Becoming-Sound: Affect and Assemblage in Improvisational Digital Music Making

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ABSTRACT

The concepts of *affect* and *assemblage* proposed by thinkers such as Gilles Deleuze and Brian Massumi can help us to understand the interaction between users and artefacts in interactive systems, particularly in the context of computer-supported improvisation and creativity. In this paper I provide an introduction to affect and assemblage theory for HCI practitioners. I then use a case study of Viscotheque, an iOS-based interface for group musical collaboration, to demonstrate the application of affective analysis in making sense of improvisational group music making.

Author Keywords

affect; assemblage; improvisation; music making

ACM Classification Keywords

H.5.m. Information interfaces and presentation (e.g., HCI): Miscellaneous.

INTRODUCTION

As designers, our capacity to build interactive systems continues to outpace our capacity to understand what we have built. As digital artefacts and technologies of interaction push beyond the boundaries of the individual and the vocational, their influence on the practices and cultures they infiltrate is complex and multifaceted. The field of HCI is well aware of the challenges and opportunities posed by this shift [7].

Interactive systems which facilitate creative interaction, including the aural and visual arts, are an oft-cited example of this shift to third-wave HCI [7]. In these contexts measuring task accuracy and efficiency is problematic. This makes experimentation and validation difficult, at least when using traditional HCI methods, and designing such systems is often seen as a 'black art' [53].

In the last decade, 'user experience' has been gaining momentum as a value system for interaction design and HCI. There is ongoing semantic [29] and methodological [5, 28] debate surrounding this term, however the broad push is an increasing

concern with our lived and felt experiences with technology, including the emotional and aspirational dimensions of these interactions.

McCarthy and Wright's *Technology as Experience* [35] has been influential in its emphasis on the relational nature of experience. Drawing on Dewey's *Art as Experience* [16] and Bahktin's dialogics, McCarthy and Wright present a fundamentally relational view of experience—to be found in the unfinalisable, emergent relationships between different centres of value: users, digital artefacts, past experiences, and anticipated futures. This concept of experience (contrary to [25]) is not limited to an conscious individual's ongoing reflection on events, it is "of this world; it is not a secondary reflection of the world apprehended from a distance" [36].

This picture of experience and technology lies towards the interactionist, holistic end of the theoretical spectrum. This is perhaps simply the next chapter in HCI's move away from the reductionistic cognitivism of the 1980s [23]. Taylor [50], however, cautions against the seductive power of the network trope—seeing everything as connected and resisting any consideration of the parts apart from the whole. His point is not that that relational conceptions of experience are incorrect or unhelpful. Rather, what must be explained is how the connections are formed, what drives the network's behaviour, and where is the *end* of the network's influence.

In this paper I suggest that the concepts of *affect* and *assemblage* can assist us in answering these questions in the context of collaborative creativity in interactive systems. Some background on these ideas, primarily from the geography and cultural theory literature, is presented in the next section. I then mobilise these ideas in making sense of a recent field trial of *Viscotheque*, an improvisational group music-making environment.

AFFECT & ASSEMBLAGE

Gilles Deleuze's thought (and that of his collaborator Félix Guattari) is renowned for its density and interconnectedness—both in form and in content. Deleuze initially rose to prominence for his unconventional readings of other philosophers, including Kant and Nietsche, particularly his emphasis on difference and movement over identity and stasis [47]. His ideas have spawned a cottage industry of scholars interpreting and applying his work [10, p3]. While he has been very influential in other fields, his work has had little impact in HCI, although Satchell is a notable exception [43, 44].

In this paper I shall focus on two related concepts: affect and assemblage. This section attempts to provide an overview of these concepts, although space permits only the briefest of sketches. Critical and cultural theory has a specific vocabulary, in which some terms are used in subtly different ways to their use in traditional HCI discourse. In providing this background, I hope to address this potential for confusion.

Affect

Affect, or its synonymous term intensity [33], describes the pre-personal, pre-reflective means by which all things (human and non-human, objects and ideas) affect one another, both positively and negatively. Affects are not the result of conscious processing and projection by human agents, they are the means by which bodies are empowered (or inhibited) to act, to *do*. According to DeLanda, bodies "possess an *indefinite* number of capacities to *affect* and be *affected* by other individuals" [13, p62] (emphasis in original).

The use of the term affect is problematic in HCI discourse. Picard's affective computing [40] uses the same term in a different sense, which is drawn from the psychology literature [42]. In this tradition, the word 'affect' is used with a meaning very close to 'emotion'. In this sense, affective computing is about building computers which can sense and represent the affective-emotional state of their users [42]. This affect is biographical and personal. It is an emotion, felt and labeled, available to conscious introspection and reflection. This 'information processing' model of affect (and emotion) has been criticised for its individualism [8].

