New Music and Aesthetics in the 21st Century Vol. 4

Electronics in New Music

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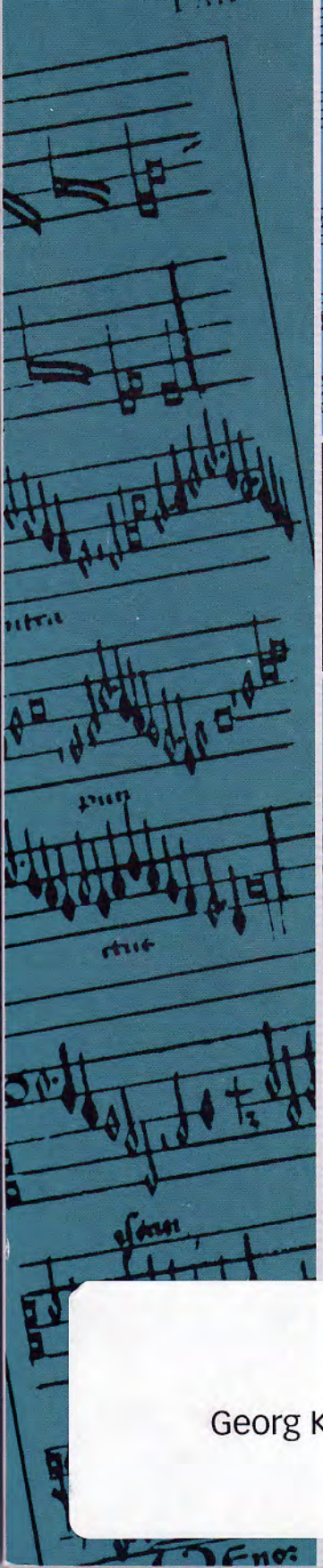
Claus-Steffen Mahnkopf, Frank Cox, and Wolfram Schurig (ed.)



Georg Klein

First Edition 2006

Acknowledgements:
The editors gratefully acknowledge permission from the following publishers to reprint copyrighted work:
Verlag Neue Musik (Corbett)
www.claussteffenmahnkopf.de (Mahnkopf)

Cover design: Friedwalt Donner, Alonissos
Typesetting: CSF · ComputerSatz Freiburg, Freiburg im Breisgau
Musical examples: Notengraphik Werner Eickhoff
Printing: Fuldaer Verlagsagentur, Fulda

ISBN-10: 3-936000-15-8
ISBN-13: 978-3-936000-15-3

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Georg Klein

Interactive Variation
On the relativity of sound and movement in transition *and* trasa *alongside various thoughts on the incorporeality of electronic media*

I. A somewhat existential preliminary consideration

Wherever there is sound, there is also movement. Wherever there is movement, there is also sound. Sometimes clearly visible, as with a vibrating double-bass string, the bright rustling of the leaves in a row of poplars or the whirring of an egg-beater. Sometimes no longer perceptible to our ears or eyes, as with the silent downward drift of a feather in the air, the invisible murmuring of a central heating pipe, or the inaudible movements of the planets. But even there, we speak of the "Big Bang," the very first sound-motion performance—yet it had no audience.

The observation that sound and movement are one and the same, that the one always refers to the other—far removed from the perspective of physics, where sound is viewed as a form of movement through space—was already made very early on in the history of mankind, then interpreted and used accordingly. In a magical-animistic worldview, the enchanting quality that lies in the production of pitches and sounds was connected to *being alive*. Every gust of wind is a spirit, every note could be the voice of a being. And this is still familiar to us today: as soon as we hear a rustling in the bushes we suspect an animal, a motion, and quickly become uneasy if we cannot find the cause. The connection to life becomes still clearer with the use of instruments: in the hands of a musician, these dead objects begin to speak, to sing, to move the soul of the listener or to make people dance—and sometimes even influence circumstances, political ones. A force that is often ascribed to instruments themselves in religious cultures, such as the shaman's drum, and which is often associated with a particular sphere of life, namely the world of spirits and ancestors. Voices from the beyond, from the world of the dead, that come to life through the use of instruments. This makes for a correspondingly ambivalent relationship to them: between demonism and divinity, as also later in Christianity, with the demonization of all things physical, leading to desensualized, abstract musical forms.

Absolute silence means immobility and death. Conversely, even the smallest sound emitted by an object, however dead it might be, possesses a quality of vitalization. Even the production of a single note can be existentially charged, for example in the case of a shakuhachi player, who seems to describe an arc of life with the inception and waning of each note; the resulting air sounds render one of life's elementary movements, namely breathing, particularly audible. The silence following the end of the last note is then characterized not only by tense

attentiveness and utmost concentration. For a moment, the player and the audience are within a precarious transitional situation, an empty nothingness: how will they return from that world to their own? Silence is often described as "unbearable." It is no wonder that rituals came into being precisely there: clapping rituals, bowing rituals, just as there have always been rituals for all existential transitional situations, whether at the points of birth, sexual maturity, marriage or death—"les rites de passage," as the French ethnologist van Gennep[1] termed them.

In electronics, the action of sound production as something directly perceptible is lost. Only measuring instruments and transducers can render the electric and electromagnetic vibrations audible or visible. The things that amazed people a century ago—from voices and music coming from gramophones as the first recording and playback devices, telephones for distant communication, Theremins for controlling sound without contact, radio waves and their transmitters and receivers, to the devices for visual transmission and storage—these are all familiar parts of everyday life. The magical dimension these machines once had is now only appreciated by children, who are amazed that an entire orchestra can fit into a small radio.

In concert performances of pure tape music or works for other electronic resources, the lack of sonic and kinetic immediacy is often seen as a deficit. Movement functions as a visual means of expression that can increase the intensity of the performance. Music and body interact, however strongly that may be. In pure computer concerts—in the most extreme case with a single player in front of a Powerbook—, a maximum of sonic force is produced through a minimum of movement—that of the index finger on the touchpad. That can certainly be impressive, but at the same time the performance can also seem lifeless and frozen through this almost complete lack of movement. It is thus inverted to form the expression of a society developing towards a monadic and technologized state of being, where the body only functions as the endpoint of a data line.

From this extreme, there are two possible approaches that disrupt this isolation and incorporeality without giving up the possibilities offered by technology: networks and interaction. The democratic ideal of network art is the participation of all concerned in a shared project in such a way that each of them can become an artist. With interactivity the body is reintroduced, whether in the case of instrumentalists connected to live electronics via sensors or through installations, where listeners must themselves become active in order to experience the sonic events.

It is precisely such interactive installation that change the perceptual behavior of listeners and viewers to a very large extent. They no longer have any fixed duration delimiting the performance in the manner of a concert, and must

1 Arnold van Gennep, *Übergangsriten* (1909) (Frankfurt a. M.: Campus, 1986).

instead take their own listening time independently. They can experience different states, depending on when and how they enter a sonically- and visually-shaped situation. There is thus no longer an *objective* work that can be observed from without, but rather a relative work that is subject to the listeners' behavior, their readiness to perceive, their actions and their ability to pursue discoveries. It is somewhat like Schrödinger's cat: the observer and the observed cannot be separated. The listener changes what is heard through the very act of listening.

This relativity is found on both sides: not only among the visitors of an installation, but also in the role of its creator. As an artist, I am crafting no more and no less than a frame within which the work is then individually realized. This cannot guarantee an entirely predictable sonic result, which may also be the case in fully-composed concert music, but is taken much further here. The installations I would now like to present are composed situations of a predominantly processual character, i.e., an open form. Beyond this, they are also—as installations in a public space—strongly site-specific, which was a significant factor in the shaping of their respective form and content.[2] Within the processes I designed, the *interactive variation* of an initial acoustic material was the most decisive. This variation is triggered, or also controlled, by a physically-related interaction, by the movement of the body through space: sound is relative to movement, this time in a new sense.

II. Transition as a theme: transition—berlin junction eine klangsituation

As a temporal art, music is always an art of transition. Whether it be from one chord to the next, one theme to the next, one key, one rhythm, one pattern, one structure or one sound to the next: the shaping of transitions—even the absence of transition with rough cuts and shifts—is a decisive aspect of any composition.

The installation *transition—berlin junction eine klangsituation* consisted exclusively of transitions: in a spatial sense, a temporal sense and also a social and historical sense. Here there was neither a beginning nor an end, as the installation ran as a continuous 6-month process in the summers of 2001 and 2002. The theme was supplied by the location itself: the installation was situated in a place of transit, a traffic island in front of the main entrance of the Philharmonie in Berlin, between the flow of traffic and the passers-by on the way to the park, the Tiergarten, or the concert halls. On the traffic island stands Richard Serra's sculpture *Berlin Junction*, in whose interstice—its *transit*

2 Cf. Georg Klein, "...unter freiem Himmel. Klangkunst im öffentlichen Raum," in *Musik im Dialog V. musik-politik* (= Jahrbuch der Berliner Gesellschaft für Neue Musik 2002) (Saarbrücken: Pfau, 2004), and also "From the sound installation to the sound situation," in *Organised Sound*, vol. 8 (Cambridge: Cambridge University Press, 2003).

space—I had the installation placed. Serra's steel sculpture consists of two bent solid steel sheets bent towards each other in a state of threatening instability. They form a passage roughly 1.5 m high and 13 m long. I had placed four loudspeakers in the floor of the passage and covered them with grating so that visitors could walk over them. Under each grate there was a small glass panel, under which I placed to distance-sensors that reacted to the movements of passers-by. Though a complex computer-controlled system, these movements triggered different forms of sound transformation and produced human voices, one male and one female.

