# Time and Reciprocity in Improvisation: in-time performance

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One of the perhaps more obvious differences between composed and improvised music is the fact that the latter unfolds in real-time, whereas parts of the former is constructed outside of real-time. This is not to say, however, that improvised music is void of compositional strategies, only that the in-time aspect of improvisation—i.e. the way that the practice of improvisation is embedded in time—is one of its important and significant features. The temporal properties of a machine, furthermore, are in every respect different from those of a human, something which the computer improviser has to address, either in the ways the interface is constructed, or in the ways that the computer instruments are designed (or both). In my presentation I will show how these issues influence both my artistic practice and my research while working in the field of interactive music, trying to incorporate computers into a live performing context.

Perhaps the temporal distinction between composition and improvisation is too obvious to have to point out. Also beyond the surface of this distinction it may be argued that, even though a composition is constructed outside of time, it is in most cases performed in real-time. This argument, however, makes the specificity of improvisation stand out because improvisation is both constructed *and* performed in real-time. And this is true even if elements of the improvisation where prepared in advance. A common criticism against the art of master improviser and jazz icon Charlie Parker (and much other idiomatic improvisation) was that he played the same licks over and over again. This is however to miss the point; prepared or unprepared, the material that it consists of, and the improvisation itself, is constructed in real-time.

Few art forms are unanimously non-real time or real-time. Even the meaning and interpretation of relatively static works such as Picasso's guitar painting changes over time. And even though Derek Bailey dismisses recordings as representations of his art, they exist and people listen to them and as such they are out-of time, static, snapshots of his improvisations.

Another distinction, one that I find useful, is that between artistic practices that are *embedded in time* (in-time processes) and those that are *contained in time* (over-time processes). I am indebted this terminology to Vijay Iyer (2008) who is referring to it in his chapter *On Improvisation, Temporality, and Embodied Experience* in Paul D. Miller's anthology *Sound Unbound* (Iyer has lend the terms from cognitive science and robotics

and the origins of the terminology may be found, among other places, in a report by cognitive scientist Tim Smithers titled *On What Embodiment Might Have to do with Cognition*.(Smithers 1996, 1998, Gelder 1998).)

For an action to be embedded in time means that the time it takes to perform it matters; that time is a factor whose value is decisive. For example, the difference between reading or writing a book in one day or to do it in one year is not necessarily a difference that changes the meaning or expression of the book, whereas the time it takes to play or listen to a piece of music has everything to do with its expressive qualities: playing the same piece of music in ten minutes or in two hours is likely to make it a very different experience.

Hence, musical performance and improvisation are typical in-time operations: They are *embedded in time* whereas over-time operations may be said to be *contained in time*. Along with advances in computer science and robotics, real time computation has altered the picture somewhat, but the distinction between an over-time operation being so fast that time goes unnoticed is very different from the way the mind "exploits both the constraints and allowances of the natural timescales of the body and the brain as a total physical system." (Iyer 2008:276) Many physical activities are in-time operations in the way that the time it takes to move a part of the body is part of the movement at large and it is interesting the way Iyer links the body and the brain into a unified system with its own natural timescales. It is also important the way he clarifies that speed is not the important aspect, but rather the quality of the temporality of the activity.

Resistance, physical or gravitational resistance, is an integral part of in-time operations, and also of musical performance. The weight and size of my leg when I walk is part of the walking activity and the resistance of my body and of my instrument are factors that shape my musical output in a performance. But the lack of a physical component in the virtual world of computers is a factor that needs to be considered when designing interactive systems for musical improvisation and I argue that a successful interactive system (in music) not only needs to understand my constraints but it will also need to construct and emulate its own.

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What then is the significance of interaction in a music that makes use of interactive computers in musical performance? In what sense can I communicate abstract parameters such as my constraints, resistances and allowances to a computer in real-time? In what sense can the machine respond to me and in what sense can I respond to it?

The aspect of interaction in the field of interactive art and media is problematic as the term *interactive* to some extent has been hijacked by computer interface designers. Though one of its lexicographic meanings is "Reciprocally active",[1] its meaning in the context of computer interface design is more geared towards a methodology of control, than sharing, or reciprocity. In the reduced meaning of computer interaction the actions of one part, 'the user', is used to control the *re*actions of the other, 'the machine', often in a one-to-one relation: one action, one re-action. In this kind of reduced interaction,

[1] "interactive, *a*." The Oxford English Dictionary. 2nd ed. 1989. OED Online. Oxford University Press. 1 Nov. 2007. `http://dictionary.oed.com/cgi/entry/50118746`

a reaction to any given action is commonly ignorant to any prior actions or reactions. A mouse click on a given icon on a computer desktop typically results in the same machine response, regardless of the user's preceding activities. Musical interaction, on the other hand, is all about reciprocity, particularly in improvised music. (As is investigated by Ingrid Monson in her important contribution *Saying Something : Jazz Improvisation and Interaction* (Monson 1996) )

A successful interplay between musicians involved in an improvisation rests on a mutual sensitivity for taking, and responding to, musical initiatives. Musicians induce differences rather than alter states; they induce differences that "*make a difference*" and according to Gregory Bateson, such a difference that makes a difference is the definition of a bit of information (Bateson:92). In other words, new information and knowledge is constructed by changes over time. It is my experience and my understanding that there is an intimate coupling between the dynamics of an in-time system and the dynamics of the cybernetic concept of differences that make a difference. The great challenge, as I see it, is to design interactive systems that is more concerned with difference (over time) than it is with state changes (over or outside of time).