This is *not* the meaning of the term affect as used in affect theory (see [22]). Shouse describes the relationship between affect, feeling, and emotion thus: "Feelings are personal and biographical, emotions are social, and affects are pre-personal" [46]. A feeling is a sensation processed and labelled but still personal, while an emotion is the outward projection of a feeling. Affect is pure *potential*, abstract, unstructured and autonomous. It is this sense of the term I use in this paper.

It should also be noted that there is a divergence of views on the nature of affect in social theory as well (in particular Tomkins [51]). In this paper I present a view based on Massumi's conception of affect/intensity [34], which is influenced by his readings of Spinoza and Deleuze.

In *Ethics* [48], Spinoza is interested in the question of *what a body can do?* The use of the term 'body' is not limited to mean a human body—the concept is much broader:

> A body is not a fixed unit with a stable or static internal structure. On the contrary, a body is a dynamic relationship whose internal structure and external limits are subject to change. What we identify as a body is merely a temporarily stable relationship. [24, p92]

Further reading on the history of the body in critical theory can be found in Blackman [6].

Bodies are perpetually assaulted on all sides by many different affective/intensive forces. Some examples here may help to clarify things. Consider a chance encounter with an old friend—noticing them across a busy road. You cry out, wave your arms, perhaps jump between cars to cross and greet them. The body, responding to this recognition, is affected to do all these things, physically and emotionally.

Or consider a scenario where you enter into a room where two lovers have just been arguing. You may not catch any of the argument, they may revert immediately to an outward civility, but the atmosphere in the room is tense. In recognising this—in registering this affect—you may slink out of the room, or rise up and take a side in the argument, depending on your relationship to the couple [9]. These intensities are registered, enfolded and acted upon in different ways by different bodies, and affect is the name of the pre-reflective force which catalyses these actions. "[Affective] atmospheres are the shared ground from which subjective states and their attendant feelings and emotions emerge" [2]. This is the autonomy of affect—it is 'registered' differently by different bodies, and affects which may arouse one may inhibit another.

In Spinoza's ethics, affects can be passive or active [24, p100]. Active affections are productive, they enable the body to act. Passive affects on the other hand are intensities that enfold a body, but only impact on the body's ability to feel or suffer. Furthermore, passive affects can be either joyful or sad. Joyful passive affects are a result of encounters with other bodies which are agreeable, consonant. Sad passive affects diminish the ability to act, they are a result of encounters with bodies whose internal relationships are not compatible with their own. These effects may be intertwined—affects may have both sad and joyful dimensions. The ethical project then, according to Spinoza, is to seek encounters with bodies which have 'an agreeable composition' to one's own body, with the ultimate goal of becoming active.

In affect theory there is no special place given to the human actor. The human body is subject to the affects which enfold it, resonating sympathetically as these affective forces pass fleetingly by as though just out of sight. The human is not an atomic, indivisible body, but is itself a composite body, with its own internal relationships and differences. This is at odds with the traditional primacy of the *human* user in HCI theory (as noted by [4]). This shift allows us greater freedom to understand complicated ensembles of digital artefacts, corporeal bodies, histories, and desires.

Music has an extraordinary power to shape our moods and actions. Malbon, describing his experiences in the UK club scene, writes

> the music and lighting effects combined so powerfully with the moving crowd on the dance floor...This kind of context—this sound and lightscape—must surely significantly change the ways that people interact. [32, xii]

Musical sound can produce active affects, which may cause toe-tapping, singing or dancing. There may be sad passive affects at play as well, such as the depressive atmosphere created by the sombre horns of a requiem. As sounds (musical bodies) enfold us we are affected; we are transformed. The nature of this transformation will be different for different

bodies, depending on musical training, cultural background, current emotional state, and many other factors. The affective power of music must be recognised in the design and characterisation of interactive systems for music-making. The affective power of music to arouse the body is especially apparent in electrically amplified and digitally synthesised sonic environments such as the Discotheque [30], and also in the open-ended interactive systems of third wave HCI.

Assemblage

So what of this 'coming together' of bodies? In what ways can bodies come together to affect and to be affected? How does that shape our answer to the question of what a body can do? *Assemblage*[1] describes the organisation of bodies which opens up new possibilities for action [15, Ch 4]. The assemblage is not static entity, it is a process—a becoming, rather than a being.

> The assemblage is less about what it is then, and more about what it can do, what it can affect and bring about [17].

