The Internet, A Musical Instrument in Perpetual Flux

Netochka Nezvanova
c/o Babeltech A/S
Esromgade 15
2200 Copenhagen N, Denmark
ecdysone@eusocial.com

> When humans listen to one person speaking, read one page of print, much of what humans think they see or hear is supplied from personal memory.
> —W. James, 1880
>
> When humans think seriously they think abstractly. They conjure up simplified pictures of reality called concepts, theories, models, paradigms. Without these intellectual concepts there is only one blooming, buzzing confusion.
> —P. Huntington, 1993

Living systems attempt to minimize unknown quantities. The work described in this article traverses ideas of cyberfeminism, Darwinism, sociobiology, information theory, pedagogy, computer science, theater, astronomy, psychology, philosophy, epistemology, and biology, and it does so necessarily. Disconnecting one of these fields from another would equate a rigid stance against the infinitely flexible which is life, a stance as lamentable as that of the ancient Greeks toward *apeiron*.

The thoughts expressed in this work will perhaps be understood only by those who have experienced such thoughts themselves. Its purpose is achieved if it shows how little is accomplished by thought. Thus the aim of this work is to draw a limit to thought—or rather, not to thought, but to the expression of thought. If this work has value, it consists of one thing: "thoughts are expressed in it" (Wittgenstein 1921). There will be places where I seem to be arguing with myself. I am.

URL Synthesis

Nebula.m81 is an initial multiplatform implementation of the USISK system (Nezvanova 1999a). USISK introduces a new type of synthesis called *URL synthesis*, an eclectic program of sound, image, and text driven by the wondrous panoply of actions and interactions, mutualism, parasitism, mimicry, and errors which form the basis of the Internet, a global network consisting of more than 10,000 subnetworks and more than 1 million computers.

Computer Music Journal, 24:3, pp. 38–41, Fall 2000

A Vast Musical Instrument

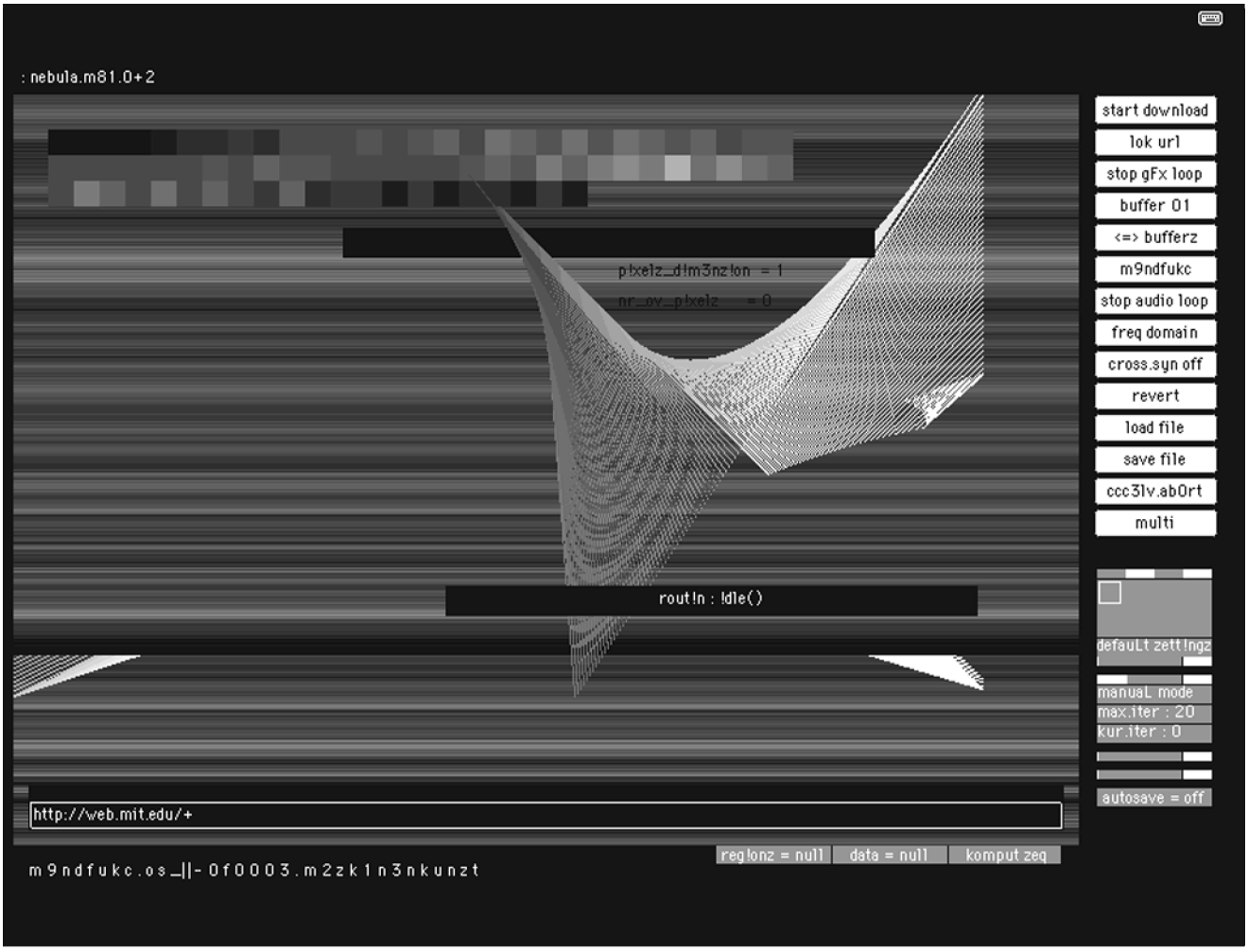
The number of Internet hosts has grown more than sixfold since 1995. In 1998 there were 23,578,000 hosts in the USA alone, with Finland having the greatest number of hosts per capita (*National Geographic Magazine* 1999). As Bailey (1996) notes, "data amounts equivalent to one person's lifetime experiences may be downloaded in minutes. The planet as a whole disgorges 1 trillion data pieces per day."

