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# Interfaces - a Musical Situation

## Vmesniki - glasbena situacija

Ključne besede: virtualne realnosti, glasba, vmesniki, glasbena izvedba, ekspresivno vedenje, digitalna kultura

Key-words: virtual realities, music, interfaces, musical performance, expressive behavior, digital culture

### IZVLEČEK

Vmesnik lahko razumemo kot (socialno) situacijo, v kateri prenesena informacija učinkuje in vpliva tako na pošiljaka kot tudi sprejemnika. Obstajajo indici, da bi lahko imeli glasbeno izvedbo za paradigmo takšne situacije. Tako kot je glasbena izvedba del komunikacijskega procesa, ki je formaliziran v glasbi sami, je vmesnik del komunikacijskega procesa, ki je formaliziran v nemehanični virtualni realnosti. Glasbena izvedba tako kot tudi vmesniki temeljijo na značilnem vedenju — s tem ko dajejo dostop, »konstruirajo« glasbo in virtualne realnosti. Takšne hipoteze so v članku razčlenjene na osnovi eksperimentalnih podatkov komunikacijskih procesov kot tudi teorij glasbe in umetnostnih medijev.

### ABSTRACT

An interface may be considered being a (social) situation where information is transferred effecting and affecting both, the communicator and the recipient. There is evidence, that musical performance could be argued to be a paradigm of this situation. As musical performance is part of a communication-process formalized in music an interface is part of a communication-process formalized in a non-mechanistic virtual reality. Musical performance as well as interfaces are based on expressive behavior — by giving access to they "construct" music and virtual realities. These hypotheses are argued on the basis of experimental data of communication-processes as well as theories of music and media-art.

First mechanical devices were triggered by humans following the principle of lever. In electronic ages triggering became independent of distance. By increasing the velocity of the transmission of trigger-impulses the mechanistic paradigm of time and space imploded in perception to the all-at-once-ness according to the imagery of auditory space (McLUHAN 1995). Early telematic-projects made use of these technologies setting up situations similar to conceits where musicians played together simultaneously over huge distances, today media-art-projects use the auditory space as psychological interfaces to the net space (JAUk, RANZENBACHER 1999).

The first computers were programmed using command languages. The introduction of icons to select made the use of computers more intuitive and therefore commonly understandable. Maybe for commercial reasons the personal computer follows the same concept Otto NEURATH used to make social and commercial processes understandable for not special-trained individuals.

Doug Engelbait's mouse - first introduced 1968 - made the access to machines „bodily". Sensor pads and movement-detection-systems not only use instrumental behavior but expressive-motion: this is where free musical performance, the instrumentarization of expressive behavior and the free musical playing-together, the non-verbal communication based on expressive behavior and its conversion to sound, may become role-models for expressive instrumentarization and collective communication mediatized in codes. Both are explored in media-aits in close connection to music. The early Theremin, BUCHLA sensor pads and MOOG modulation wheels<sup>1</sup> as well as today's conductor's jackets (MIRANDER & WANDERLEY 2006) and ultra-sonic detection of playing movements<sup>2</sup> are paradigms of intuitive body-environment-interaction in wo-man/machine/interfaces<sup>3</sup>, collective free improvisation are paradigms of body-body-interaction and informal group structuring in wo-man/wo-man/interfaces of collectivating (de KERCKHOVE 1995) and collective processes in net-art (SCHLÄBITZ 1998, JAUk 1999 a, b). At least sound is used as an affecting aspect of communication making interfaces more immersive. Immersion is an essential part of an interface, it works as a motivational attractor (BELSCHNER 2000).