Figure 1: The sculpture *Berlin Junction* by Richard Serra in the snow (March 2001). In the background the Philharmonie (left) and the Kammermusiksaal (right) in Berlin.
Figure 2: Footprints in the snow between the sheets of the Serra sculpture with the grating of the sound installation transition, with loudspeakers and distance-sensors underneath (March 2001).

In the case of the speaking voices, it merely required a few people passing by one of the sensors to make the voices come up from the ground. The element of surprise was accompanied by a feeling of unease, especially at night, when the inside of the sculpture was illuminated only be a weak glow from the grating. If sound always also means movement, then what makes it eerie is the *invisibility of movement*, the invisible source of the sound. This is heightened by the presence of human voices whose organs, whose physical bodies are absent. The unsettling atmosphere that could arise in my sound-situation through the

voices coming up from the ground was entirely intentional, and is related to the history of this location in front of the Philharmonie. Before the end of the Second World War, it was the site of a formerly Jewish villa that was used as the headquarters for organizing the murder—"euthanasia"—of roughly 200,000 physically and mentally handicapped people. The crime itself was given the codename "Aktion T4" after the address of the house, Tiergartenstrasse 4. A memorial plaque set in the ground near the sculpture like a tombstone gives a brief, but clear description of the murder. While developing the conception for the installation, however, I observed that this plaque went mostly unnoticed by those passing it. In this way, working on the perception of this location in all its relations became my real point of departure. I refer to such a working method —exposing oneself to a situation and shaping it through specific changes—as the production of a *condensed situation*.

1. *Basic structure* transition

The compositional structure of the installation consists of four parallel processes that can each be altered through the audience's participation:

1. Subpatch "Radwechsel" [Wheel Change], in which a recording of a text by Bertolt Brecht ("Der Radwechsel," spoken by a male voice, the actor Otto Sander, duration: 18.3 sec.) is controlled interactively
2. Subpatch "Hier" [Here], in which a recording of the single word "hier" (spoken by a female voice, the actress Angela Winkler, in four versions of 0.6 sec. each) is controlled interactively
3. Subpatch "Strassenklang" [Street Sound], which synthetically generates a permanent drone with 6 sine-wave generators and alters it interactively, e.g. with a modulating recording of common local traffic sounds (duration: 15.9 sec.)
4. Subpatch "Skulpturklang" [Sculpture Sound], which interactively generates dynamic *sound curves* limited to a duration of 26 sec. from the state of the drone at the respective moment.

The installation's starting material, then, consisted of three recordings with a total duration of only 36.6 seconds and a bank of six sine-wave generators. The entire piece consists essentially of the *interactive variation* of this starting material, which was thus extended to a duration of twice six months. The sonic events in the sculpture are thus not a prefabricated endless loop, but rather a compositional process realized through a music machine, namely a computer equipped with Max/MSP software.

All four processes had access to the four acoustic outputs, and could thus activate individually each of the four loudspeakers that were spaced evenly along the passage through the sculpture, fitted into the existing grid of floor plates (see the sketch in Figure 4). The six infrared distance-sensors and two light-sensors reacted to the people passing through, depending on how close

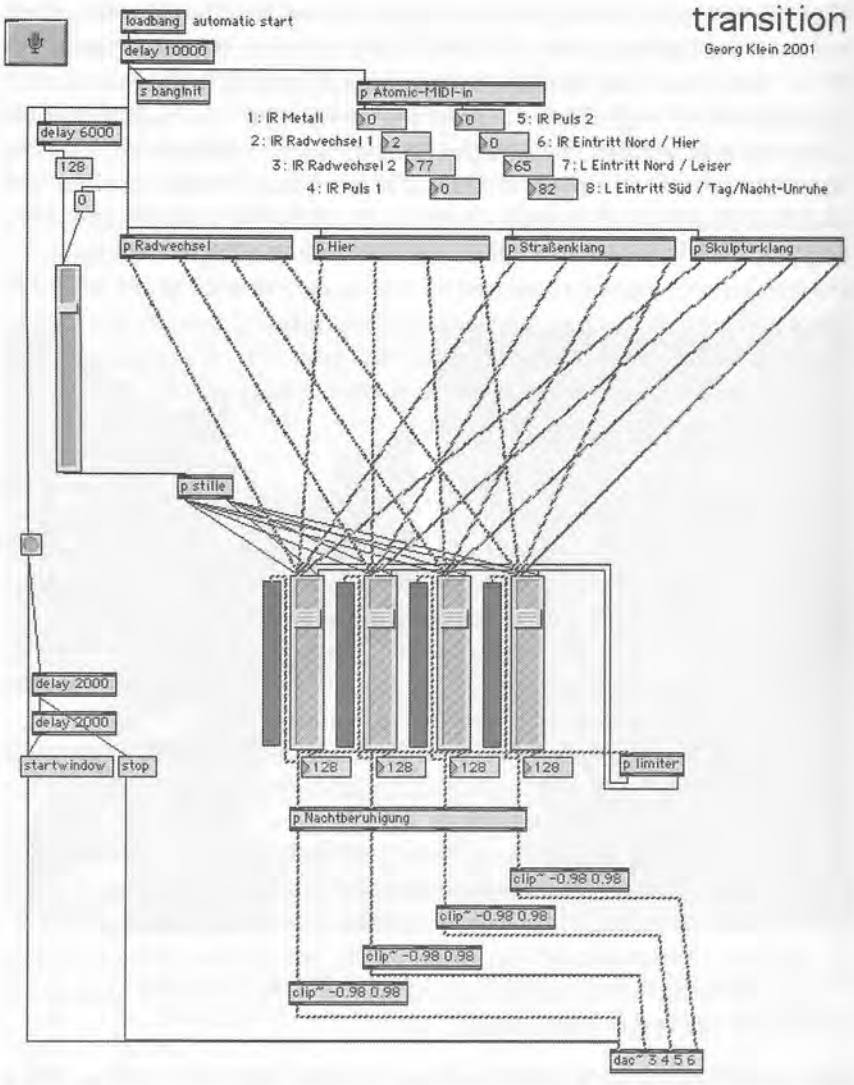

Figure 3: Uppermost layer of the score of *transition*. The current readings from the eight sensors can be seen above the four main processes running in parallel. The subpatch "Stille" [Silence] creates a general pause in a particular constellation of the installation.

they came to the sensors. In this manner, most of the variations were triggered randomly and unconsciously by the passers-by. Only those visitors who were so bewildered by it that they pursued its interactive possibilities were able to have a direct influence on the formation of variations. Children were prepared to do this much more often than adults.

In the first two processes, the interactive control of the texts only served the

momentary formation of variations, meaning that the installation always returned to its initial state once it was left. This also occurred with a delay depending on how long someone remained by one particular sensor, so that the next visitor night possibly encounter the sonic legacy of his predecessor. In both the processes "Strassenklang" and "Skulpturklang," the interactive control served not only the formation of momentary variations, but also a constant progression and proliferation of sound. I shall restrict myself here to a description of these two processes, as I would like to present a more extended example of text control in part C (Installation *TRASA*).

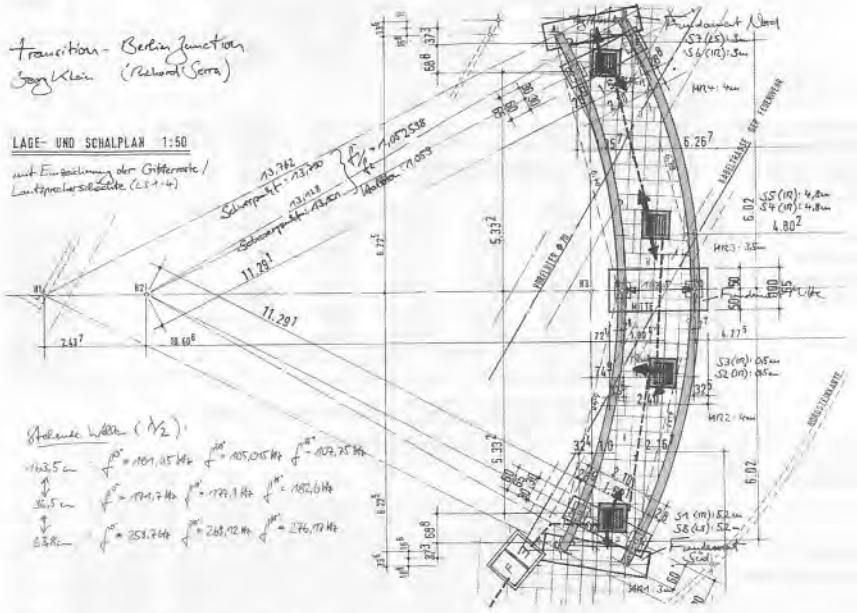

Figure 4: Original sketch for *transition—berlin junction*. Top view 1:50. The arrows by the floor grates between the curves of the sculpture indicate the directions of the sensors. The two different radii of the two steel sheets are determined through the two midpoints of the circle (H1 + H2). The difference between them yields the predominant frequency ratio of the drone in the sculpture.

