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(DRAFT #4) Virtual Terrain: the Nomadic Trajectories of Vasulka's Electronic Networks

by David Sears Mather

Could it be that it is at the moment the war machine ceases to exist, conquered by the State, that it displays to the utmost its irreducibility, that it scatters into thinking, loving, dying, or creating machines which have at their disposal vital or revolutionary powers capable of challenging the conquering State?

Gilles Deleuze and Felix Guattari<sup>1</sup>

In their seminal work on nomadism, *Nomadology: The War Machine*, Deleuze and Guattari explore principles of constructing and occupying space according to mobile tendencies and open-ended topologies. Continually moving beyond the boundaries of a striated, sedantary society, nomads move unrestrained over land. The tendency for nomads to construct and occupy open space according to mobile and intuitive strategies can also illustrate how space originates within non-physical, electronic environments. Terrain, in either the physical or virtual sense, can be filled without its needing to be strictly defined or circumscribed. Digital space is like nomadic space in that it cannot be physically confined, nor can it be defined by a specific location.

Moreover, Deleuze and Guattari show how nomads, by transgressing boundaries of sedantary societies, have been innovators of technology throughout the ages. With a mobile orientation and a propensity for assuming others' language and behavior, nomadic tribes have a pronounced technical virtuosity that is primarily associated with the development of weaponry and the strategies of war. Transgressive nomadic tendencies, symbolized by technical innovation within a mobile model, frame the efforts and concerns of electronic pioneer Woody Vasulka, whose recent series of media installations explore territorial relations, both digital and physical, between human and machines

Vasulka's approach to electronic networks is unconventional, since he explores the vast digital domain according to experimental trajectories, without knowing precisely where he will end up: like a nomad, he proceeds without a specific destination in mind.

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<sup>1</sup> Deleuze and Guattari, *Nomadology: The War Machine*. New York: Semiotext(e), 1986. 9-10.

~~where he will end up; like a nomad, he proceeds without a specific destination in mind.~~

Within a nomadic tradition of technological invention that advocates mobility, resistance, and transgression in lieu of mainstream market practicalities, he constructs complex electronic networks that behave in unanticipated ways. Vasulka uses his technical knowledge and mechanical expertise to fashion electro-mechanical networks that confound dominant market sensibilities and challenge viewers to conceive of and participate in alternative compositional environments.

As Jacques Attali says in *Noise*: "Composition can only emerge from the destruction of the preceding codes."<sup>2</sup> With roots in an (aesthetic) critique of technological innovation, Vasulka defies existing conceptions of electronic networks by exploring the compositional possibilities of cybernetic systems. The basic principle for network composition is feedback, whereby input devices monitor human and machine activity and, in turn, activate output devices, according to specific internal instructions. Feedback may display direct correspondances between a network's input and output activities, or, if several feedback mechanisms operate simultaneously, as in Vasulka's work, it may display complex, random, and chaotic behaviors. As a primary operating principle of Vasulka's media installations, system feedback allows for unpredictable network behaviors to arise from a sophisticated software architecture.

The software operating on Vasulka's computer system is especially noteworthy, because it permits input devices to affect high-level operations of the entire system in real-time. Designed by software engineer Russ Gritz, this software relies on free-floating software agents <sup>named</sup> ~~called~~ <sup>by Gritz</sup> **A**ctors<sup>n</sup> which interpret, arrange, and distribute data through the system. As miniature computer programs that wander nomadically, **A**ctors regulate network activities by instructing devices how to behave when specific events (feed data into the system) Taking the form of logical arguments written as lines of computer code, **A**ctors answer basic operational questions: where are the devices? what are they doing? and how should they proceed? "While each **A**ctor in the system functions in a discrete,

<sup>2</sup>Jacques Attali, *Noise: The Political Economy of Music*. Minneapolis: University of Minnesota Press, 1992. 136.

predictable, and understandable manner, the ensemble of all actors exhibit an 'organic', high-level behavior," <sup>states</sup> ~~writes~~ Gritzko of his concept. <sup>2</sup>

