IDENTITY AND INTIMACY IN HUMAN-COMPUTER IMPROVISATION

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ABSTRACT

Artificial intelligence invites a new approach to computing in live music performance. Computers and human performers might collaborate on an equal basis. The perceived identities of participants, both human and machine, are enriched but problematic. The conflicting relationships between these identities impact upon both performers' and listeners' experience. The film *Orlacs Hände* is a starting point for a speculative discussion about human-computer improvisation, problems of identity, the self and the Other, social intimacy and the therapeutic process.

INTRODUCTION

Computational creativity offers the prospect of proactive, artificial performers able achieve Boden's key facets of creativity – newness, surprise and value [1] – in synergy with their human partners, but not dependent upon them at the moment of realisation. Such systems must have capabilities that are not attributable to encoded rules or overt direction. A novel performance practice is possible that admits computers as equal participants, not as glorified musical instruments. This is the central aim of the *Live Algorithms for Music* network [2].

If human-computer improvisation is genuinely collaborative, this means computers should not be tethered to controllers, no more than a human performer might expect to be. But it also poses a problem of how machines might enjoy a performer-like identity, given that this socially situated praxis is normally understood to be the exclusive preserve of humans. Arguably, there is already a crisis in established computer-based performance, a confusion of identities and a problematical relationship with audiences. We can speculate how more general models of human interrelationships might further our understanding of a "live algorithmic" performance practice.

My current experiments with real-time improvisation systems began with *"piano_prosthesis"* (2007), the first of a series of systems for solo musician and computer [3]. These semi-improvised duo "compositions" present an environment for interaction based on mutual listening, adaptation and creative action by both parties [4]. Both participants acquire knowledge about the other's behaviour, and this knowledge is represented ("expressed") in the music they produce. For the computer, the sound world in each version is closely allied to the timbre of the relevant instrument. This is intended to be a quasi-social process. The "prosthesis" of the title is used questioningly: do we hear the electronic element as only as extension of the performer's wishes and the solo instrument's capabilities, or as another, intentional agent?

ABOUT FACE: CHANGING IDENTITY

The horror-film motif of "a body-part transplant with a mind of its own" rests on the conceit that the instinctual or conscious psychological qualities of the donor are transferred to the hapless recipient. In *Orlacs Hände* (dir. Robert Weine, 1924), remade as *Mad Love* (dir. Karl Freund, 1935), Orlac the pianist loses his hands in a train accident. In a feat of medical technology, these are surgically replaced with those of an executed murderer, a former circus knife-thrower. The hands cannot play the piano for him as hoped but want to use knives to murderous effect, eventually asserting themselves over Orlac. They manifestly are and are not the "hands of Orlac".

While encompassing the recognisable horror themes of uncontrollable causation, fear of powerlessness and fear of the unconscious self [5], the film explores a fundamental issue of identity. Orlac's sense of self waivers then dissolves. His functioning identity – not least as musician – is undermined by the initial traumatic loss, but is then apparently reconstituted, only to be devastated by catastrophic alienation and "re-loss". Parallels might be found with real-life responses to body part transplants [6] [7]. But in this fictional tale, Orlac is forced to come "face-to-face" with the Other, in Levinas's ethical sense [8], because the hands are not just strangers, but invoke involuntary and shocking thoughts and behaviours of a stranger. They retain the psyche of their original owner and resist assimilation.

Should this story be read as an inspirational or cautionary tale about present-day musicians' encounters with technology? In live music, we see players with their familiar means of expression (voice, instrument) amputated so to speak, but replaced by technological alternatives that function as would-be prosthetics; haptic, gestural and mechanical controllers. Their capabilities might be outwardly empowering, offering radically different forms of control and expression for the musician. Other technologies might be less physically palpable, but share this prosthetic-like character; as can be seen with the performer who stares fixedly at the laptop screen as if directly connected to it, or the motionless performer who acts as a source of live EEG data.

