Chapter Two: Computer-Mediated Improvisation

> Roger Dean: Can computer interaction provide unique opportunities/outputs?
>
> George Lewis: I'm taking this to be a version of the FAQ "What do you get out of improvising with computers to you don't get from improvising with people?" I invert this question to maintain that the most important formal issues in this sort of music concern how a program operating in a conceptual space compatible with group improvisation might have the *same* set of problems as the human musician – namely, how sonic behavior, communication, personal narrative, and intersubjectivity affect musical form. (Dean 2003)

This chapter will explore specific concerns regarding computer-mediated improvisation. What does computation bring to the practice of improvisation? What is enabled by the design and use of extended or hybridized electroacoustic instruments and interactive performance systems? How do these developments impact the role of the composer, system designer, performer, and audience member? A range of computer functions and possible models pertinent to improvisation will be outlined, and the implied relationships will be analyzed. I will also discuss some of my personal motivations for building and performing with computer-interactive improvisational systems.

What does electronic technology, and more specifically computation, bring to the practice of improvisation? This question will be examined from three somewhat unique vantage points: from the perspective of the composer/interactive system designer, the performer/improviser, and finally from the perspective of the listener/audience member. Approaching this question from three separate viewpoints is somewhat artificial, as the concerns of all three overlap.

The Composer/System Designer

> One of the powers of computer-generated sound is to progressively move along axes that distinguish one sound from another by a variety of morphing processes. Thus one can choose to use a sound world aligned to instrumental sound, to natural sounds, or to electronic sound, and to move between such worlds freely, and even gradually. (Dean 2003)

For the composer/system designer, computation dramatically expands the range of available sounds and sound transformations. This is a key attraction for many composers who are primarily interested in the timbral aspects of sound making, and less concerned with the notion of notes, melody and harmony. This ability to directly generate and transform a wide range of complex sound materials without the intermediaries of either notation or performers is a dramatic break in the history and practice of music making. While expanded sound resources have been available to the studio composer for quite some time, real-time digital signal processing and computer-mediated performance has only become available or reasonably practical in the last quarter of the twentieth century.

Even when compared to the wide range of extended instrumental techniques developed by acoustic improvisers, the sound resources available to computer-mediated improvisers is remarkable. These resources include real-time transformation of acoustic or electroacoustic sounds, buffering and playback of performed sounds, synthetic generation of sound materials, and the playback and manipulation of previously recorded or produced sounds. The use of pre-produced materials expands the range of available sounds, and further blurs the distinction between composition and improvisation.

In addition to a greatly expanded sound palette, the interactive composer also has access to the intriguing space between the extremes of highly structured composition, and open improvisation. One of the negative critiques surrounding some forms of improvisation is the alleged lack of organization or formal structure. By working with computational systems, a composer can make pieces that have an overarching identity or form, but also allow a high degree of flexibility and performer input. This interest is articulated by Roger Dannenberg:

> My goal is to encode some of my compositional ideas into the computer so that they can be realized in performance. This is an alternative to traditional notation. It imposes something on the performer without dictating note-by-note what the performer should do. Ideally, this gives the freedom to improvise and inject new ideas into the piece, but I want there to be a well-defined piece at some level, and that's where the computer's generation is important. (Dean 2003)

This ability to encode compositional ideas into an interactive system is further enhanced by the opportunity to vary the amount or type of formal influence the computer provides within a given piece or performance. Dean cites this ability to alter the active computational algorithms in real-time as one of the most fundamental and exciting aspects of computer-interactive improvisation (Dean 2003). The ability to effect or steer the higher level behavior of a performance system makes possible a type of formal structure and complexity that would be difficult, if not impossible, for an unmediated acoustic improviser. Robert Rowe discusses the idea of mutual control in his book *Machine Musicianship*, and suggests that by sharing the creative responsibilities between performers and interactive systems, “the composer pushes composition up (to a meta-level captured in the processes executed by the computer) and out (to the human performers improvising within the logic of the work)” (Rowe 2001).

As someone who often performs in a solo setting, I appreciate the combination of sound diversity and computational control or influence available through mediated systems. These improvisational systems allow me to create and interact within a complex, semi-structured, polyphonic sound environment. Through the design and use of these extended performance systems, I have been able to partially fulfill my goal of combining the roles of composer/system designer and performer/improviser.

