Preface to Special Issue

ARTIFICIAL INTELLIGENCE IN MUSIC AND ART

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Artificial Intelligence (AI) research has traditionally focused on exploring and modeling the left-brain side of human intelligence: science, math, logic, engineering, etc. This focus is probably correlated with the academic background of the typical AI researcher: heavily grounded in mathematics and computer science. Accordingly, the AI literature follows this trend, with the exception of a few specialized journals such as MIT's *Leonardo* and *Computer Music Journal*.

Nevertheless, the quest to study and model human intelligence will always be incomplete, unless we allow for the fact that human cognition includes a problematic "right brain": art, music, imagination, creativity, etc. This reciprocal side of human intelligence is less amenable to quantification and thus far more challenging to explore and model. However, it can be argued that this intuitive, creative side has equal significance in the emergence of human intelligent behavior, as does the traditional logical side.

At the place where the two sides meet we find *homo universalis* – an individual with broad intellectual interests who is accomplished in both the arts and the sciences. This includes people from the era when τέχνη (*technê*, the word for art or practice) overlapped with επιστήμη (*epistêmê*, the word for science or knowledge), such as Pythagoras and Aristotle. It also includes *renaissance men* such as da Vinci and Mozart. Such individuals are generally considered prime examples of the potential of human intellect. Exploring the "right brain" domain, where such intellects create and perform, allows us to explore the synergy between established AI techniques, such as neural networks and evolutionary algorithms, and other techniques that are not traditionally considered part of AI, such as fractals, chaos theory, Jung's personality theory, cellular biology, and music psychology, to name a few.

This special issue brings together invited papers exploring this synergy. These papers present results spanning the spectrum of AI tools as platforms for testing hypotheses and exploring models of human cognition, to AI tools as cognitive prostheses for problem-solving, task exploration and performance. By presenting a diverse collection of AI approaches in various artistic domains, we hope to encourage the creation, refinement, transfer, and cross-fertilization of ideas across all AI paradigms and relevant application domains. Hopefully, this is a step towards overcoming the scarcity of publications in this valuable area. If nothing else, we hope this special issue may contribute to a growing awareness among AI researchers of the importance and potential of such studies.

A brief overview of the papers presented herein follows:

- J. P. Collomosse and P. M. Hall present a new non-photorealistic rendering algorithm able to convert photographs into impasto-style images. To optimize the output, they resort to a genetic algorithm, which searches the space of possible renderings seeking the ones where the salient detail of the original image is preserved while the non-salient is attenuated.
- Evelyne Lutton makes a detailed analysis of *ArtiE-Fract*, an interactive evolutionary art tool that allows the exploration of a 2D fractal shape space, presenting and discussing the experimental results attained with this tool. Through the use of interactive function systems and by allowing non-affine transformations, the system allows the compact representation of stunning images, as is thoroughly demonstrated by the samples presented.
- Gary Greenfield proposes two autonomous biology-inspired approaches for the evolution of images with aesthetic proprieties. The first approach mimics cellular processes while the second mimics behavioral processes of ants. Particular emphasis is given to the development of appropriate fitness functions, which efficiently guide the genetic algorithm towards aesthetically pleasing regions of the search space.
- Hugo Liu and Pattie Maes present *Aesthetiscope*, a generative art system that creates abstract color grids based on input text. By basing their approach on psychological interpretations of aesthetics, and by choosing color according to psycho-semantic principles, they aim to generate color grids that are evocative of the overall feeling conveyed by the inspirational text.
- Rafael Ramirez and Amaury Hazan propose a machine-learning approach to create and explain expressive musical performances. Their system has been tested through generating saxophone performances of monophonic jazz melodies. The results attained indicate that the system is capable of conveying and explaining expressiveness.
- Sören Tjagvad Madsen and Gerhard Widmer focus on the understanding of piano performances. They start by using a self-organizing map algorithm to identify several "performance archetypes". In a later stage, using genetic algorithms, they find the similarities within the performances. By measuring the uniformity of the pianist's expression, i.e., the tendency to play similar phrases in similar ways, they propose a ranking of performers.
- Judy A. Franklin resorts to Long Short-Term Memory (LSTM) recurrent artificial networks to learn and generate new musical pieces. In a first stage, two inter-recurrent LSTM networks are used to memorize a series of melodies. In a second stage, by presenting new harmonizations to the trained networks, new songs are generated.
- James Mandelis and Phil Husbands employ an interactive evolutionary algorithm to evolve the mapping between the control and parametric space of a synthesizer and the sensors of a data-glove. This coupling gives rise to *Genophone*, a tool for sound synthesis and real-time performance, which is suitable for users that do not possess extensive knowledge of sound design.