Such technologies are nearly always mediated by computer processing; new data obtained from the performer are assimilated and transformed by computational processes beyond his or her immediate cognisance. There is no meaningful separation between computer (computation) and control device (input). Machover proposed a range of approaches to instrument-design that progress "from the highly deterministic…to the computationally flexible…to the truly intelligent", intelligence described in algorithmic terms as "the analysis by rule of performed music and the machine-choice of an appropriate response" [9]. Across this spectrum of performance strategies – from direct control, through computational interpretation to independent generative process – Orlac's problematic encounter with the stranger's hands is evoked. Does the performer find a prosthetic-like extension of his/her self, or experience a disquieting encounter with the Other? How can this be recognised, valued, or avoided?

INTERFACE: CONTROL INTIMACY

There is a vast preponderance of gesture-control devices that aspire to a kind of intimacy, a physical relation. This intimacy seeks unification of performer and device, just as Orlac's identity at first appears integrated with his newly grafted appendages. These musical devices seek to integrate human agency with a sonic outcome, capturing data from physical action to produce musical, and sometimes tactile or visual, feedback. Michel Waisvisz's system *The Hands*, a complex array of sensors assembled into glove-like devices, provides an influential example from the mid 1980s. In interview, Waisvisz emphasises the synergy between physical action and creative thought ("the hand is the brain") and advocates sensors that detect the "micro-information that gives music its life" [10]. Although he questions the distinction between human creativity and mere machine rationality, there is no doubt where the responsibility rests: "I never use computers to make musical decisions, especially in time-related matters".

Moore proposes a well-delineated but intimate relationship between performer and expressive device. Closeness, or "control intimacy" is equated with immediacy of response and technical sensitivity: "Control intimacy ... is based on the performer's subjective impression of the feedback control between the moment a sound is heard, a change is made by the performer and the time when the effect of that control changed is heard" [11]. He sees intimacy as a measure of the synergy occurring between a performer's expectations and the range of possible creative outcomes. Fels also proposes intimacy as a measure of efficacy and artistic achievement [12]. These properties suggest a unified, cyborg-like state:

"When a person has a high degree of intimacy with a device, she can communicate ideas and emotions effectively through the device as if it were an extension of herself...A high degree of intimacy is required for embodiment to occur; thus, if we have a mechanism to measure intimacy, we can predict the success of an interface".

The *BioMuse* system, as used by Tanaka [13], has no added-on mechanical element because muscle movements are detected directly as electromyogram signals. It is used as an "abstraction of instrumental gesture in the absence of a physical object to articulate music through corporeal gesture". Nevertheless, an imaginary or abstracted instrument-like object persists, perhaps, around which vacant arm and hand movements can be framed. Gestural information is both data rich and visually evocative. Instrumental characteristics, such apparent effort, expressive movement and fluency, remain relevant, even though "the direct effect of acoustic coupling" (such as tactile feedback) is necessarily replaced by "a kind of intellectual parsing". The performer seeks to identify directly with the music as if it were an embodiment of his or her actions.

The general framework proposed by Wessel and Wright describes performer, controller and synthesizer as part of unified adaptive system [14]. Their model emphasises the "coherence of the cognitive model for control" achieved by any controller that is unfettered by latency, is readily usable, and offers potential for new device-specific skills and creative strategies to be identified and developed.

In these examples a productive player/device relationship is envisaged; intended by design and perfected in rehearsal, possibly over many years. They are holistic monitoring and feedback systems that purport to integrate performer and machine. The principles valued (that create a feeling of intimacy) are essentially innate design features: responsiveness, accuracy, synchronicity,

appropriateness of feedback, emulation (or knowing rejection) of traditional instrument behaviours; all these facilitate, and influence, the realisation of creative intentions.

But in practice a system with these values remains problematic, however experienced the user. In historical terms, there is the sheer rapidity of software and hardware developments, which discourages extended exposure to one particular system, and so prevents " a dynamic relationship that goes beyond the athletics of technique, and highlights the musical qualities of a personal interaction created between the musician and his instrument" [15]. The problem runs deeper than just a lack of familiarity and longevity. As Wessel and Wright point out, who says, "'I play the computer'?" [16]. Waisvisz acknowledges that his devices are "really difficult for other people to play... the way one approaches the synthesizers through The Hands is heavily influenced by my timbral conceptions" [17]. A prospective user of any such device encounters the Other. Perhaps this is a proxy for designer's intentions (whether or not the designer and user are the same individual) but the Other also comprises the wider social and cultural signifiers constituted in the device and software. The performer might try to locate his or her identity through experimentation, but the problem of self-identification remains in this "face-to-face" encounter:

"If the I in its separation is the absolute starting point, then the Other is also absolute in the sense of transcending, exceeding or overflowing this starting point in such a way as to call the I into question. The Other puts me in question in such a way that I find myself responsible for the Other, for whom I can never do enough" [18].

