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Conceptual Art and Algorithms

Susan Happersett
249 4th Street
Jersey City, NJ 07302
United States

The paradigms of Conceptual Art can be used to create Mathematical Art. By building from the foundations of early Conceptual Art we can produce algorithmically generated works of art.

What is conceptual art? Sol Lewitt gave us one of the most concise definitions in the summer 1967 ArtForum, in his "Paragraphs on Conceptual Art". According to Sol Lewitt:

"In Conceptual Art the idea or concept is the most important aspect of the work.... all planning and decisions are made beforehand and execution is a perfunctory affair. The idea is the machine that makes the art." [1]

An example of Sol Lewitt's work: Wall Drawing # 263:

(A wall divided into sixteen equal parts with all one-two, three and four part combinations of lines in four directions). The first row of this sixteen square grid contains lines in four basic directions – vertical, horizontal and two diagonals. [2]

Another conceptual artist whose early work I would like to discuss is Hanne Darboven. Quoted in 1968 in Art International She said:

"My systems are numerical concepts, which work in terms of progressions and/or reductions akin to musical themes with variations." [3]

An example of Hanne Darboven's work: Konstruktion:

Konstruktion was developed around 1968 it involved the mathematical process of adding the numbers of a specific date and denoting the operation with "K". Darboven used dates in the European form (day/month/year). The digits of the year were taken separately but the day and month where used as a whole.

Example 29/12/96= 29+12+9+6=56K

Hanne Darboven did not however consider her work Mathematical. In 1973 she was quoted by Lucy Lippard in ArtForum: I only use numbers because it is a way of writing without describing ... it has nothing to do with Mathematics. Nothing. I choose numbers because they are so constant, confined and artistic. Numbers are probably the only real discovery of mankind." [4]

But I want to go one step further and make the art about mathematics. Use mathematical ideas and principles to define the art making process.

Sol Lewitt and Hanne Darboven's have both developed processes of creating art that conform very closely to the Mathematical definition of Algorithm. In David Berlinkski's book The Advent of the Algorithm he states:

>"An algorithm is a finite procedure, written in a fixed symbolic vocabulary, governed by precise instructions, moving in discrete steps, 1, 2, 3 ... whose execution requires no insight, cleverness, intuition, intelligence, or perspicuity, and that sooner or later comes to an end." [5]

Comparing the definition of algorithm with the early writings and examples of conceptual art, we can see that the two fields are closely related. Conceptual art was born out of a society thrown into the realm of algorithmic thinking and working due to the age of computerization. The artists, without realizing it, were creating these systems of art making based on the corner stone of the most basic mathematical definitions of algorithms. I think as artists we can further develop this relationship.

I had always felt there were aspects of mathematics that possessed natural grace and beauty. Determined to find a visual way to express the intrinsic aesthetics of mathematics, I work with grids plotting various mathematical relationships. These graphs allow me to study the aesthetic characteristics of functions, sequences, and series in a purely visual language. In this mathematical language, it is the number of strokes per grid space that holds significance. The placement of the strokes within the grid is random. I start by setting up a set of rules for making a drawing. I decide the dimensions and the grid size. Then I plan the number of markings in each grid based on a set of rules. The rules are decided by the particular sequence, series, function or ratio that I want to describe visually.

For the past few years I have been working with growth patterns. The Fibonacci sequence and binary growth have been the subjects of a lot of my work. In a drawing based on the Fibonacci sequence and plant growth I start with a column grid in a Fibonacci ratio 1:2, 1:3, 2:3 etc. Then I make a plan, plotting a Fibonacci number into each square of the grid. Using the common algorithm of adding the two consecutive terms to find the next. For example in Branch a drawing on canvas I use a grid with a 1:3 ratio. I start at the center with 1 marking per square then working out in both directions, after three rows I start to add another marking to have two (1+1) markings per square, then three rows later I add another mark to each square to have three (1+2), then three rows later five (2+3). This continues on with 8, 13, 21 and 34 markings, until I am at the top and bottom of the grid. Quite often I will make a series of drawings that are based on the evolution of a particular growth pattern. These completed drawings then work together as a book or a wall installation.

Creating these patterns has become a type of meditation. So the act of writing in this mathematical language has become part of the art. In a way I have become the human computer that processes the Algorithm that I have defined.

References

[1] Sol Lewitt, *Paragraphs on Conceptual Art*, ArtForum, summer 1967
[2] Sol Lewitt, *Wall Drawing 263*, Whitney Museum 1975
[3] Hanna Darboven, *Artists on their Art*, Art International 12, No 4, April 20 1968
[4] Lucy Lippard, *Hanna Darboven: Deep in Numbers*, ArtForum 12, No 2, October 1973
[5] David Berlinski, *The Advent of the Algorithm*, Harcourt 2000