The Performer/Improviser

While many of the features of computer-mediated systems previously outlined (such as expanded sound pallet and meta-level structural tools) are also attractive to the performer, some unique performer oriented possibilities deserve discussion. One key feature for the performer is the potential to separate the performance gesture or interface from the sound producing system. Once the space between gesture and sound is opened up, the relationships and interconnections can be redefined. From the perspective of the acoustic musician, this disconnect makes little sense, but for the mediated performer, it offers the possibility to examine and redefine the performer-instrument relationship. Sidney Fels describes this situation as "a separation of sound and the physical cause of that sound." He goes on to suggest that this "provides new directions for improvisation, musical expression, and collaborative sound production" (Dean 2003).

In addition to extending timbral possibilities, this also opens the door to instruments and performance systems that attempt to bypass some of the physical and cognitive limitations of the unaided performer.[1] An example is the use of memory structures in software design. By capturing, transforming and playing back sound or gestural data during a performance, some of the physical limitations imposed on a single

[1] Many of the cognitive issues surrounding improvisation, as well as cybernetic issues in performance systems have been discussed by Jeff Pressing (Pressing 1988; Pressing 1990; Pressing 2002).

performer can be overcome. This is not only a means to produce virtuosic sound events that are faster, louder or more complex; it also makes possible the production of sounds and sound transformations that are slower, more gradual, or longer in duration than would otherwise be physically possible. Computation allows the reintroduction of previously performed materials (either the original or transformed version) much later in a performance than would be practical given the memory and organizational limitations of most improvisers. While the possibility to redesign performer-instrument relationships holds great promise, this practice is still quite immature when compared to acoustic instrument design and established instrumental performance practices.

Mediated systems can be designed to intentionally challenge, surprise, or disrupt the performer. For Dean, the key distinguishing factor between computer interaction and computer-mediated improvisation is "whether the computer response to a user interaction is or becomes predictable, or whether sufficient variability of response is programmed that users must in turn make unexpected responses to satisfy their own sense of musical kinetics" (Dean 2003). This is a key concern in the software I design for solo improvisation, as I am interested in entering the moment of performance without knowing precisely how the instrument/system will behave. This creates a challenging and unpredictable environment that is usually available only in a group improvisation setting. Tim Perkins of the computer network band, The Hub, expresses a similar interest in surprise:

> I see the esthetic informing this work perhaps counter to other trends in computer music: instead of attempting to gain more control over every aspect of the music, we seek more surprise through the lively and unpredictable response of these systems, and hope to encourage an active response to surprise in the playing. And instead of trying to eliminate the

> imperfect human performer, we try to use the electronic tools available to enhance the social aspect of music making. (Bischoff, Perkis et al. 1989)

This description highlights two interesting and important themes. First, that computers, often valorized for precision, can also be used to create surprise, and second, that interactive systems can enhance the social component of music making or improvising. Performing within this unpredictable computer-mediated environment presents many unique challenges for the musician, as Joel Chadabe points out is his important article on interactive composing: "But in interactive composing, because the music and the performance are inseparable, the quality of the music itself, rather than simply its execution, is in large part dependent on the ability and talent of the performer" (Chadabe 1989).

The Listening Audience

> It is essential to distinguish between music the sole purpose of which is to produce a uniform and deliberate effect, thus stimulating a collective action of an intended kind, and music whose meaning is, in itself, expressing feelings, ideas, sensations, or experiences, and which, far from welding people into a homogenous mass with identical reactions, allows free play to individual subjective associations. (Fischer 1963)

While it is difficult to make the distinction suggested by Fisher, it is clear that different types of music place different demands on the listener. Improvisation, especially when it does not fit into defined idioms, places unique demands on the audience, as well as offering unique rewards. An improvised performance provides the opportunity to experience the music making process as it unfolds. At best, this offers the listener the freedom from pre-composed, and possibly predictable musical forms. The difference between knowing a piece ahead of time and hearing it for the first time is dramatic. The awareness that the performers are also hearing the piece for the first time creates a certain context of spontaneity, excitement, and risk. Bailey claims that this relationship empowers the audience:

> Undeniably, the audience for improvisation, good or bad, active or passive, sympathetic or hostile, has a power that no other audience has. It can affect the creation of that which is being witnessed. And perhaps because of that possibility the audience has a degree of intimacy with the music that is not achieved in any other situation. (Bailey 1993)

Pauline Oliveros highlights this important aspect of the performer-audience relationship by suggesting that, "If performers are listening then the audience is also likely to listen" (Oliveros 1998). In technologically-mediated improvisation, not only is the musical outcome unknown ahead of time, even the basic nature of the sounds can be foreign to the audience. In my experience, this can stimulate a range of reactions, both positive and negative.

