

Disruptive Systems and Organizing Principles in Generative Art: Two cases (1980-ongoing) by Ernest Edmonds

Francesca Franco

De Montfort University
Leicester, UK
ffranco@dmu.ac.uk

Abstract

This article explores the work of British artist and pioneer of computational art, Ernest Edmonds, and its relevance to the field of generative art. Its focus is on two important, but often overlooked, works he created: *Fifty One & Fifty Two* (1980) and *Four Shaped Forms (Park Hill B)* (2014). The article poses a number of questions about the origins and development of these works. How were these works created and what inspired their creation? How are they connected? Based upon an analysis of material held in Ernest Edmonds's Archive, the National Archive of Computer Based Art and Design at the Victoria & Albert Museum, London, and a series of interviews conducted with Edmonds by the author, the article provides answers to these questions.

Keywords

Interactive art; generative art; computational art; computation and creativity, Ernest Edmonds (b. 1942); art and technology.

Introduction

Ernest Edmonds (b. London, 1942) is a British artist who has been active in the field of interactive and generative art since the late 1960s. This article first examines the artist's background, context and key works engaged with the notions of color, structure, time, and interaction. Looking at how some of Edmond's works have been created, this paper investigates how they disrupt the formal systems of art perception, particularly through interactivity and audience participation. From the late 1960s through the following two decades, most of Edmonds' work has been either concerned with the implications of the notion of computation, exemplified by his seminal work *Nineteen* (1968-9), or with the application of Systems approaches to the construction of art works, such as in *Communication Game* (1970), as described below. Nonetheless, in the early 1980s, Edmonds carried out a parallel experimentation in art concerned with the organization and structure of surfaces and colors, both in terms of process and execution. The results, analyzed in this article in detail, included two important, but often overlooked, painting works, *Fifty One & Fifty Two* (1980) and *Four Shaped Forms (Park Hill B)* (2014). As the article will demonstrate, despite the thirty-four year gap that separates these works, the way they were created and similarities that connect them, help us understand one

of the key developments of generative art from its very early stages as well as its evolution up to the present time.

Artist's Background, Context and Key Works

Ernest Edmonds is a pioneer of computational art whose work has been engaged with the notions of color, structure, time, and interaction from the late 1960s. As demonstrated by a number of recent studies and art exhibitions, his work has contributed to establishing a link, often overlooked, with the structural research conducted in the late nineteenth century by Paul Cézanne and the subsequent developments carried out by constructivist artists in the 20th century. [1]

Edmonds's background in mathematics, philosophy, and logic has provided opportunities for interdisciplinary exchanges that have had a profound impact upon the nature of his art. These studies enabled Edmonds to explore new ideas in art through the use of technology that have become a constant stimulus in his creative research.

Edmonds's art is rooted in Constructivism, an art movement established in Russia in the late 1910s to the early 1920s. Constructivists aimed to design objects with a new, revolutionary, and functional approach. Inspired by such ideas, Edmonds soon developed his own artistic language based on an ongoing dialogue around color, structure, time, and interaction.

Among Edmonds's early influences in art was Cézanne and his research on structure conducted through direct observation of nature and the unique way he represented volumes and space through color. Cézanne represented for Edmonds the high point in his understanding of color and structure. But it was the work of Henry Matisse and its bold colorism that particularly influenced him in his use of color. Visiting the Tate Gallery in London as an undergraduate student, Edmonds admired the master's technique and studied his secrets behind the use of color as a vehicle giving balance to a composition while creating visual sensations. It was then that he realized that color has structure, a notion that continues to be a central focus in his art practice today. Works such as his early 1970s sprayed painting reliefs, the paintings *Jasper B* and *C* (1988), and his most recent developments demonstrate this.

From the early 1960s, Edmonds began experimenting with structure in his work, in his painting, drawing, and poetry. His early watercolors, his drawings in china black ink from the early 1960s, and later paintings created between 1974 and 1982 using acrylic paint, depict geometrical abstract shapes. These works reference the iconic color structures of the Dutch artist Piet Mondrian and the experimental American artist Charles Joseph Biederman's evolution of constructivism. A work such as *Nineteen* (1968–1969), which will be described below, provides a link to Edmonds's early experiments in structure using a computer.

In the early 1980s, Edmonds's work evolved towards a praxis increasingly engaged with the notion of time. This was made possible in part by the introduction and availability of the personal computer. This represents a pivotal moment in the artist's career: when he realized there was a way in which he could combine his research into structure and add time to it, making time-based art.