The performer might have differing expectations about timbre or any other musical element, but this identity is brought into question by the very attempt at human-computer integration. No matter how successful or problematic this control intimacy might be, the experience is hard to communicate to listeners or other participants. We can experience the Other only in terms of our own subjectivity, "starting from an I...the 'face-to-face' is inaccessible from the outside" [19]. It cannot be witnessed externally or reasoned. The real value of this intimacy is therefore open to question.

Performance can be understood to be fundamentally relational [20], constituted in terms of its reception, but here the essential issue at hand remains entirely opaque to observers. As Godlovitch argues, the computer in music "changes basic agency relationships. There is a non-primary causal link between agent and result because immediate control over the product may be absent or vestigial" [21]. We can imagine that a distinctive data stream emerges from a gestural device, and the resultant sound might be apprehended as a surrogate for that source. But with appropriate transformation and parameter mappings, data might be emulated by another device that acts as a surrogate of this surrogate. The performer and sonic outcome are alienated. This is the consequence of the virtual instrument environment that allows functionality to be redefined at will.

If musicians are valued for a capacity to demonstrate skill under constraints, in these circumstances value judgements seem impossible. Arguably, a concert audience attributes value empathetically, in accordance with Husserl's transcendental concept of "intersubjectivity" [22]. Performers are recognised as subjects who are themselves experiencing the world, so intentions and abilities can be attributed to them, and a critical experience of musicianship and technical accomplishment experienced through them. This process is severely eroded in human-computer performance. Listeners might feel "well that's easy, I could do that" or, more crucially, "I wonder what he/she is actually doing?" The performer has no true presence; source and outcome are confused; the metaphorical hands of Orlac belong to both (and neither) musician or knife-thrower. In musical terms, we are left to appraise the sound itself as an acousmatic experience, as an object in the world, whatever its human origin in reality. In this circumstance the performer and computer, aside from providing visual interest, are equally irrelevant to our understanding.

FACE-TO-FACE INTIMACY

Instead, we might consider performance as a social medium for participants and their audience alike, and speculate how a computer might engage with this scenario appropriately. The level of integration between human and computer performers should be analogous to what might be expected between humans, not between a performer and a prosthetic. In any group performance we may witness evidence of social intimacy, evidence of dialogue and mutual engagement. This is as true of notated composition as improvised music, although it may differ in impact and extent, as Benson has explored in depth [23]. We do not just empathise with one individual's interrelation with his/her voice or instrument, we also evaluate interpersonal relations that occur between players.

Intimacy is an autotelic state to which we are all driven, culturally or instinctively, in some way. In social psychology it is characterised as a reciprocal, interactional process that develops between individuals; evident in music-making as much as any other imaginable praxis. Intimacy develops when revelatory self-disclosure from one subject in turn finds validation through another's response [24]. This is subsequently interpreted by the subject as evidence of an emergent and binding understanding with the other. Real intimacies are an expression of psychological proximity, synonymous with cohesiveness and trust [25]; trust that a partner can offer what is wanted, (or if not,

that they can offer what will provide benefit rather than harm). The development of trust occurs in situations that require interdependence, as when experience is shared, and activity and aims co-ordinated ("agentic cohesiveness"), or when there is an apparent need for a reciprocal exchange of information, for mutual control and a state of "quid pro quo" in order to achieve something desirable [26]. All these are facets of music performance and contrast with game-theory models of social interaction that emphasise self-interest.

If intimacy is learned over time, through a series of transactions and negotiations, it cannot be designed for or known in advance. Freely improvised music rests upon this premise as well. In the absence of designed procedures or intended outcomes, the socio-musical process is the central focus of interest that both problematises and constitutes the improvisation. (These transactions may be situated by a shared history of cultural understanding and social placements [27]). To situate a computer in this generic setting could be a grossly simplistic and anthropomorphising endeavour. This is true even if a sonic outcome is contrived to satisfy a working definition of computational creativity: "behaviour exhibited by natural and artificial systems, which would be deemed creative if exhibited by humans" [28].

