BRIDGES
Mathematical Connections
in Art, Music, and Science

Splinters from the Keyboard
Artistic Work and the Experience of Production

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Abstract

This essay accompanies the exhibition of artwork at the Conference. It contains discussion about making use of computer graphics for art production, with accompanying description of the author's original artwork. Inspiration taken from natural and human made structures and processes is applied to creating and teaching art.

1. Artistic concerns

Acutely aware of order, I examine what technological and human worlds have in common. Natural order, revealed randomly and regularly, infuses several levels of both worlds: some determined by man, through buildings, their windows, even cars parked in lots, and some determined by nature, through trees, branches and leaves arranged. My task is to juxtapose the regularity of nature with man's physical and intellectual constructions. The title "Splinters from the Keyboard" brings together my creative process into some manner of union: the initial algorithmic program and the final wooden sculpture.

2. Technical concerns

2.1. Computer graphics (Programming in 2D). Since the eighties, I was fascinated with computer abilities to make precise markings controlled by a program, to be later juxtaposed with a free-hand line.

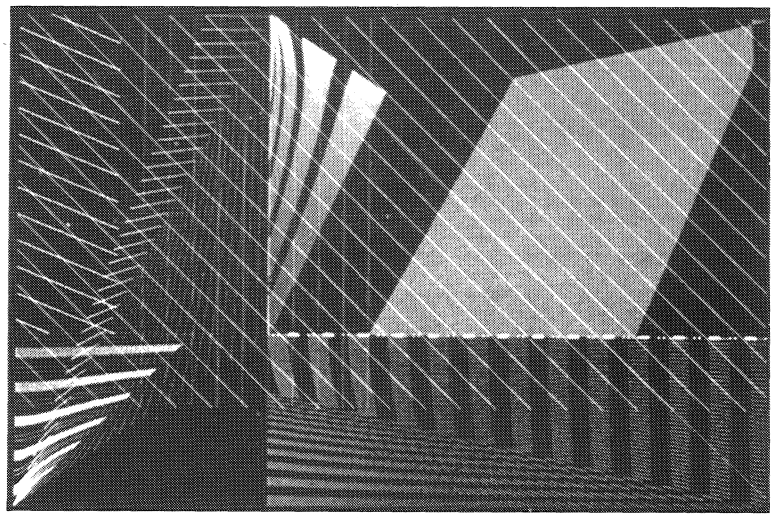

Figure 1: *Report From Colorado*
(VAX mainframe, Fortran 77, COM recorder and PC)

In my work, I use the computer on different levels, so creating art runs through stages. For my two-dimensional works, I have been programming with Fortran 5, then Fortran 77 using Cyber and VAX mainframes, Interactive Graphic Library (IGL), then C++. The Cyber and VAX/VMS mainframes (designed for technical but not artistic use) allowed me the use of large-size (20-in width infinite length) plots, and the possibility of creating numerous kinds and qualities of colors. COM recorders deal with the mixing of light rather than pigment. One can mix colors infinitely using Fortran 77 with the IGL, setting color combinations in percentages and thus combining additive (red, green, blue) or subtractive (cyan, magenta, yellow) colors. Transforming programmed images adds more dimensions to the picture. One can obtain a gradation of color intensity using reiterating lines, grid patterns and some chiaroscuro effects, as well as moire effects, so 2D drawings gain a 3D look. The gradation of the intensity of color gives the effect of 3D space through the use of shading, similar to hand drawing. To attain composition, I create programs to apply repetition of lines, shapes and forms, select color combinations and light intensity, apply grid patterns and moiré effects, transform, distort and manipulate images by scaling, rotating, slanting and changing perspective. Printouts have been obtained in several ways: first, black-and white plots from the Versatec plotter and color slides via the Computer Output Microfilmer (COM) recorder, then various printers/plotters.