Edmonds' insight was that logic programming, one of the four main computer programming paradigms, based on axioms and goal statements, could be applied in art to make generative work integrated with the notion of time. As the artist explained in 2012, [2] logic programming can be used as a method for handling structures in time by visually representing the internal search process within a computer. Time can be used to make generative work in which the rules, specified in logic, control the form and order of a sequence of images. The sequence can go on forever without loops, depending on the rules. The logic specifies how the work unfolds; both the structure of each individual image and its structure in time. The details of this depend on a particular way of using logic in computer systems known as logic programs. In this method, a set of logical statements (in this case about the design of images) is interpreted as a program that instructs the computer to search for some specific goal or state (in this case of the image). An important element of logic programming is that it includes "backtracking," where, when certain rules have been tried and fail to get to the goal, the computer goes back and looks for alternative ways of using the rules. In what Edmonds calls his *video constructs*, a series of works created in the early 1980s, this process of backtracking is used to generate an unfolding search and the artwork, the image sequence, is a trace of this search. [3]

Interactivity

Interactivity has been a central concern in Edmonds's work since the late 1960s. [4] It developed more visibly when Edmonds collaborated with British artist Stroud Cornock to produce **DATAPACK* (1970), an interactive piece shown at the Computer Graphics 70 exhibition held at Brunel University in Uxbridge, London. **DATAPACK* represents an early interactive computer-based art system.

The work was, as Cornock described it in 1973, "an example of a matrix that consists of participants, a display, a computer installation and a designated area around the Vickers Building next to the Tate Gallery in London." [5] **DATAPACK* was a system that allowed participants to have a "pseudo-English conversation" with the computer. The results of this conversation were then processed by the machine connected to drum plotter. This was able to identify a volume of space around the Vickers (now known as the Millbank Tower) and allocate it to the active participant. Part of the output of this process was a drawing, made by the plotter, using impulses collated from the participant's data. **DATAPACK* represents an early investigation into the potentially changing relationship between artist and viewer or "participant," accelerated by the intervention of the computer.

Nineteen (1968–1969) (Figure 1) embodies Edmonds's first use of a computer program in his art. A computer-program approach, which Edmonds had used in 1968 to solve a mathematical logic problem, was applied by the artist to compose his work *Nineteen*, "in order to try to structure the work according to a set of pre-defined rules." *Nineteen* was first exhibited in the *Invention of Problems* exhibition at the City of Leicester Polytechnic (now De Montfort University) in 1970. It was a large panel measuring 135 × 170 × 15 cm, which consisted of twenty squared reliefs attached to a white supporting structure and arranged in a grid of five pieces wide by four high. Each piece shows a number of abstract shapes delineated by vibrant colors. The variety of forms and colors, and the ways the pieces were juxtaposed, created a dynamic composition that vibrates in front of the viewer's eyes. Shadows and reflections added extra depth and sophistication to the orthogonal structure making the work inseparable from its environment.



Figure 1: Ernest Edmonds, *Nineteen*, 1968–1969. ©Ernest Edmonds. Image courtesy of the artist.

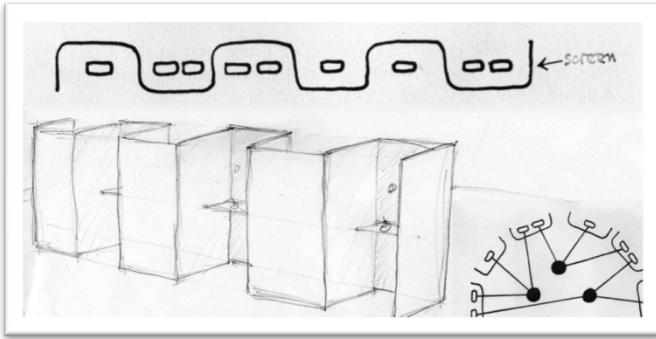


Figure 2: Ernest Edmonds, *Communications Game*, 1970. ©Ernest Edmonds. Image courtesy of the artist.