2. The drone and its variation

Through the slanted position of the curves (see Figure 1), Serra's sculpture—as so often in his works—hangs in a delicate state of balance. Its centers of gravity are calculated in such a way that they can simply stand there, require no anchoring, and can withstand even strong crosswinds. The fact that the two solid steel sheets nonetheless convey the impression that they could collapse at

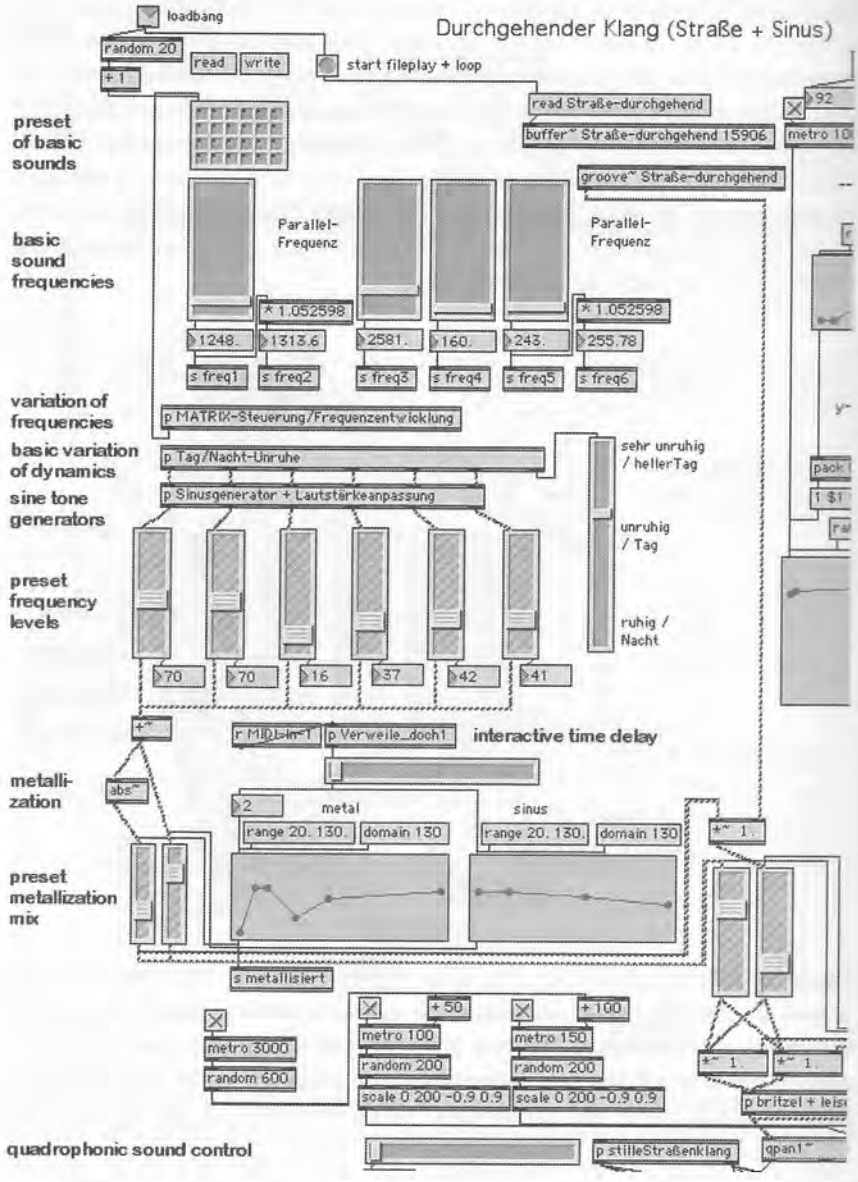

Figure 5: First sub-level: subpatch "Strassenklang" (detail) with control of 6 sine-wave generators located in the subpatch "Sinusgenerator + Laustärkeanpassung" (sine-wave generator and volume adjustment), which was also used for a frequency-dependent adjustment of the volume according to the acoustic situation in the sculpture.

any moment creates a sinister feeling, especially if one walks through the sculpture. This unstable balance of heavy masses causes a tension—one that is

initially even physically palpable—that interested me, and which to me determined the atmosphere of this sculptural situation—and my sonic situation.

Furthermore, the sculpture has highly unusual echo characteristics due to the not-quite-parallel sidewalls, where static waves between 101 and 276 Hz can arise. Mere steps with loudly-clapping shoes here produce an acoustic result. I therefore refrained from adding any reverb. All I did was to use a four-channel spatial distribution of the speakers, in order to allow the sound to wander or jump to the back.

The initial acoustic condition I created in the sculpture was a static, permanent drone that only changed if a visitor moved through this sonic situation or actually started playing with the six infrared sensors. The events were also partly influenced by the daylight (day/night, sunny, clouded). *Physical* movement (of the visitors, but also of the planet Earth) led to *sonic* movement. The possibilities of change via the sensors were not simply repeatable, as in a stimulus-reaction schema, but rather proliferated in the sense of a musical process. Over the course of those months, then, the situation was continually changing in its sonic composition, its dynamics, its temporal form and its rhythmic structure.

a) The synthetic starting material: 6 sine-wave generators

Corresponding to Serra's approach of working with his material (steel) in its simple materiality—in particular its heaviness—, the drone was produced by sine-wave generators, the simplest form of electronic sound production. Of the total of six sine-wave generators, two were able to move independently through the frequency range. The remaining four generators, on the other hand, were grouped in two pairs with a fixed frequency ratio. This ratio corresponded exactly to the ratio between Serra's curved sheets, 1:1.052598, thus approaching a semitone (1:1.059) (see Figure 4: the radii marked in). From this perspective, Serra's sheets are therefore almost a semitone apart, and in my drone one could perceive, in many variations, a constant movement around two note-pairs separated by this interval. This constellation provided the first case of acoustic tension, characterized by a relationship between proximity and distance as tense as that in the spatial constellation of Serra's steel sheets. The frequency relation with the *sculpture factor* of 1.052598 was one of the constants within the permanent variation, and thus a central characteristic determining the basic quality of the sonic situation.

b) Dynamic change: fluctuating unrest

The next step in the treatment of this still very static and uniform starting material was already influenced by a light sensor that brought the six frequencies into a dynamic state of unrest. According to the intensity of the light (day—night—sunny—clouded), the amplitude of each individual frequency was set in motion via band-limited white noise modulated onto it (Figure 6: function "rand" [edge]). On bright days, therefore, the sound was very restless, while the dynamic fluctuations became calm in darkness. The individual frequencies could then appear and disappear very slowly, and the random function of the band-limited white noise caused a constant variation in this dynamic change. This change, however, depending on the weather and the daytime, could be disrupted if someone remained directly in front of the sensor, cutting off the light, and thus bringing it—depending on the degree of eclipse—into a different state for a short time (60 seconds).

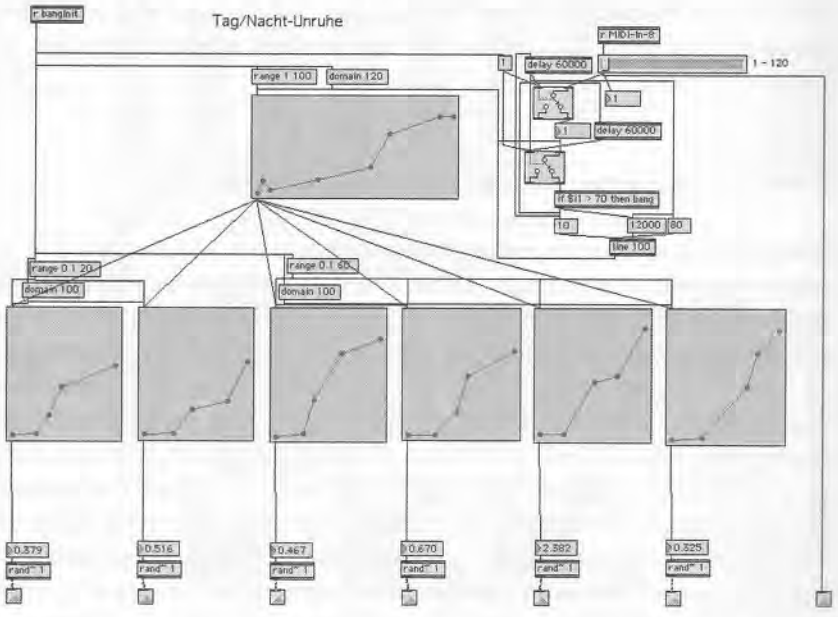

Figure 6: Subpatch "Tag/Nacht-Unruhe" [Daytime/Nighttime Unrest]. A light sensor (MIDI-In-8) controlled the dynamic shifts in amplitude via a general function (above) in the separate frequencies with the respect courses taken by their individual functions. Whenever someone stepped in front of the sensor, a value in this general function became decisive (depending on the depth of shadow) for a short time. – These dynamic changes between the individual frequencies brought the synthetic starting material to life, creating a state of calm or arousal according to the amount of light. It was precisely in times of greater unrest that the note-pairs circled one another separated by the afore-

mentioned fixed frequency ratio in a very striking fashion, causing internal fluctuations within the sound—a "fluctuating unrest" that accompanied the spatial situation of the ominously crooked steel sheets.

