Free Enterprise: Virtual Capital and Counterfeit Music at the End of the Century

Mark Trayle

Some technological innovations induce tectonic shifts in musical forms. Where do these innovations come from and what kind of opportunistic signifiers do they bring with them? The iron-casting technologies that made possible Beethoven's Opus 106 "Hammerklavier" Sonata (1817) originated in the same foundries that bootstrapped the Industrial Revolution. Contemporary with the invention of the cast iron piano frame are the invention of the first practical steam locomotive (George Stephenson in 1814), the invention of the metronome (Johann Maelzel in 1814), the discovery of electromagnetism (Hans C. Oersted in 1819), the discovery of the fundamentals of electromagnetic rotation (Michael Faraday in 1821) and Charles Babbage's early attempts to construct a computer in 1823. By resisting attempts to credit these inventions to individual inspiration and considering instead the contexts in which they appeared, we can characterize these inventions as products of the rapid capitalization and mechanization that fueled the Industrial Revolution. The gaslamp-lit think tanks and laboratories that spawned these modern marvels were funded by modern business technology—joint-stock limited liability companies to provide credit and private investment to provide venture capital.

Over the last 150 years, capital has applied technology to the streamlining of production, distribution and promotion of goods. Much of this has happened through a process of miniaturization and modularization.

Moving from a factory model of working, in which all elements of production are at a single physical site, capital has taken advantage of the global networks of transportation and communication to distribute labor and thus reduce its costs. This has led to a modularization of work, changing the topography of the factory from an assembly line to an assembly web. As a result, units of work must have readily definable parameters, a high degree of unit-to-unit similarity and clear lines of travel through the corporate body. Workflow has mutated from a linear, synchronous model to a parallel, asynchronous one and has thus reshaped the corporate organization. The operative concepts of late-twentieth-century business—modularization, miniaturization, parameterization, hierarchy and the classification, stockpiling and concealing of data—all reveal themselves in the defining features of its information technology.

Technology has often been associated with the radical fringe of Western art music. The open-form pieces of the 1950s and 1960s intersected with key concepts of early information technology and organizational science. Decades on, composers use sophisticated programming languages when composing for distributed networks of microcomputers that make sound. Far from being a benign influence on the development of musical form, technology carries with it encodings of the economy from which it arises. Distributed forms of composition may adopt not only the technology of modern business but its organizational structure and culture as well. If capital is the engine of technological innovation, and technology the servant of capital, then technology is the means of capital's control over music. Let us appropriate information technology for our own purposes, mark it as we would a (U.S.) $50.00 bill in a bag of ransom money and follow the money through the underground of art music in the second half of the twentieth century.

DISTRIBUTED COMPOSITION: OPEN FORM

During the 1950s and 1960s, composers began to experiment with process, autonomy and interdependence. In contrast to the detailed specification of musical events typical of post-war serialism, composers began to shape "systems of interaction" [1] that would generate music possibly unforeseen by the composer.

The music generated by Christian Wolff's For 1, 2, or 3 People is indeterminate with respect to form. The score consists of 10 pages of symbols, some of which vaguely resemble traditional music notation. A single page may be repeated up to 10 times, or two or more pages may be played in any sequence without repetition. The symbols describe ways of initiating, coordinating and transforming sonic events. All sonic events have multiple parameters, including frequency, amplitude, duration and coordination markings (displacements in time from the onset or disappearance of another event). Some parameters may be indeterminate. The order of events on the page is not predetermined. A player chooses what to play and when to play it according to rules laid out in the score and her own personal taste and discretion. Sonic events are more often

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than not responses to other events, transforming the previous event along the axes of time, frequency and amplitude. The piece is a web of sound created from the interplay of action and response. What Wolff creates is a network of interactions; what we hear is the emergent behavior of that network.

Method, the note-to-note procedure, is also indeterminate. There is no... fixed relationship of parts... [it is]... not a time object, but rather a process [2].