Communication Games (1970) (Figure 2) represents Edmonds’s original network communication art system conceived in 1970. *Communications Game* was originally a proposal for the Computer ‘70 trade exhibition held at Olympia, London, in September 1970, but it was not carried out, and the detailed design of required input/output devices was not specified. It was proposed that the system of the project be controlled by a “digital computer.” The work was later produced and shown in the Invention of Problems II exhibition at the City of Leicester Polytechnic in 1971. It included stations for a maximum of six participants. The stations were arranged so that participants could not see one another, but could see one or two stimulus-providing units within the station. Each unit could be acted upon by the participant in response to a given stimulus. No instructions were given to participants on the manner in which the system of units operated. The idea behind *Communications Game* was to see art as a communication or interaction between people enabled by technology.

Through such projects, Edmonds demonstrates how color, structure, time, and interaction influence each other. The viewer becomes an active participant, bringing new unexpected turns to the artist’s work. These interchanges are a constant stimulus in Edmond’s explorations in art. They represent a path towards the creation of new constructs in art that technology has enabled and that Edmonds has, over the last forty years, made visible.

Fifty One & Fifty Two (1980)

Fifty One & Fifty Two (Figure 3) are part of a series of acrylic paintings on canvas created by Edmonds in 1980, when exploring new ways of structuring and executing an artwork by using rules as organizing principles. This was a direct consequence of the discovery of the value of the computer in organizing the structure of an artwork Edmonds made in 1968 when he created *Nineteen*. This discovery also taught Edmonds that the computational process was of interest to the making process of an artwork.

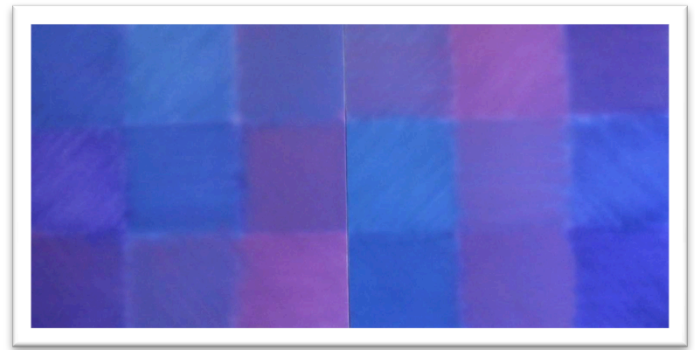


Figure 3: Ernest Edmonds, *Fifty One & Fifty Two*, 1980. ©Ernest Edmonds. Image courtesy of the artist.

Fifty One & Fifty Two were structured in two concurrent respects: firstly, the organization of the surface and the colors; secondly, the process of execution of the painting. As to the organizational aspect of the artwork, this had no implications on how it was done, whereas the process drove how the painting was made, in what order the paint was applied, and where.

Fifty One & Fifty Two are two separate squared canvases placed side by side and represent two variations of a theme, or structure. Each one uses three basic colors, called “seeds colors.” Let us take the first variation, *Fifty One* (Figure 3, on the left), as an example. The first rule specified by the artist is that the image be divided into nine sections of equal area that define a three by three grid. There should be three seeds colors in it; each of those three colors should be allocated a square in the grid where none of them has to appear on the same row or column as another. For ease of explanation, Figure 4 exemplifies the grid; the numbers in it refer to a specific square in the grid. The three seeds colors in *Fifty One* therefore appear in square number 4, 2 and 9.

1	2	3
4	5	6
7	8	9

Figure 4: organizing grid (*Fifty One & Fifty Two*).

The second organizing rule states that when any one of these colors appears in any particular row or column, then such color has to be in all of that row or column. So for example, the color in 9 has to appear in 7, 8, 6 and 3; the color in 2 has to appear in 1,2,3,5 and 8; and the color in 4 has to appear in 1,7,5 and 6.

As to the process of execution of the painting, this followed other sets of rules. The paint was applied with an electric way control spray gun. As one of the organizing rules implied the presence of two colors in one single square of the grid, the artist decided that, when combining the two colors, they should be sprayed both without mixing them. This created a result that visually recalls the work of Seurat, where the combination of different colors appears unified by the physical process made by the eye of the viewer.

Edmonds decided to make the spraying process obvious, so the colors were intentionally sprayed lightly. This meant that the direction of the spray was made visible. The artist therefore chose three ways of spraying: bottom left to right top, horizontally, and top left bottom right. These three directions formed, similarly to the three seeds colors mentioned before, three different generating squares following the same organizing rules set up for each seed color. As a result, if square 8 was allocated horizontal spray, then 7, 8, 9, 5 and 2 will have to use horizontal spray, and so on. There are now two overlapping patterns: the pattern of colors and the pattern of spraying. In this way, the artist has defined the structure of the organizational elements of the painting, and the process of making it. The second painting, *Fifty Two* (Figure 3, on the right) is a variation of the same theme, where the allocation of the colors and spraying directions are changed.

