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Computational Creativity: A Personal Approach

Andreja Andrić

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Andreja Andrić
Composer and programmer
Aarhus, Denmark

COMPUTATIONAL CREATIVITY: A PERSONAL APPROACH

We live in a world driven by software. Software powers and transforms the way we learn, the way we interact with each other, and the way we produce and exchange goods. Similarly, software transforms the way we create experiences and engage in art. Where this transformation has taken place in a marked degree we can talk about computational art and computational creativity.

There are two ways in which we usually understand computational creativity. One way refers to attempts to construct programs that mimic human creativity. This category contains projects such as, "I fed my system with 1000 hours of jazz and

Andreja Andrić, *Portrait with Hands* © Barbara Katzin

now it plays jazz." Such systems have been developed since the late eighties, and have attained a degree of fame (or infamy) over the last few years with songs like *Daddy's Car* from Sony Research. The other way that we can understand computational creativity is as a different kind of creativity, that is, at least to a degree, unlike human creativity. More well-known examples of this are works of randomly generated literature, such as Nick Montfort's *World Clock*. I will focus on this second way as it is of more interest to me artistically and I find it to be an area of true artistic innovation and experimentation. I believe it offers us the possibility to extend what humans are creatively able to do, or rather, be innovative in unexpected ways, and offer new experiences that are not attainable by other means.

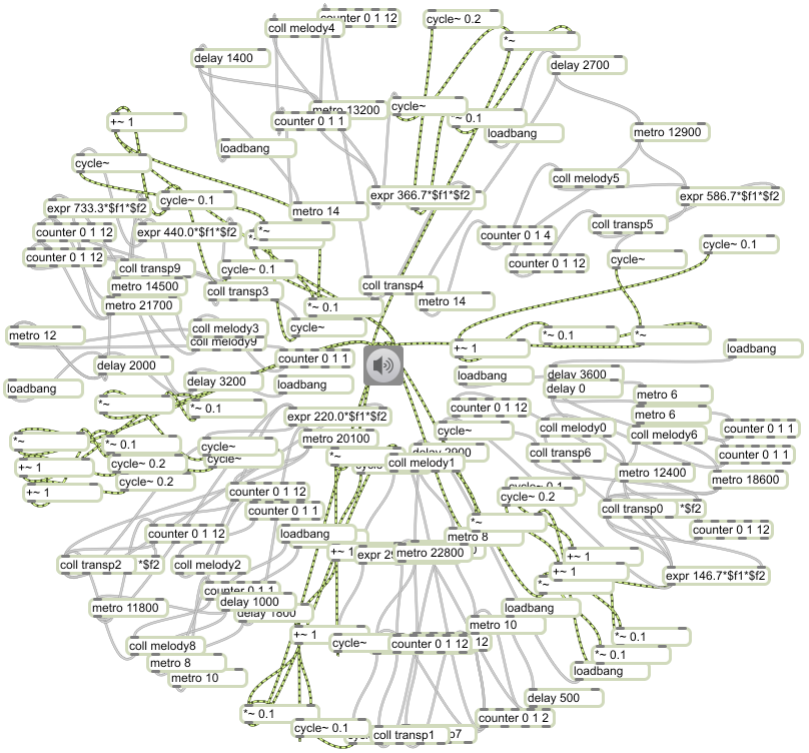
I was always attracted to the unexpected dream-like utterances of computational poetry. Being a musician rather than a poet, I enjoyed what similar procedures were capable of doing within the realm of sound even more. Randomized, game-like procedures for music creation have always been known to musicians, from at least the time of Mozart and his Musical Game of Dice. I was also always interested in creating musical works where the creation process executed by the computer exhibits game-like, playful attributes, while at the same time resulting in dream-like flows of computer-generated sound that resembles natural events more than human expression.

For instance, counting features prominently in a series of my works. Counting is by itself a generative procedure, as each number yields the next by the addition of one. Also, the set of natural numbers projects itself on the set of digits (or any other objects) in interesting and, at times, unexpected ways. Counting and repetition has a meditative character. It is part of many children's games, like hide-and-seek, where the seeker has to count up to a randomly decided number during which time the other players hide. The ability to find a hiding place depends on how long the counting takes, and the counting by itself also gradually increases the tension caused by the anticipation of the search that is about to take place. My piece *Effervescence* (2018), a virtuoso study for solo guitar, performed by Danish guitarist Jakob Bangsø during some of his guitar recitals, counts 4 note figures from 9 notes of an e-minor chord that spans three octaves. In this work the counting is projected onto ever different fast-paced tone patterns creating an illusion of a multiplicity of voices and melodic movement.

Besides counting, random decisions play an important part in many of my works. Many natural phenomena happen or appear to happen according to different kinds of random distribution (think of raindrops hitting the ground, autumn leaves covering the pavement, or stars seen from Earth). Many games involve throwing dice or picking cards from a deck. Divination rituals always involve a random procedure to divine the opinion of the gods. Pseudo-random functions can be easily implemented on a computer and one of the simplest implementations, called linear congruential random number generator, is also based on a procedure that somewhat resembles counting: the current number is (instead of increased by one)

first multiplied by a large constant, then increased by another large constant, and finally the modulus of it is taken by a third large constant. In *Pocket Electronic Symphony #1* (2018), performed at the World Music Days 2019 in Tallinn, Estonia, the performer freely combines 15 algorithms that heavily use random functions to direct the flow of a large number of parallel sound lines. *Meditations for keyboards and string instruments* (2019), soon to be performed at the Kyoto Arts Center by the Japanese ensemble Rosetta, is a set of 200 computer-generated text-scores to be interpreted by an ensemble of human performers. The text scores are constructed out of sentences whose parts are selected at random out of a set of predetermined possibilities.

In another series of works, the computer program sets in motion ten or more circles of fifths which progress at different but constant speeds, decided randomly at the start of the performance. Here there are also counting steps that go through discrete positions on a circle. Circles also feature prominently in many folk dances, rituals, and children's games, and also reflect natural phenomena like sun rising and setting or the change of the seasons. *Spin* (2015) is a series of electronic music works which feature ten circles of fifths of sine waves each slowly moves at its own speed to reveal ever-changing tonal interrelations. The works are implemented in the graphical programming language Max/MSP, with the elements disposed in concentric circular patterns reminiscent of Ars Subtilior practice from high middle ages.



Andreja Andrić, *Spin #5* (2015)

In this text I have attempted to survey the use of computer programming in my own compositional work and show that all of it can be traced down to a few simple generative processes. All of these processes are very suitable for implementation on a computer and stand in the root of all classical programming languages. In trying to trace my own fascination with these processes, I have tried to show that these generative procedures also play a prominent part in children's games, folk dances, magic rituals, divination, and meditation practices from which they may derive their wider psychological significance.

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