Sounds Like Superman? On the Representation of Bodies in Biosignal Performance

By Daniël Ploeger

Abstract

This paper focuses on performance art which uses biosignals to digitally trigger or synthesise sound. A discussion of work in this field by artists Stelarc, Atau Tanaka, Pamela Z. and Mona Hatoum is followed by an account of how a critical engagement with these artists' work is reflected in the practical approach to biosignal sonification in the author's own performance practice. Adopting a cultural critical approach, the author suggests several ways to read the sound material in the discussed work as signifiers in a gender critical paradigm. Subsequently, drawing from accounts of the author's own work, possibilities for a 'queer' practice of performance art with sonified biosignals are introduced, in which sonification methods which may be identified as adhering to normative technological paradigms, are deliberately juxtaposed with sonic references to technologies which are commonly considered inappropriate for male bodies.

Introduction

Since the 1990s, electronic sensor devices and computer controlled mechanical actuators have become cheaply available on the consumer market. Consequently, a number of artists have started to explore the use of digitised body signals to trigger mechanical body extensions and generate digital video and sound (Knapp & Tanaka, 2002; Arslan et al., 2005; Linz, 1996). In this paper, I will focus on performance art which uses biosignals to trigger or synthesise sound. I will use the term 'biosignals' for data based on activity of an organic body, which may be registered by means of sensors. Examples of commonly used sensors in digital performance with biosignal sonification are galvanic skin reponse (GSR) sensors to measure sweating, electromyography (EMG) sensors to register muscle activity, electroencephalography (EEG) sensors to map brain activity and Doppler ultrasound sensors to register blood flow. I will first discuss work by artists Stelarc, Atau Tanaka, Pamela Z. and Mona Hatoum, followed by an account of how my response to these artists' practices is reflected in my own work using biosignals. In my performance installations, I thematise interactions between my body and commercially available technological devices. My reading of the work of other artists in this paper will contextualise the sound and technology involved in their practices from the perspective of semiotics and cultural theories of technology. My main objective, then, is to propose an approach to biosignal sonification which takes into account, and at times 'queers', the sound and its technologies' affordances as cultural signifiers, and thus departs from an aesthetic or formalist approach[1], which, I will argue, prevails in large parts of the field. My anales of the work of Pamela Z. and Mona Hatoum are based on my own experiences of their work through performance and exhibition, respectively. Since both Stelarc and Atau Tanaka have stopped performing the work discussed in this paper, my analyses of their work are based on video and audio documentations of their performances.

Futuristic Sounds and 'Neutral' Technology: Stelarc and Atau Tanaka

Australian performance artist Stelarc's *Amplified Body* was developed from 1970 until 1994 and involved pioneering experimentation with a range of medical equipment designed for body observation or investigation. Similarly, Japanese/ American Atau Tanaka has performed with motion sensors and the BioMuse, a sensor device which registers muscle activity in the arms, for almost two decades between the early 1990s and the late 2000s.

In *Amplified Body*, Stelarc's body is equipped with EMG, ECG and EEG sensors (see introduction), as well as sonar (to determine the body's relative position) and accelerometers (to register movement of limbs). The data registered with these sensors is used to synthesise sound or trigger pre-recorded sound with a specially designed computer program (Linz, 1996). In most of his work since the 1970s, Stelarc presents his body with technological prosthetic extensions such as a mechanical extra hand (*Third Hand,* 1976-1981), a computer controlled performance harness (*Movatar*, 2000), a pneumatic walking machine (*Exoskeleton*, 1998), and, since 2006, an operationally inserted ear on his left arm, constructed out of artificial cartilage and the artist's own skin (*Extra Ear*). Explaining the motivations behind his performance practice in his provocative 1991 essay 'Prosthetics, Robotics and Remote Existence: Postevolutionary Strategies', Stelarc states that, in contemporary information society, the

human body 'is intimidated by the precision, speed and power of technology, and [...] is neither a very efficient, nor a very durable structure' (1991, p. 591). Consequently, he argues, the organic body has become obsolete and we should 'hollow, harden and dehydrate' (1991, p. 592) it to make it more durable and less vulnerable in order to enable the attachment and implantation of technological prostheses. Cultural theorist Amelia Jones (2005) has suggested a reading of Stelarc's rhetoric from a psychoanalytical perspective. Drawing from sociologist Klaus Theweleit's study of literature written by officers of the proto-fascist German Freikorps in the first half of the 20th century, she argues that Stelarc's allusions to a necessity to hollow, harden and dehydrate the body may be read as a masculinist fantasy[2].