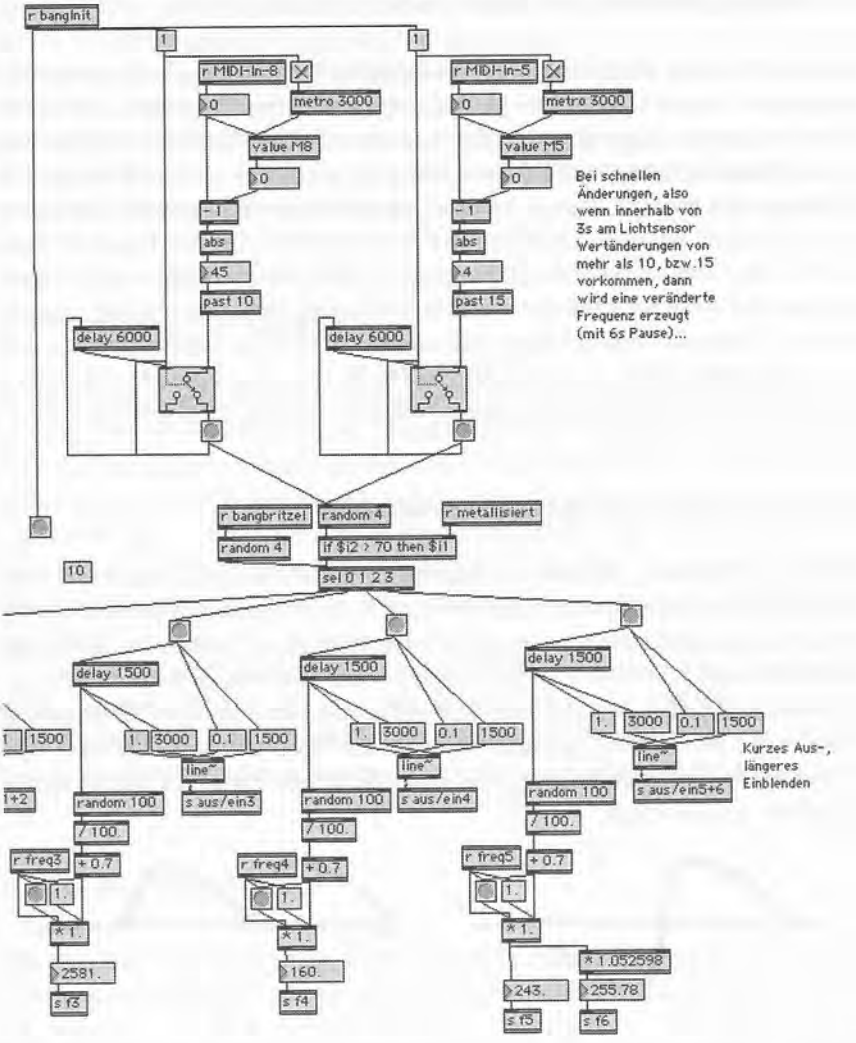

Figure 7: Detail of the subpatch "Matrixsteuerung und Frequenzentwicklung" [Matrix control and frequency development]. Rapid changes at one of sensors 5 and 8 (a visitor passing by) triggered a variation in the frequency: a first random procedure selected a sine-wave generator. Its momentary frequency was multiplied by a randomly-selected value between 0.7 and 1.7. If, for example, the frequency f3 = 2150Hz, it could change to 2581Hz through the factor of 1.2; here, the frequency f5 had just jumped from 267Hz to 243Hz and the coupled parallel

frequency f6 to 255.78 Hz. The changes thus more or less corresponded to the logarithmic frequency perception of humans.

c) Frequency variation: sonic developments over long periods

In a further step, the pitches of the six individual frequencies could change. If a passer-by moved quickly through the passage between the sheets, one of the four frequencies (together with the frequencies coupled in the fixed ration) was randomly selected and shifted up or down using a further random function. The change took place in such a manner that there were no completely arbitrary leaps; instead, each value followed on from the previous one (see Figure 7). Thus, in the combined sound of the six frequencies, only one or one pair was changed, so that the variation in the sound was internal rather than general. Over a longer period, however—depending on the number of visitors—all frequencies, and thus also the combined sound, developed further, making it possible that after a few days or weeks a high, brash sound might be replaced by a soft, deep one.

d) Change of sonic characteristics: metallization

Not only the form, but also the material of Serra's sculpture (rusting Corten steel) formed an important point of reference for my sound treatment. For the decisive change in the sonic characteristics took place through the process of *metallization*. A vibration, in the simplest case following a sinus curve, possesses one part above and one part below the zero line. This lower part of the curve was folded upwards through a simple modulus function, thus placing the entire vibration on the upper side (see Figures 8 and 5; metallization, *abs* function).

Figure 8: Sine curve with the negative part folded upwards, leading to a "metallization" of the sound.

This mathematical conversion produced many discontinuities, breaks and creases in the course of the vibrations, leading to a multitude of the non-harmonic overtones that are characteristic of metallic sounds. The degree of metallization was changed through a mixer, depending on the distance of the passers-by from sensor 1 (see Figure 5: preset metallization mix). This meant that anything between pure sine waves and sharp metallized sounds could

result. For the transitions either way, there were various mixer-curves assigned via presets to different drones.

Like the rust on Serra's sculpture, which originally caused distaste among those attending concerts at the Philharmonie, even the pure sine waves could appear "dirty" as metallized sounds. For if several starting pitches are related not by an even-number ratio or any other simple pitch-relation, but in a rather, shall we say, slightly crooked fashion (as with the sculpture factor), then the sound is further distorted. The metallized sound became "rusty." I was not entirely able to predict what form the distortion would take, as even a small change of frequency—triggered by a passer-by—could in fact substantially alter the sound. That was the exciting aspect of this open concept, but also the risk.

e) Rhythmicization of the sound

In the fifth step of treating the starting material, a rhythmicization of the drone was possible via sensors 4 and 5. The parameters of a temporal envelope (see Figure 9: interactive envelope) changed according to on a visitor's distance from a sensor. Thus a continuous sound could be made into a pulsating one. Depending on the type of envelope, this rhythmicized sound could be either soft or incisively hard. The frequency of the pulse was influenced via a sensor whose distance-value from a passer-by was translated into a speed-value (Figure 9: MIDI-In-5).

Depending on the drone, a second pulse on the same sound could also appear, with a similar control to pulse 1. Both together produced more complex, irregular rhythms, at times even in contrary motion. The overall volume of the two pulses was normalized downwards to avoid any unintentional distortion.

f) Modulation by traffic noise

The final step was the addition of the sampled traffic noise from the surroundings. It was modulated onto the current drone through a multiplication, changing the sound—depending on the sensor (see Figure 9: traffic noise mix)—into a form of white noise, which in extreme cases could barely be distinguished from the traffic noise.

Interestingly enough, this was an important aspect in the listening experience of the visitors: many of them told me that after listening inside the sculpture for a while, their hearing was sensitized to such a degree that they perceived the sounds of their environment more intensely even after leaving the sonic situation. In attempting to perceive the sounds and voices within the traffic noise, that same traffic noise itself became a mass of acoustic events.

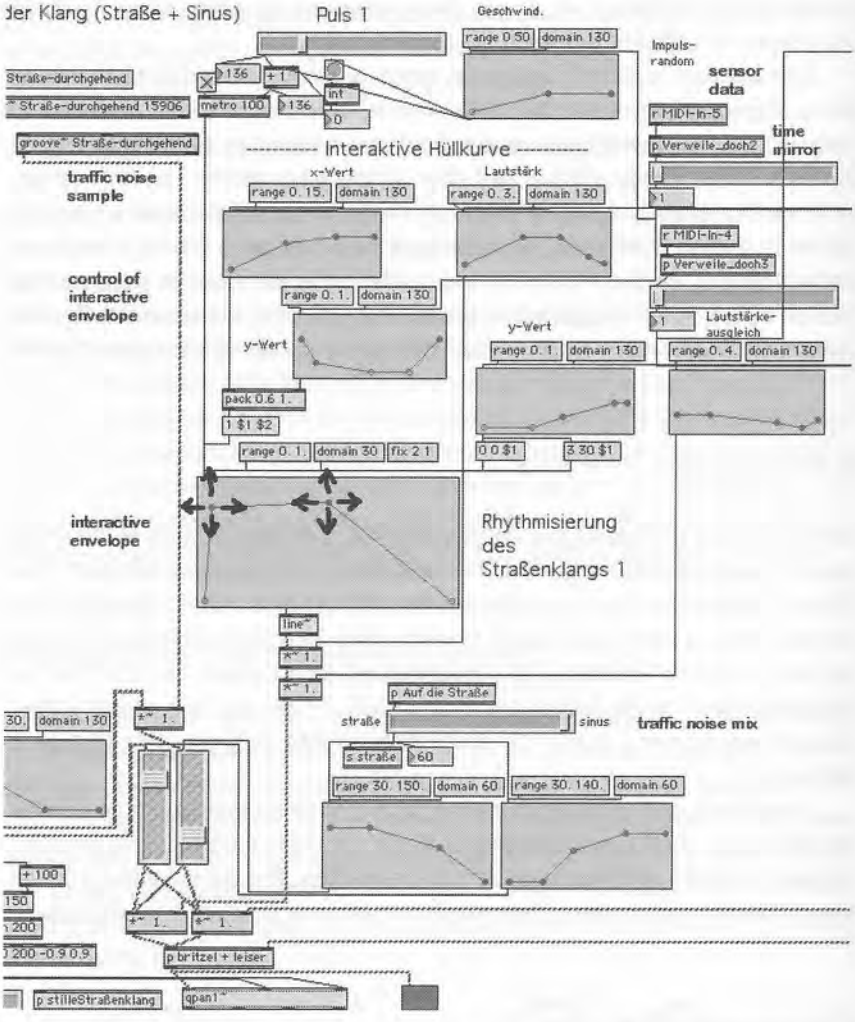

Figure 9: Detail of the subpatch "Strassenklang", one of two rhythm sections with an interactive envelope and modulation by traffic noise.

g) Time mirrors

Temporal links (e.g., Figure 9: time mirror *Verweile_doch2* and 3) were built into both pulse control systems—and also the interactive text control systems—to measure the duration of a visitor's interaction with a sensor and calculate the mean of the distance-value. If the visitor left the sensor, this tracking function repeated the visitor's action like a temporal and acoustic mirror.

