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ISE 575

Iannis Xenakis's *Achorripsis*: The Matrix Game

The goal of Linda Arsenault's paper is to guide us through the process Xenakis went through to compose Achorripsis, which despite much attention to his other processes had gone mostly unnoticed. The paper gives a brief introduction of the mathematics employed by Xenakis and how he used the mathematics to compose his piece. It also provides some insight into choices Xenakis was required to make when the mathematics did not fit the rules preimposed to complete the piece, since Xenakis's original paper on the subject led one to believe the mathematics completely prescribed the outcome.

The overarching mathematical theory used in the piece is based on the distribution of events proposed by Poisson and is given by:

$$P_k = \frac{\lambda^k}{k!} e^{-\lambda}$$

This distribution predicts the expected probability of k simultaneous events occurring. For example the probability of 1 kernel of corn popping independently versus 2 kernels of corn popping at the same time. Xenakis's idea was to fill in a matrix with sound events based on the probabilities given by this equation.

The first deliberate choice Xenakis had to make was the choice of lambda. He chose a value of .6, but little reason was given other than it “worked out”, which in the age prior to computers seems reason enough. Another choice early on not explicitly related to the mathematical game regarded as “composing” the piece was exactly how many cells should the matrix have. The choice was 192 and is assumed to be arbitrary. Multiplying the probabilities, obtained from the above formula, by 196 resulted in the number of sound events for each particular density that would be played in the piece. Next the cells where then arranged into a matrix with 28 columns and 7 rows. To find the distribution of events in each column Xenakis again appealed to the Poisson distribution, however adjusting the lambdas to account for the new constraint such that each new lambda was computed as the total number of events in the class (single, double, etc) divided by the number of columns (28). However, it is pointed out that strictly following the Poisson distribution will not evenly divide out and fill the columns so an intentional action had to be made to redistribute the probability mass. Many choices were possible but it appears that Xenakis made a choice based on an aesthetic intuition he had unrelated to the mathematical theory. Since a matrix is two dimensional it was not enough to fill the columns but also distribute amongst the rows as well. Without the aid of a computer the task is quite difficult and indeed more approximations were needed to redistribute the events to make everything “add up” and in some cases it is shown the results are actually quite distant from a Poisson distribution.

The work as described by Arsenault reiterates several points that have come up in previous discussions and papers we have read throughout the course. There is an interesting correlation between solving mathematical problems and solving musical “problems”. Where here and as in Tom Johnson's work solving the mathematical problem becomes solving the musical problem through a mapping of one to the other. It is also interesting to note, as Arsenault does, that regardless of the mapping or purity of the idea choices and interventions are inevitable and reveal aspects of the aesthetics the artist has internalized but is perhaps not even explicitly aware of themselves.