Nowadays only a very simple cybernetic point of view sees interfaces as mechanical devices which make access to machines. Thereby interaction is reduced to the concept of reaction (JAUk 1995), the principle of lever. It is an action of information sending from wo-man to the machine as part of the process of extension of man (MCLUHAN 1994). The machine reacts to wo-man, who triggers predetermined choices. Coming from the cybernetic and kinetic arts it is Frank POPPER who consequently reports his cybernetic and kinetic understanding of interaction, where interaction is a reaction determined by physical processes and mathematically described as algorithmic processes. What he postulates could at least be seen as participation. The public interacts with those kinetic systems and triggers complex physical movements between the boundaries of a range of movements determined by the way the parts of the kinetic system are connected. Interaction is the „intensivere und vollstündigere Beteiligung des Publikums [...], die besonders durch die besser beherrschbare und differenzierte Technik ermöglicht wird" (POPPER 1991, S. 263).

On the other hand BALES (1950) considers interaction being a process of communication, where information is transferred and this process effects (and affects) the communicator as well as the recipient. Interaction not only leads to a common product of interacting people but to a social structure of interacting agents, a structured of communication nodes (NIERSTRASZ & PATHOMAS 1990).

<sup>1</sup> To give expressive modulation to a synthetic sound triggered by a keyboard while playing.

<sup>2</sup> GRUPPE 01 uses communication processes of three musicians to structure computer-music. What is played is detected by a MIDI-score-follower; how it is played is detected by an ultra-sonic-space-system. Playing movements indicate the emotional quality of the score. Correlating structures, patterns of common playing, are learned by the computer — the computer starts to interact with the musicians. Werner JAUk, John PREININGER, Stefan STASTNY (2003). GRUPPE 01 - a live reorded interactive computermusic performance at styrian autumn/4, austrian soundcheck. ORF/Extraplatte, Wien

<sup>3</sup> BCIs, Brain-Computer-Interfaces, using EEG as artefact of action or even imagination are hardly to handle in mass-production because they need a very complex individual adjustment.

Based on the theory of communication interaction is the psychological part of an interface as a social situation which leads the communication structure to a social structure and at the same time to a common product - it is a dynamic process of interdependence of content and structure of communication.

Cognitive theory explains the effect of information-transfer to the change of the knowledgebase of the agents. Group psychology shows the effect of information-flow in correlation to structuring-processes of informal groups on the efficiency of problem solving.

What seems to be just criteria-based right or wrong information is at least emotionally associated. It is evident that information transmission is embedded in emotional processes and that even information by itself is not a sign but a signal, an emotional expression.

In some kind sound is the signal of communication structuring groups and music. Its mediatisation leads to polyphonic music which ADORNO assumes to be the „Objektivierung des Wir“ (ADORNO 1958).

Anthropological theories of music describe its origin in pre-linguistic communicational processes. Music is the process of culturization of expressive behavior (BLACKING 1977), music is the process of culturization of the expressive sound (KNEPLER 1977), both based on an emotional state. Because of its low mediatisation, its direct connection to the body, it is a common experience and therefore has communicational function as a signal. Idealistic philosophies consider the process of mediatisation being a process of culturization (CASSIRER 1964) which leads to the re-presentation of states in signs. Digital culture frees signs from any connection to the material being signed. Signs turn into codes, at least to immaterial codes (see LYOTARD 1985) which could be organized deliberately. But our way of thinking about structuring codes is based on experiences of body-environment interaction which therefore is mechanistic by itself (BERGSON 1941; GIBSON 1982; LEW 2000). Serial music could be considered as the formalization of mechanistic processes.

Algorithmic processes in music are compositional rules that reduce communication processes (of making music together) to physical rules. It was STOCKHAUSEN who claimed this part of compositional work of secondary interest: The primarily compositional work is to make decisions about which output in a series of possible results of algorithmic processes will work better than another. This decision-making is at least based on hedonistic values of humans despite objective external nature based criteria - what seems to be algorithmic is at least hedonistic.

Digital music working with algorithms and/or samples is completely characterized by the choice of feasible and available materials - generating minimal structures with copy & paste is a hedonistic process of selecting.

Pop-music - even a counterpart to (idealistic sign-based western) culture - goes the development of mediatisation backwards. Sound is the immediate artefact of an expressive behavior, pop-music is organized by immediate communicative processes - both are regulated by the hedonistic value of the interaction.