In some cases, shifts in the orientation and objective of a device are triggered by ~~actors~~ <sup>actors</sup> that monitor the physical environment with electronic sensors. These sensors emit ultrasonic pulses of energy to gauge the viewer's proximity to the installation, <sup>they are</sup> ~~the~~ same type of device used in cameras <sup>to</sup> ~~that can~~ focus a lens automatically. Configured around a single space, many sensors operating simultaneously can provide very specific information about the movement of bodies. By means of sensors to interpret physical conditions of certain installations ~~actors~~ <sup>the installation's</sup> observe viewers and compose behaviors <sup>that</sup> ~~which~~ contribute to electro-mechanical performances for viewers.

(optical includes DSM) (

With a background in radio telegraphy, engineering, and cinema, and fascinated by components of modern warfare, Vasulka collects discarded military apparatuses and converts them into machines for compositional, not destructive, purposes. Arrayed around the salvaged machines are various classes of devices (i.e., optical, robotic, pneumatic, and laser-disk players) that have been integrated into a singular, computer-controlled environment, which may also be called a hybrid electronic network. Within the context of hybrid networks, Vasulka explores modes of cybernetic integration. He and a team of programmers and technicians design hardware and software for the simultaneous operation of numerous devices; that may implicate few or many participants. All the installations in *The Brotherhood* produce a play of images and sounds amidst a complex mechanized environment, yet each installation proposes its own distinct strategy for constructing space and composing interactive behaviors.

X Table I: (*Translocations*) includes a salvaged computer from an early generation  
 X of automated, <sup>1</sup> aerial-navigation units commissioned by the United States <sup>2</sup> military. At the  
 X installation's core, this table has a horizontal platform with a grid of identical squares  
 (like a large <sup>eg. vata</sup> ~~press board~~) for plotting coordinates. <sup>3</sup> Originally used <sup>3</sup> on bombing missions,  
 X this plotter would guide airplanes along specific paths toward targets. In Vasulka's media

<sup>3</sup> ~~The Evolution of the Soul of the Machine, unpublished manuscript.~~

- ① TARGETING TABLE
- ② NAVY
- ③ (MOST PROBABLY A TRAINING DEVICE)

environment, the table <sup>by means of</sup> positions a mechanical arm over the grid <sup>based on</sup> motion detectors

that sense activity around the table. The same instructions for guiding the arm are sent to a set of projectors and their screens, moving on wheels along two tracks <sup>placed</sup> at some distance <sup>away.</sup>

The tracks themselves <sup>tempting of the viewer them, and when he does enter</sup> are tempting to walk between, except that upon entering this

corridor of images, one projector <sup>s</sup> abruptly moves toward the viewer — a mechanical nomad that shadows the viewer's movements. The projectors display real-time images that come from cameras mounted around the grid (two cameras are attached to the mechanical arm itself), with a video switcher alternating specific images being sent to each screen.

With <sup>disparate array of media</sup> this installation does not rely on a dominant modality (visual, aural, or mechanical) but, rather, it integrates all of its media into an <sup>intriguing</sup> hybrid network of displaced images. <sup>1</sup>

Despite direct feedback to the network from ultrasonic sensors, *Table I* exhibits random and unscripted mechanical behaviors. This is <sup>owns</sup> due to a high volume of random data from numerous sensors, which, when fed into the system simultaneously, flood the network with instructions. As previously mentioned, <sup>actors</sup> give specific instructions to devices, but they also sometimes activate or terminate other <sup>actors</sup>, which <sup>results that</sup> can complicate the network immensely and <sup>which may</sup> make the installation's behaviors appear

unpredictable <sup>even</sup> the technicians who operate the system. Bruce Hamilton, a long-time colleague of Vasulka, admits that, while network behaviors may be difficult to define accurately, creating the context for intelligent cybernetic behavior is a goal of this installation. <sup>4</sup> In *Table I*, the behavioral correspondence between human participants and

the electro-mechanical system can produce unpredictable human-machine relations, whereby the possibility arises for machines to develop their own strategies for action

without strict control by any <sup>central processing unit</sup> human entity. The complex cybernetic interactions emerge from the combination of the installation's non-striated physical environment and the implementation of Gritzko's open-network architecture, which together permit humans and machines to collaborate in unscripted, nomadic activities.

