Concert 4 - July 6th, 19h30

kurivari-live

Alo Allik (tehis.net)

This is an algorave project *kurivari* that derives its musical style from analysis of traditional rhythm patterns fused with sonic material generated with genetic sound synthesis algorithms. The rhythmic structure of the performance is built from patterns that have been stripped down to their most essential skeletal structures and are then juxtaposed during performances to create long complex cycles and unpredictable syncopation while still maintaining a clearly discernible downbeat in order to undermine the dominance 4/4 time signature of electronic dance music. The outcome is more reminiscent of rhythmic structures found in more recent subgenres of hip hop music such as drill or trap rather than the regularity of a techno beat.

Apart from a selection of samples, the sonic palette is predominantly created with [gene experssion synthesis] (https://geen.tehis.net/), a generative synthesis technique that harnesses the power of genetic algorithms to write computer code. Gene expression synthesis combines ideas from the two most widely used and well-known evolutionary programming methods: genetic algorithms and genetic programming. The algorithm generates computer code, SuperCollider SynthDef objects in this case, by initiating a population of candidate solutions - either from a predefined selection or randomly generated - and then applies genetic operators to the population. Each candidate is defined as a list of either unit generator functions or function parameter placeholders designated with lower case letters. The translation from genotype to phenotype follows a breadth-first recursive principle: as the codons of a gene are traversed, for each function encountered, the algorithm reserves a number of following unreserved codons as arguments to that function regardless whether they are functions or terminals. Once decoded as an executable program, each candidate solution in a population is subjected to a fitness evaluation that determines how well it performs at solving a target problem, which is a similarity measure to an existing sound sample.

This method has generated thousands of SynthDef objects that are saved in a NoSQL cloud database [MongoDB] (https://www.mongodb.com/) and can be accessed in real time during a performance. Each object is also analysed with music information retrieval algorithms and the results stored in a database to facilitate easier search functionality. The audio features that are used to find synthesisers include tempo measures such as beats-per-minute (BPM), beat timings and onset rate, and spectral characteristics such as mel-bands, spectral flatness, and spectral centroid, extracted with [madmom] (https://madmom.readthedocs.io/en/latest/) and [librosa] (https://librosa.org/doc/latest/index.html) audio analysis toolkits. Beat timings also assist in identifying interesting sonic loops that can be used in the live composition process and inserted into the rhythm patterns.

Real time sound spatialisation with the [Ambisonic Toolkit] (https://www.ambisonictoolkit.net/) is another characteristic of this performance to depart from the traditional directionality of live performances. *kurivari* has performed on multi channel systems consisting of up to 26 speakers distributed throughout a performance space, but also has been easily adapted to stereo systems using binaural rendering principles.

The fusion of traditional rhythm patterns and complex modulation synthesis is intended to create a sonic environment that explores the uncertain area between rigid rhythmic structures and completely form-free noise improvisations, the edge where order and chaos meet and create interesting moments of complex- ity intermittent with simplicity. The sonic environment is complemented by 3-dimensional generative computer graphics that are based on artificial life algorithms and incorporate the computer code evaluated during the performance to look aesthetically more engaging than simply displaying the livecoder's screen.