Karlheinz Stockhausen’s Kurzwellen (“Shortwaves”) dates from 1969. It is one in a series of works that include Plus/Minus and Prozession. These pieces, inspired by Stockhausen’s work in the tape music medium, explored alternatives to serial procedures as a way of structuring music. The scores to these pieces describe displacements rather than define musical events using a notation he had developed with Plus/Minus [3]. Both Prozession and Kurzwellen employ a similar ensemble of viola, piano, tam-tam and electronium (a monophonic proto-synthesizer), and in Kurzwellen Stockhausen has each instrumentalist play a shortwave radio as well. The score to Kurzwellen consists of four instrumental parts and a “combination-part” that a fifth player uses to filter and pan the other players’ outputs, participating “in the forming of the process” [4]. “Register, dynamics, duration, and number of segments of each event are determined in comparison to a previous event” using a system of +, − and = signs [5]. These sequences of signs are used to transform the sounds of the shortwave radios and the sounds of the other players. Coordination between players is determined by a system of “call signs.” Players may invite others to join in duets, trios or quartets at specified points in the score. There are also four places in the score where players can enter a sort of “holding pattern” until all other players have arrived there. Other than these places, coordination of events is left up to the intuition of the player. Unlike For 1, 2, or 3 People, Kurzwellen does not allow for a non-linear traversal of the score. By keeping a relatively constrained framework for musical exploration, Stockhausen really “shapes” his piece. Moment-to-moment details may be left to the players, but, unlike the Wolff piece, Kurzwellen has an easily identifiable form.

While Wolff and Stockhausen took different approaches to generating the unexpected and constraining chaos, they both allowed for a redistribution of compositional intelligence through the use of process, autonomy and interdependence. Each part acts as a separate musical stream in time, proceeding at its own pace and—in the case of For 1, 2, or 3 People—on an indeterminate route across the page. Each stream is modularized, carrying its own musical intelligence with it, not in detailed markings on the page but in the form of the performer’s intuition and expertise. Furthermore, each part has a definable “interface,” a rich communications pathway to other players. These examples of open-form music share with mid-twentieth-century industries the technologies of parameterization, modularization and localization of knowledge. As musical networks, they also presage the topology of the distributed organization of the late twentieth century, where the corporate hierarchy is flattened to accommodate the globalization of production and consumption.

**DISTRIBUTED COMPOSITION: COMPUTER NETWORK MUSIC**

In the late 1970s, some composers in the San Francisco Bay Area got together to form a group called the League of Automatic Music Composers. These composers—John Bischoff, Jim Horton, Rich Gold and, later, Tim Perkis—were all associated with Mills College. They made home-brew electronic music systems from small microcomputers and inexpensive integrated circuits and played their music in real time. This was a fairly revolutionary idea at the time: there was no idea of “real time” with few exceptions computer music was still a tape-based art form made on big computers; and the computer itself was strictly a military, industrial or scientific product, not something one would see on a desk in a child’s bedroom. The idea of the League was for each composer both to write a piece of music that would stand on its own and to provide hardware and software connections that enabled other members of the group to influence its musical direction during performance. In an era before music industry standards these connections were, of course, of the home-brew variety, running the gamut from simple parallel port to risky CPU-to-CPU interfaces, each made specifically for a single piece. Bionic offspring of the open-form music of the 1950s and 1960s, this music was a form of distributed composition, with each composer executing a semi-autonomous stream of music in the same place at the same time within an asynchronous web of mutual influence.

In 1985, a few years after the League disbanded, some of its members got together with another group of composers from Mills, including myself, to form the Hub. The Hub was a group of composers who shared a common interest (and still do) in creating a social context for composing and performing music based on the emergent behaviors of networks of semi-autonomous and non-linear musical processes. The history of the Hub has been well documented in this journal and others [6]. Rather than retell the tale here, I will offer a reinterpretation of the group’s record of technological shift.

Shortly after the group formed in 1985, some of its members designed and built a simple serial interface based on modem chips to use as an electronic “mailbox” and dubbed it “the hub,” from which the band derived its name. As composers played a piece, they could leave musical information in another composer’s mailbox. A composer would pick up his “mail” periodically and apply it to one or more musical parameters of the piece-in-progress. Pieces were not so much “written” as “designed,” specifying a set of musical signals one could expect to receive and what responses one should make to them. A typical Hub score would describe sonic events in terms of displacements from previous musical conditions rather than defining the moment-to-moment growth of a musical composition.

Later, the original hub interface was replaced with the industry-standard musical instrument digital interface (MIDI). The group members had each migrated their own computer music systems to MIDI at this point and the original hubs were becoming accident prone, as most home-brew gear does. The MIDI aspect of the new hub did not easily support the idea of the mailbox because MIDI is simply designed to trigger synthesizers from a keyboard. Aided and abetted by the use of object-oriented programming languages, the switch to an industry-standard interface changed the music of the group radically. Using MIDI encouraged us to follow the keyboard synthesizer paradigm. Instead of leisurely and asynchronously checking our mailboxes for musical data from our cohorts, we were expected to respond immediately to other performers’ actions. For the first time, Hub composers could take advantage of a much greater level of control over other performers and define events moment to moment rather than influ-
ence them. The notions of composer/performer hierarchies basic to Western art music that had only been glimpsed as subtexts began to emerge as the dominant form of Hub music.

