

TRANSPARENCY
AND
OPACITY

INTERFACE
TECHNOLOGY
OF
MEDIATION
IN
NEW
MEDIA
ART

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Mediality of artistic computer-human interfaces

In recent decades, computer-human interfaces (CHIs) have increasingly served as a technological condition for New Media Art and at the same time as an artistic subject. The design of experimental CHIs, with help of which the observer/performer can explore a computer generated artistic environment, belongs to an essential part of New Media Art. An interface in the context of human-computer interaction (HCI) is defined as a part of the machine through which it 'communicates' with its environment. An interface mediates acts of sensory and motor processes of interacting entities. Input interfaces such as keyboards or diverse sensors make external symbolic activities accessible to a machine. The processes of machine observation in the form of 'seeing', 'listening' etc. focus on certain modalities of input data streams. A digital computer, which is capable of transforming one modality into any other, executes an action via output interfaces such as display monitors, loudspeakers, or other actuators in accordance with machine observation and interpretation of activities mediated by the input interfaces. Interface design does not only include hardware design, but also software-technological strategies of mapping from input data into output data. Mapping strategies are concerned with the question of how sensory and motor processes are related to each other by an arbitrary organisation of intermedial translation provided by digital technologies. Hence generally CHIs serve as media, not only in the sense of technical apparatuses but also in terms of performing intermedial translations which act as a condition for the emergence of meaning and/or experience. In New Media Art, CHIs can be seen in particular as media for an artistic experience. In other words, to design an artistic CHI is not only an information technological task, but also demands artistic and theoretical strategies of mediation, interfacing human and machine perception/action, which forms an artistic experience.

Starting from our thesis that an interface technology is a technology of mediation, we will investigate the mediality of artistic CHIs. In using the term "mediality" we deal with the question of how CHIs mediate 'meaning' and, in this way, shape an artistic experience while transferring signals produced by human beings and computer systems between real-worlds and computer-generated worlds. How then can a CHI act as a medium which is characterised in media theory as a blind spot:¹ A medium fades into the background despite its material presence (e.g. the form of technical apparatus) so that the mediated comes to the foreground, not the medium itself. Taking this into account, it is not surprising that "transparency" of a CHI has recently been a hot topic of interface design, even from the engineering point of view.

1 See for instance Krämer 1998, pp. 73-75.

But some of the more recent arguments discussed in this context need to be reconsidered and called into question. The issue of “transparency”, in the design of many of the new interfaces used for interactive music performances now take into account ideas about ‘intent’ which is virtually postulated as ‘pre-existing’ and might be *ex-pressed* (in terms of externalisation) by motor action in dealing with a (transparent) interface.² In our view, dealing with ‘pre-existent intent’ is far from unproblematic. The core idea underlying the design of a transparent (musical) interface, which is however not related to intentionality, can be recognised in this early example posed by the composer and researcher of computer music, F. Richard Moore in 1988, on how to solve the distance between the input and output of a device mapping. He discusses this question, introducing the term “control intimacy”:

Control intimacy determines the match between the variety of musically desirable sounds produced and the psychophysiological capabilities of a practiced performer. It is based on the performer’s subjective impression on the feedback control lag between the moment a sound is heard, a change is made by the performer, and the time when the effect of that control change is heard.³

The recent discussions on “transparency”, however, not only “provides an indication for the psychophysiological distance, [...], between the input and output of a device mapping”, but also implies “the distance between the intent (or perceived intent, in the case of the audience) of the artist to produce some output, and fulfillment of that intent through some control action”:⁴ the discussions focus on the design of a transparent interface, which offers a user practically no distance between intent and action. In this mode of a so-called transparent mapping, transparency is often considered an important property of an ‘expressive interface’, which is intended to allow a user/performer to mediate her or his (inner) artistic expressiveness. But this concept of transparency seems to deviate from the “control intimacy” developed by Moore. The latter is based on the notion that “the performer must receive both aural and tactile feedback from a musical instrument [including computer-aided instruments utilising CHIs] in a consistent way – otherwise the instrumentalist has no hope of learning how to perform on it musically.”⁵ Hence, control intimacy acts as a criterion for (musical) interfaces which are capable of responding “in consistent ways that are well matched to the psychophysiological capabilities of highly practiced performers.”⁶ The idea of control inti-