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Building on the cybernetics of Bateson, in my PhD dissertation from 2008 *Improvisation, Computers, and Interaction: Rethinking Human-Computer Interaction Through Music* Frisk (2008) I coined the two modes of interaction *interaction-as-control* and *interaction-as-difference*. The control paradigm influences much of the interaction design we encounter. When we press channel 1 on the remote control for our TV set, we generally do not want the technology to interpret our intent; we just want to control the channel displayed on the TV. The control paradigm, however, becomes problematic if it is transferred to the domain of musical practice. When I play, I do not want to only control the technology I engage with, be it a computer or a saxophone. I want, to use the ecologically informed words of Iyer, to exploit both the constraints and allowances of the natural timescales of the instruments I use and let these parameters induce differences that makes a difference rather than control them towards a preconceived result. This is an aesthetic choice intimately linked to my improvisational attitude towards musical organization. (In composition interaction-as-control may be a more appropriate paradigm in that composition commonly is the activity of structuring events outside of time in order to have them played back as intended in performance.)

Just as in-time and over-time are not unanimous categories, however, interaction-as-control and interaction-as-difference are not clear cut definitions in binary opposition. We are clearly dealing with a continuum; a continuum of interactive potential ranging from the most reduced form of interaction-as-control (click and response) to the infinitely complex interaction-as-difference (e.g. human interaction, musical interaction, performer/audience interaction).

The activity of playing back a CD-recording of a symphony on a sound system is an example of the former while conducting a symphony orchestra playing the same symphony is an (extreme) example of latter. What one may gain in control with the CD player, the recording and the sound system—a CD can be paused, repeated, removed, etc.—we loose

in influence over content. As conductors we may alter the music in ways that we see fit, limited merely by cultural and social practices. But what we gain in influence in this context we loose in control: We can not as easily pause a live performance, considerable financial resources needs to be deployed in order to gather all the musicians needed, the training needed to be able to conduct a symphony orchestra is counted in years whereas the training needed to play back a CD is counted in seconds, etc.

The challenge for me is to build interactive systems for musical improvisation that are able to adapt and move back and forth along the continuum of interactive potential but that are more geared towards interaction-as-difference and human interaction than towards interaction-as-control.

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A number of composers and theorists have stressed the multiplicity of temporal modes present in music signaling that, apart from the two different temporal schemes (in-time and over-time), there are several different timescales in simultaneous operation. The American electronic music composers Curtis Roads makes the interesting remark that the discontinuities that appear in the boundaries between different (concurrent) time scales give rise to perceptual differences in sonic events. (Roads 2001:4) A note terribly out of tune in one temporal order may have just the right intonation in another, and a beat out of sync in one time scale may swing in another. (For an example of the great variation in rhythmic timing among jazz musicians when observed at high temporal resolution, see Friberg and Sundström 2002) In other words, depending on our temporal zoom level we may appreciate different qualities in the music. This also suggests that the differences depend on the perspective; the note out of tune, in isolation, is an error but an emotional infliction when heard in context.

To the Greek composer and architect Iannis Xenakis the discontinuity of musical time was of pivotal import. Not only the interruptions that occur when moving across the boundaries between different temporal scales, but also the separability of events occurring within the flux of one particular time scale. Xenakis, with his background as an architect, had a great interest in the spatial properties of music in general and musical time in particular. The idea that musical time may be rendered in space, however, is common to several descriptions and in essence, this is what musical notation does.

A popular example of time to space transformation is the famous scene in Hitchcock's 1959 movie *Vertigo*. Madeleine (played by Kim Novak), whose identity is overwhelmed by her great grand-mother, is standing in front of a cross section of an over 1000 years old Redwood tree. She places her finger towards the outer ring of the tree and marks out the point where she was born and the point where she died. The distance between the two points is short relative to the size of the tree, and, as she is moving her finger across the wood, she says "It was only a moment to you". Hitchcock (1958) The cross section of the tree is used to spatialize a (short) life span, to transform a duration to a distance, to transform time to space.

Another, similarly schizophrenic, example is the end of the first act of Richard Wagner's opera Parsifal where there is a slightly more subtle and continuous transformation from time to space. In Wagner's music there is a seamless transformation, like a walk through

a long series of infinitesimal transformations (In a common staging, along with the music in this passage, Gurnemanz and Parsifal are slowly walking towards a changing landscape, backs turned to the audience who are watching the actors watching the transformation.) while the protagonist's mentor Gurnemanz mystically explains to him: "*Du siehst, mein Sohn, zum Raum wird hier Zeit.*" (You see, my son, time here becomes space).