I should point out that much of the pre-MIDI aesthetic of the group was retained, and that there is often a way of working around the homogenizing strategies of the music industry. Yet one can see from the specifications of pieces (scores) and hear from the recordings the paradigm shift from pre- to post-MIDI Hub. This shift reflects the introduction of the economy of repetition into the work of the Hub, an opportunistic infection carried in MIDI hardware and software.

While we tend to think of non-linearity, chaos and emergent behaviors as recent discoveries of the sciences, the evidence above suggests that in the field of music they have been explored since the late 1950s and early 1960s. Radical music’s terms of engagement with process, autonomy and interdependence have traced an arc that follows the evolution of capital technologies in the second half of the twentieth century. The distinguishing features of distributed composition lie along a curve outlined by open-form music, the work of The League of Automatic Music Composers and the pre-MIDI Hub, and that of the later, post-MIDI Hub.

CAPITAL MAGNETIC
Jacques Attali writes in Noise: The Political Economy of Music

Thus, there exist in the nature of codes mechanisms that entail their rupture. But this destruction of codes is reinforced by the dynamic of the link between music and money. Each code or network entertains specific relations with money. Money creates, reinforces, and destroys certain of its structures [7].

In Capital Magnetic, I take this last sentence at face value and use money to make music. Capital Magnetic is a network-based multimedia installation that exploits the musical possibilities of the credit card. Participants in the installation use their credit cards to generate short pieces of music that interact with each other in a simulated musical economy. In addition to up-ending the role of money in the composition of music, the piece explores issues of privacy and personal and musical identity in the so-called “free market.”

Each card, like its owner, is unique. In Capital Magnetic, the data encoded on magnetic stripes is treated as a kind of musical DNA. Each time a card is swiped, this genetic material is captured and parsed to form the rhythmic, melodic and timbral elements of a short musical composition. This “microcomposition” enters a simulated economy where it competes, cooperates, evolves and mutates in parallel with other microcompositions [8]. Some of these become dominant, others become marginalized. Some marginalized compositions may combine to form new “styles” or “genres” that in turn influence the more dominant ones, and so on. Information found on the card is also used to estimate the economic status of the user and create a user profile, a sort of simulated lifestyle, that accompanies a composition so that its position (“market share”) in the virtual marketplace can be tracked over time and evaluated. The profiles are used to tailor short advertisements to the user’s changing simulated lifestyles, composed in real time from a variety of stored still and moving images and displayed on video monitors. When these compositions mutate over periods of time ranging from minutes to hours, so do the simulated lifestyles of those who “bought” them, much as the “classic rock” radio format tracks the changing lifestyles of the baby boom generation.

Central to the piece is a character named “Uncle Digibux,” a combination of Uncle Pennybags—the top-hatted, cigar-smoking, captain of industry from the Monopoly® game—and Reddy Kilowatt, an icon used by many American electric utility companies. Uncle Digibux is the cheerful, generous, avuncular face of capital in this virtual economy (Fig. 1).

In addition to the installation described in this article, a version of the work for solo performance is being prepared. For this version of the piece, audience members will be asked to lend me their credit cards or bank cards just prior to the performance in order to produce a version of the piece unique to that particular audience. Using the card reader as a performance interface, I will explore a form of card-swiping more “virtuosic” than the typical consumer transaction.

CAPITAL MAGNETIC: NARRATIVE DESCRIPTION

As users approach the installation, they can hear a slowly evolving mix of electronic sounds coming from the speakers. On the screen they see a looped animation (a “teaser”) inviting them to “Take a swipe!”. When a user does so with any credit card or bank card, a new window pops up on-screen and he or she meets his or her guide, Uncle Digibux. Uncle Digibux introduces himself and in so doing describes what he finds on his card (“Good morning, John Doe. I see you’re using a Citibank Visa with account number 4726 1145 6743 1948”) and illustrates how the data stored on the card is being used to make a musical composition (a rather “audience-friendly” animation of a series of letters and numbers turning into musical notation). After this introduction and description, the composition begins playing, clearly audible among other compositions in the mix. While the user’s composition plays, audibly mutating as it interacts with other compositions, Uncle Digibux occasionally presents short advertisements tailored to that user’s simulated lifestyle.