One of the key characteristics of assemblage thinking is a commitment to a flat (that is, non-hierarchical) ontology. A bicycle, a species of bird, a song, a mathematical theorem: these are all equally real, they are the product of the intensive forces which gave rise to them [13]. Assemblages are scale-free—each assemblage may be a component in still larger assemblages (e.g. a person as a member of a family, which is a member of a society). A body of theory (such as HCI) is an assemblage—the result of different ideas, experiments and researchers affecting each other, sometimes strengthening sometimes discrediting, and always transforming.

Again, building on Spinoza's ethics of affected bodies, the assemblage is not directionless, it is striving towards new potentials. The progress of the assemblage towards these heightened capacities for action is not inevitable, and sad passive affects may inhibit this expression. When the assemblage resonates harmoniously, though—when its internal feedback loops reinforce joyful and active affects—then the affective potentials are at their greatest, and the assemblage is empowered to become something new and different.

The assemblage is best conceived not as a collection of identities but as a network of forces and intensities. And in the outworking of these intensities the assemblage is transformed, so that it can affect and be affected in new ways. This is perhaps the key difference between assemblage thinking and Latour's Actor-Network Theory (ANT) [27]. Neither give any special place to the human agent in complex systems, but while ANT is concerned with what is required to produce the phenomenon, Deleuze and Guattari are more iterated in what possibilities for future action it opens up [21]. The essence of the assemblage is in the opening up of new potentials for expression and action.

DeLanda [14, p9] contrasts an assemblage picture with an organismic one—seeing a complex system as an organism (such as a human body). In the organismic metaphor, each

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[1]*agencement* in Deleuze's native French

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component is works together in harmony to produce an organic *unity*. Examining any component of the system in isolation is problematic, because being this component in a larger whole is a core part of what it *is*. Also, as components are transplanted or repurposed in other systems (where their function is different) their identity necessarily changes as well. In an assemblage picture, by contrast, the nature of a component is fully defined by its intensive/affective history and the potentials for change that it opens up. If the component is 'plugged into' another assemblage, it may open up *different* potentials—affects are unstructured potentials, which affect different bodies differently if at all—but the component itself is not stripped of its identity in any way.

Another implication of this move away from the seamless unity of the organismic picture is the importance of heterogeneity in the assemblage. Differences between components are not to be glossed over, they are the animating force which drives the movement of the assemblage. The way a thermal gradient in a container of water produces a convection current, or genetic differences in a population give rise to diversity and adaptation through reproduction—these are examples of the *vitality* of difference. For Deleuze, difference is not simply the residual left behind when distinct identities are compared. Difference is prior to identity, and all identity and movement flows from the actualisation of these differentials.

It is important to point out that this is a selective reading of this literature. This is obviously a necessity in a paper of this length. The Deleuzian corpus, with its rhizomatic and interconnected ideas, is sympathetic to this kind of treatment. Deleuze himself was notable for his particular and somewhat selective readings of other thinkers [47] and his appropriation of those ideas which he found productive in his own work. The ideas presented here can be useful in HCI and in the design community, and as such I have attempted to present them in an accessible manner.

THE JAMMING ASSEMBLAGE

Having discussed these ideas largely in the abstract, I now wish to turn to a specific cultural practice: 'jamming'.

> **Jam session** (*informal*): improvise with other musicians, especially in jazz or blues [1].

There is no formal specification as to what exactly constitues a jam, and there are many diverse musical practices which are referred to by this term [26]. However, a helpful definition is improvisational group music-making. The improvisational aspect of jamming is what sets it apart from other musical practices. Jamming requires no necessary ceremony. A group of teenagers in their parents' basement are as free to jam as a highly skilled professional jazz trio. The sonic spaces they explore will be different as they bring different instruments and skills to the table. Their assemblages, with their different compositions, have different capacities to act and different potentials for making sound.

The concept of assemblage can help us to think about jamming groups. Each musician in an improvising ensemble is a body (indeed, is a composite body) with the ability to influence other bodies. They do this through their own musical

contributions, as well as through their bodily movements and facial expressions. They are also vulnerable to the musical and bodily contributions of the other musicians. Each individual contribution must be understood in the context of the unfolding jam—prior contributions shape the way that present act of expression is understood.

Gilbert [20] stresses the rhizomatic nature of improvisation. Unlike musical forms where the composer predefines the structures and relationships between the musicians and sounds ahead of time, in a jam the musicians are free to make their own connections, undirected by any central coordinating force. This is not to say that their interaction is chaotic or aimless. There are certainly creative forces at work in the improvisational assemblage, but they are decentralised. Any musician, through their music, can affect and be affected by all the others.