Music technology refers to this. Although not very accepted in the theory of pop-music, technology is just the extension of expressive behavior. This technology to play low mediated music is in some crucial aspects a paradigm for intuitive emotion-based communication - even in highly mediated digital culture where our body, the base of our imagination of physical reality, has to interact with a coded virtual reality.

First of all, pop-music is sound-music (HARTWIG-WIECHEL 1974). The voice, „die reine, kleine [...] Stimme“ (DIEDERICHSEN 1996: p. 107) is the immediate articulation of an emotional state. On the one hand the sound of the guitar is the extension of this expressive voice and on the other hand the playing of the guitar is the instrumentarization of the expressive behavior.

The guitar-plâying of Jimi Hendrix combines both and is the hedonistic use of artefacts, of feedback between his single-coil equipped fender stratocaster and the marshall 1959 with two 1960 cabinets equipped with four pieces of 12-inch cheleston speaker each. This guitar-amplification-system is extremely sensible for feedback. To control it, body-movements shield the feedback in the circuit. This technique allows expressive body-movements to be converted directly to sound - this is the immediate instmmentarization of expressive behavior. In addition this playing is accompanied by musical techniques of the blues where the voice is doubled by the instrument and (therefore) the instrument is played in a voice-ductus which is technologically extended by the wah-wah-effect. These techniques reinforce the sound character of the guitar which, in its tune, presents the vowels of the voice (TRAUBE & DEPALLE 2004 a, b). Open tunings are basic playing-techniques in blues orientated music that at least could be considered being the extension of the voice by the guitar. What was popularised by Hendrix and may be considered being typically pop-music-playing was explored by the avant-garde e.g. in the Welkzyklus „Mein Körper ist eine Posaune geworden" by Vinko Globokar (see BECK 2004).

When making music - at least dominated by an „Wir-Gefühl" (JAUKE 2005, 150ff) in the sixties - in pop-groups composing is the process of informal structuring, which refers to KNAUER's (1996) assumption of playing jazz by interaction. When pop-music became digital music, where only movements of the finger on a mouse-track-pad direct and drive masses of sounds (BUNZ 2001) (and as some kind of reaction-formation to expressive hot playing) cool static behavior of the musicians became a style, while the audience called for the playing movement (WICKE 1998).

What's due to the generating of music is due to the perception too: pop-music is immediately bodily perceived and has an emotional homeostatic function - it regulates the arousal on an individually preferred level (ROSING 2001, SLOBODA et al. 2001), it stimulates single humans and masses.

This bodily and emotionally based music is part of an infomalization process (BROWNE 2000, SCHULZE 2000) and a rise of hedonistic behavior in western culture. But it is not only a side-effect of its use to lead desires for commercial profit, it is a basic essential process of structuring elements which, by themselves, don't mean anything but are syntactic qualities.

Digital code as a non-meaningful code can't be structured by a logic that is inherent to a meaning. Algorithmic structuring, the formalization of the (bodily) experience of the behavior of nature (LEVY 2000), and hedonistic structuring, the structuring of material qualities by their perceivable value on the dimension „tension - relaxation", are alternative methods of structuring. The early classic avant-gardes used algorithmic processes to create new music in the belief to free itself from nature-based theories of composition, the „andere Avantgarde" (HOFFMANN 2002) refers to the misuse and hacking of methods for another purpose and refers to hedonistic structures.

Together with subcultural political values and normes of counterculture (HEBDIGE 1979) existing high intensities (see WUNDT 1874) became a dominant force of generating pop music from its beginning to punk, industrial and the digital music of clicks, cuts & bursts.

The experimental aesthetics of BERLYNE (1970, 71, 74) explains the structuring where the individually preferred amount of arousal effected by the collative variables, syntactic qualities, regulates the behavior of attention and therefore the perception and at least the generating of digital arts. BERLYNE's (1970, 71, 74) experimental aesthetics explains the combination of both ways of structuring - algorithmic-based structures of immaterial codes are preferred to others by their hedonistic values. This makes it central to explain interaction in digital culture.