2 Fels/Mulder 2002; Gadd/Fels 2002; Griffith et al. 2002; Marshall/Rath/Moynihan 2002; Moody/Fells/Bailey 2007

3 Moore 1988, p. 21

4 Gadd/Fels 2002

5 Moore 1988, p. 21 (supplemented by Jin Hyun Kim)

6 Moore 1988, p. 21

macy does not take pre-existing intentions of the player into consideration, which should be conveyed by an interface designed as a transparent means. However, and crucially, the recent discourse on a transparent interface in which transparency is presumed to be one of the essential properties of an *ex-pressive* interface is hardly any different to a traditional concept of media which subsumes instruments, tools and devices as a transparent means of transmission of signals or representation of pre-existent entities. Should the transparency actually be seen as a property possessed per se by an interface which acts as a medium of an artistic experience? To address this issue, media theoretical discourses on transparency of a CHI will be surveyed.

Transparency of a computer-human interface: From a New Media Theory point of view

In different discourses on interface design and New Media Art, “transparency” has been discussed as a myth⁷ allowing the user to have a preferably natural experience as if it would be quasi non-mediated. In particular, the myth of transparency has been widespread with regard to virtual reality which is achieved through a three-dimensional representation providing the user a natural (three-dimensional) perspective of a computer-generated space. Immediacy is in this context a buzzword associated with transparency. Theorists on New Media, Jay David Bolter and Richard Grusin, place an emphasis on “the logic of transparent immediacy” underlying virtual reality.⁸ Immediacy is here related to the perceptual illusion of an immersive “experience without mediation”⁹ which is called forth through a “disappearing act”¹⁰ of media. This myth of a non-mediated experience in computer-mediated communication also underlies research on virtual presence,¹¹ the experience of being in a virtual environment, and on telepresence, the sense of being in a remote environment or virtual reality. Most research on presence is based on a realistic view of reality. Therefore the representation of a physical environment as closely as possible serves as a condition for the reality created in a technologically mediated environment. This realistic representation, (referred to by Jonathan Steuer with his term “vividness” meaning a high degree of representation or “the representational richness of a mediated environment as defined by its formal features, i.e. the way in which an environment presents

7 On this see Bolter/Gromala 2003, pp. 48-56.

8 Bolter/Grusin 1999, pp. 21-31

9 Bolter/Grusin 1999, p. 23

10 Bolter/Grusin 1999, p. 21

11 This term is adapted from Sheridan 1992 to make an explicit reference of “presence” discussed for a computer-mediated experience.

information to the senses”),¹² is considered necessary for transparency of a technical apparatus used for virtual reality. Transparency of a medium is constitutive for virtual presence or telepresence based on the immediacy the user attains to, which the researchers on presence, Matthew Lombard and Theresa Ditton, characterise as “the extent to which a person fails to perceive or acknowledge the existence of a medium during a technologically mediated experience.”¹³

Jay David Bolter, however, directs our attention towards different strategies of interface design which include not only transparency, but also its opposites such as hypermediacy. Hypermediacy offers multiple signs of representation or reflectivity reacting to the user her- or himself situated in her or his surroundings and in the context initiated by compelling experience mediated by means of an interface.¹⁴ Transparency is considered a strategy which can be chosen along the continuum consisting of manifold scales of hypermediacy. Hence, transparency cannot be regarded as a property possessed per se by an interface. A property of an interface arises out of medial strategies of interface design which vary according to each artistic project and can be changed in the course of interaction.

As opposed to interface design from an engineering science point of view (which aims in general at the illusion of transparent immediacy an interface offers), media art tends to direct the user's/observer's focus towards the media designed especially for any artistic purpose along with the palette of multiple meanings of the media emerging during the user's/observer's exploration. For media art, a medium can be both a means of, and at the same time a subject for artistic projects. In New Media Art, in which interactivity comes to the fore, a CHI designed and used for an artistic purpose serves as a medium which, however, does not remain static. It is assigned a temporal dimension due to the character of works of art based on a temporally expanded interaction space. Therefore a status change of the same interface as a medium relies on interaction actively explored by the user/observer.

To make clear the idea that transparency of the media acting as a blind spot to bring the mediated to the fore is not a property of a medium per se, in the following, some considerations on the performative logic of the medial are to be made, which are connected with the attempt to determine more precisely the procedures of media in the light of a theory of transcriptivity.¹⁵

12 Steuer 1992

13 Lombard/Ditton 1997

14 On the logic of hypermediacy see Bolter/Grusin 1999, pp. 31-44; on the strategy of interface design leading to reflexion see Bolter/Gromala 2003, pp. 62-65.