Stelarc has not discussed his choice of sonic material in *Amplified Body* in detail, and his writing (1991) about the work suggests that he considers the 'amplification' of the body in itself, independent from the chosen method of sonification, a strategy to thematise the body's 'obsolescence'. One might argue, therefore, that the sound in the performances can be considered abstract, and should, in line with traditional linguistics-based discourses around music and meaning, be read as a polysemic structure. However, since the 1990s, ethnomusicologists and popular musicologists have challenged the common assumption that relations between musical signs and extra-musical signifieds can never be specific (Tagg, 1999; Turino, 1999). Explaining that this understanding is merely based on the fact that 'musical categories of signification do not coincide with verbal ones' and 'precision of musical meaning does not equal precision of verbal meaning', musicologist Philip Tagg argues that when a certain sonic event affords associations with 'verbally-denotatively disparate concepts' this does not imply that it cannot denote a distinct area of 'affective experience' (1999, p. 8).

I will therefore approach the sonic material of the *Amplified Body* performances from a semiotic perspective. Whilst listening to sound recordings of several *Amplified Body* performances, two aspects were prominent: Firstly, the predominant and most clearly recognisable sound I perceived throughout the recordings was the sound of electro motors, probably originating from contact microphones on the *Third Hand* or other mechanical attachments to the artist's body. Secondly, it struck me that the overall sonic texture of the performances sounded familiar. I didn't think much of this, until, whilst sorting out my audio library, I came across a short sound fragment of a performance of *Risveglio di una città* (Awakening of a City) (Russolo, 2004), one of Futurist composer Luigi Russolo's early pieces for his Intonarumori ('noise intoners'), performed on reconstructions of the original instruments. I realised that this was the sound Stelarc's performance had reminded me of: Russolo's layers of rotating factory machine-like sounds, superimposed by powerful impulses reminiscent of the rattling of automated industrial production processes, appeared closely related to the squeaking flow of high pitched sounds (a slipping conveyor belt?) and the repetitive rotation of electromotors combined with chains of hammering impulses (an industrial assembly machine?) in the *Amplified Body* recordings.

 [AUDIO FILE] Stelarc; *Amplified Body*; 1996 – 1997.

One may read this machinic sound as a synecdoche (part-for-whole) for the body image Stelarc is trying to establish, since by sonically placing the electro motor in the foreground, the motorised aspect may perceptually determine the experience of Stelarc's body. Moreoever, Russolo's Noise music is associated with the Futurist movement and with its ideologies concerning the (male) body. Both

Russolo's work and Stelarc's *Amplified Body* might therefore be interpreted in relation to the Futurist's dream of a superman. Art historian Christine Poggi summarises this dream as follows:

The Futurist male, "multiplied" by the machine, would exemplify a new superhuman hybrid adapted to the demands of speed and violence. Sportsman, aviator, or warrior, he would be capable of astounding feats of physical prowess. His inner consciousness, modeled on the running motor, would be emptied of all that was private, sentimental, and nostalgic (1997, p. 20).

Thus, I suggest that Jones's critique of Stelarc's hard-body rhetoric, stressing its masculinist connotations, may also be applied to the approach to biosignal sonification in *Amplified Body*.

Atau Tanaka has described his work with the BioMuse as 'sensor-based musical instrument' performance (Tanaka, 2000). The BioMuse is a sensor device specifically designed for application in sound performance by Hugh Lusted and Benjamin Knapp from the late 1980s. In Tanaka's performances, the device has been primarily used to register EMG signals from the performer's arm muscles. Tanaka clearly approaches the sensor equipment from the perspective of traditional musical instrument design, where 'the performer's ability to channel his creativity through his instrument' (2000, p. 389) and the listener's perception of this expression of creativity are the primary aspects of interest in a performance. Following the semiotic approach introduced in the preceding section, it would be possible to analyse the sound in Tanaka's practice and find aspects of potential extra-musical meaning. Even though the notion 'musical expression' may seem vague in linguistic terms, different instances of this 'expression' may very well denote quite specific modes of affective experience. However, when listening to documentation of some of Tanaka's performances (localisation, n.d.; primaudiodan, 2008), it becomes apparent that this approach will not lead to a broader understanding of his practice as a whole: Tanaka's performances with the BioMuse are truly diverse and his variation in sound qualities and modes of expression vary from tranquil and relatively quiet to quite wild.