① ALSO BIG EYE TO M D. FROM STE/14

<sup>4</sup>From an interview with author, April 1998

*Table II: (Theater of Hybrid Automata)* formally explores the interface between physical and virtual space as well as between a theatrical (human) space and an automated (computer) model. From a fixed position within a ten foot, cubic exoskeleton, a robotic gyroscope (also a military relic) navigates in the three directions of classic Cartesian space. By following a series of pre-set operations, this installation orients itself in physical space by determining the position of the gyroscopic head in relation to directional targets that define the edges of the cube. A synthesized voice announces the position of the head. At the same time, a video camera, mounted on the gyroscope sends images of the installation to a projector. This video projector alternates between the realistic video image of the cube and a computer-generated model of the same space that was created by Vasulka. The 3-D model keeps track of the head's position, rotating in concert with the machine (and its corresponding image). Once the animated space becomes oriented to the physical space, the head proceeds to another position. Without a pre-determined script for movement, this installation orients itself to and navigates through mechanical and simulated spaces according to established propensities for action within a free-motion, nomadic model.

The coexistence of two types of spatial representation (actual and animated) in *Table II* suggests a hybrid construction of space, where real and simulated models inflect each other, but where neither is dominant. Virtual space is thereby made physical, and a more seamless integration of actual and virtual models of space is hypothesized by an emphasis on their common relation *within electronics*. Since an electronic network mediates (and represents) both types of spatial construction, the virtual and the actual become more interchangeable. With a pronounced sense of irony about electronic representations of space, Hamilton notes that "control of the physical world makes physicality unnecessary." *Table II* presents a preliminary context for the challenge to physical necessities by simulated potentialities. Setting the stage for more complex integrations of real and virtual spaces, this media environment frames a three-dimensional

hybrid space, which provides a basic context for a dramatic, situational enactment of virtuality to transpire.

*Table III: (Friendly Fire)* emphasizes image and sound more than the other installations. With an array of five projection screens suspended around a large central machine that emits clamorous, amplified audio, *Table III* establishes an environment for intense sensory stimulation. A central machine projects found footage from the Gulf War that illustrates an instance of friendly fire—~~an~~ deadly engagement of American forces with their own soldiers. This war footage is stored in a laser disk player, which, in turn, is linked to a MIDI (Musical Instrument Digital Interface) drum pad so that, by drumming on the pad, a participant makes the sequence of images move slowly or quickly, or even skip backward or forward. The MIDI interface allows for a visceral audio-visual experience of the battlefield akin to a 3-D video game.

Vasulka's military machinery and battle images refer to overlapping cultural associations with 'war toys' as both devices for entertainment and machines of death, and the sensory immersion of *Table III* blurs the boundaries between technology's entertainment objectives and its destructive potential. Regardless of these connotations, his machines simply follow prescribed instructions and may serve any (ulterior or immediate) motive. As Vasulka says of the machine in general, "There's no loyalty in the way it destroys, or constructs, but it does it in a pure way. There is no ethical definition." His machine logics (and the technical rigors responsible for his machinic production) function nomadically and transcend human psychology by traversing an open field of operational potential beyond specific cultural applications and beyond particular human propensities for entertainment and war.

*Table IV: (Untitled)* comprises an amorphous media landscape ~~that is~~ still under construction that proposes to link of many salvaged machines to form a complex network for producing electronic events. Perched on a recovered tank seat that will move forward

and backward along a mechanized track, a viewer will be able to manipulate the behavior of a helicopter's target-sighting device, within which a light-beam reflects off a rotating prism. The preliminary design for this installation suggests that the viewer's actions will affect cameras located within a separate table-unit. The cameras will move on miniature tracks to navigate through the inside of the separate machine, which was originally used for manufacturing computer chips. The visual information of this machine's circuitry <sup>will</sup> be projected onto a screen nearby. The viewer's actions will trigger miniature robotic devices to relocate cameras within the table and to alter images that correspond to the tiny sequence of events.