2.2. Combining programming with printmaking media and software

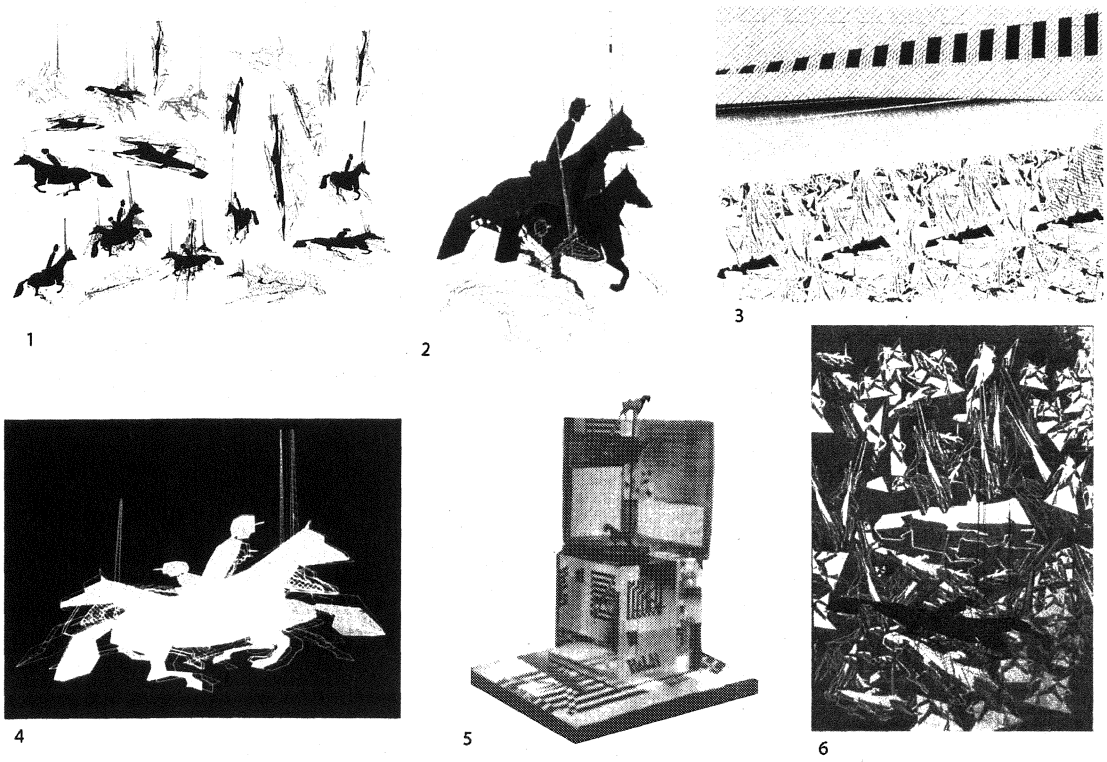

Figure 2: *Horses in motion*
Images of a horse have been printed on paper as a computer art graphics (1 and 3), processed as a color slide via COM recorder (4), translated into a photosilkscreen after 3-D computer program (2), a photolithograph after computer program (6), and transformed into a sculptural form (5).
(VAX mainframe, FORTRAN 77, COM recorder, photosilkscreen, photolithograph)

I extended images beyond the computer screen and optional outcomes provided by the system. I transformed images created algorithmically on the computer using various kinds of software, translated them to other media tools, and used them as a starting point for creating other forms of art. Slides can only be presented in a slide show, so I started to translate printouts into another language, that of photosilkscreened prints, photolithographs, and photocopies, to unify computer generated and painted images. They were later included both into my two-dimensional and three-dimensional works. I appended photographic content using scanners and digital cameras for further image manipulation.

2.3. Computer enhanced sculptures. I became deeply interested in exploiting endless possibilities offered by three-dimensional graphics in order to create wooden sculptures and computer-enhanced mixed-media sculptures [1]. I used computer programs as an inspiration for creating wooden sculptures.