What is striking in the video documentation of the different work is the way in which, in all of the performances, one's attention is drawn to Tanaka's body: One sees a performer standing all by himself next to a laptop, merely attached to a few wires and with black straps wrapped around his forearms, making slightly awkward looking gestures into the air, which are apparently correlated with the sounds one hears. Unlike the expected, conventionally staged music performance experience, where a performer is in physical interaction with a perceptible object, such as an acoustical musical instrument, Tanaka seems to be interacting with his own body, a body which is strangely wired-up and moves like a sort of digital marionette. Taking into consideration the prominence of his body in the performances, it is surprising that Tanaka's writing pays a lot of attention to the way in which the technological equipment mediates the performer's 'expression', but never seems to consider its role in the representation of his body from a wider cultural perspective. Here, I also find it of interest that the chosen sound in the performances, albeit very diverse and inventive, avoids signification of anything that might be associated with the performer's body (apart from the occasional use of samples of the human voice, which are quickly transformed to a point where they are perceived as formal sonic material). The musical instrument concept, and the computational strategy mapped on this, appear to be a formal principle underlying the performance practice, whilst the presence and relevance of the

performer's body, as well as the potential broader cultural connotations of the technologised, wired-up body, do not seem to play a noteworthy role in the conception of the work.

Underlying the work, there also seems to be a more fundamental concept of technology, which I consider of relevance to a cultural analysis of the work and its sound synthesis methods. In the introduction to his essay on musical performance practice on sensor-based instruments, Tanaka claims that '[b]y itself, the computer is a *tabula rasa*, full of potential, but without any specific inherent orientation' (2000, p. 390). This concept of digital technology as a neutral instrument, supposedly beyond any kind of social shaping or cultural signification, then serves as the starting point for his discussions of the development of sensor-based instruments. From this perspective, it might not be very surprising that Tanaka's discussions of the hardware and software in his performance setups are largely confined to technical descriptions and a discussion of the equipment's limitations in terms of processing power. Though Tanaka's (2000) writing identifies the computer and the other digital performance hardware as a central element in his performance practice, it ignores these technologies' potential to become a trope of signification when it interacts, and is brought into close contact with his body during a performance.

The notion of technology as a 'neutral' force, which enters society as a *tabula rasa*, suggests a deterministic concept of technological change, where technological innovation is considered an independent force, driven by a cause-and-effect process inherent in the technology itself. Scholars in the field of cultural studies of science have challenged this understanding of technology, arguing that technological development and social contexts have a mutual impact on each other, so that technological change does not only shape society, but society also influences the course of technological innovations (MacKenzie & Wajcman, 1999; Bijker et. al., 1987; McNeill, 2007). Discussing how technologies have historically been defined and constructed with male users in mind, feminist scholar Cynthia Cockburn argues that the design of technology is complicit in the perpetuation of gender inequality. Accordingly, I suggest that biosignal performance based on a traditional 'musical instrument' approach, which considers technology as a neutral force, is not necessarily the result of a merely aesthetic decision. Rather, the denial of a technological artefacts' gender-political relevance, may be read as part of a gender-normative paradigm where male subjects are beyond the need of gender definition[3].

Sonified Biosignals and Technologies of the Everyday: Pamela Z. and Mona Hatoum

In her short and witty performance piece *Typewriter* (1994)*, Pamela Z. uses a BodySynth, an EMG sensor device (similar to the BioMuse), which is attached to her forearms to trigger sound samples of a typewriter, whilst narrating the text of a letter (brrubrrr, 2011). Rather than using gestural control to generate abstract sound material, Pamela Z.'s objective is clearly to create a direct (and quite literal) reference to other, non-sonic, aspects of the piece. Here, the sound serves as a signifier for a typewriter, which, in turn, gives meaning to the performer's gestures (they will undoubtedly be recognised as typing) and frame the recited letter in a quasi-nostalgic atmosphere (the typewriter is now an antique technology).