X Vasulka intends to explore the notion of interactivity in *Table IV* <sup>#4</sup> by using the viewer's impact on this electro-mechanical system to produce both motivated and arbitrary sequences of electronic events. When framed both as an engagement with the operations of the installation and as a superfluous exchange of coincidental responses, his attempt to produce an interactive cybernetic network incorporates various strategies for establishing communication between machine and human processes. At present, the elusive project of actuating a machine-human transference of meaning can only be apprehended by specialists who, in dialogue with machines in an operational language, search for ways to grasp the electronic means for composing intelligent behaviors. Because of the seeming impossibility of intelligent interactivity, few people are willing to step so boldly as Vasulka into the arena of unscripted cybernetic interaction. The installation in progress aims to preserve the operational logics that emerge from ~~the~~ creative participation with complex machinery linked electronically.

*Table V: (Scribe)* is a network for transcoding linguistic data from one medium to another. A video camera initially locates the words in a book, <sup>which was made</sup> specifically for this project, <sup>P and J</sup> and <sup>then</sup> by using a pneumatic suction device, a robotic arm turns the pages (designed by Roderick Peyketewa). As a notable technical challenge, embroiled in the difficulties of machinic orientation and navigation of space, the design of and

<sup>6</sup>From an interview with author, January 1997, portions of which were published as "Falling into Video," *EI*

interface with the page-turning device for *Table V* took several weeks to perfect. Word-recognition is accomplished by *optical character recognition software*, which determines the words based on the camera's data and ~~which~~ informs output devices how to proceed. A separate plotting table, using a light-wand on a light sensitive tablet, then renders letters that correspond to the text. The letters are drawn, but soon disappear, allowing the next page of text to be transcribed in the same area. The software recognizing the words also sends instructions to a voice synthesizer that speaks the same words to the audience. By interpreting and mimicking word-patterns with the assistance of the recognition software, devices for indentifying text establish a direct feedback loop with machines for writing and speaking words.

As both an honoring and a parodying of linguistic production, *Table V* transcribes a text into other media, while also permitting subtle slippages of meaning ~~to occur~~. For instance, any errors produced by the word recognition software get echoed in the other media, yielding inadvertent deviations from the text. Also, without an obvious human context, the mechanically plotted version of the text carries a different weight ~~than~~ <sup>from</sup> the text in the book. The words become more susceptible to being seen as arbitrary line patterns or as cryptic phrases of an unseen agent whose intentions remain unknown.

The slippages of meaning that emerge from this unstable context can be attributed to the process of transcoding words from one medium to another. Fredric Jameson explains how the process of transcoding need ~~not~~ be

a question of establishing some simple one-to-one correlation between two already existing entities. . . , but rather of showing how any given text knows lines of flight out beyond itself, being apparently autonomous yet in its very structure carrying a kind of referentiality, a kind of movement out of itself to something else.<sup>7</sup>

The mimicry of linguistic processes in *Table V* suggests how cybernetic transcoding both confirms and denies the communicative import of language, since the text is at once an index of complex human processes and a template for electronic interpretation and

*Palacio*, vol. 101, no. 3.

<sup>7</sup>Fredric Jameson, "Marxism and Dualism," *The South Atlantic Quarterly* (Summer 1997) 407.

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italian  
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mechanical composition. As a formal transformation that affects the text's meaning, this <sup>mechanical</sup> ~~machinery~~ transcoding derives nomadic strategies for depicting a linguistic operation and for opening a text to alternative readings.