The user’s composition is the loudest element in the mix for 5 to 10 minutes until it gradually fades into the background, at which time Uncle Digibux signs off and the teaser loop returns to the video monitor.

Fig. 1. Mark Trayle, Capital Magnetic, 1998. Uncle Digibux, our guide through the virtual economy, as featured on the Capital Magnetic logo.

Trayle, Free Enterprise
CAPITAL MAGNETI¢: TECHNOLOGY

To get the data off the credit card and into the piece, I designed and built a MIDI credit card reader. This device uses readily available electronic components to read the alphanumeric data encoded on the card’s magnetic stripe, translate the data into MIDI program-change messages and send them to a host computer.

The card reader consists of a plastic card guide, magnetic read head (similar to the playback head on an audio tape recorder), and circuitry that translates the fluctuating patterns of the magnetic stripe into bit patterns. I use a 68HC11-based microcontroller to collect these bit-patterns from the reader and translate them into MIDI program-change messages. (Note that MIDI is only used here as a protocol for communication with another computer, and is thus stripped of its usual musical significance). The MIDI messages are sent to a host computer, referred to as The Bank, with a home-brew serial-to-MIDI interface (Fig. 2). The code to capture bits from the reader and translate them into MIDI is written in a combination of 68HC11 assembly language and the FORTH development language that comes installed on the microcontroller [9]. Much example code, as well as documents on card protocols and banking standards, were found on the World Wide Web at various hacker sites.

Data from a credit or bank card has a consistent format of data fields (e.g. account number or name) isolated by field separators. The software for capital magneti¢ applies each of these fields to a musical parameter. The account number is applied to melody, with each number from 0 to 9 representing an interval, while portions of the “variable data” field (which includes expiration date, card type, country code and Personal Identification Number [PIN], among other things) are applied to note duration and timbre. The card type is also the primary determinant of the user’s simulated lifestyle. A VISA Platinum® card is in a higher “class” than an ordinary automatic teller card. Following a rather simple model of the demographics of music consumption, the more common the card the simpler the kind of music it buys; rarer cards buy more “sophisticated” (complex) music.

CAPITAL MAGNETI¢: RUPTURE

Handling money at the automated teller machine (ATM) is a very private act executed in a public place. Unlike standing in line for a movie or concert, waiting to use the ATM is usually a solitary and circumspect affair, occasionally seasoned with suspicion about those around us. The personal identification number, the password and the data magnetically encoded (and therefore made invisible) on the card seem to conceal and protect some of the most private aspects of our lives. If we pierce this illusion of security, we find that there is nothing at all private about an electronic banking transaction.

Anyone who makes a purchase with a credit card or bank card contributes to a constantly shifting map of lifestyle signifiers. Information that pinpoints the age, gender and postal code of a product’s consumer is commonly stored for post-purchase analysis and sold back to the company that makes the product. In the virtualized economy of late capital this demographic “targeting data,” used to seek out and destroy the consumer’s will to resist, is of higher value than the labor that produces the product. It is this information that generates demand for new products, not the products themselves.

The economy of repetition can survive only if it is discovered each time how to recreate a use-value for the objects produced [10].

With the swipe of a credit card, capital magneti¢ gives its users a chance to turn capital back on itself and make an act of consumption into an act of production. Distributed composition as applied here permits users a glimpse into the workings of the virtual economy. Adding a performative element to the collection of demographic data, it offers a chance to actively engage in the process of music production. capital magneti¢ is a counterfeit bill in the economy of repetition, adding noise, rupturing codes and seeking to turn music back on capital through technology.

References and Notes

5. Stockhausen [4].
8. A prototype for the economic simulation was developed using the StarLogoT application. StarLogoT was developed at the Center for Connected Learning and Computer-Based Modeling at Tufts University in Medford, Massachusetts: <http://www.ccl.tufts.edu/cm/starlogoT/>.
9. The 68HC11 assembler was written by Mark Coniglio and is available on the Troika Ranch Dance Project’s website: <http://art.net/Studios/Performance/Dance/Troika_Ranch/>. The 68HC11 microcontroller with Max-FORTH is available at: <http://www.newmicros.com>.

Manuscript received 22 January 1999.