For Edmonds, this process of creating an artwork derived from two important sources of inspiration. Firstly, as mentioned above, was the process activated by *Nineteen*, which represented to Edmonds the first critical point of change in his art. Secondly, was the work of Charles Biederman.

The first major retrospective of Biederman's work was organized by Robyn Denny for the British Arts Council in 1969 at the Hayward Gallery in London. The exhibition had a strong impact on the art community at that time. The exhibition was then shown at the Museum and Art Gallery in Leicester. Edmonds visited the exhibition at both venues and was overwhelmed by Biederman's work, particularly the simplicity in which he constructed and organized his reliefs, and the effect that bold shining colors had on the reliefs' aluminium surfaces.

It was particularly the way Biederman understood art as the solution of a problem to be found in pure observation that connected with Edmonds' research and art practice. As Biederman suggested, "Nature teaches us the methods and

structural conditions by which to solve problems." [6] The next step for the artist was to abstract from the structural process of nature. This point led to the notion of structural procedure and minimal complexity that excited Edmonds' curiosity. It was the way reliefs were constructed without having anything excessive - no redundancy, - that interested Edmonds the most. After visiting the Hayward Gallery exhibition, Edmonds studied Biederman's works in more detail when the retrospective moved to Leicester.

It was seeing Charles Biederman's exhibition in London that really settled my decision to minimise the elements with which I worked in order to maximise the potential richness of what I was able to produce. [7]

These two experiences helped Edmonds crystallize the understanding that making the elements of the work simpler added power to his work. As he learned more psychology through his interest in human-computer interaction, then he came to understand that actually there is nothing surprising about that and there are many examples from psychological experiments that show how our mental processes deal much better with constrained choice situations than unconstrained choice situations.



Figure 5: Ernest Edmonds, *Four Shaped Forms (Park Hill B)*, 2014. ©Ernest Edmonds. Image courtesy of the artist.

Four Shaped Forms (Park Hill B) (2014)

Four Shaped Forms (Park Hill B) (Figure 5) is a four-piece of acrylic paint on canvas strongly connected to *Shaping Forms*, a series of time-based works Edmonds made from 2007 exploring the notion of interaction. Interaction has been one of the focuses of Edmonds' investigations, initiated by works such as *Communication Game*, as analyzed above. It developed even further in recent years, as demonstrated by his *Shaping Forms* series. Here, interaction is intended as an exploration of "long term influences rather than short term reactions." [8]

Shaping Forms (Figure 6) are a series of generative and computational works displayed on a square monitor, surrounded by a purpose-designed frame built in plastic and wood by the artist. *Shaping Forms* are individual works where images are constantly generated by a computer program that decides which colors, patterns, and timing the work should display at any given moment. The movement in front of each work is detected by a camera and produces changes in the image, shape, and duration, so that the environment, the active spectator, and the work influence each other. Edmonds once described his unique way of perceiving interactivity in his art as an interest in "seeing how computer generated art systems can interact with the most purposeful enquiring systems—human beings." He continues,

I am interested in how humans react to artworks that behave differently because of their presence and whose form and appearance change over time...The atmosphere, the light, the space, the audience are all part of the experience of a work...In interactive art, the audience is deliberately made a component of the work: the person in the art space becomes an active participant. In participative interaction, the artefact is just one element of the whole experiential space. [9]

The four canvases making *Four Shaped Forms (Park Hill B)*, represent four variations of a theme directly connected to *Shaping Forms*. The selection of colors, in both cases, is generated from a system that uses color models, where the hues are equidistant according to some rule and the saturation levels are the same or close together according to a system.

In *Four Shaped Forms*, the structure of the elements within the picture organized in a four by four square grid looks similar to the way *Fifty One & Two* were organized. As a matter of fact, its structure is much more complex and less easily explained by geometry, as *Four Shaped Forms* are four moments selected out of a time-based sequence. The way *Four Shaped Forms* is structured is therefore more obscure, but nevertheless it provided Edmonds with a procedure and process for generating the images in a rigorous way, similarly to the earlier experiences of *Nineteen* and *Fifty One & Two*.



Figure 6: Ernest Edmonds, *Shaping Forms*, 2007. ©Ernest Edmonds. Image courtesy of the artist.