But there is evidence in other circumstances of intimacy developing without direct social contact. On-line or *"computer-mediated"* intimacy has been studied by Parks and Floyd, [29] showing how trust develops free of non-verbal cues or immediate trust situations. Human-computer musical intimacy might occur in a similarly shared but restricted environment, i.e. the performance context and the medium of the music itself, even though the respective understandings of that environment would differ: humans listen and decode information with a cultural and social perspective, whereas machines deploy audio feature extraction and data analysis. The performer is still "face-to-face" with the computer, a stranger, but this dilemma can now be recognised. An audience might be sensitive to how intimacy occurs (or fails) between separable participants, because sonic events can be interpreted as evidence of (or a rejection of) psychological proximity and agentic cohesiveness.

FACE OFF: THERAPY

Therapy is a defined social situation in which intimacies and identities are questioned and developed in a methodical way. Perhaps a human-computer performance can be thought of as a structured therapeutic process, rather than an undefined, open-ended social encounter. This process might be open to interpretation by a listener.

In Lacan's therapeutic model, represented like a game of Bridge, there are four roles involved as a *"quadripartition"*, but only two participants, analyst and patient. Two subjective egos are present, but these can only relate along an *"imaginary axis"*. It is imaginary in Lacan's theory because the ego develops an alienating identification with the image of the other. This axis is seen to be therapeutically flawed and misleading: "Analysts engage here in a narcissistic project of self-duplication, attempting to clone themselves by making new analysts in their own image" [30]. In the context of the human-to-computer relationship, we assume there is really only one ego present. So this flawed therapy can be read as a metaphor for anthropomorphism, human participant as analyst; seeking human-like intentions, analytic methods and expressivity in the computer's musical output, or reading the output in terms of the ego of the originator/designer.

But there are also two other parties in Lacan's quadripartion, one for each of the two individuals present, which connect across a *"symbolic axis"*. This is the unconscious subject of the patient (unknown to the patient, and with which the analyst aims to connect) and the Other, or "dummy" as in the card game. The analyst is seen to interpret from the standpoint of the Other, an ideal position that is revealed, structured and denies subjective ego; as Fink explains, the analyst's "interpretation is heard [by the patient] as if it were coming not from her as a living, breathing, flesh-and-blood human being with her own specific personality or ego... but rather from her as the person she is imputed to be by the analysand in his transferential relation to her" [31]. This is symbolic transference, which to Lacan denotes the supposition of knowledge. In human-computer performance, this supposition might relate to the musical grammar or expressive rhetoric, evident or implicit, in the sound heard. It could also suppose knowledge that the human performer is always separated from: the mathematical functioning of audio analysis, feature extraction and computational processing. If we do consider the human participant as the "patient", the unconscious subject might be read as his/her creative volition. The computer is the Other/dummy, which functions as a structuring method that can both instigate creative acts by providing an initial postulate, or re-contextualise creative acts that originate from the unconscious. Either way, the misleading issue of machine intention is circumvented.

CONCLUSION

Creative applications of artificial intelligence open new avenues for performance systems. These possibilities differ radically from the established use of computers as a performance tool or device to realise previously encoded music. But they raise difficulties in our understanding of human-computer

improvisation as a performance practice. A methodical evaluation of real-life experiences in working with quasi-autonomous machines is needed. In the near future, creative systems might collaborate effectively in many musical contexts; not just follow pre-programmed routines or depend on direct stimuli, but engage with performers at a commensurate level, offering new horizons in creative expression. There is the prospect of a truly "transformational" creativity [32].

Author Bio

Michael Young is a composer and senior lecturer with interests in artificial intelligence and music, improvisation and generative media. He is co-founder of the Live Algorithms for Music network. His recent work explores real-time interaction and learning systems for performance. Previous works (including *Argrophylax,* 2006, *ebbs-*, 2008) explore musical scores with interpretation-sensitive computer response. He has also collaborated in a number of joint science/visual arts projects, the most recent, *Exposure*, is a real-time generative installation and exhibition exploring sonification, human habitation and environmental change in Greenland. www.ground-breaking.net

Acknowledgments

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