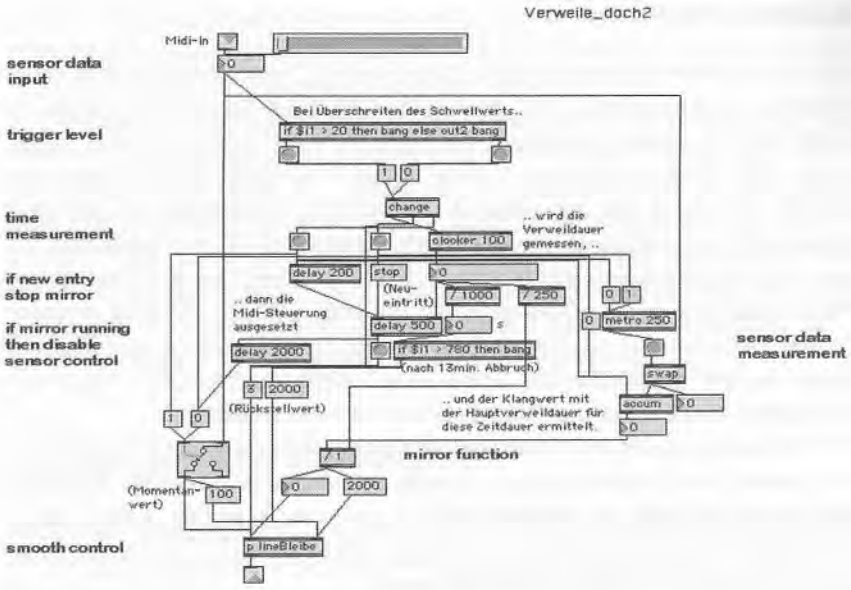

Figure 10: Temporal and acoustic mirror, which measured the duration and mean distance of visitor activity at a sensor, and mirrored it through repetition after the sensor had been left.

g) Modes of different drones and their possibilities of variation

For the steps in sound production and sound treatment outlined from a) to f) I ultimately developed 36 modes, in which drones of differing composition and their individual processing forms were preset (see Figure 5: preset of basic sounds). Each of these modes thus contained a drone of 4 + 2 frequencies, a preset degree of dynamic unrest, metallization of the sound, rhythmicization and modulation by noise. These default settings could be individually changed in their volume and specific interactive changes (e.g., the course of the curves in "metallization mix," "interactive envelope," "traffic noise mix"). The interactive changes and developments described above were thus possible *within* each mode. A change to a *different* mode only took place in a particular constellation of the sonic situation, namely when the sensor had been sufficiently stimulated by a visitor for the poem by Brecht ("Der Radwechsel") to sound in full, i.e., to the last word "Ungeduld" [Impatience].[3]

3 Bertolt Brecht: *Der Radwechsel* (1953) (Translation: David Sanchez)
"Changing Wheels
I sit at the roadside. The driver is changing the wheel.
I don't like where I come from. I don't like where I am going.
Why do I watch the changing of the wheel with impatience?"

3. Dynamic sound curves

The drones were conceived as static, "inert sounds," which would only be set in motion once the audience was moving through them. But even if a sound is static there is already movement, for even an "inert" sound requires movement—that of the sound-source and the transport medium—in order to become audible, to exist in the first place. A contradictory relationship of stasis and movement, as unstable of the seemingly paradoxical "frozen movement" of Serra's heavy, stationary and at once dynamically-formed "curves." I translated their shape into music in two respects: the ratio between the radii of these "curves" corresponds to the aforementioned frequency ration of roughly a semitone, and determines the fundamental, static tension state. The curves themselves reappear in the "sound curves" of the installation.

The sound curves are 26-second pitch sequences comprising the notes of the current drone, whose precise course is determined by the visitor activity at the sensors. As with the shadow outlines inside the sculpture, whose shape shifts with the changing position of the sun (see Figure 11), the form of these sound curves varies with every appearance.

Figure 11: Depending on the position of the sun, different shadow curves were cast into the interior of the sculpture. This was mirrored in the structure of the "sound curves," which varied with a similar constancy of form.
Figure 12: A few boys trying out the sensors on the ground (July 2001).
Figure 13: Visitor covering a voice sensor with her shoes while listening (June 2001).

a) Bent pitch sequences

The sound curves were triggered via sensors 1 and 5, i.e., whenever a passer-by walked past or over one of these sensors. The frequencies of the current drone were then taken to produce the sound curve with the subpatch "Strassenklang"

and placed into a variable 26-second pitch sequence. It was made impossible to trigger a new sound curve at the same time and for the next 14 seconds, in order to preserve these as separately perceptible events.

The shape of each sound curve (see Figure 14: curve) had fixed starting- and end-points as well as an unchanging final phrase, which formed a constant characteristic within the variable sonic situation. Between these (in the segment from 1-18 seconds) the course taken could change according to a visitor's distance from sensor 1 or sensor 5: for example with a rapid ascent and drawn-out descent leading into the closing phrase, or falling evenly and rising gently until the closing phrase. These distended, bent pitch sequences had a maximum range of one whole tone upwards or downwards.

b) Dynamic progressions and metallization

Within this pitch sequence, the volume of the individual frequencies changed according to six further dynamic curves (see Figure 14: amplitude envelope). In this manner, each sound curve was assigned a form of frequency behavior outside time, i.e., the sound changed internally at the same time as following the pitch sequence.

A further step involved a metallization of the sound, as in the shaping of the drone. The degree of metallization was here determined by a random function triggered by the passers-by. Depending on the value selected, the sound of the sound curve could differ from that of the drone to a greater or lesser extent, even if the frequencies had been identical as starting material.

For all four main processes there were additional pausing functions, which were controlled via an internal control system (e.g., Figure 14: subpatch "stilleSkulpturklang"). A particular constellation—a change of mode—could also lead to a general pause through the subpatch "stille" [silence] at the uppermost level (see Figure 3); in this silence, only the sounds of the surroundings and the noises and voices of visitors could be heard. As the months passed, after all, the installation was not used only for listening. Some people sang or played the saxophone or didgeridoo to the sounds in the sculpture. I myself organized many concerts to accompany the installation, what I referred to as "mid-issages," for example with a 60-voice choir.

For me, making a location speak has something to do with its *vitalization*. The fact that I was working in that particular place with *disembodied sounds and human voices*, which rose up from the ground within the sinister, spatial transit situation of Serra's sculpture is related to the traditional way of contacting the dead implied at the beginning (part I), and which is connected to the history of the location. The second historical connection came about through the title of Serra's sculpture, *Berlin Junction*. It had been created in 1987, while the Berlin Wall was still standing, and for me the two curves, ominously

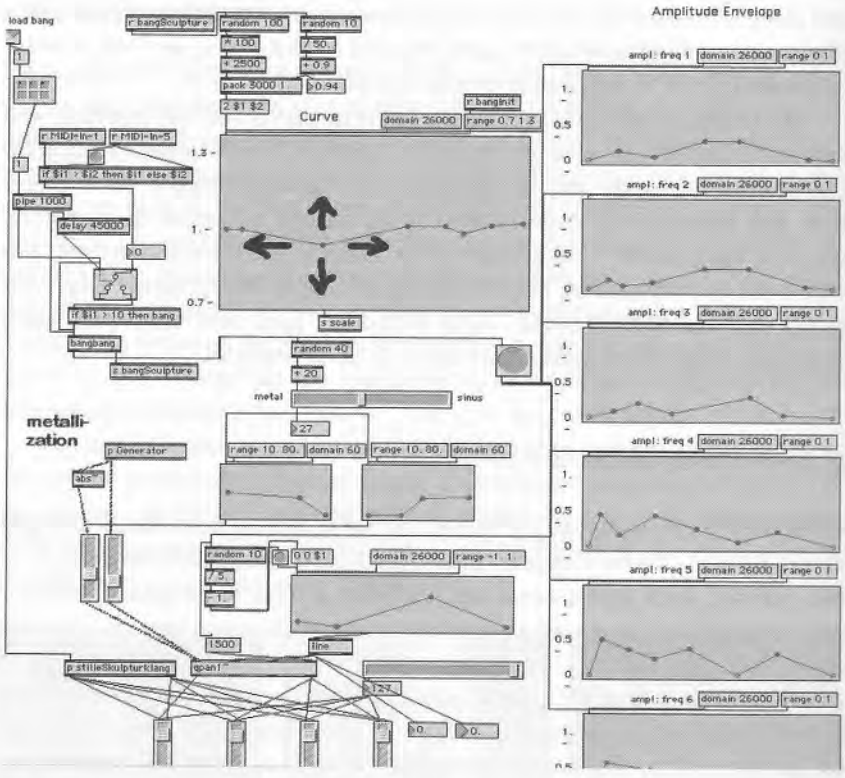

Figure 14: Subpatch "Skulpturklang" using sound curve (pitch sequence) with fixed points at the start and the end, and variable pitches in between. On the right the dynamic progressions of the individual frequencies.