Some listeners embrace what is often an abstract sound environment and enjoy listening to sounds that have little direct correlation to acoustic instruments. Other listeners find computer-mediated performance disorienting and alienating. Some of this has to do with expectations about performance that are based on more traditional acoustic music paradigms. The highly correlated gesture-to-sound relationships found in acoustic music performance are at least altered, and may be nearly absent in computer-interactive performance. Alan Belkin articulates a common concern, "When I go to a live concert I enter into communication with the performer, and through him, with the composer. If the performer becomes anonymous or seems disconnected from what I hear, I will find him irrelevant" (Belkin 1991). This concern may be due in part to a tendency to impose preestablished performance expectations or criteria onto a relatively new and unique medium. In most acoustic music performances, even if we do not understand the exact nature of the music or sound production, it is usually relatively clear who is doing what. For example, few of us understand precisely how a pipe organ works, but we are pretty sure that the person playing it (even with their back towards us) is directly controlling the sounds that we hear. For some listeners, this need to understand the role and actions of the performer is very important.

Because interactive music systems can mystify or directly challenge the role of the composer/performer, the relevance or empowerment of the performer is sometimes undefined. This can lead to comments such as " the music was fantastic, but you looked like a bunch of air traffic controllers" (Gresham-Lancaster 1998). These concerns are largely dependent on the background, experience, and needs of the individual listener. As a listener, I do not always need to understand what the performer is doing, or how the sounds are being made or controlled in performance. I am often content to simply listen and experience a performance without needing to clearly understand the agency of the performer. As a performer, I am not interested in constructing artificial or gratuitous performance gestures to convince the audience of my role or relevance. At the same time, it is important to contemplate what is being offered to the listening (and watching) audience.

In most of my performance pieces, a certain level of understandability is available because I use acoustic instruments or physical objects as the initial sound sources. While the sounds may become radically transformed via real-time digital signal processing, the audience can see and hear the source of the sound that is undergoing transformation. This seems to allow a kind of identification with the sound that some listeners find meaningful. I do not work this way specifically for the benefit or comfort of the audience. This approach is based primarily on my own desire to interact with physically tangible sound sources, while at the same time accessing the power of computational systems.

I attempt to present my improvisational performances in settings that deviate from those associated with traditional acoustic concert performances. The formal concert hall and the proscenium arch tend to encourage expectations on the part of the audience that may not be coherent with the types of performances I seek to create. I am trying to avoid framing my performances as either virtuoso concerts or theatrical spectacles. I have had much better experiences in unique alternative spaces that can be setup with the needs of a specific performance in mind. This may involve strategies such as setting up in the round to minimize the separation between the performer and the audience. Ultimately, as in any performance setting, each audience member's listening experience is highly personal and difficult to predict or even describe.

Reexamining the Divisions

> It is unusual, except in the works of composers like the American Christian Wolff, for the relationship of the composer and the player to be about equal in creative importance. In western 'classical' music the unique potential of this rational and progressive creative relationship has all but been lost. Composer and musician either become one, as in the case of electronic music, thus ensuring compatibility of concept and realization. Or the musician is employed – becoming a skilled factotum – in the contemporary market place dominated by the needs and direction of the composer. (Prévost 1995)

While this description may be overstated, it clearly questions the composer-performer relationship and identifies electronic music as one of the ways to combine these two interrelated roles. This potential integration is one of the primary reasons I am interested in mediated performance systems. For many years, in addition to playing music, I composed music using various forms of notation to be interpreted by performers. This is certainly a viable and useful model for music making, but in many ways I found it problematic and unsatisfying. Beyond the practical problem of finding interested and talented musicians willing to commit large amounts of time to realize my compositions, there seemed to be deeper, more fundamental problems.

