Editorial

Penousal Machado*

CISUC,
Department of Informatics Engineering,
University of Coimbra,
3030 Coimbra, Portugal
E-mail: machado@dei.uc.pt
*Corresponding author

Juan Romero and Adrian Carballal

RNASA-IMEDIR,
Departamento de Tecnoloxías da Información e as Comunicacións,
Facultade de Informática,
Universidade da Coruña,
Campus de A Coruña, 15071 A Coruña, Spain
E-mail: jj@udc.es
E-mail: adrian.carballal@udc.es

Biographical notes: Penousal Machado is an Assistant Professor at the Department of Informatics Engineering of FCTUC and the Scientific Director of the Computational Design and Visualization Lab. of the Centre of Informatics and Systems of the University of Coimbra. His research interests include nature-inspired computation, artificial intelligence, computational creativity, computational art and design. He is the author of more than 100 refereed journal and conference papers in these areas. He is also the recipient of several scientific awards. His work was featured in *Wired* magazine UK and included in the 'Talk to me' exhibition of the Museum of Modern Art, NY (MoMA).

Juan Romero is an Associate Professor at the University of A Coruña, Spain. He is the founder of the 'Working Group in Music and Art' of EvoNet – the European Network of Excellence in Evolutionary Computing – and of the European Workshop on Evolutionary Art and Music (evoMUSART). He is the author of more than 30 refereed journal and conference papers in the areas of evolutionary computation and artificial intelligence, and Editor of a special issue of the MIT Press journal *Leonardo* and the journal *Genetic Programming and Evolve Machines* and of the book *The Art of Artificial Evolution*, published by Springer in its Natural Computing Series.

Adrian Carballal received his BSc and PhD in Computer Science from the University of A Coruña (Spain) were he works as a Post-Doctoral Research Associate at the Department of Information Technologies and Communications and as a part-time Professor. He has authored over ten articles and edited three journals. He has also participated as researcher in five funded research proposals. His main research interests include image processing, computer graphics, pattern recognition and machine learning.

Since 2003 the annual 'Conference on Evolutionary and Biologically Inspired Music, Sound, Art and Design' (evoMUSART) joins artists and scientist that employ evolutionary computation and other biological inspired artificial intelligence techniques in artistic domains.

Evolutionary computation is a set of artificial intelligence techniques inspired on Darwinian theory of natural evolution. The use of these techniques for the development of artistic systems is an exciting and significant area of research. There is a growing interest in the application of these techniques in fields such as: visual art and music generation, analysis, and interpretation; sound synthesis; architecture; video; poetry; design; and other creative tasks.

In this area the opportunities for collaboration between artists, scientist and engineers are broad. For Instance, the artist can use an application to create new artworks or explore a new aesthetic theory or style. The use of evolutionary art applications tends to be simple since the user only must evaluate artworks, provide reference images or make little changes in the configuration of the system.

When you have a computer problem that you do not know how to solve, you can codify the possible solutions in a genetic code (equivalent to DNA). An image can be a set of pixels or a set of strokes, or a programme that determines the value of each pixel or a filter to apply over a photograph or a collage of different photos. All these things can be coded as a set of numbers. In music, dance, architecture, design, sound synthesis similar approaches can be used.

In order to employ evolutionary computation, you need a method to determine if the final product (image, sound, poetry) is good. This 'how good is the product' is called the fitness. The fitness can be provided by one human being (that evaluates directly the product) or can be assigned in an automatic way. The first approach is called interactive evolutionary computation. Although it has some limitations (e.g., tiredness, subjectivity, incoherence) it can be applied to almost every single problem. In order to compute fitness automatically you need to define your preferences, which can be done in an explicit or implicit way. You can for example express your desire to produce musical pieces similar to the Bach music, or a new design of a 'jug' with certain functional and aesthetics characteristics, or an image that meets some theory of aesthetic, or an image constructed by strokes that looks very similar to a reference photography, or images that match the preferences of an user that are expressed through a set of positive and negative examples.

Usually the evolutionary computation system creates initially a population of individuals (by random). Next in each generation the individuals have descendants. The most fitted individuals have more probability of participate in the genetic code of the descendants, so each generation usually are more fitted than the previous one.

The papers presented in this special issue constitute a compact but enlightening selection from the evoMUSART event.

The paper 'Fitness in evolutionary art and music: a taxonomy and future prospects' by Colin G. Johnson, provides a thorough and coherent state of the art of evolutionary art. It constructs a taxonomy based on the fitness functions, including more than 130 papers. In the final section, Colin G. Johnson proposes a set of suggestions for future research on evolutionary art, including the relation to outside world (using web search), the incorporation of more meaning to the products and the use of memory (previous products).

In the paper ‘Evolving textures from high-level descriptions’, a system assists a designer in the exploration of textures that follow a stylistic description. Craig Reynolds presents four examples of stylistic description that he converts into a hand-built fitness function. The experimental results, i.e., the evolved textures, demonstrate the capabilities of the system.

In ‘An evolutionary algorithm to create artificial soundscapes of birdsongs’, José Fornari explore the use of evolutionary computation for creation of artificial soundscapes. The system employ sound synthesis to emulate the sound of birds and includes allow the participation of users though twitter messages.

In ‘Using scalable vector graphics to evolve art’, Eelco den Heijer and A.E. Eiben use evolutionary computation to create abstract images. They adopt a scalable vector graphic representation, which allows the system to create abstract and figurative vector images.

The evolutionary computation techniques, together with other biological inspired computer models, allow new ways of artistic exploration. They allow us to see what images emerge from a particular aesthetic theory or from the learned user preferences. Moreover, it proposes a new way of think about ‘artificial intelligence’ that incorporates, at least partially, creativity and other human capacities. Finally, it provides a new view and tools to conduct research on topics such us human perception, aesthetics or artistic style definition.

The success of evoMUSART would not have been possible without authors submitting their work, members of the programme committees dedicating energy in reviewing the papers, and an audience. All these people deserve our recognition.

We express our gratitude towards Colin G. Johnson, one of the founders of evoMUSART and co-chair in 2003 and 2004, Jon McCormack, co-chair in 2008 and 2009 and Gary Greenfield, co-chair in 2010 and 2011, for their enthusiasm, support and hard work. We would also like to acknowledge the organisers of the art exhibitions associated with evoMUSART – Paulo Urbano, Anna Esparcia, Tim Blackwell and Janis Jefferies – and the local chairs who created the conditions for these exhibitions to take place, Anikó Ekárt and Anna Esparcia. Last, but certainly not least, we especially want to express a heartfelt thanks to Jennifer Willies and the Centre for Emergent Computing at Edinburgh Napier University. Ever since its inaugural meeting in 1998 this event has relied on her dedicated work and continued involvement and we do not exaggerate when we state that without her, evo* could not have achieved its current status.