Due to the computer's unique capabilities, images can be cut, transposed, reorganized, pasted, scanned and partially blown up, variations can then be compared to the original image, if it was saved in its unaltered form. None of this is possible with hand drawing of painting. The sculptures I describe would never have come into existence without my use of a computer.

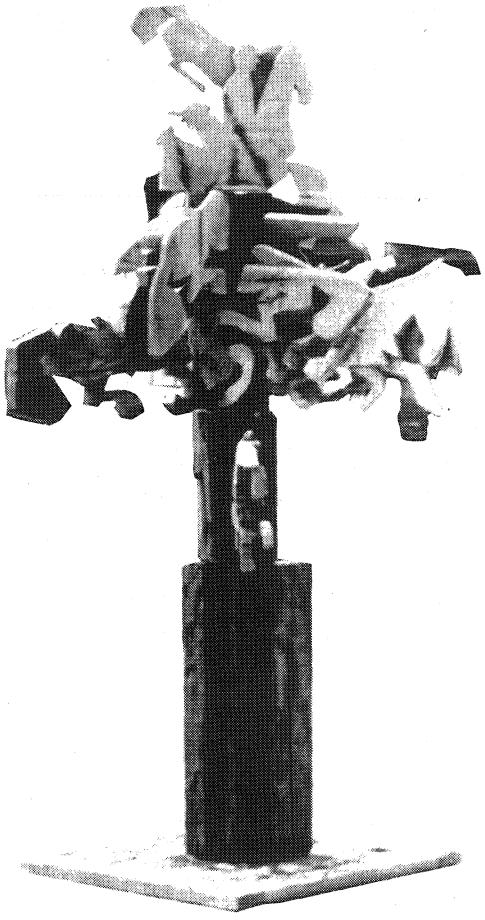

Figure 2: *Speeding*
Computer enhanced wooden sculpture
(Fortran 77, VAX mainframe, wood)

Thus, computer programs shaped my wooden and mixed-media sculptures. I wrote my 3-D programs in Fortran 77 using Interactive Graphic Library (IGL) to transform a line drawing into a three-dimensional wire frame drawing. I transformed my programmed image of an animal or a man into a simple image, an iconic object such as a horse or a symbolic picture of human — a warrior, for example. I used three approaches to creating graphics to aid sculpting: (a) adding a factor of time into sculpture, (b) transforming images, and (c) to creating mixed-media sculptures.

(a) Adding a factor of time into a sculpture. While working on generating images to visualize concepts, I made 3D wireframed drawings (without a hidden-line package, with the z axis visible). I superimposed the transformed images through the use of perspective from different positions. Although it is possible to walk around a sculpture and look at it from different angles, I wanted to achieve a representation of the fourth dimension. I duplicated then changed each image by scaling, rotating, stretching, and assigning various perspectives to each representation. I also changed the center of direction of projection (the point of view), so the design of the object could be seen from numerous directions at the same time. The wireframed designs incorporated the factor of time into the sculpture and offered illusion of movement. In my figurative wooden sculpture "The Speeding" I applied this kind of transformation: I multiplied a 3D design of a running horse and rider many times, with resizing each copied horse, giving the image different perspective, viewpoint and point of reference. Such presenting simultaneous views of a subject within a 2D work can be noticed in some drawings made by Cubists (Pablo Picasso, Georges Braque), in works of Italian Futurists (Giacomo Balla, Gino Severini), and in studies made by the photographer Eadweard Muybridge and the American painter Thomas Eakins as well.

(b) Transformation of geometrical graphics to solid material. I used representations of masses in a vector mode, creating a wireframe design as a guide in constructing sculptures. Through the superposition of images— multiplied, superimposed, transported — I initialized my wooden sculptures.

(c) Computer aided mixed-media sculptures. To vary color combinations in my 3D mixed-media compositions, I converted computer printouts into photolithographs after computer programs and photo silkscreened prints on canvas and paper. The surfaces of the wooden sculptures have been covered this way.

