouting optimisation in cognitive network', presents the design of cognitive behaviours for network nodes, based on the cognitive science model, to benefit the QoS routing and rerouting optimisation. It proposes a QoS routing protocol oriented to a cognitive network, referred to as CogRT which addresses the rerouting issue as well. CogRT is a distributed protocol

where the route search is undertaken using a multi-hop strategy. Inspired by the small-world phenomenon, the experiential route information is collected and stored at each node to benefit the future route selection. Its performance is compared with another two popular routing protocols and the results show that CogRT has achieved remarkable performance improvements over the protocols with no cognitive behaviours exploited.

The paper, 'A visual cryptography copyright protection method based on artificial bee colony algorithm', proposes a novel visual cryptography (VC) copyright protection scheme based on an artificial bee colony algorithm (ABCA). Firstly, wavelet decomposition (DWT) to decompose the cover image is applied and ABCA is used to adaptive select feature sub-blocks. Then singular value decomposition (SVD) is implemented to extract the image feature, which is classified into two clusters for generating the master share. Finally, ownership share is generated with the help of the secret image and the master share. Experimental results show that the proposed scheme is robust and effectively resists several different signal processing attacks, without any distortion to the cover image.

In general, these papers cover a spectrum of highly important research areas. They give a clear indication of the present state of play and point to exciting opportunities for future research programmes and investigation in the years ahead.