Notation is a limited means of communication and many of the ideas that I find interesting are not well served by notation systems or the fixed structures they suggest. When I did find techniques for translating my ideas into formal notation, the performers were often resistant to realize such atypical music and generally preferred to play standard repertoire, or at least more conservative contemporary music. While in many ways I enjoyed working with performers, I found the complete reliance on others for the realization of my musical ideas uncomfortable and limiting. I also missed actively participating in musical performance, so whenever possible, I would include myself in the ensemble pieces I was writing.

I quickly realized that electronic and computer technology could provide partial solutions to some of these concerns. I started to create pieces in the studio, thereby combining my interests in performance and composition. I was excited to apply these technologies to live performance, and started by experimenting with simple delay systems and multiprocessor feedback networks. For the past several years I have performed all my own pieces, or performed in duo or trio settings with other composer/improvisers.

One of my primary interests is exploring how technology can be used to enable or redefine my musical practice. I am engaging in a musical practice that combines the roles of composer, system/instrument designer, and performer/improviser. Others share this interest, as Robert Rowe points out: "One of the notable characteristics of the field is the resurgence of the composer/improviser, those musicians who design interactive systems and then improvise with them and other players in performance" (Rowe 2001). In a more general sense, Alvin Curran sees the improviser as the one "in whom the traditional roles of composer, performer, director and teacher are fused into one single role" (Curran 1995).

In addition to integrating composition, system design and improvisation, I am also attempting to use computation and interactive systems to refashion my own idea of virtuosity. Starting with my earliest experiences playing the trumpet, I have always felt that my musical intuition and ideas were more developed than my physical skills or instrumental technique. No amount of practicing the trumpet would make up for the shape of my teeth or jaw and the influence this had on my playing. Similarly, my attempt to transition to piano was limited by my late start and reduced dexterity due to an injury. Granted, some of this could be reduced by long term, single-minded devotion to one specific instrumental practice regiment. But from the start, I had the idealistic notion that somehow, I should be able to focus my energy on the higher-level conceptual aspects of music making, and use the available technology to reduce some of the physical constraints and manage the low-level necessities. Tod Machover expresses a similar idea in a discussion regarding hyperinstruments and interactive music systems:

> One of the things I see as a possibility with these instruments is – not just instruments but generally the kind of technology environments that we are

> starting to build for music now – is that we could take some of the focus off of physical virtuosity and the kind of athleticism of learning to play an instrument, and put as much focus as we could on the mental and emotional activities of music, whether it's being a better listener or imagining things and making them happen or interpreting things to your liking. (Machover 1999)

This is not laziness or naive better living through technology rhetoric. The history of instrument building and musical performance has followed a path of developing better, more expressive, easier to play instruments using the available technology. In acoustic instrument design, this has been a relatively slow evolution and is usually a refinement of an existing instrument or performance practice, rather than a total paradigm shift. I am following this evolution by using computer technology, but the opportunity to radically redefine the composer-performer-instrument relationship is unprecedented. This involves designing performance systems that reflect my own aesthetic and conceptual orientation towards music making, and encoding in the software/hardware the features and functionality that are important to me as a composer/improviser. This is similar to Rosenboom's notion of propositional music "in which the act of composing includes proposing complete musical realities. It presupposes no extant model of music and no predefinition of a proper critical stance about music" (Rosenboom 1997a; 1997b)

One clear advantage of designing systems for my own use is the opportunity to design around my particular strengths and weaknesses. Ideally, this allows me to sidestep some of the more problematic aspects of traditional virtuosic instrumental performance, or at least reduce some of the particular physical concerns. This is an idealistic notion, given that most mediated instruments introduce their own unique performance demands. The untold hours of practicing an acoustic instrument are often substituted for a similar numbers of hours designing, building, programming, and learning to play a mediated instrument.

An additional challenge is embedded in the very nature of computer-based performance systems. The same flexibility that allows the gesture-to-sound relationship to be remapped means that many different configurations of an instrument must be learned, and each new software improvement requires learning new aspects of the instrument. It is difficult to balance the variety of demands placed on the composer/designer/performer. When these roles are clearly separated, each participant can focus on the specific concerns of their discipline. This is an ongoing challenge for those attempting to combine the various roles, as it requires a range of knowledge, skill and ability from overlapping disciplines. The advantages outweigh the challenges, and I continue to pursue the practice of composing, designing, and performing with computer-mediated systems.