15 This theory has been developed by the first author within the scope of the German Collaborative Research Centre Media and Cultural Communication (=SFB/FK 427).

The performative logic of the medial: Disturbance and transparency

The term *transcriptive* refers to all infra- and intramedial procedures of cultural semantics which generate meaning through the mutual co-reference of various media or symbolic means of the same system.¹⁶ In the following, the term “transcriptivity” is to be specified more precisely against the background of a media and communication theoretical model in the centre of which are the terms *disturbance*¹⁷ and *transparency*¹⁸. (At the same time, the term can certainly be understood against the background of some referential terms of New Media Theory, such as that of “*cultural reconceptualisation*”, as used by Manovich¹⁹, or that of “*remediation*”, as introduced by Bolter and Grusin.²⁰)

The model which I propose here assumes that communicative processes can be in at least two states of aggregation: (1) in that of non-disturbance, in which the medial (symbolic) means respectively used are not an issue as such, so that a direct “looking through”²¹ onto the semantics of the communicated is possible. A communicative state of this kind can be described as a state of medial *transparency*. A second state is to be distinguished from

16 Jäger 2002, in print (a) and (b).

17 Interference is not understood as a ‘miscommunication’, as in the communication theoretical approach of Shannon, but as the constitutive impetus of communication; on Shannon see Shannon 1949; on the history of the impact of the Shannon/Weaver “flow diagram of communication” see also Schüttelz 2002; for a more detailed discussion of a media theoretical concept of interference, see Jäger 2004.

18 The concept of transparency originates from the semiological discussion of the close of the 18th and the beginning of the 19th century (here see also Jäger 2004) and here is placed in a media and communication theoretical context. In the semiological tradition from which it comes, transparency does not mean that the medium becomes glass-like for the benefit of premedially existing contents, but that it virtually disappears with and in its function of constituting content. The concept of transparency therefore does not refer to the glassiness of the sign expression, but to the fact that the ‘transparent’ medium is dissolved in its content-constituting function, and so shifts receptive attention from the mediation to that which is being mediated. In an approximately analogous manner to our own use of the term, Bolter and Grusin speak of “transparent immediacy” (Bolter/Grusin 2001, p. 21).

19 Manovich 2001, p. 47: “In new media lingo, to “transcode” something is to translate it into another format. The computerisation of culture gradually accomplishes similar transcoding in relation to all cultural categories and concepts. That is, cultural categories and concepts are substituted, on the level of meaning and/or language, by new ones that derive from computer’s ontology, epistemology, and pragmatics. New media thus acts as a forerunner of this more general process of cultural reconceptualization.”

20 Bolter/Grusin 2001, p. 45: “(...) we call the representation of one medium in another remediation, and will argue that remediation is a defining characteristic of the new digital media.” In the same vein, for instance p. 55: “It would seem, then, that all mediation is remediation. (...) No medium, it seems, can now function independently and establish its own separate and purified space of cultural meaning.”

21 On the distinction between “looking through” and “looking at” see Bolter/Grusin 2001, p. 41.

this, (2) the state of interruption of the transparency mode by an interactant for the purpose of fixing the attention on sign sequences communicated, and their mono- or interactive processing on a semantic stage for negotiating. A communicative state of this kind can bring about a “looking at”²² of particular, topicalised sections of medial performance in their material presence, because these are detached from the communicative process and become the object of transcriptive attention. I would like to describe this communicative state as the state of *disturbance*. Disturbances mark those moments of medial communication in which the medium itself becomes the object of communicative attention.

Disturbance and transparency are to be understood as two polar functional states of medial performance which are constitutively inscribed in the process of transcription. Transcription could then be described as the transition from disturbance to transparency, from the decontextualisation to the recontextualisation of the signs/media on which the focus is placed. While disturbance as the respective point of departure actuates the transcriptive process of remediation and brings the medium as a (disturbed) operator of sense into the focus of attention, transparency can be seen as the state (in the process of medial performance) in which the respective medium *disappears* or becomes transparent with respect to the content which it mediatises (distributes, archives, constitutes). Disturbance and transparency therefore mark two modes of *visibility* which are in general mutually exclusive: the visibility of the *medium* and that of the *mediatised*. The invisibility (transparency) of the sign/medium virtually allows the undisturbed ‘realism’ of the mediatised, while the becoming visible of the medium, i.e. the irritation of the habitualised contexts of use, indicates the looming crisis of the ontological illusion which is then withdrawn from the mediatised objects. Realism is, as Goodman notes, relative to the media: “(...) it is determined by the system of representation standard for a given culture or person at a particular time,”²³ or by the medial dispositive in which the communication respectively takes place. The realism with which symbolic means carry out representation²⁴ is higher, the more familiar (the more transparent) the means selected are. Medial displays seem realistic to us when “practice has rendered the symbols so transparent that we are not aware of any effort, of any alternatives, or of making any interpretation at all.”²⁵ In communicative states of this kind, the