*Table VI: (The Maiden)* is the most embodied of the installations, <sup>since</sup> the electronic, pneumatic, and mechanical components elegantly converge atop a biomorphic structure, akin to ~~an~~ animal anatomy. *The Maiden* also operates <sup>in a more amply gestural way</sup> ~~more gesturally~~ than do the other tables, since pneumatically-powered pistons move distinct parts with fluid motions and familiar rhythms in response to viewers. <sup>The Maiden</sup> Reacting to the speed of a viewer's approach, ~~it~~ 'wakes up' abruptly for viewers who rush into range of its sensors, but it stirs more slowly for cautious observers. Along with activating pneumatic devices, *Table VI*'s sensors trigger an audio track that speaks a work <sup>of</sup> fiction, written by Melody Sumner Carnahan, recorded onto laser disk, detailing a hostile encounter. The sensors also instruct projectors to send images to screens that resemble gigantic paper fans (As of this writing, the images have not been determined). *The Maiden* responds in a creaturely way to the audience's physical momentum through the space by using ultrasonic sensors and software instructions.

Informed by the Vasulka team according to a complex integration of audio, visual, and mechanical elements, *The Maiden* has come to personify a feminine "witness to war"—no longer awaiting an outcome at a safe distance but, rather, participating in the exhilaration and tragedy of human aggression. An ethical question of managing human aggression on an increasingly populous planet is posed by this cybernetic <sup>entity</sup>, which finds creative and exploratory strategies for behaving and for interacting with viewers, rather than relying on rhetorical and restrictive parameters. With *Table VI*, Vasulka attempts to transpose cultural assumptions about violence into concepts of interaction with hybrid electronic networks.

There arise subterranean, aerial, submarine technicians who belong more or less to the world order, but who involuntarily invent and amass virtual charges of knowledge and action that are usable by others, minute but easily acquired for new assemblages.

Deleuze and Guattari<sup>8</sup>

The title—*The Brotherhood*—evokes the historical lineage of technical specialists responsible for developing weapons and the concepts of warfare, which, according to von Clausewitz's classic formulation, are "nothing but the continuation of policy with other means."<sup>9</sup> However, according to Deleuze and Guattari, the technicians responsible for developing war technologies are not intrinsically allied with political systems and their policies but, rather, exhibit the tendency to move according to their own ambulatory logic and to reveal "another justice, another movement, another space-time."<sup>10</sup> In fact, technological innovation is, in part, based on the discovery of new territories and of mapping tactical relations within these new spaces. This technological development has recently led warfare into a virtual environment, and the basic issues of framing territory within non-physical space are now embedded within military machinery. By following this notion of technological innovation, Woody Vasulka also searches for new territory. He, however, investigates participation and performance within hybrid networks and auspiciously implicates military apparatuses in alternative mappings of interactive space. The nomadic modalities of cybernetic engagement arise from the (particular hybrid configurations of his electrical networks,) which frame complex behaviors within a mediated and mechanical environment.

Transforming physical matter and organizing force, which inventors of new technologies essentially do, require<sup>5</sup> the tools, context, and language for producing and describing energy-related events. Originating in a conceptual space and, to some extent, beyond conventional or traditional encodings, the transformative events of hybrid electronic networks transpire in non-centric space. As Vasulka explains:

<sup>8</sup>Deleuze and Guattari, 89-90.

<sup>9</sup>Carl von Clausewitz, *On War*. New York: Knopf, 1993. 77

<sup>10</sup>Deleuze and Guattari, 4.

war held  
stable

OK?

In the media sense, space is what you create. It's machine-made space, and these are manufactured pieces of information that are drawn into a cognitive context, and it eventually becomes a product of machinery. This carries through to the computer . . . all modalities of space are represented in that machine by simply organizing data structures. It is basically a new territory of representation of the world . . . This is non-centric space.