Digital culture - defined by non-mechanistic processes - is regulated dominantly by hedonistic processes; digital culture is the transgression of the mechanistic paradigm (JAUKE 2003).

The structuring of virtual realities by itself as well as the access to these virtual realities with our bodies are regulated by hedonistic processes (JAUKE 2001) - highly mediated absoluté mu-

sic is the paradigm of virtual realities - low mediated processes of making music, "originäres Musizieren" (JAUK 2005b), is a paradigm of interfaces to these non-mechanistic worlds.

A digit is a code that has no connection to the content it is coding. Although human perception is multimodal (de la MOTTE-HABER 2006), signs usually mean information from specific sensory channels; iconic signs include qualities of specific sensory perception.

A digit is a common digit - it is not different in representing a visual or an acoustical information. It is common to represent all possible informations and meanings. Aits of common digits transgrede the sensory defined aits (JAUK 2005a). This led some authors to the re-interpretation of the "Gesamtkunstwerk" as the "Gesamtdatenwerk" (ASCOTT 1989) based on the "digitalem Grundalphabet" (CLAUS 1988).

The more crucial point is the fact that compositional work is done just by structuring the code without notion of the sensory stimuli that it codes. To make the product sensory perceivable it is converted to coixesponding analogous information afterwards. This means that the code is considered being some kind of syntactic information, structural information. Because of its immateriality this code has the potentiality of being structured deliberately. Freeing structuring from mechanistic paradigms means to free the structuring mind from mechanistic imageries as results of experiences of body-environment-interactions (BERGSON 1941; GIBSON 1982; LEW 2000). An alternative to this way of „thinking“ is the way of „feeling“ following the human hedonistic system. The logic of the behavior of meaningful occurrences is based on this mechanistic way of thinking and its generalization in narrative processes. The hedonistic way of thinking is concerned with non-meaningful elements. Music is a paradigm to structure non-meaningful codes.

Let's consider codes to be similar to these apriori non-meaningful elements that are part of musical thinking represented in musical notations. Their meaning is in one sense presentation of physical aspects as high or low, or short or long, or presentation of feeling in form (LANGER 1953). In another sense these codes could have become signs by historical processes. Serial music tries to free these codes from musical meanings as signs by stochastic definitions; digital code in computer music even tries to free the notation from its representation of physical behavior of things, at least from materiality.

Digital culture structures its codes by their hedonistic values - independent of their later conversion to sensory perceivable stimuli.

Digital culture brings the experimental aesthetics (BERLYNE 1970, 71, 74), where the structure of syntactic elements is organized by their hedonistic value, to a new importance. BERLYNE (1970, 71, 74) postulates an inverted u-shaped function between complexity of information<sup>5</sup> and pleasingness. The syntactic quality of a single element or - in case of structures like music - of series of elements defines its hedonistic value: the more information the series is inherent, the more the series would excite. Low excitement of low informative structure would be boring, high excitement of high informative series would be overstressing - a middle level of excitement would be perceived as pleasing, these structures would have the most hedonistic values. In the case of generating those structures would have highest probability being realized, in case of perception those structures would have the highest probability being attended. The amount of information is subjective and based on expectations depending on former learning processes (KONECNI 1977).

Structure is not only a series in time but takes account of relations in time and „space“. Music as "beziehendes Denken" (RIEMANN 1914/15) formalizing "the auditory logic" (JAUK 2000) describes this information theory based understanding of structure, where relations in time and space are considered being organized statistically. The hedonistic „logic“ of those musical structures is basically described by the Schenkerian (1935) Ursatz.

- Information theory allows to formalize the amount of information (SHANNON & WEAVER 1949)

Music may be considered being a role model for generating and perceiving non-mechanistic virtual realities.