22 Bolter/Grusin 2001, p. 41

23 Goodman 1976, p. 37

24 For Goodman representation does not mean “mirroring”. (Pictorial) representation and (verbal) description are kinds of denotation: “Representation is thus disengaged from perverted ideas of it as an idiosyncractic physical process like mirroring, and is recognized as a symbolic relationship that is relative and variable” (Goodman 1976, p. 43).

25 Goodman 1976, p. 36

mediatisation of the real is "... obscured by our tendency to omit specifying a frame of reference when it is our own,"²⁶ or – formulated differently – when it is one of our own present (undisturbed) language games which is in use as a symbol system. Only "changes in representational practices",²⁷ in other words effects of disturbances, only the erosion of habitual contextual frames, allow the medial relativity of the real and hence the symbolic representation system to become visible as a "way of worldmaking"²⁸ again.²⁹ Crises of this kind are natural as disturbances of semantic equilibrium, not just epochal events which every once in a while distress cultural viewpoints and world views. They are first and foremost, common transitional stages which medial processes pass through according to their own logic of transcriptivity until communication in turn enters into phases of transparency.

Disturbance is then taken to mean that state in the process of a communication which has the effect that a medium (operatively) loses its transparency and is perceived in its materiality. Transparency in turn means that state in which communication is not 'disturbed', and so the medium is not in the focus of attention as a medium. Transparency can be understood for instance, in the sense in which Luhmann assumes that in the interdependent relationship of medium and form the form is visible and the medium remains invisible.³⁰ If one were to transfer the disturbance-transparency model onto Luhmann's medium-form distinction, disturbance would be the state of a communication in which it is not the form which is observed *through* the (invisible) medium, but the "contingency of formations"³¹ or "the free capacity of the medial substrate to make ever-new couplings"³² that would be observed *in* the medium. One could also – following on from Edgar Rubin and Marshal McLuhan – say that the medial process in the state of disturbance brings the medium into the focus of attention as a *figure*, while it recedes into the *background* in the state of transparency: "(...). All cultural situations are composed of an area of attention (figure) and a very much larger area of inattention (ground). The two are in a continual state of abrasive interplay,

26 Goodman 1976, p. 37

27 Goodman 1976, p. 39

28 Goodman 1978

29 For a critical discussion of the media theoretical implications of Goodman's symbol theory, see Mitchell 1994, pp. 345-362.

30 On this see for example also Luhmann 1997a, pp. 190-202. For instance, the following is noted with respect to the perceptive media: "We do not see the light, but things (...). We do not hear the air, but noises." (Luhmann 1997a, p. 201; translated quoting); on this see also Krämer 1998. Following on from Luhmann, she formulates "that wherever we encounter media, we do not perceive media themselves, but only forms" (Krämer 1998, p. 76; translated quoting); also Krämer 2001, p. 157: "Moreover, the form is visible – the medium, on the other hand, remains invisible." (translated quoting)