As already noted, affect is autonomous—it does not do the bidding of the bodies it enfolds. A musician can make a sound, they cannot control how that sound will contribute to the affects present and transform other bodies in its environment. These sounds are not affects themselves, but may give rise to powerful affective potentials, hinting at multiple potential musical and bodily responses. Rhythm, for instance, has the power to arouse and entrain movement in sympathy [12].

As noted by Nesbitt[37], the assemblage also provides an opportunity to critique the glorification of the human creative actor

> In place of the longstanding critical tradition that sees jazz through this lens of a metaphysics of human productivity, a range of actors, both human and non-human, come together in any given musical improvisation to construct a musical experiment. Instead of a protean, subject-based spontaneity, one discovers instead from this Deleuzian perspective, say, an instrument-club-musician-head-solo-influences-practice-time-mood assemblage. [37, p159]

There *is* room for human creativity and intentionality in the jamming assemblage—the musicians are not leaves blown about on the winds of affect, robotically dancing to a tune they have no say in shaping. Rather, intentionality is simply an outworking of the nature of life itself: "life is always active and creative, affirming the power to become" [11, p66]. One implication of the flat ontology is that while the musician *is* an assemblage of biological and experiential elements, they are not any less real or important than their constituent parts. So while there is no special place for a transcendent creative soul, the subjective feeling of intentionality experienced by the musicians is real—just as real as those interacting lower-level components.

The desire of the musical assemblage is to undergo transformation such that new potential musics are possible. Many factors may hinder or even dissolve the assemblage, such as a lack of instrumental skill or equipment problems. The fundamental drive, though, is to become active, to throw off any constraints which limit what sounds can be made. When we consider all dependencies of a musical improvisation event,

all the factors which resonate in concert, it is no wonder that making sense of improvisational musical interaction is so hard and that articulating normative laws is so difficult.

Smartphone-based DMIs

Jamming as a musical practice has not escaped the influence and infiltration of computing devices. Digital musical instruments (DMIs) are tools for musical expression which incorporate digital technologies. DMIs can take many different forms—Paine [39] provides a helpful overview and taxonomy. The design and use of such instruments provides musicians with new opportunities to jam, both socially and sonically. From a Deleuzian perspective, this is a good thing—any new instrument offers new potential actions, new sounds to make.

Touch-screen smartphones provide a rich palette of sensors and networking capabilities which can be used to build new instruments, such as [38]. From a design perspective this may seem limiting—there is clearly more creative freedom afforded the designer when the DMI is built from scratch. However, the ubiquity and affordability of smartphones, such as the Apple iPhone[2], makes them a good option for DMI design [18], and this is the approach I have taken in the design of Viscotheque.

Very simply, a DMI consists of two main components: a *gestural controller*, which registers the physical manipulations of the musician, and a *sound producer*, which produces the sound [52]. In between these components is a mapping from gestures into sound. From a design perspective, this mapping provides the most, and perhaps the only, fertile space for creativity. In many cases, as is indeed the case with an off-the-shelf smartphone, the operation of the gestural controller and the sound producer is largely pre-determined, immutable. The touch screen will always respond to touches in the same way, the phone's sound chip and speaker will always render the audio it is fed in the same way (barring a malfunction—which may cause interesting and unanticipated affects). The mapping from gestures into sound is therefore the primary space in which smartphone DMI innovation can occur.

In the jamming assemblage, just as there is no special place afforded the human, there is similarly no special place reserved for conventional or acoustic instruments. In the use of DMIs in the jamming assemblage, we are prompted once more to ask the question: what can a body do? What does the 'digitality' of the DMI bring to the jamming assemblage?

The shift to the digital opens up new possibilities for jamming in two ways. Firstly, the digital instrument is not limited in the sounds it can produce by its physical and acoustic properties. This freedom is not unlike the development of electric amplification and electronic processing in 20th century popular music.

The digital musical instrument is further freed from the tyranny of physical resonance. Deleuze himself was fascinated by the possibilities offered by early digital synthesizers [45]. Gestures may be mapped to reproduce sounds as-

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[2]www.apple.com/iphone/

sociated with more traditional instruments, for instance in the case of a digital keyboard which responds to key presses by playing back pre-recorded samples from an acoustic piano. More exciting, though, from the perspective of what the musical assemblage can do, is a mapping from gestures into sounds unlike any produced by acoustic instruments. A DMI is not completely freed from the realities of physical sound reproduction, some sort of physical loudspeaker is required to transform the digital data stream produced by the sound generator into vibrations in the air which can be heard. Still, the move to digital sound sources and synthesis does represent an opening up of the capacity of the jamming assemblage to act.