2.4. Multimedia work. What technological and human worlds have in common? My task is to juxtapose the regularity of nature with man's physical and intellectual constructions. Processes in nature and events in technologies inspire my images. Natural order guides our understanding of big data sets related to network analysis, when we employ physical analogies of the data, render the data graphically, explore them 'by eye' and interact in real time. The big city, for example, combines how humans affect their environment, and at the same time, how a city metaphor reflects rhythm and organization of big data sets, and makes data mining easier. Thus, humans create cities, whereas a city metaphor reflects data sets. Observers — whether artists or technology experts — perceive such relationships from different perspectives and different points of view. Inspiration by processes in nature and events in technologies also supports my instruction in computer art and graphics, where students learn to create artwork and demonstrate what they understand of scientific concepts.

Computer plots obtained with the use of Fortran, IGL, then transformed into photosilkscreens for color variation were applied on a surface of a mirror to create an image of a city. A short animated film with people in motion has been projected on this mirror surface, just creating a reflection of people's movement. Thus, the image of the city has been juxtaposed with the animated actions, to show how a big city life involves individual life events and daily routines.

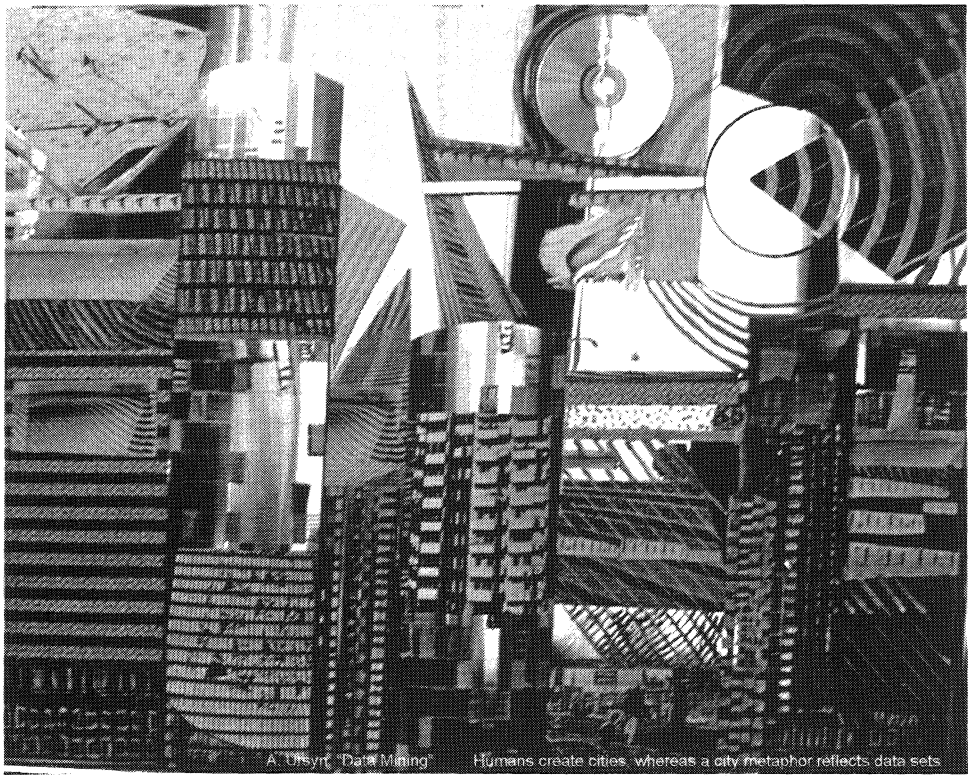

Figure 4: *Data Mining*
(Vax, digital camera, Macintosh
Adobe Photoshop, Final Cut Pro, Quick Time, programs written in Fortran)

Reference

[1]Ursyn, A., *Planks, Programs and Art: Computer Graphics as a Sculptural Tool.* LEONARDO, Journal of the International Society for the Arts, Sciences and Technology, Vol. 26, No. 1, pp. 29-32. 1993.