31 Luhmann 1997b, p. 168 (translated quoting)

32 Luhmann 1997a, p. 200 (translated quoting)

with an outline or boundary or interval between them that serves to define both simultaneously.³³ If Alfred Schütz were to be brought in, we could also describe the state of disturbance as the *becoming relevant* of the medium, and the state of transparency as its return to the mode of *familiarity*.³⁴ What could be even more illuminative for the unravelling of the processual complementarity of disturbance and transparency than the terminological analogies provided by Luhmann, Rubin, McLuhan and Schütz is a pair of terms which has been talked about in the discourse of analytical philosophy in a context having to do rather with the logic of research, namely the terms *implicit* and *explicit* knowledge.³⁵ In a broad sense transcriptive processes, insofar as they are understood as processes which move out of disturbance and into transparency, can then be understood as processes of “expressing”: “(...) as a matter not of transforming what is inner into what is outer but of making explicit what is implicit.”³⁶ If – as Brandom formulates – “what is expressed must be understood in terms of the possibility of expressing it,”³⁷ it is one of the constitutive conditions of implicit semantics that it – in the case of communicative disturbances – must be able to be made understandable in explicative (transcriptive) processes. Hence while in the state of medial transparency semantics is processed in the form of *silent knowledge*, *explicative* (transcriptive) actions are required when the implicit in one form or another becomes problematic or the subject of attention, and with this the medium as such comes to the fore. Transcriptions are therefore to this extent explications which under particular communicative discursive conditions are once again transferred into the status of implicit, i.e. silent knowledge. If this kind of precondition is assumed, then the medium is the mediator³⁸ of something which – depending on the aggregate state of the communication – changes between figure and ground or between relevance and familiarity. And it is precisely this continuous changing which allows the medium to be more than an expression and a mediator of something internal: namely the *explicator* of something implicit which, by being explicated, changes its epistemic status to such an extent that one could say, in a sense that the implicit is not only expressed, but also constituted by its explication. The medium is then the (performative) place, the place of processing at which implicit semantics becomes explicit, only to – in the case of ‘undisturbed’ communication – enter

33 McLuhan/Powers 1989, p. 5; on this see also Fohrmann 2008.

34 Schütz 1971; on this see Jäger 2001.

35 On this see for example Hare 1974; Polanyi, 1966; Brandom 2000.

36 Brandom 2000, p. 8

37 Brandom 2000, p. 9

38 “Mediator” in the sense of Engell und Vogel, who understand the medium as “the middle and the median, the mediation and the mediator” (Engell/Vogel 1999, p. 9; translated quoting).

into the state of the implicit once again, by which process the medium disappears behind the semantics which it helps to organise (without being absent). Explications are to this extent processes of (disturbance-induced) focusing and concentrating on media (and their implicit semantics) in the interest of creating (explicative) semantic effects which, when they occur, push the medium out of the focus of attention once again. They are processes of recursive self-processing, i.e. the application of communication to the effects of communication.³⁹ I would like to call this feedback movement which operatively determines the processes of media systems *recursive transcriptivity*.⁴⁰ It is this process of recursive transcriptivity through which the processes of disturbance and transparency are connected with each other, through which – under different medial and communicative conditions – the processes of cultural semantics are kept going, i.e. are updated through alternating stages of stabilisation and irritation in fragile states of equilibrium which can be disturbed at any time. In contrast to many media theoretical positions, the model proposed here does not assume that *transparency* can be seen as a constitutive property of the medial. That media tend to “become virtually imperceptible, anaesthetic” with respect to what they mediatise,⁴¹ that they remain invisible under certain conditions⁴², because – as Fritz Heiders formulated in 1926 – a true medium is only one through which “one can see through ... without obstruction”,⁴³ does not refer to a quasi-ontic feature of the medial, but to a particular stage which medial processes pass through in the process of recursive transcription. So the thesis which is advanced here is that the transparency of the medium is not a ‘property’ of the medium, but an aggregate state in which the mediatised semantics as silent knowledge is not communicatively ‘disturbed’. Just as conversely, disturbance is not a parasitical defect of communication, but that aggregate, communicative state in which the sign/medium becomes visible as such, and hence semanticisable. In other words, disturbance is that state which is always connected with the need for remediation, i.e. transcription.

39 See here Luhmann's concept on the recursive “individual behaviour” of systems: “It [the term “individual behaviour”] refers to a stability reached in the recursive procedure of the application of procedures to the results of procedures.” (Luhmann 1997a, p. 213; translated quoting)