The second way that DMIs open up new potentials for action in the jamming assemblage is due to their novelty. The smartphone, as an instrument, does not have the hundreds of years of musical tradition and repertoire that are associated with, say, the violin. Designers of DMIs *can* choose to tie their designs into these traditions and the musical understandings and sensibilities of the musicians who play them. The opportunity exists, however, to break free from notions of tonality, expectations of which notes can follow each other, and other constraints on the way the assemblage can act musically. Deleuze calls this freedom the 'cosmic', characterised by active affects which enable, rather than constrain the movement of the assemblage [20].

THE VISCOTHEQUE CASE STUDY

The case study I present here shows how these ideas may be helpful for understanding complex, open ended interaction in human-computer assemblages. It concerns a month-long longitudinal study of expert musicians jamming together using Viscotheque, a custom iPhone-based digital musical instrument (DMI).

The Instrument

The Viscotheque instrument used in this case study is a gestural controller for musical sample manipulation and synthesis. The instrument is really a multi-user interactive environment, with multiple iPhone-wielding musicians jamming together in a shared space through a large PA system. The music-making component of the system uses a client-server architecture; each iOS device sends control messages over a wireless local area network to a laptop server which handles sound generation and processing. The system is described in more detail in [49].

The Viscotheque iOS app registers multi-touch input gestures from the musician and communicates wirelessly with the Viscotheque server which maps the gestures into sound. The instrument is designed to be responsive, with any touch on the screen immediately triggering a sound. The Viscotheque interface is primarily a process control interface, as classified by the instrumental design patterns in [19]. The mapping of the gestures into sound is designed to be continuous—smooth changes in the input space, such as dragging a finger or fingers around on the screen, result in a subtle change in the output sound. 'Discontinuous' gestural moves, such as the addition or removal of fingers results, produce a more pronounced change in the sound.
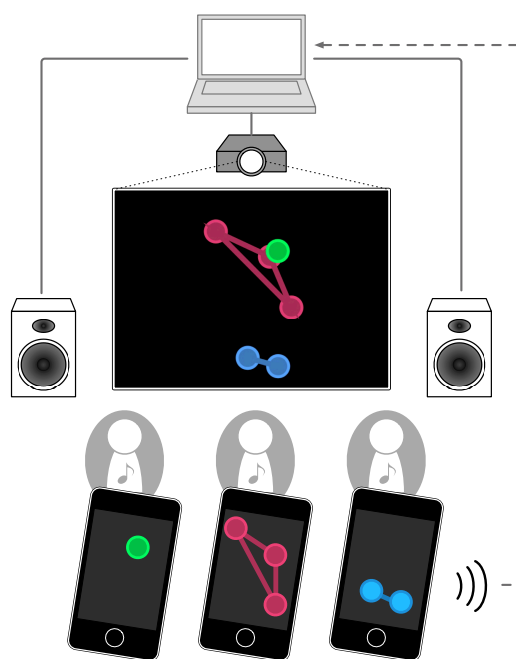

Figure 1. The Viscotheque system. The visual feedback on the main screen is a composite of the displays of all three instruments. Each dot represents a finger on the iPhone's touchscreen.

The jamming environment includes a pair of Duntech stereo speakers and a 50" plasma display to provide visual feedback to the participants. The screen presents an overlay of all participants' finger positions, colour-matched to the unique colour on each musician's device. This was primarily for orientation purposes, to aid each musician in identifying their own sound in the mix. In each session participants sat together in the jamming room, playing through the shared pair of loudspeakers. The architecture of the Viscotheque system is shown in Figure 1.

Study Procedure

For this study, musicians were recruited through the University's Music School. Twelve participants (eight male, four female) were divided into four groups of three. The groups were kept consistent from week to week so that the musicians could build a rapport. Each group came once a week for an hour long jam session in Viscotheque and post-jam interview. None of the musicians had used the system before participating in this study.

When the musicians came to the jam sessions, they were not given any prior training or explanation about the instrument, although they were informed that they could ask questions about it at any stage. They were also told that they could talk to one another, and that they were free to experiment with the instrument whatever way they chose.

Observations

In digital anthropology it is important to "make sure the voice of the ethnographer's firsthand experience in the field is not lost" [41]. The nature of affect is such that there is no substitute for *being there*. During the sessions I was present in

the room with the jamming group, although I was positioned so as to be out of sight while they were looking at the screen. I took notes during the session, paying particular attention to the affective atmosphere in the room as I was feeling and registering the affects myself.