Figure 15: Visitors singing to the sounds in the sculpture (during the Love Parade, July 2001)

Figure 16: The choir *Berliner Capella* around the sculpture. Listeners were able to move between the singers and through the sculpture (Midissage II).

Figure 17: Nocturnal saxophone improvisation by Ulrich Krieger to the sounds in the sculpture (Midissage IV).

collapsing into each other and yet immobile, represented the status quo of the divided city. In this constellation *transition*, from 2001, emphasized the transition, the reaching of a state of flux after the fall of the wall, with all its imponderabilities.

These historical references, however, were no more than a background to the development of the sonic events. They were not depicted on site, but only in an accompanying catalogue.[4] A central aspect was that of confusion leading to curiosity, but also to an ambivalent feeling: an "un-settling" in the sense of an inner movement expressing itself in the external motion of the constant stream of people, sounds and time as a form of repose. A deceleration amidst the rapid activity of our everyday lives, of lingering in a transitional situation.

III. Acoustic text topography in TRASA warszawa—berlin

In the sound/video installation *TRASA* I occupied myself further with transitional situations, probing more deeply into everyday life and public spaces. This installation is a direct continuation of *transition*, even if completely new elements appeared and others moved to the background. *Trasa* is the Polish word for a marked-out route. While the conception of *transition* aimed more towards individual listening within a sonic and spatial space of transition and encounters between visitors had no particular significance, interactive contact and communication between the passers-by became central in *TRASA* within a trans-national space. An audio-visual path was marked out between two cities, creating a *bi-medial contact space*.

1. The basic concept of TRASA

In *TRASA* I worked with two passage-spaces simultaneously, two subway entrances at central squares in Berlin (Alexanderplatz) and Warsaw (Plac Defilad). The two passages with their stairways were connected both visually and—indirectly—acoustically via a fixed Internet line, not only for the duration of a single evening, but rather day and night for two months, so that the installation could have an effect on people's everyday lives.

a) Visual contact

In each of these two centrally-located underground passage-spaces, video pictures of the urban space with random passers-by were recorded and then transmitted to the other city via live Internet stream. Distortion and delay were

4 *transition textbuch*, with essays by Sabine Sanio, Caroline Neubauer, Georg Klein, Götz Aly and Eckardt Tramsen (Saarbrücken: Pfau, 2001).

Figure 18: Warsaw, central subway station, stairway with projection space (Berlin on the left, Warsaw on the right) and suspended speakers (top left).
Figure 19: Berlin, subway station Alexanderplatz, stairway with projection space (Warsaw on the left, Berlin on the right) and speakers attached to the pillars (left and right).

applied both to the picture from the respective other city and the on-site picture, which were then projected together onto a facing wall. The passers-by in each urban space thus had a direct view of the other urban space—and at the same time of themselves: perception of the self and of others as a simultaneous process.

Figure 20: A woman in Berlin, on the left, and a man in Warsaw, on the right, merge virtually in the center of the picture, becoming a single person with two arms (projection wall in Warsaw). As a staircase led downwards in front of the projection walls, people could also disappear below the picture and then reappear. Similarly, the visual distortion and roughly 2-second delay in both pictures (local and remote) led to many playful communication forms.

b) Acoustic-literary contact

Within this visual constellation a route was defined in the space, using a laser distance sensor, on which a text became audible—in Berlin the poem "Glückloser Engel" by Heiner Müller, in Warsaw the poem "Train Station" by Wislawa Szymborska. Upon reaching a certain point in the sensor area, passers-by heard the text-passage assigned to that location in a language-musical setting. In this manner, people could physically pass through the text and experience it depending on their own position: an acoustic text topography. The text loops were played via 10 or 16 red horn loudspeakers distributed throughout the space, as well as two hi-fi speakers each, with changing sonic variations and multiplications. While the passers-by in the Warsaw passage determined the flow of the Polish text, those in the Berlin passage controlled that of the German text. The two sets of control data were transmitted simultaneously, so that the texts were heard in both spaces. The two languages mingled in a shared sound space between comprehension and incomprehension.

TRASA was in two senses a "multilingual" and "reflective" installation connecting two urban centers in Europe along the east-west axis. The relationship between the countries of Poland and Germany, as well as that of the two capitals, has been an eventful and often one-sidedly hostile one. The installation established a temporary medial contact within this historical *tension space* that also raised the question of the *success of contact* in our present medial society. Alongside the aspect of the bi-national tension space, the choice of location was also determined by the historical development of each square. The Alexanderplatz and the Plac Defilad are both centers that were shaped by socialist architecture, but meanwhile remodeled by capitalism. In this fleeting, highly mercantile atmosphere, where one person barely perceives another, the everyday routes of passers-by were confusingly interrupted: an *urban intervention*. On their way from the department store to the subway, they were confronted with their mirror image and a different living-space, and led into a poetic sound space.

With such a project that intervenes in everyday life, the visual side is the primary aspect, as orientation in the public space takes place mostly visually. With most passers-by, looking at themselves in this defamiliarized manner on a wall in a large format led them to investigate this audio-visual situation further. The delay-effect in particular often stimulated them to play at length with their own mirror images. If this was augmented by the communication possibilities with the silent live images from the other city, it often resulted in exciting encounters, sometimes moving scenes, sometimes also unpleasant moments.[5]

5 See the documentation of audience actions in the catalogue *TRASA warszawa-berlin*, ed. Julia Gerlach, with articles by Barbara Barthelmes, Uwe Rada, Georg Klein, Julia Gerlach and Piotr Rypson, German/Polish (Heidelberg: Kehrer, 2004). Video documentation (in English) at www.georgklein.de.

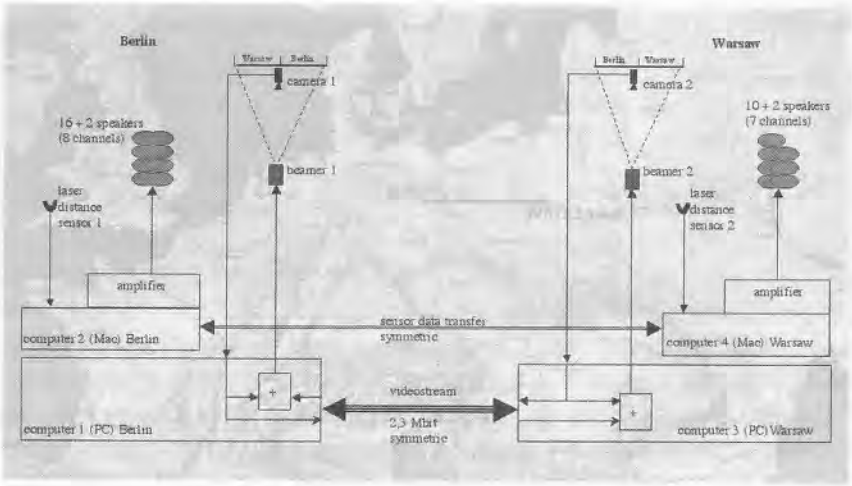

Figure 21: Schematic sketch of *TRASA*. Technology and Internet connections used. The two cities lie only about 600 km apart. Due to historical events, however, the emotional distance between the two neighboring countries is substantially greater. This "distant closeness" in a tension space was one of the criteria in the selection of the two cities and their mode of connection.

The acoustic side of things was much more random and peripheral by comparison, but nonetheless determined the atmosphere of the audio-visual situation. Many of those passers-by who allowed themselves to be confused and stimulated by the visual side read the text-panels with explanations of the project on the sides, and then also began to perceive and discover the acoustic side more consciously. In the following I shall deal purely with the acoustic side and the concept of *acoustic text topography*.

2. Acoustic starting material and interactive route

As in *transition*, the acoustic starting material for *TRASA* consisted of synthetic sounds, as well as the recorded sounds of a turnstile (entry gate in the Warsaw subway) and, very importantly, the recordings of spoken poems.

The initial state of the installation was a continuous synthetic sound from the two hi-fi speakers, which merged very strongly with the surrounding sounds of escalators and trains. This was accompanied by the whispering of the two poems, which issued quietly and permanently from the red horn loudspeakers. These horn loudspeakers have a very particular, narrowband sound character, similar to megaphones, and thus form a part of the acoustic starting conditions like an instrument. But they also influence the audio-visual situation through their striking protective grilles and red-brown color (see Figures 23 & 25). They are remnants of socialist production, and were removed directly in front of one

of the train stations, namely Alexanderplatz. For several decades they served the transmission of announcements—and now poems. Only those who listened directly by the loudspeakers, however, could make out anything amidst the tapestry of whispers. This initial acoustic state changed, however, as soon as a passer-by stepped into the sensor area.