Available Models

There are many available models for discussing and analyzing interactive systems, and a brief overview will help to clarify conceptual and implementation issues. Charles Dodge (Dodge and Jerse 1997) describes the following real-time, though not necessarily interactive, computer music modes: electronic-organ mode, music-minus-one mode, player-piano mode, conductor mode, and synthetic-performer mode. A different approach is taken by Todd Winkler (Winkler 1998) who uses existing musical ensembles as a conceptual starting point for interaction models. He examines interaction and control issues represented by a symphony orchestra (conductor model), a string quartet (chamber music model), and a jazz combo (improvisational model). Rowe presents a classification system “built on a combination of three dimensions, whose attributes help identify the musical motivations behind types of input interpretation, and methods of response” (Rowe 1993). The first dimension divides the interaction mode between score-driven and performance-driven systems. The next dimension classifies response methods by differentiating between transformative, generative, and sequenced responses. His final and perhaps most important distinction is between instrument and player paradigms:

> Instrument paradigm systems are concerned with constructing an extended musical instrument: Performance gestures from a human player are analyzed by the computer and guide an elaborated output exceeding normal instrument response. Systems following a player paradigm try to construct an artificial player, a musical presence with a personality and behavior of its own, though it may vary in the degree to which it follows the lead of the human partner. (Rowe 1993)

Rowe is careful to point out that this classification system is not based on distinct or completely separate classes, as a given system can incorporate a mixture of features or points along these continuums.

This notion of an instrument/player paradigm deserves further exploration. At one end of the continuum we can place the hyperinstrument or extended instrument approach. The term hyperinstrument, coined by Tod Machover at the MIT Media Lab in 1986, refers to interactive instruments designed to extend the expressive capabilities of performing musicians (Machover 1999). According to Dean, the basic concept involves sensors “used to detect aspects of the playing process that can then be converted into quantitative signals and used for aspects of sound production, in addition to, or instead of, the normal acoustic sound of the instrument (Dean 2003). This work started with simple MIDI controllers, progressed to custom instruments using physical sensors, and now includes real-time audio analysis as one of the available control sources. While this work has been evolving over the years, central design concerns have been learnability, repeatability, and control:

> We also strongly believe in designing performance systems that allow the performer to remain in control of the system, and in some ways afford the performer even greater musical power than he or she normally would have. I'm not interested in systems in which the computer acts as an accompanist, playing a role of its own, or in systems that prevent the performer from knowing what to expect from the computer. The performer must remain in control at all times. (Machover 1992)

The issue of control is especially significant as it is one of the key elements defining the performers relationship with the instrument or system. This hyperinstrument model is more consistent with a traditional acoustic instrument/performer relationship, but with computer-enhanced capabilities.

Another instrument-based model is the Expanded Instrument System used by Pauline Oliveros and members of the Deep Listening Band. This system grew out of Oliveros' work with tape and delay systems in the late 1950's (Oliveros 1984). David Gamper (a member of the Deep Listening Band) describes the system as a "performer-controlled delay-based network of digital sound processing devices designed to provide an improvisational environment for acoustic musicians" (Gamper and Oliveros 1998). This system has gone through many incarnations and is currently implemented in the Max/MSP environment (Zicarelli 1998). Foot pedals, MIDI faders, and algorithms are used to control the digital signal processing and spatialization that is applied to the performers acoustic instruments and voices. Because this system is designed specifically for improvisation, it must be flexible, extensible, and have an easily understandable user interface. While this system is primarily user-controlled, it does have elements of autonomy due to the use of long regenerative delay structures, modulation algorithms, and random variation generators. Current system developments include additional autonomous elements and higher-level control parameters.

On the other end of the instrument/player continuum is the *Voyager* performance environment by composer, improviser, and system designer George Lewis. *Voyager* is described as a "nonhierarchical, interactive musical environment that privileges improvisation" and a place where "improvisers engage in a dialogue with a computer-driven, interactive virtual improvising orchestra" (Lewis 2000). The most unique aspect of *Voyager* is the systems high level of autonomy: "In Voyager, the computer system is not an instrument, and therefore cannot be controlled by a performer. Rather, the system is a multi-instrumental player with its own instrument" (Lewis 1999). This system is based on a computer program that is designed to exhibit independent behavior, but also respond to input from the human performer. This input usually comes from a MIDI stream generated by a pitch-to-MIDI converter analyzing an acoustic instrument, such as Lewis's trombone. Lewis talks about influence instead of control, and acknowledges that *Voyager* has a range of response modes from "complete communication to utter indifference" (Dean 2003).