Videos
Two simultaneous video recordings were made. One was a direct video and audio feed of the sound and visual feedback from the jam. The second was a recording from a video camera set up in the room, capturing the musicians as they jammed. The participants were aware that they were being filmed during the session. A composite still from both these cameras is shown in Figure 2).

Interviews
Immediately following each session, I filmed a semi-structured group interview to explore the affects and experience of jamming together. Interviews were conducted following Light's 'evocation' interview technique:

> The process involves questioning in a focusing, yet non-directive and unstructured, way. The interviewer chooses when and where to request more detail but leaves the direction, language and content to the interviewee to determine once the context of the interview has been set up and agreed [31].

The primary focus of the interview questions was the holistic experience of the session rather than about any particular aspect of the interface or system, although the musicians were free to comment about the specifics if they chose to. The participants were encouraged to discuss and elaborate on one another's responses as well as directly answering the interview questions.

SEARCHING FOR AFFECTIVE TRACES
An empirical approach to studying affect must be sensitive to its prepersonal, elusive nature. It is a potential—it gives rise to action but is not action itself, therefore it can only be examined indirectly. To gain an understanding of gravity, one may drop a stone and observe it as it falls to the ground. In a similar vein, we observe the way that the bodies in the Viscotheque respond in response to the affects that enfold them. It is these 'affective traces' which are of interest in empirical investigations of affect. I am not trying to 'prove' or 'verify' these ideas, rather to see if they can help us understand this complex sociotechnical system.

This approach involves analysis of the notes taken during the jam session, the recorded audio-visual artefact, the video recordings of the sessions, and the group participant interviews. Glimpses of the affects at work may come from one or more of these sources—for example the facial and bodily postures of the musicians are shown in the session video while their subjective linguistic reflections come out in the interviews. My presence in the room during the sessions provided the opportunity to feel the affects first-hand.

In this section I hope to synthesise these multiple viewpoints to shed light on the jamming assemblage at work in Viscotheque. The data presented is a combination of observations from the video, 'readings' of the musical interaction and excerpts from the interview transcripts. In the interview excerpts, the musicians are labeled M1 through M12, while the interviewer is denoted INT. Each group of three musicians is anonymised in a contiguous block, e.g. group 1 is M1, M2 and M3.

Affective Atmospheres
The initial jam sessions were characterised by exploratory behaviour from all the musicians. Observing the participants on video, looks of concentration are evident on their faces as they play their instruments. This orientation period was characterised by frequent changes in visual attention; switching between looking at the instrument, the visual display, at each other, at the camera, etc. There was an air of flightiness or volatility to the jamming group in these sessions.

The initial sessions were punctuated at regular intervals by moments of shared laughter and light-hearted banter between the musicians (e.g. M2: *"now I know how Björk's backing band feels"*). Often caused by surprise at the sounds produced by their own actions, the musicians would regularly break from their own music making to share a smile or ask one another how a particular sound was made. The co-location of the musicians was a key factor here, as both verbal and bodily communication provided these opportunities for affirmation and interruption.

Musically, short bursts of sound with fast attack (the time between a sound's onset and its maximum volume) were used by the musicians in the initial sessions to identify their own sound in the mix. Rapid-fire, staccato touches on the screen from the musicians also reinforced this energy as they are displayed on the main screen in the jam room. These sonic and visual factors further reinforced this affect of flightiness and volatility.

So what did this affect of orientation, exploration and 'figuring out' empower the musicians to do and feel? M1, after the first session, describes the mixture of interest, satisfaction and frustration felt during the jam.

M1   *I think I would say that I was interested the whole time, but it sort of varied between whether it was frustrating or satisfying—but it was always interesting. Just trying to figure out in the early ones how it worked... in terms of working with my colleagues, but also figuring out what actually happens when you move this [points to the device] and how to access the different sounds.*

The theme of 'figuring out how it worked' came up frequently in the interviews. While the valence of M1's feelings varies, the arousal—the pull to action—is a constant. Despite the frustration, the affective atmosphere in the early sessions is an active one, preparing the musicians for action.

As the sessions continued over the four weeks, some differences began to emerge, both within and between the groups. The volatility of the earlier sessions began to give way to a

Figure 2. Musicians jamming together in Viscotheque. The visual display projected onto the screen in the jamming environment is shown on the left of the figure. The researcher is present in the background.

more stable, almost subdued atmosphere. Particularly notable was the way that the participants looked around the room, at the screen and at each other. In the later sessions, these movements were less frequent and less obvious, although periods of head-bobbing occurred even when the sound had no strong rhythmic pulse.