Although the time-to-space transformations are common and important in music, I believe it to be important to embrace the infinite interactive possibilities of in-time performance and resist the out-of-time (spatially rendered) representations of music. This is difficult and the temporalities of technology is in my experience very different from the multiple temporal possibilities of musical listening and performance. Using interactive technology in performance is daunting in the way that the interaction may disrupt the flow of the musical performance. Again, if the interactive interface is made in a way that bi-directionally communicates the in-time properties of the performance, I believe it is possible to overcome these difficulties.

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Music has had an out-of-time spatial representation ever since musical notation was introduced. In the Western music history there is a tendency of disregarding the performative aspects of a musical work and regarding the score, i.e. its graphical representation, as equal to the identity of the work.[2] Furthermore, with the advent of recording technology, not only the representation of sound in scores, but also sound itself has been transformed into space: "We might say that recording is a reflux, or distillation in which time is boiled off, for time must be added back in to get sound, in the form of a steady motion of the turntable or tape heads or the crystal clock in digital recording." (Evens 2005:54) In the engravings on an LP, or through the holes on the surface of a CD, the elusive nature of sound as embedded in time is captured and spatialized. The digital representation of sound in a computer is similarly spatialized: In other words, to even begin to think about using interactive computer technology in performance involves a transformation of the in-time embedded sound to an over-time representation.

In his book *Digital Performance: A History of New Media in Theater, Dance, Performance Art, and Installation* Steve Dixon discusses the problematic issue of 'liveness' in performance. There is a common sense that technology have "transformed or destabilized notions of liveness, presence, and the 'real"', (Dixon 2007:127) suggesting that the real-time arts somehow becomes less 'live' when technology is made use of. Similar ideas have been discussed here based on the notion that the temporality of technology is different from the temporalities of live performance. Even though a performer (and an audience), simultaneously employs a number of different temporalities, the addition of the computer appears to sometimes disrupt the in-time process in various ways. As if the over-time operations of the computer, however lightning fast these may be, is sometimes too much for the performance to carry, making it impossible for the interactive interface to inform the digital system in a useful way. The reasons for the failure may be due to poor interaction

[2]The topic is brought up by British improviser and composer Trevor Wishart who rhetorically asks what constitutes music: "what we experience in the sounds, or what we might theoretically appreciate of the score through the sounds [. . . ]." Wishart (1985)

design but it may equally well be due to a limited understanding for the prerequisites of computer interaction on the part of the performers and the designers (programmers) of the system. Either way, in the way that the use of interactive computers in artistic practice highlights questions relating to in-time interaction makes it both artistically and conceptually interesting, and although the problems related to human-computer interaction in real-time artistic practice may be seen as particular to its context, any knowledge produced about the interaction and about the ways in which it may be improved, may well be of interest also outside of that field. The significance of arts based research in this context has at least two axes: (1) to more fully understand the notion of liveness and temporal embeddedness in the real-time arts involving computers, and (2) to inform the design of new human-computer interfaces.

## References


Gregory Bateson. *Mind and Nature*. Hampton Press, Cresskill, New Jersey, 1979.

S. Dixon. *Digital Performance: A History of New Media in Theater, Dance, Performance Art, and Installation*. The MIT Press, Cambridge, Mass., 2007.

Aden Evens. *Sound Ideas : Music, Machines, and Experience*, volume 27 of *Theory out of bounds*. University of Minnesota Press, 2005.

A. Friberg and A. Sundström. Swing ratios and ensemble timing in jazz performance: Evidence for a common rhythmic pattern. *Music Perception*, 3(19):333–49, 2002. Invited paper.

Henrik Frisk. *Improvisation, Computers, and Interaction: Rethinking Human-Computer Interaction Through Music*. PhD thesis, Malmö Faculty of Fine and Performing Arts, Lund University, 2008.

Tim Van Gelder. The dynamical hypothesis in cognitive science. *Behavioral and Brain Sciences*, 21(5):615–65, 1998.

Alfred Hitchcock. Vertigo. Film, 1958.

Vijay S. Iyer. On improvisation, temporality, and embodied experience. In Paul D. Miller, editor, *Sound Unbound : Sampling digital music and culture*, chapter 26. The MIT Press, Cambridge, Mass., 2008.

Ingrid T. Monson. *Saying Something : Jazz Improvisation and Interaction*. Chicago Studies in Ethnomusicology. University of Chicago Press, 1996.

Curtis Roads. *Microsound*. The MIT Press, Cambridge, Mass., 2001.

Tim Smithers. On what embodiment might have to do with cognition. Technical report, AAAI, 1996.

Tim Smithers. In time and over time. *Behavioral and brain sciences*, 21(5):651–652, 1998.

Trevor Wishart. *On Sonic Art*. Imagineering Press, York, 1985.