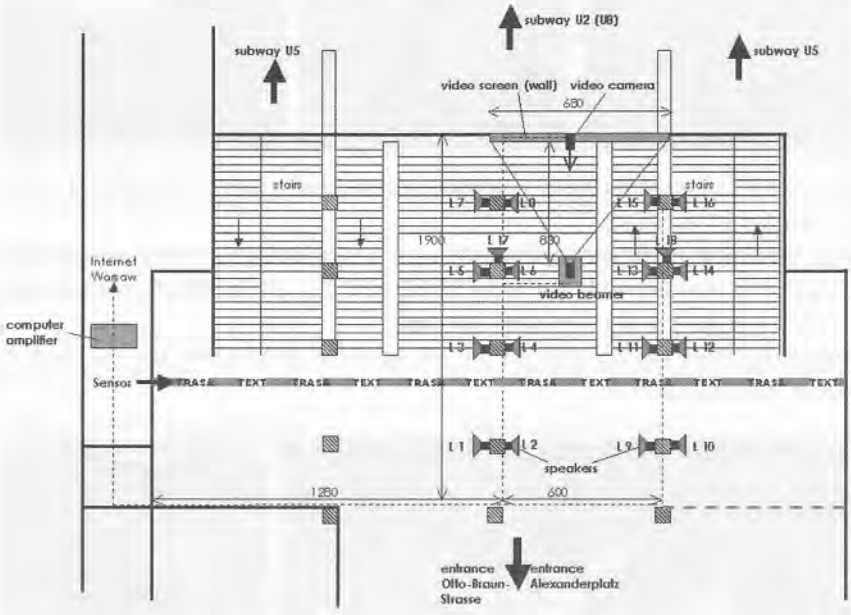

Figure 22: Sketch of the setup at Berlin Alexanderplatz. With a total of 18 loudspeakers (L 1–18) on the pillars of the stairway, video camera and official, the projection wall opposite and the interactive text route (—TRASA—TEXT—).

The interactive route was realized with the help of a laser distance sensor (with casing) attached to the side of each wall (see Figures 22 & 24). The beam of each laser was located roughly at hip-height, crossing the most common direction of the passers'-by movements a few meters away from the landing. On the floor, the interactive route—24.5 m long in Berlin, 17 m long in Warsaw—was marked as a line made from the words TRASA—TEXT—TRASA—TEXT (see Figs. 22, 26 & 27). If passers-by went through the sensor area or crossed a light barrier, a single measurement of their momentary distance was taken. If they walked along the line, their distance from the sensor on the sidewall was measured continuously.

The poems were not only employed as lingual sound material, but also as a reflection upon the real-life situation in this installation. Both texts describe situations of coming together, yet ultimately not coming together. Both deal with something that is missing. In the audio-visual situation on site, people could see one another yet were far apart at the same time. They could not speak to one another, yet heard the two languages nonetheless.

Figure 23: Loudspeaker-pairs in Warsaw whose front grilles corresponded to the structure of the ceiling.
Figure 24: Laser distance sensor with metal casing and glass front panel on the sidewall in Warsaw, with the start of the text line on the floor. In Berlin the sensor was built directly into the sidewall.
Figure 25: Horn loudspeaker on the pillars of the escalator in the stairwell at Berlin Alexanderplatz.

Figures 26 & 27: Text route with audience on the line (—TRASA—TEXT—) in Warsaw. The pairs of red horn loudspeakers hung perpendicular to the line, while the two hi-fi speakers were hidden under the ceiling directly above the text line. On the sidewall was the text-panel with the description of the project and the poems translated into the respective national language.

In the images used in both poems, there is a private intimacy that stood in opposition to the anonymous public situation in which they were appearing. And in fact very emotional scenes of successful and failed communication between Berlin and Warsaw residents took place in front of the projection walls, chance encounters turned into full-blown flirts, and all these contacts were defined by the "distant closeness" that characterized this situation.

Furthermore, one finds the thought of a utopia appearing in the poems: one that can perhaps no longer be attained, as with Szymborska: "In the paradise

lost of probability. / Somewhere else. / Somewhere else. / How these little words ring." Or one that is no longer recognizable, as in the Müller: "The angel I hear him still / Though he no longer has a face / But yours which I do not know". Both poets end here with acoustic metaphors for their images of lost utopia.

Wislawa Szymborska: Dworzec[6]:	The railroad station
Nieprzyjazd mój do miasta N. odbył się punktualnie.	My nonarrival in the city of N. took place on the dot.
Zostałes uprzedzony niewysłanym listem.	You'd been alerted in my unmailed letter.
Zdążyłés nie przyjść w przewidzianej porze.	You were able not to be there at the agreed-upon time.
Pociąg wjechał na peron trzeci. Wysiadło duzo ludzi.	The train pulled up at Platform 3. A lot of people got out.
Uchodził w tłumie do wyjścia brak mojej osoby.	My absence joined the throng as it made its way toward the exit.
Kilka kobiet zastąpiło mnie pośpiesz nie w tym pośpiechu.	Several women rushed to take my place in all that rush.
Do jednej podbiegł ktoś nie znany mi, ale ona rozpoznała go natychmiast.	Somebody ran up to one of them. I didn't know him, but she recognized him immediately.
Oboje wymienili nie nasz pocałunek, podczas czego zginęła nie moja walizka.	While they kissed with not our lips, a suitcase disappeared, not mine.
Dworzec w mieście N. dobrze zdał egzamin z istnienia obiektywnego.	The railroad station in the city of N. passed its exam in objective existence.
Całość stała na swoim miejscu. Szczegóły poruszały się po wyznaczonych torach.	The whole remained in place. Particulars scurried along the designated tracks.
Odbyło się nawet umówione spotkanie.	Even a rendezvous took place as planned.

6 Wislawa Szymborska, *Dworzec*, in: *Sto pociech* (PIW, 1967), translated by Stanislaw Baranczak and Clare Cavanagh.

Poza zasięgiem naszej obecności.	Beyond the reach of our presence.
W raju utraconym prawdopodobieństwa.	In the paradise lost of probability.
Gdzie indziej. Gdzie indziej. Jak te słówka dźwięczą.	Somewhere else. Somewhere else. How these little words ring
Heiner Müller: Glückloser Engel 2 (1991)[7]	Unlucky Angel 2
Zwischen Stadt und Stadt Nach der Mauer der Abgrund Wind an den Schultern die fremde Hand am einsamen Fleisch Der Engel ich höre ihn noch Aber er hat kein Gesicht mehr als Deines das ich nicht kenne	Between city and city After the wall the abyss Wind at the shoulders the foreign Hand on the lonely flesh The angel I hear him still Though he no longer has a face But yours which I do not know

As I have already implied, there were two possible ways for the acoustic side to develop: through *chance interaction*, unconsciously triggered by the movements of passers-by, or through *controlled interaction*, where passers-by were able to influence the acoustic events consciously.

3. Chance interaction

The interactive route was divided into different zones. As most passers-by only went through the sensor area briefly, the decisive factor was which zone they crossed.

a) Variation of the synthetic sounds and triggering of the barrier sound

As I already described the far more complex sonic development of synthetic material in *transition*, I will now present only the basic features of the sonic variation. The synthetic sounds formed the sonic background that allowed each space to be submerged in a particular light, as it were. They consisted of a set of 12 drones that could change interactively, but without the intention of any

7 Heiner Müller, *Glückloser Engel 2*, in: *Die Gedichte*, Werke 1 (Frankfurt a. M.: Suhrkamp, 1998), translated by Mark Washeim.

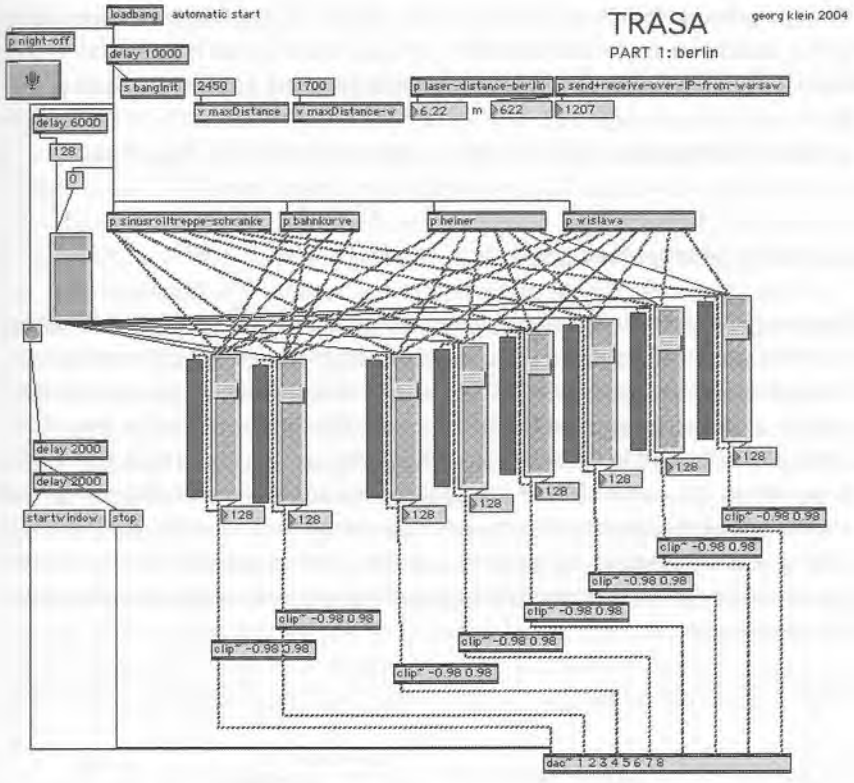

Figure 28: Top level of *TRASA* with the four main processes (Subpatches "sinus-rolltreppe-schranke" [sine wave escalator barrier], "bahnkurve" [train curve], "heiner", "wislawa"). Above that the data from the laser sensor in Berlin and the data received via Internet from Warsaw.