However, the connection Pamela Z. establishes between her technologised, wired-up body and the image of the typewriter as an old-school information technology, can also be read as a more serious attempt to engage with the situation of her visceral body interacting with digital technology. Notably, typewriting has historically often been associated with women (Hartman Strom, 1994)[4]. Considering this, Z.'s connecting of biosensor technology with typewriting, may also be seen as a subtle reminder that the common view of engagement with technology as an historically male activity is, as Cynthia Cockburn suggests(1999a), forged by an exclusion of technologies commonly used by women in patriarchal societies from the realm of technology-proper.

The use of biosignal sonification to thematise technologies' cultural aspects, which, arguably, is manifest in Pamela Z.'s *Typewriter*, also plays a prominent role in Mona Hatoum's video installation *Corps Étranger* (1994) (rachwelle, 2011). The core of this installation consists of observations the artist made of the inside and outside of her own body. Inside a white cylindrical booth, which can be entered by spectators, video footage from a medical endoscopic camera is projected on the floor. Upon entering the space, spectators are confronted by a confusing sequence of short fragments of extreme close-up investigations of parts of Hatoum's body: a nostril, the stomach, the vagina, an eyeball, the anus. At the same time, close-miked sound recordings of Hatoum breathing and a Doppler sensor registering blood flow, are played through loudspeakers which are installed at ear-height inside the booth.

In her discussion of the use of video in *Corps Étranger*, art historian Ewa Layer-Burcharth suggests that the unsettling experience of the foreignness of Hatoum's body in the installation is evoked by what she calls the 'exclusionary logic of three gazes' (1997, p. 199). These are manifested in the simultaneous occurrence of three different viewing experiences: The video material's apparent focus on bodily orifices and genitals and the peepshow-like setting of the presentation booth the video is shown in, might make the setting somewhat reminiscent of a pornographic scenario. Yet, this perception is undercut by the clinical scrutiny and extreme close-up of the images, as well as the horizontal projection of the video on the floor, reminiscent of an anatomical lesson. This clinical perspective, in turn, is troubled by the aesthetisised format of presentation, as well as the apparent lack of medical purpose of the video footage.

Echoing the 'clinical perspective' of some aspects of the video material, the methods of body sonification chosen by Hatoum refer to a medical surveillance situation: To anybody who has been subjected to a thorough medical check-up (or, for that matter, people who are familiar with medical reality shows on television), the sound will easily be recognised as originating from diagnostic equipment. Notably, the sound of the Doppler flow sensor is commonly associated with pre-natal consultations in particular[5] . In this context, Hatoum's sonic references to medical observation equipment can be read as a further amplification of the 'foreignness' of her body, that, arguably, shows that this foreignness does not only concern her experience of not fully belonging to either Palestinian or British society, but also the estrangement from her own body. This estrangement is not, as the video material of the work might suggest, exclusively established through rigorous medical practices of corporeal invasion, which are normally only applied to seriously ill people, but also through everyday, and commonly considered innocent, diagnostic routines.

'Queering' the Hard Body: Soft Feedback and Intimate Electrodes

My own work focuses on interactions between my body and technological consumer goods, usually in mixed media environments, combining installation and performance. Unlike Stelarc's apparent interest in performative explorations of possible future forms of human bodies connected to technology, I am primarily interested in the role of technological devices in conjunction with bodies in everyday culture. Taking my white, male body as my conceptual ground (whenever I perform with my body, it will be with this white, male body), my practice is often aimed at establishing a juxtaposition of, on the one hand, performance methods which can be read as part of a Futurist or otherwise male-normative technological paradigm (as I suggested in my analyses of Stelarc's and Tanaka's work) and, on the other hand, a play with sonic signifiers referring to technologies usually considered outside the realm of -to echo Cynthia Cockburn- male formative experience (in accordance with my readings of Pamela Z. and Hatoum's work). Thus, one of the objectives of my practice is to 'queer' commonplace assumptions concerning the way in which my male body ought to 'naturally' interact with technological artefacts.