When an application sends data using Transmission Control Protocol (TCP), the data is sent down the protocol stack through each layer until it is sent as a stream of bits across the network (Stevens 1998). Avoiding an unbearable silence, the four network layers of TCP are drawn into motion. The protocol suite vibrates as the strings of a cello, an interaction that causes a quiver—a responsive tone of harmonic complexity. The articulation of subject interaction as expression determines the value of its output packets; the resolution becomes the composition, a stratification of data.

Traversing Digital Corridors: The International Bitstream

Carl Sagan has said (1997): "For 99.9 percent of the time since our species came to be, we were hunters and foragers, wanderers on the savannas and the steppes. There were no border guards then, no customs officials."

Figure 1. Nebula.m81 animated-image sequence, generated from data referenced by http://www.mit.edu.



According to the world view that mathematicians call Platonism, we do not create the mental objects of which we speak. Instead, we find them. All thoughts are already present (Gödel 1940).

Nebula.m81 compositions are binary amalgamations of data referenced by uniform resource locator (URL) locations. Because data associated with URL locations is transient and evolving, the compositions adapt to reflect these changes. In autonomous mode, Nebula.m81 interfaces with Internet search engines. The operation is recursive. The number of iterations may be undefined, facilitating an itinerary of indeterminate duration. The search criterion is specified deterministically or stochastically from a database or from information accumulated in previous queries.

Meaning Recompilation

Data referenced by URL locations is often textual. Words have a linear, discrete, successive order. Beyond the very limited meanings of inflections that can be incorporated into the words themselves, we cannot speak in simultaneous bunches of names. Mapping textual data to sound and visual forms facilitates new interpretations (see Figure 1).

J. Bailey (1996) writes: "Lines, colors, proportions

are just as capable of articulation, of complex combinations, as words. The laws that govern this sort of articulation are altogether different from the laws of syntax that govern language. The most radical difference is that visual forms are not discursive. They do not present their constituents successively but simultaneously. The relations determining one visual structure are grasped in one act of vision."

Heterosexual Reproduction: The Cut-Up Technique

With animals and plants, a cross between different varieties but of another strain gives vigor and fertility to the offspring; close interbreeding diminishes vigor and fertility (Darwin 1859). A literary parallel—the "cut-up" or collage—is a technique similar to contemporary experiments such as action painting and aleatoric music, and avant-garde theories such as structuralism and deconstruction.

Nebula.m81 utilizes the cut-up/collage technique extensively. Data referenced by URL locations is interspersed in the time and frequency domains by stochastic modules. The operation types and associated parameters may be entirely decided by software or operator instructions.

The real-time granular sequencer module performs a parallel pseudoscrub operation. Cursor movements activate the corresponding audio regions. Cursor coordinates delimit a region's start time and duration, while the directional velocity of the cursor affects the playback direction. Specifying segments of very short duration facilitates granular synthesis, time scaling, etc.

Activated regions are completely detached from their parents, thus control over individual granules is retained. Furthermore, continued operations on parent sources without changing previously generated material are possible. Coupled with the ability to selectively add or subtract activated regions, this permits flexible, complex layering.

The non–real-time variant module performs a similar operation. Processed data is composited into new source material. A principal aspect is that the playlist generated via cursor movement is detached from its parent, thus it may be affiliated with different parents during the course of composition.

It has been noted that "close interbreeding diminishes vigor and fertility," so it is perhaps significant to observe that recursively applying a playlist to the playlist's composite output often results in curiously appealing offspring.