Group 3 in particular was notable in the way the musicians in the later sessions would no longer look at each other, adopting slumped postures in their chairs, with eyes often closed. Along with this, there was a change in the general character of the sound being made, away from the choppiness of the earlier sessions towards smooth, sustained sounds, slowly waxing and waning together. The musicians, with their subdued physical appearance, were *less* obviously aroused, and to an observer could be mistaken for a group that was bored and uninterested. However, from the interview following group 3's third session (of four):

M9   *. . . and I did find that there were a couple of points where I was just 'wow, this sound I'm making is the shit', and I'm just having fun [mimes playing vigorously] and, well, there were a couple of times where I zoned out completely of what the other guys were doing*

M8   *Yeah*

M9   *'Cause it's just—this sound is so wicked, I'm having so much fun with this—and you think 'well, hang on a second, I'm. . . this isn't just me here, I've gotta do something that they can work around, you know, so I can't be totally unpredictable.*

This shift in atmosphere from one of skittish arousal to subdued calm was most obvious in group 3, and to a lesser extent in the other groups. As I sat in the room in the later sessions, the change in affect even had an effect on me, as I shifted from constant note-taking to simply listening to the sound.

Notice that M9 is aware of the need to still work productively with the other musicians. In 'zoning out', M9 is worried that he may not be providing the other musicians something they can work around, impeding their ability to act. His activity may, through network effects, result in sad passive affects elsewhere in the assemblage. Each Viscotheque jam session is a heterogenous assemblage of musicians, mood, experience, hardware, software and sound. Some of these interacting components work to strengthen and solidify, others to destabilise.

The musicians in group 1 did discuss these moments of inhibition and frustration

M2   *I dunno, I tend to do the thing where I find something that's good, and I stick on it, or I think it's working, and I spend a lot of time trying to find that, I think, because it's, I dunno. . . you feel like you can't drop in on someone else's sound, so, you know, you've gotta find your own thing while you're doing this. . . it's kind of frustrating at times.*

INT *What aspect of it is frustrating?*

M2   *Like, I was on the whirly thing (mimes circular motion)*

M1   *Making a fresh sound*

M2   *and then M3 said 'try something else!', and I'm 'aargh! I don't know how!'*

This discussion refers to an incident which occurs after a sustained period of synchronised and rhythmic musical activity involving all three musicians. M1, perhaps feeling a need for the music to change, says *"M2, you change something now"*. M2 describes feeling the pressure to not 'drop in on someone else's sound'. The current sonic context governs what sounds may follow at any given point—the sound powerfully shapes what the musicians can and cannot do. This feeling, combined with her inexperience with the instrument, renders

her unable to respond to the instruction from M3. A diminished capacity to act musically is combined with a feeling of frustration. This is a mixture of sad passive and active affects.

One recurrent theme in the participant interviews was the musicians' compulsion to fit in with the sound, particularly as they became more familiar with the instrument.

M4 *Yeah, and I think it gets—I think I know similar things in terms of—you get to that stage where you think 'oh, ok, I'm just gonna sit back a bit and try and slot in, rather than 'I'm just taken with whatever sound I'm doing'. . . try and work it. You get to a point where you try and work a bit more as a group.*

The notion of 'slotting in', of acting coherently in the current sonic context, drives the actions of the musicians as they jam. In terms of governing what the assemblage can do, the sound is a powerful affective agent, shaping the complex interactions between the musicians, the instruments, and the environment. The sound creates an affective atmosphere which determines what *fits* and shapes the actions of the musicians. This is unsurprising—musicians have a deep affinity for sound, and come together to jam with specific expectations about the nature and composition of their interactions. The group's sound, the harmonious (or dissonant) blend of all their musical contributions, has perhaps the greatest effect on the affective atmosphere and unfolding behaviour of the jamming group.

Becoming-sound

Gilbert [20] suggests that the improvising assemblage at its most active and most capable of expressing itself is characterised by a blurring of boundaries, with musician, instrument, and sound all moving together as one. The assemblage reaches towards a becoming-music, a harmonious and resonant productive flow of intensities moving together in musical production.

M8 *Yeah, the best times are when we don't think about it, cause that's when it's most surprising*

M7 *And that's when you just put something down, and everyone would be, like—wait! And you could just feel this moment of starting into nothingness and playing with some fingers on this [mimes playing the device] and it would just all fit into place, I find.*

M8 *Yep*

M7 *There were definitely points—there was one, I can't remember if it was the third session or not—but I was just doing something, and it ended, and I was, like [mimes looking at watch] we just started, we literally just started!*

This absorption was also noticeable at the end of each jam session, when the instrument turned itself off and the sound stopped abruptly. This disruption of the atmosphere caused (at different times) laughter, swearing and audible exhalation.