The colors and patterns chosen for each canvas of *Four Shaped Forms* are selected by the artist from stills of *Shaping Forms*. The colors are then manipulated and adjusted by eye onto the canvas. The dialogue that this relationship creates between the time-based work and the paintings is strong. In the time-based works, the viewer can only appreciate colors and patterns in one sequence with different lengths of time between them, which generates a kind of rhythm through time. Although this musical quality is lost in the paintings, by looking at the four variations of *Four Shaped Forms*, the viewer is able to experience four different moments of a theme at the same time.

Conclusions

This article has explored a selection of works by Ernest Edmonds that delineates one of the possible roots of the very complex field of generative art. The mathematical rules applied by the artist to create *Fifty One & Two* and the software work that inspired *Four Shaped Forms* have generated paintings that are in constant dialogue with their computational counterparts, *Nineteen* (1968-9) and *Shaping Forms* (2007). *Fifty One & Two* and *Four Shaped Forms* demonstrate that rules and computation methods can be seen as inventive forces that delineate a new order in the creative process of an artist. Although the computer was not used directly to create such works, these could have not been created without the earlier computational works generated and programmed by Edmonds from the late 1960s onwards. There is a dialogue between the painting works and the software pieces analyzed in this article,

and they represent one of the developments of generative computational art that is in constant evolution.

Acknowledgments

I am deeply grateful to Ernest Edmonds who kindly accepted to be interviewed and generously allowed me access to the material held at his studio in Sheffield. I would like to extend my gratitude to Douglas Dodds and Melanie Lenz of the Victoria & Albert Museum, London, for their help in making supporting research material available, and Linda Candy for providing helpful comments on earlier drafts of this article.

References

1. Francesca Franco, "Exploring Creative Intersections: Ernest Edmonds and his time-based generative art," *Digital Creativity*, Vol.24, No.3, 222-236 (2013); Francesca Franco, "Documenting Art as Art: the case of Notes (2000-ongoing) by British artist Ernest Edmonds," *Visual Resources - An International Journal of Documentation*, Vol. 29, No. 4, 333-352 (2013); Catherine Mason, *Computer in the Art Room: The Origins of British Computer Arts 1950-1980* (JYG Publishing, Hindriham, Norfolk, UK. 2008); *Ernest Edmonds – Light Logic*, ed. Laura Sillars, exhibition catalogue, Site Gallery, Sheffield, 2012; *Automatic Art – Human and machine processes that make art*, ed. Robert Devcic, exhibition catalogue (GV Art gallery, London, 2014).
2. Ernest Edmonds, interview by Francesca Franco, Hathersage, Derbyshire, January 15, 2012.
3. Ernest Edmonds, *On New Constructs in Art* (Sussex, Artists Bookworks, 2005), 12.
4. Ernest Edmonds and Francesca Franco, "From Communication Game to Cities Tango," *International Journal of Creative Computing*, Vol.1, No.1 (2013).
5. Stroud Cornock and Ernest Edmonds, "The Creative Process Where the Artist is Amplified or Superseded by the Computer," *Leonardo* 6, no.1 (Winter 1973): 11–16.
6. Charles Biederman, *Art as the Evolution of Visual Knowledge* (Minnesota: Red Wing), 557.
7. Ernest Edmonds, *On New Constructs in Art*, 2005, 7.
8. Edmonds, interview by Franco, January 15, 2012.
9. Ernest Edmonds, *Shaping Form* (Sydney: UTS, 2007), n.p.

Author Biography

Francesca Franco is Senior Research Fellow at De Montfort University, Leicester, where she is studying the Edmonds Archive of computational art held at the Victoria & Albert Museum. In 2009–10 she was Research Fellow on the AHRC funded project Computer Art and Technocultures at Birkbeck, University of London, and the V&A Museum. She holds a PhD in the History of Art (Birkbeck). She is an Associate Editor of *Media-N*, Journal of the New Media Caucus. Her most recent publications include

"The First Computer Art Show at the 1970 Venice Biennale. An Experiment or Product of the Bourgeois Culture?" *Relive: Media Art Histories*, Cubitt and Thomas, eds, MIT Press (2013); "Exploring Intersections: Ernest Edmonds and his time-based generative art," *Digital Creativity*, 24:3 (2013). Francesca's first monograph on the history of generative and interactive art is contracted with Ashgate: *Ernest Edmonds – Generative Systems Artist* (forthcoming).