40 Jäger 2004

41 Engell/Vogel 1999, p. 10; see in particular footnote 15.

42 Krämer 2001, p. 157

43 Heider 1959, p. 3

Transparency and opacity of an interface in New Media Art

Applied to our research area of New Media Art, we can behold a performative logic of the media underlying an artistic interaction, which is based on the oscillation between disturbance and transparency of a computer-human interface. The act of recursive transcription which is constitutive for transparency of the medium emerging as an effect during a medial performance can be illustrated in cases of interaction between bodily movement and sound. In artistic interaction mediated by an interface translating bodily movement into sound, the interface operationally loses its transparency in favour of the processing of bodily-based expressions of generated sounds. In this state, the interface becomes – with its physical materiality – opaque. Every new kind of interface gives rise to partially or completely unfamiliar relationships between bodily movements and sounds. This allows a user to explore explicitly how motor and auditory feedback may be coupled. Dealing with a new interface hence includes a self-perceptive moment in the progress of artistic production. Each act within the interactive situation seems to begin with a kind of disturbance that redirects one's attention to the opacity of the interface. Opacity first comes to the foreground so that a user may generate expressiveness, appropriating the procedures of intermedial transcription, as an effect which, once achieved, shifts the interface – without making it become really absent – out of the focus of attention. In this state of transparency, the self-significance of an interface becomes absent. Thus, the mediating aspect of interface technology does not seem to consist in the function of an interface as a means of expressing or transferring a user's pre-existent intentions or states. Rather, the medial operation of oscillation between transparency and opacity renders an interface capable of problematising an implicit artistic intention or meaning and constituting it as an effect.

Let us have a look at some concrete strategies of the design of interfaces mediating bodily movements and sounds. One of them is oriented towards a model of physical-acoustic musical instruments. This aims to simulate or extend traditional physical-acoustic musical instruments by digital technologies. In these strategies, a bodily movement acts as a kind of trigger and controller for digital sound synthesis. The principle of digital (algorithmic) sound generation is characterised by a decoupling of the sound generation mechanism (synthesis algorithm) from its control device – this is substantially different from the mechanism of sound generation underlying a physical-acoustic, musical instrument in which sound generator – e.g. violin strings – and controller – e.g. violin bow – are closely coupled. In digital musical instruments, a mapping from the input parameter of bodily movements as a control parameter into an output parameter used for algorithmic sound synthesis,

which is called gesture mapping (Fig. 1), therefore plays an important role for a (re-)coupling of sound control and generation mechanisms.

Such an artificially enacted relation between bodily movement and sound is constituted by transcription which may serve as a basis for mapping algorithms. Hereby, transcription relates to the intermediality between

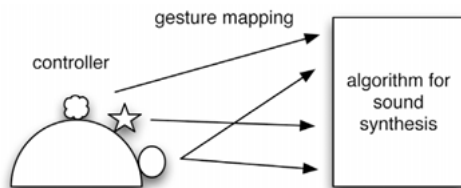


Fig. 1. Gesture mapping

bodily movement and sound. When an interface is in a state of opacity, a user is required to ascertain this intermedial coherence which becomes evident in an action-perception loop taking place during an interaction.

At the outset of dealing with a musical CHI, a user/musician is able to recognise what strategies of remediation of a traditional musical instrument have been used in the design of the CHI: highlighting, refashioning or absorbing it.⁴⁴ The design of the series of MIDI (*Musical Instrument Digital Interface*) controllers – for instance, MIDI keyboard, MIDI string and wind controller – simulating the controller of physical-acoustic, musical instruments in connection with synthetic instrument sounds, pursues a strategy highlighting the musical instrument. Another group of musical interfaces called *augmented musical instruments* or *instrument-inspired gestural controllers* are designed with strategies of reshaping musical instruments.

Let us take the *overtone violin* developed by the composer Dan Overholt as an example of an *augmented musical instrument*. This controller is capable of preserving the traditions of violin bowing technique in dealing with the strings (albeit six strings instead of four). A set of embedded sensors added to this controller, however, afford extended or even new possibilities for musical control. Violin playing techniques captured for instance by optical pickups sensing the vibrations of the strings are used for the creation of expressive nuance of sounds. Other musically relevant gestures captured by diverse gesture-sensors are used to add new control dimensions to the instrument.⁴⁵

As a result, musicians can play this augmented instrument with violin playing technique as is usual and at the same time explore a new playing technique. Such a musical interface might become transparent while musi-

44 The terms "highlighting", "refashioning" and "absorbing" borrow from the different strategies of remediation of older media in New Media developed by Bolter/Grusin 1999.

45 Overholt 2005

cians are mastering the instrumental technique necessary for the combination of the usual and novel control dimensions. The “playing” of augmented musical instruments therefore requires an intensive time-consuming exercise, comparable to dealing with traditional musical instruments.