In Viscotheque, this blurring of boundaries between musician, instrument and sound came through in the way the participants talked about their agency in making sound with their

instrument. The instrument affords the musician a presence and influence in the 'world of sound', which as we have seen is a world of powerful affects and intensities. Becoming familiar or competent involves bridging the gap between the finger manipulations required to make the sound required by the current sonic context.

A key question, from an assemblage standpoint, is what are the intensive differences which drive the assemblage forward, opening up new potentials for musical expression? One of the interesting aspects of musical expression is the importance of repetition. The 'doing' of music, even in the simplest case, requires sustained activity from the assemblage of musician and instrument. Change, or *transformation*, on the other hand, involves embellishing, developing or destroying these patterns of activity. To examine 'what a body can do' in Viscotheque, then, is to observe the affective atmospheres which give rise to transformations and transitions in the jamming group.

One recurring feature of the jam sessions was the impact of sonic 'discontinuities', such as the introduction of an interesting timbre, a sudden loud noise, or the sudden removal of a sound. Some of these sounds were obviously unintentional and serendipitous, as evidenced by the expression of surprise from the musician upon making the sound. Others were a deliberate attempt to change things up, while still others were an attempt to blend in and fit with the current sonic context which was interpreted and transformed by another musician. These moments of novelty—of *difference*—were often the catalyst for the group as a whole changing the overall atmosphere of the jam.

M7 *And then it would just be—M8 would start doing this, just a little tap or something like that—and then it would work*

M9 *Yeah*

M7 *and then M9 would just bring up something like that, and I would just kind of be messing with this thing, and it would all just accidentally fall into place.*

M8 *Yeah, I wasn't even trying to make it work, it would just work*

M7 *and it was just experimenting, yeah. And then when it worked, or when we found something where we all linked, it was like—'bang!', it was just, you know. . . a lion pouncing on a zebra, or something.*

ALL *(laughter)*

M9 *Just flick the switch, it was like—'bang'—it worked.*

This is a striking and vivid description of how quickly the feeling in the group can change—a change registered by all the musicians. The sound is the affective agent, providing the unstructured potential which is then appropriated by the musicians in their response to it. The feeling in the room could change in an instant, as a new and different sound created a sonic atmosphere which almost *demanded* a response.

As the musicians became familiar with the instrument they showed a willingness to move beyond the conventions of western art music. Group 1 was particularly interesting in this regard. M1, whose musical training is in classical voice,

began the sessions playing fairly conventional melodies and rhythms, taking advantage of the responsiveness of the instrument to tap out repeating motifs. These motifs were compelling, causing the other musicians to try and sync up with varying degrees of success. As the sessions progressed, though, M1 began to explore the synthetic digital timbres the instrument was capable of producing. After the final session, reflecting on his surprise at the way his sound developed:

M1　*I actually think, given what you have to use—which is four loops and a synthesiser—there's a lot more than I expected initially, there's a lot more potential than what I initially sortof assumed. And so I wouldn't say that I wasn't looking forward to it, but that I, um, yeah. And I think in the second session, when these guys started making some of the cool sounds you get when you slow things right down and that sort of thing the really different sounds to what you get to start with, then it was like 'oh, there's all these things that you can do'*

From an assemblage perspective, this is the *real* opportunity and benefit provided by the Viscotheque jamming group—the ability to throw off constraints about what sounds can be made and bring new potential sounds within reach.

The sound is not the *only* factor which contributes to the affective atmospheres in Viscotheque—the system's visuals, the musicians' bodily and verbal expressions, their mood and many other factors contribute as well. However, the affective power of loud sound and music is enormous. This has implications from a design standpoint, as music, video and dance are increasingly common features of third-wave HCI. They create a high intensity environment which is unlike other human-computer interaction contexts like web surfing or word processing. The powerful affects these elements can contribute to an environment can have a significant impact on the behaviour of the bodies they enfold, and in these contexts affective atmospheres must be considered in the design process.

CONCLUSION

Designing digital musical instruments was not part of the project of 20th century continental philosophy. However, it is important to be aware of this body of work, lest we develop our own (impoverished) versions of it. Still, we must resist the temptation to adopt whatever bits and pieces of these ideas suit our purposes, without a proper understanding of their context and history [3].

I hope that this paper has provided an insight into how the concepts of affect and assemblage can be mobilised to understand the rich, open-ended, creative interactions in HCI that are so difficult to examine sensitively. As third wave HCI wrestles with issues surrounding creativity, play and self-expression, the affective dimension of these environments cannot be ignored. More work needs to be done to integrate these concepts into a mature design practice.

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