My performance installation *Feedback* is set up in two spaces: I am standing in the first space, whilst a video monitor and a suspended loudspeaker are installed in the second space. In addition, the packaging material and parts of a case of an AngelSounds Fetal Doppler sensor (a cheap consumer device intended for pregnant women to listen to a sonification of their unborn baby's hearbeat) are exhibited on a pedestal in the second room. The modified sensor, installed in a transparent box so the pink volume control wheel of the device is conspicuous, is strapped to my chest. A prepared loudspeaker is attached to my back. The sensor registers the movements of my heart and converts this data into an audio signal. This signal is sent to the loudspeaker on my back. However, the loudspeaker's cone has been removed and the signal is sent through an extreme low-pass filter, which removes high frequencies from the signal. Normally, a loudspeaker generates sound because it causes the air around it to vibrate by means of moving the surface of the cone. If the cone is removed, the loudspeaker does not move enough air to generate sounds in the lower frequency range. If the audio signal is additionally sent through a low-pass filter, the speaker will merely follow the movements of the lower frequencies of the signal. Thus, the coil of the loudspeaker mechanically replicates the movements of the contours of the signal from the heart sensor. Metal pins have been attached to the loudspeaker coil and prod the skin of my back. The only sound coming from the speaker is the mechanical clicking of the metal parts of the speaker's interior slamming together because of the high amplification of the signal.

AngelSounds™ Fetal Heart Detector box.

In the second space, which is much larger than the first, the video monitor shows a real-time close-up of the part of my back where the metal pins touch the skin. Next to the monitor, an unmodified loudspeaker (the same type as the prepared loudspeaker attached to my body) is suspended from the ceiling. This loudspeaker emits the unfiltered signal of the Doppler sensor in the first space and therefore generates an audio signal. The visually perceived movements of the prepared loudspeaker displayed on the monitor and those of the sounding loudspeaker suspended from the ceiling are practically identical. During a performance, spectators can move freely between the two spaces.

 [VIDEO FILE] Daniël Ploeger; *Feedback*; July, 2010.

I have discussed the role of the spatial dispersion of visual and sonic mediations of my body in this work elsewhere (Ploeger, 2011) and will focus my examination here on a reading of the sonic aspects of the piece from a gender-critical perspective. In the first space, only the persistent mechanical clicking of the pins connected to the modified loudspeaker is clearly audible. I am standing in an upright, static position throughout the performance, seemingly unmoved by the prodding of my back by the metal pins. In this space the work seeks to evoke the impression of a 'hard body', as discussed in Klaus Theweleit's *Male Fantasies*. I then attempt to undermine this apparently macho scenario in the first room by the sound emitted in the second space. The unmodified amplification of the sound of the heart monitor in this space sounds similar to the Doppler sound in Hatoum's *Corps Étranger*. Taking my cue from my reading of Hatoum's use of this biosignal sonification method as a reference to the medical practice of surveillance of female bodies, the AngelSounds Doppler sensor was used for its obvious non-masculine connotations (not only sonically, but also visually by means of the traditionally feminine pink-and-white appearance of the casing and the packaging material). Thus, whilst moving between the two spaces, visitors experience a juxtaposition of two related methods of biosignal sonification which first facilitates, and then undermines a reading of the work in terms of normative gender performance in conjunction with digital technology.

Whereas the sound in *Feedback* was generated using the signal of a fetal Doppler sensor, my work-in-progress *Electrode* presents a commonly used medical commodity to monitor and treat problems related to a malfunctioning sphincter muscle. In *Electrode,* the activity of my sphincter muscle will be registered with an Anuform® anal electrode connected to a sensor interface. The EMG data thus

obtained will be used for digital sound synthesis in a sonification process which takes its cue from Atau Tanaka's concept of a sensor-based musical instrument. I have suggested that the visual appearance of biosensor performances draws the spectators' attention towards Tanakas's body. Rather than trying to downplay this aspect, I am interested in a further heightening of the presence of my body and its interaction with the technology connected to it. Using an anal electrode to obtain data from my body was therefore a deliberate decision: The anal electrode is, on the one hand, a technological artefact that will be very conspicuous in a performance context (wiring coming out of my anus). On the other hand, this sort of taboo medical technology (people usually don't publicly mention their use of a device like this) draws attention because it is usually excluded from the realm of utopic visions of a future with superman-cyborgs and, accordingly, a lot of more widely-known digital performance practices.