A non-centric conception of space (also known as digital, or virtual, space) can reframe notions of physical space (i.e., territory, location/identity, and free-will) by positing an open space beyond political and commercial systems. In this sense, non-centric space is a stage for reframing physical conditions and for rehearsing possible outcomes. Mapping digital events presents a curious dilemma, however, because it is difficult to determine the salient features of human perception and cybernetic engagement from which emergent networks arise. While virtuality complicates the construction and occupation of physical space, new interactive terrain will emerge directly from the efforts of visionary technicians, like Vasulka and his team.

With extensive assistance from software designers Russ Gritzo and Tim Odell, systems administrator Bruce Hamilton, and robotics technician Roderick Peyketewa, and (many) others, Vasulka implements sophisticated computer networks that facilitate the development of his complex media environments. Using Java Script, a programming language that facilitates a broad distribution of commands throughout a network, Tim Odell has designed a user-interface that allows Vasulka to directly compose actors for each installation. However, the most basic level of network communication are 'drivers', which give commands directly to electronic devices. The drivers (for the serial and TC/PIP connections) and other network protocols are written by Gritzo— developed as the rigorous implementation of the actor architecture. An actor listens to a device, which is configured (by drivers) to emit MIDI code, and, when the MIDI code matches that actor's specific argument, it responds with commands in device-specific languages. Bruce Hamilton, the chief systems administrator, executes design schematics for each installation by bringing networks into line with particular mechanical apparatuses. The

<sup>1</sup> Interview with the author, January 1997.

physical apparatuses themselves are primarily built by Vasulka and Peyketewa, <sup>who</sup> they design, assemble, test, and fine-tune each custom electro-mechanical, pneumatic and robotic device operating within each hybrid network.

Vasulka's media installations and hybrid electronic networks explore digital space and articulate a context for participatory experience; <sup>however,</sup> they may be difficult to comprehend. Despite appropriating many linguistic, visual, and acoustic elements and despite his use of numerous machines and mechanistic structures, Vasulka pursues few symbolic themes. Vasulka's electronic media environments, as illustrated by *The Brotherhood*, are formally abstracted from conventional applications of technology and purposefully removed from common technical associations. In this regard, his vision remains esoteric. Indeed, the operational language of Vasulka's media installations resides internally (*esoterōs* <sup>from</sup> means 'inner' in Greek), as software protocols, drivers, and actors; the physical behaviors of the works simply externalize internal dynamics. In addition, the operational procedures of electro-mechanical devices, which define his formal strategies for composition, are not psychologically dependent. The audience confronts a colossal machinic enterprise that challenges common technological categories, requiring mental acuity if viewers are to make any sense of it. To learn about the installations, audience members need to become cognitively engaged with the operation of the machines, and, as each person delves <sup>deeper</sup> into discovering what machinic logics are at work, a mirroring of the media by the viewer occurs. Through Vasulka's machinic complexities, mental activity mimicks network operation.

Vasulka's media installations demand a degree of viewer participation to simply experience the work. However, transforming (viewers' cybernetic experiences) into interactive knowledge of complex networks depends on the effectiveness of mechanical feedback from the systems, as well as on the individual cognitive capacities of viewers, which inform each's propensity for thinking nomadically. As an ambitious project of <sup>intriguing</sup> technical variation, *The Brotherhood* invites viewers to revise their own notions of hybrid electronic networks and to contemplate their own behavioral tendencies while engaged with sophisticated media installations. By undertaking the challenges set

forth in his work, participants and observers alike examine non-human implications of interactive electronic networks. Vasulka's immense technological project establishes a non-centric territory for transcoding human symbols and movements as well as providing a nomadic arena for re-mapping physical, virtual, and cognitive spaces within electronic network spaces.

Since all information and assumptions are open to doubt, and with chance at work everywhere, the commander continually finds that things are not as he expected . . .

If the mind is to emerge unscathed from this relentless struggle with the unforeseen, two qualities are indispensable: *first, an intellect that, even in the darkest hour, retains some glimmerings of the inner light which leads to truth; and second, the courage to follow this faint light wherever it may lead.*

von Clausewitz<sup>12</sup>

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<sup>12</sup>*On War*, 117; his emphasis.