The Hybrid Model

Somewhere between the controllable extended instrument and the independent virtual performer is the hybrid instrument approach. My design philosophy for hybrid systems is to balance playability with elements of autonomy and surprise. These idiosyncratic behaviors are encoded into personalized instruments/systems designed for improvisational performance. The systems often utilize a combination of explicit gestural control, control data derived from real-time audio stream analysis, and chaotic/random behavior. The improviser has access to certain meta-level controls for overall system influence, but many of the processes run with minimal performer intervention. For some pieces, audio stream analysis is used as the only control input to the software system, allowing the improviser to focus exclusively on the performed sound.

Because I often perform in solo settings, I am interested in building a certain degree of autonomy and unpredictability into my performance systems. At the same time, I seek a level of engagement with the sound making process, so playability is also required. For ensemble improvisation, a much higher degree of playability may be desired, so the focus of the interaction can be directed towards the other musicians. In this case, it is important that the software does not exhibit so much independent behavior that the human interaction is compromised. In an ideal hybrid implementation, the system design utilizes the best features from both the extended instrument and virtual performer models.

The Composed Instrument

The notion of a composed instrument is a general, yet powerful model that merits discussion.[2] A composed instrument can be described simply as an instrument or system in which the gestural control is independent from the sound generating mechanism. This allows the instrument to be composed by designing the gestural interface, sound synthesis and processing, and most importantly, the mapping and interconnections between the

[2] This approach has been written about by Wanderley (Wanderley, Schnell et al. 1998), Bahn (Bahn and Trueman 2001), and Schnell (Schnell and Battier 2002).

various components. As Curtis Bahn and Dan Trueman state, "We consider our entire systems, from physical instruments, sensor interfaces, interactive computer music environments to spherical speaker arrays, to be both extended instruments and non-linear compositions: composed instruments" (Bahn and Trueman 2001).

The composed instrument attempts to address and unify the concerns of instrument design (both hardware and software) and composition or improvisation design because "the notion of a musical instrument is interwoven with that of the musical work" (Schnell and Battier 2002). This unity is reflected in Jonathan Impett's description of his meta-trumpet as an "integrated interactive instrument-interface-composition system" (Dean 2003). The model of the composed instrument is compatible with and conducive to the general goals of mediated improvisation, as an instrument can be designed or composed with a wide range of musical uses in mind, and according to Bahn, can include "an interface whose potentials and scope are dynamic; a compositional structure of musical possibilities with the agency of their realization given to the performer (Dean 2003). The concept of the composed instrument highlights the artificial and unnecessary divisions drawn between composition, instrument design, performance, and improvisation.

Personal Motivations

Before moving on to specific design strategies for interactive systems, I would like to briefly summarize my personal interests and motivations for working in the area of computer-mediated improvisation. This is another attempt at answering the question that opened this chapter, what does computer mediation enable? One of the most enabling elements is the real-time access to a complex and malleable sound world that is not restricted to the domain of acoustic instruments. From my earliest music making experiences, I was deeply interested in the nature of sound and how it could be manipulated and transformed. By designing and performing with computer-mediated systems, I am able to explore interesting timbral spaces, while hopefully sidestepping some of the melodic/harmonic implications associated with many acoustic instruments.

Computer-mediation allows me to create systems that reflect my personal and often idiosyncratic approach to sound making. I am able to build certain behaviors into the hardware/software that can guide or influence the direction of an improvisation, thereby combining my interest in form and structure with my desire to realize key elements of a piece in the context of performance. This approach has allowed me to combine and integrate the roles and concerns of composer, system designer, and performer. By composing the entire performance system, I can work around certain personal performance limitations, and redefine virtuosity in my own unique aesthetic context.

By utilizing hybrid control strategies that combine playable gestural controls, audio analysis based controls, and random or autonomous behaviors, I am able to design systems that produce unexpected and compelling sounds. Improvising with these instruments/systems encourages me to listen and respond thoughtfully. This approach embraces the artistic and conceptual challenges of entering the moment of performance without knowing what will happen, and represents a process over product mentality. I am attempting to make performance systems that are flexible and extensible enough to allow me to respond to the specific circumstances or context of a given performance setting, thereby blurring the line between performance and site-specific music/sound environments.

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