To interact with a world like this mechanistic paradigms fail. Musical performance is a very basic low mediated hedonistic behavior, the instrumentarization of expressive behavior - it could be considered being role model for interaction with virtual realities.

## Conclusion

Despite just converting visually coded information into sounds, playing a musical instrument is the instrumentarization of expressive behavior - the paradigm of a wo-man/machine- interface.

Based on this anthropological approach to music expressive behavior is a pre-linguistic communicational situation. The content of communication is intuitively understood as a signal. This puts expressive behavior as an interaction in a social situation<sup>6</sup> - the paradigm of a wo-man/wo-man-interface.

Musical notation is the development of a system of codes to „store“ the sound of a social interaction - at least it allows to construct music as a virtual reality.

(Polyphonic) Music is the „objektivisation des Wir“ (ADORNO 1958). The process of communication forms a community as it brings out a common formed product at the same time. Informal communication may be considered being a paradigm of collective art.

Technological information transmission over huge (cultural) distances integrates wo-man/machine-interfaces into telematic works, integrates wo-man/wo-man-interfaces into net-art.

Using sound as part of emotional expressive behavior the situation becomes primarily affecting: Sound works as feedback and reinforces the interaction, it involves physically and emotionally - sound is a psychological interface and makes the interface-situation a highly immersive one.

Until now we have talked about input-interfaces. Its bodily to perceive aspects make sound a paradigm of output-interfaces too, of mixed realities where participants are embedded in code-based physical environments like hearing sound in an ego-centric sound-space despite seeing a picture on a screen in front of them. Techno-culture create multimedia environments as to immerse into an „ocean of sound“ (TOOP 1997)

Considering music as a process of mediatization from the immediate expressive behavior/sound to its presentation and representation in signs and at least its existence in codes is a paradigm to explain interfaces, the interaction of humans with and in non-mechanistic virtual realities. Hedonistic qualities regulate these interactions and (therefore) the structure of virtual worlds, while body-environment-interactions give us access to physical reality that we assume is regulated by causality. We use signs to describe the rules of those mechanistic worlds - but its reconstruction is not different from its construction: The formalization of experiences in signs lets us construct models of the world as hedonistic experiences with codes lets us construct virtual worlds.

At the same time this theoretical approach gives us a short insight what music could be...could it be a code-based construction of a virtual reality where our hedonistic system works as construction-rule as well as an interface to this world?

There is some experimental evidence that emotional expression might be an intercultural behavior (CLYNES 1977, 80; HAMA & TSUDA 1990.)

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## POVZETEK

Članek skuša glasbeno-komunikacijski process razumeti s pomočjo mehanicistične in kiber-  
netične logike. Izkaže se, da bi igranje na inštrument, torej muziciranje lahko razumeli v smislu  
vmesnika, ki ga avtor definira kot socialno situacijo, v kateri prenešana informacija učinkuje in  
vpliva tako na pošiljalca kot tudi na sprejemnika. Igranje na inštrument je instrumentalizacija ek-  
spresivnega vedenja, kar pomeni, da gre za »prevajanje« telesnega v zvočno. Samo glasbo je potem-  
takem mogoče razumeti kot mediatizacijo takojšnjega ekspresivnega vedenja oz. zvoka k njeni  
prezentaciji in reprezentaciji v znakih, ki imajo lahko tudi vrednost kodov (notacija, digitalne glas-  
bene operacije). Medtem ko bi preprosto muziciranje lahko razumeli v smislu vmesnika, pa je  
absolutna glasba paradigma virtualne realnosti, v kateri so strukturirani nepomenski kodi glede  
na hedonistične vrednosti. Glasba lahko tako predstavlja model generiranja in zaznavanja ne-  
mehanicističnih virtualnih realnosti, muziciranje pa interakcijo med različnimi virtualnimi realnostmi.  
Takšne hipoteze so v članku razčlenjene na osnovi eksperimentalnih podatkov komunikacijskih  
procesov kot tudi teorij glasbe in umetnostnih medijev.