Anuform® anal electrode.

These mainly visually perceptible aspects then form the basis for my approach to biosignal sonification in the work. The collected EMG data will be sonified according to two different algorithms simultaneously. Though formalist in approach, these two algorithms will be designed with the objective to generate 'distinct affective modes'. The first algorithm is foreseen to consist mainly of relatively simple digital sound synthesis processes such as square and pulse wave generators, as well as basic amplitude and frequency modulation. Thus, the sound is likely to evoke something quite aggressive and mechanical. The second algorithm will synthesise layers of white noise in combination with band-pass filters mapped on the sensor data. Sharply contrasting the sound generated by the first algorithm, this sound will have hardly any impulsive, 'edgy' elements. The two different sound materials will then be transmitted to eight sets of headphones, suspended from the ceiling throughout the gallery space. The audience will be able to move freely within the space and choose to listen to the different sound materials by putting on headphones, whilst I am standing in the middle of the space, wired up to the sensor and surrounded by parts of publicity material and packaging of the electrode. Comparable to *Feedback,* a central objective in *Electrode* is to provoke an ambiguous experience of my bodily presence in the gallery: On the one hand, the temporally simultaneous occurrence of two different sound structures, based on the same EMG data, draws attention to the fact that the sound is not an 'amplification' of my body (as Stelarc might call it), but a representation which is largely controlled by the artist. On the other hand, though, the assumption of performance technology as a *tabula rasa* (which is potentially heightened by the sonic experience of the 'represented' rather than 'amplified' body) is clearly contradicted by the conspicuous role of the all-but-neutral anal electrode in the work.

Conclusion

In my practice, I seek to expose my fascination with normative representations of bodies whilst simultaneously problematising and undermining this attitude. My suggestions for a queer approach to biosignal performance can be seen as an exploration of art theorist Craig Owens' proposition of postmodern performance practice's 'unavoidable necessity of participating in the very activity that is being denounced precisely in order to denounce it' (1984, p. 235; original emphasis). My approach, therefore, to biosignal performance in *Feedback* and *ELECTRODE* juxtaposes elements which adhere to normative technological paradigms with references to technologies that are commonly considered inappropriate for 'the' male body. The objective of this strategy is not to develop a gender critical stance to biosignal performance which positions the work and the artist outside the cultural practices that are held up for scrutiny. Rather, its critical aspect is framed in an acknowledgement of the artist's position as part of her or his complicity in[6] the economy of popular media representations of the body.

Footnotes

1. An artistic strategy based on the primacy of the interrelation of compositional elements, often also characterised by a preference for emotional expression over representation of, or reference to, material objects (Williams, n.d.). [↵]
2. I have discussed this reading in more detail elsewhere (Ploeger, 2010). [↵]
3. See for example Butler (1990). [↵]
4. Friedrich Kittler (1986) suggests that the emergence of women typewriters in the early 20th century played a prominent role in breaking down the pre-industrial polarity. Where women's productive role was seen in generating products of craft, writing was considered the domain of men to disseminate their thought. The popularity of a 1950s television sketch by American comedian Jerry Lewis, in which he stereotypically mocks the performance of femininity and the monotony of the work of typewriters (igvmyslf1000pts, 2006), further illustrates the role of the typewriter (both the technology and the person) in the public perception of gender politics. [↵]
5. After one of my own performances in which I used a Doppler heart scanner on my body, a friend who recently became a mother described the performance as 'a man trying to give birth'. [↵]
6. Amelia Jones (2004) argues that performance artists' circulation of images of their bodies and their interest in being represented in the media makes them complicit in commodity fetish culture. [↵]

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His performance installations explore interactions between the human body and technological commodities. Originally trained as a musician, his work often engages with the cultural roles of sound. Daniël teaches on courses in performance art and performance technology at Brunel University West London and the University of Sussex, where he is currently completing his doctoral thesis under the supervision of Professor Nicholas Till. His writing has been published in the *Body, Space and Technology Journal* and *Media–N Journal of the New Media Caucus.*