Error: Mark of the Higher Organism

G. Bateson (1979) noted, "All that is not information, not redundancy, not form and not restraints is noise, the only possible source of new patterns."

Practically all operations in Nebula.m81—URL traversal, input/output routines, digital signal processing processes, imaging operations—can be governed by pseudorandom number generators and data transmissions. Although feasible, operator interference with the composition is not disproportionately emphasized under the dubious pretense of interaction, a pretense that often betrays the slightly obfuscated silhouette of the millennia-old geocentrist viewpoint. Thus, operator thought activity is stimulated not by the imposition of decision making, but rather by an invitation to observe and analyze data transformations, to be distracted, and ultimately to select.

Von Neuman and Morganstern's *Theory of Games and Economic Behavior* (1980) introduces the cut-up method of random action into game and military strategy: "Your opponent will gain no advantage from knowing your strategy since he cannot predict the move. The cut-up method could be used to advantage in processing scientific data. How many discoveries have been made by accident? We cannot produce accidents to order. The cut-ups can be applied to fields other than writing."

Conclusion

Ever since the time of Plato and the cult of Pythagoras, humans have been inordinately impressed by whole-number relationships, regular geometries, and mathematical patterns in the natural world. These data models, flung together by those irredeemably attracted to wholism, are designed to

satisfy the being's curious but credulous mind, while bearing no resemblance to how nature operates.

Children born today will grow up to live in a world where computers outnumber them, where thought no longer holds an exclusive franchise. To destroy the tendency toward classical and neoclassical equilibrium and to create a new disequilibrium, to travel where thought alone cannot, is the role of innovators in the bit society (Bailey 1996).

USISK research has bifurcated into a number of projects. Kinematek.0+2, MMF0+99, and Venera 8 (Nezvanova 1998) also use the Internet as their primary data source. Kinematek.0+2 is a "nonlinear book." Whereas a book is a sequential one-track structure, Kinematek.0+2 is a nonlinear textual sampler. Chords of paragraphs or entire Web pages may be "played" from a keyboard or via a program. The data may be transposed, segmented, sequenced, and dispersed. MMF0+99 performs similar operations and translates the output into MIDI information. Venera 8 maps data transmissions of electronic mail servers to sound, MIDI, and video.

USISK works debuted at the Fifth International Festival of Computer Arts, Maribor, Slovenia (Grzinic and Eisenstein 1999) and are employed in presentations at the modern art museums of Santiago, Chile and Paris, France. Nebula.m81 was awarded first prize in the multimedia category at the Fourth International Musical Software Competition, which took place in 1999 at Bourges, France.

Nebula.m81/USISK research continues with NATO.0+55 (Nezvanova 1999b), an Internet, audio, video, VR, 2-D, and 3-D graphics environment for the IRCAM/Opcode Max programming language distributed by 0f0003 and IRCAM. Within a few years, it is expected that nearly all major Internet sites will be capable of accommodating mobile code (Kotz and Gray 1999), and thus I am currently investigating mobile USISK modules.

References

Bailey, J. 1996. *After Thought*. New York: Basic Books.

Bateson, G. 1979. *Mind and Nature: A Necessary Unity*. New York: Ballantine Books.

Darwin, C. 1859. *The Origin of the Species*. New York: Penguin Books.

Gödel, K. 1940. *The Consistency of the Continuum Hypothesis*. Princeton, New Jersey: Princeton University Press.

Grzinic, M., and A. Eisenstein. 1999. *Od Drugod do Kiberfeminizma in Nazaj*. Maribor, Slovenia: MKC.

Huntington, P. 1993. "If Not Civilizations, What?" *Foreign Affairs* 72(5):186–194.

James, W. 1880. "Great Men, Great Thoughts, and the Environment." *The Atlantic Monthly* 46(276):441–459.

Kotz, D., and B. Gray. 1999. "Operating Systems Review." *Journal of the ACM* 33(3):7–13.

National Geographic Magazine, supplement. 1999. 196(3).

Nezvanova, N. 1999a. USISK patent application. 0f0003 Maschinenkunst, Copenhagen.

Nezvanova, N. 1999b. "NATO.0+55: An Internet, Audio, Video, VR, 2-D, and 3-D Graphics Environment for the IRCAM/Opcode Max Programming Language." 0f0003 *Arkiv* 247:1–8.

Sagan, C. 1997. *Pale Blue Dot*. New York: Ballantine Books.

Stevens, W. R. 1998. *TCP/IP Illustrated*. Reading, Massachusetts: Addison-Wesley.

Von Neuman, J., and O. Morgenstern. 1980. *Theory of Games and Economic Behavior*. Princeton, New Jersey: Princeton University Press.

Wittgenstein, L. 1921. *Tractus Logico-Philosophicus*. New York: Routledge.