Instrument-inspired gestural controllers featuring a strategy of reshaping a musical instrument allow musicians to use a more or less traditional instrumental technique to generate and modify sound events. However, the sounds that actually emerge may likely have little to do with the instrumental gestures normally associated with their production. An example of *instrument-inspired, gestural controllers* is the violin-inspired controller *BoSSA*

(*Bowed-Sensor-Speaker-Array*) developed by the composer Dan Trueman and Perry Cook (Fig. 2). This instrument consists of the violin's physical performance interface and its spatial filtering, audio diffuser, yet possesses neither the resonating body nor the strings. Instead it is equipped with a bow interface extended with pressure, force resistance and accelerometer sensors and virtual strings consisting of sponge divided into four parts which can be bowed.⁴⁶ In this way, musicians can use a set of possibilities of bowing techniques familiar to them. But gestural data captured by



Fig. 2. Dan Trueman is playing the BoSSA. Courtesy of Dan Trueman

different sensors while playing this interface can be mapped arbitrarily to any musical parameter so as to give rise to a change of loudness, vibrato or timbre, for instance.

As a consequence, musicians are confronted with the opacity of the controller at the outset far beyond their expectations which have been caused by the possibility of using traditional, gestural techniques. The novel relationship between instrumental gesture and sound events triggered by this gesture, however, challenges a musicians' available image underlying the playing of a musical instrument. This disturbance gives rise to a reprocessing of intermedial relationships between gestural activities used for instrument technique and auditory as well as tactile perception, in the course of which a new image of playing technique is constituted, replacing a previous one. This process of constitution of a (mental) image is due to intermedial transcription which is based on cultural semantics associated with instrumental techniques and

46 Trueman/Cook 1999

used tone systems. Transparency of such an *instrument-inspired gestural controller* is achieved when the interaction renders a musician capable of becoming habituated and of feeling musical expressiveness in dealing with the interface.

Alternate controllers which do not have any affinity to a traditional musical instrument allow the user/performer to develop her or his own strategy which mediates bodily movements and sounds, since habitual behaviour adapted from an old medium cannot be applied. But some musicians tend to design such controllers

as instrument-like to offer a gesture mapping from musically meaningful gestures intentionally produced, into comprehensible and reproducible musical events. A well-known alternate controller *The Hands* (Fig. 3) developed at STEIM (Studio for Electro-Instrumental Music) since 1984 is a prominent example for instrument-like, alternate controllers. Although the shape of this interface does not have any similarity to a traditional musical instrument, it allows a musician to perform with virtuosity. A lot of *alternate controllers* which have been used in less musically oriented, media performances pursue a strategy of absorbing a musical instrument, so that each user – not only a musician – is required to (re)build her or his own image with regard to the intermedial relationship between bodily movement and sound. In the stage of getting to know such an interface, the medium is fully in the focus of attention. In this state of disturbance of an interface, a transcriptive process begins with problematising an implicit image and explicating it while dealing with a medial trace in the process of artistic interaction, in which the medium becomes ultimately transparent and an image explicitly explored becomes, in turn, implicit. An implicit knowledge of how to deal with each new interface is generated as an effect of embodied interaction guided by the match between bodily action on the one hand and auditory and tactile perception on the other. The user's/observer's active involvement in an unknown (artistic) world offered by New Media Art therefore acts as a condition for the genesis of an artistic experience which then comes into the focus of attention as a figure, pushing the interface into the background.

An artistic experience, which is often related to expression on the one hand and to impression on the other does not seem to be strictly separable into productive and receptive experience in New Media Art, where artists often act as observers of constituted works of art and vice versa at the same time. A person who enters into a computer-generated world acquires an artistic



Fig. 3. Michel Waisvisz is playing the second prototype of *The Hands*. Courtesy of Michel Waisvisz

experience via a coupling of activity and passivity, production and perception, motor and sensory processes. In this way, coupled acts of sensory and motor processes have an impact on (completion of) implicit artistic expressiveness experienced by the interactant, while explicitly exploring the strategies of an interface, artificially mediating action-perception loops.

The mediality of an artistic CHI therefore consists in a reshaping and constitution of artistic experience which is initiated by a disturbed, opaque state of an interface as a medium. Each strategy of an interface mediating and modeling a relationship between bodily movement and sound proves to be based on recursive transcription which attracts one's attention towards explicating processes of artistic experience to attain to implicit aisthesis. In this way, interface technology of mediation, oscillating between transparency and opacity of the medium, accentuates the mediality of (intramental) aisthesis even by modeling intermental processes taking place in embodied and situated interaction such as artistic human-robot interaction, which require transcriptive remediation to constitute a cultural semantics of artistic experience.

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