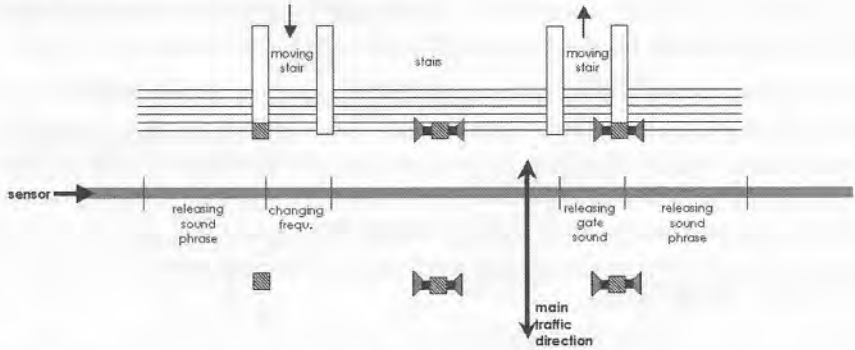

Figure 29: Interactive zones on the text route in Berlin. The passers-by went through the sensor area (gray) as if through a light barrier. The distance was measured, so that correspondingly divergent acoustic events were triggered.

directed control. Their transformation was merely triggered in particular zones of the interactive route and involved a change of individual frequencies in the overall sound, as well as temporal/rhythmic phrases. Even the sound of the barrier was simply triggered in one section in front of the escalator, causing as a symbolic interruption of the continuous flow of sounds (see Figure 29).

b) Filtering of speech sounds

The two poems in the original languages of Polish and German were "whispered into" the sound space—i.e., via a very narrowband filtering further reinforced through the sonic characteristics of the horn loudspeakers—in a permanent loop. If a passer-by entered the sensor area, the filter switched to one of six settings that made the speech sounds much clearer (see Figures 30 & 31: voice filter). When the passer-by left the sensor area once more, the filter switched back to one of 18 narrowband settings with a delay of two seconds. The choice of setting was determined by random selection. One could say that the voices jumped from the background to the foreground with constantly changing sonic characteristics.

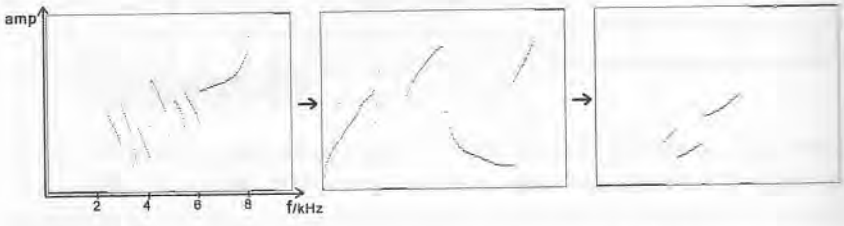

Figure 30: The speech sound filter consisted of 256 bands that were assigned graphically to 24 filter presets. From a narrowband setting (left) the filter could switch to a broader-band setting (middle) and back to a narrowband one (right).

As these two interactive control systems were transmitted via Internet, the local actions also had effects in the distant space. One could, for example, suddenly hear a clear Polish voice in the Berlin space because someone had just walked through the sensor area in Warsaw. This change in the speech sound attracted one's attention briefly while walking through the sensor area. If a passer-by then stopped in the sensor area, this activated further processes that could be controlled by the visitors.

4. Controlled interaction

a) Acoustic projection of text into the space

In the extended sensor area (see Figure 22), the text—in Berlin the poem by Heiner Müller, in Warsaw the poem by Wislawa Szymborska—was spread out in the space as if it were written there along a line. In fact, however, the text was present not in written form, but rather as a spoken text: if a passer-by stepped on a particular part of this line, the corresponding part of the text was spoken. If a passer-by moved along a line, he could move acoustically through the entire poem. But there could also be disturbances: if a second passer-by appeared between the sensor and the first passer-by, the text jumped to the new point.

I refer to this coupling of an acoustically-represented text and a spatial dimension as *acoustic text topography*. It was controlled via the distance-values measured, which had access to the saved sample of the recording via a history function (see Figure 31: play position in sample). Through this graphic function it was possible to distribute the whole text along the length of the sensor route in different site-specific ways. In Berlin, the poem by Heiner Müller started in the middle of the route and progressed towards both sides. In Warsaw, as the Szymborska poem was much longer, the text was divided into three sections that were projected acoustically in alternation along the sensor route.

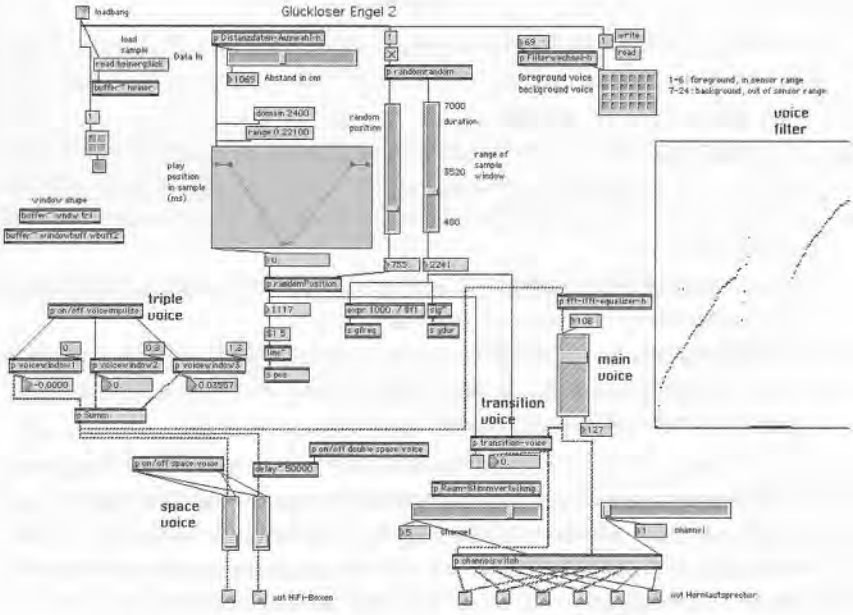

Figure 31: Subpatch "heiner". Sample control and voice multiplication, as well as filtering of the spoken recording of Heiner Müller's poem "Glückloser Engel."

b) Loop generation

In order for the text passage on which a visitor was standing or walking at a given moment to sound, a time window was placed over the corresponding point in the recording and this section was then looped (see Figure 32: text window). As in the process of granular synthesis—only with long grains—the time window was applied with a show/hide window function (see Figure 33: voice window). The length and position of the time window or loop could thus be varied in several respects:

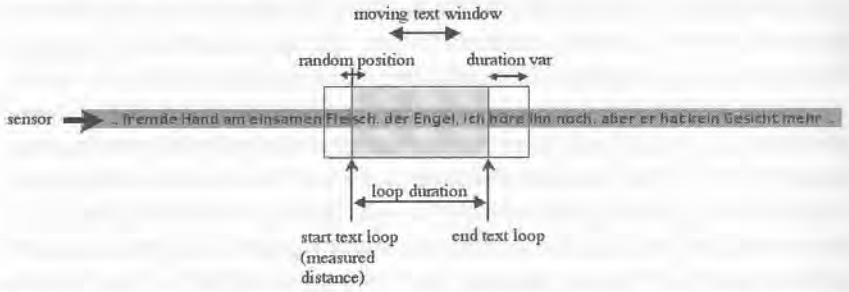

Figure 32: Text window that was moved over the speech sample according to the distance measured between the position of a visitor and the laser sensor (moving text window). The text loop was thus varied in its starting position and duration.

1. The *length* could vary between roughly 0.4 and 7 seconds (Figures 31 & 32: loop duration, there 2.241 sec.). This meant that both short text fragments and entire lines could appear.
2. This length was then constantly altered slightly via a random function (see Figures 31 & 32: *duration var*), so that the distension of the time window varied in relation to its absolute length. This lead to a first movement around the text passage.
3. The *starting position* changed according to the visitor's position measured as described in a) (in Figure 31 10.69 m).
4. This starting position could likewise be slightly shifted through a random function (see Figures 31 & 32: *random position*). The text loop thus varied in a second movement around the text passage.

Thus, if a visitor remained on a point within the sensor area, these processes started to encircle the text passage being played in such a way that the text was no longer repeated mechanically and rigidly, but rather in variations. As the varied repetitions followed on from one another seamlessly, new text elements and phonetic amalgams arose, as well as new semantic contexts:

Text window (see Figure 32):.. -sch, der Engel, ich -sch, der Engel, ich -sch, der Engel, ich ...
Shifted backwards: .. Fleisch, der Engel, Fleisch, der Engel, Fleisch, der Engel ...
Extended forwards: .. Fleisch, der Engel, ich höre .. Fleisch, der Engel, ich höre .. Fleisch

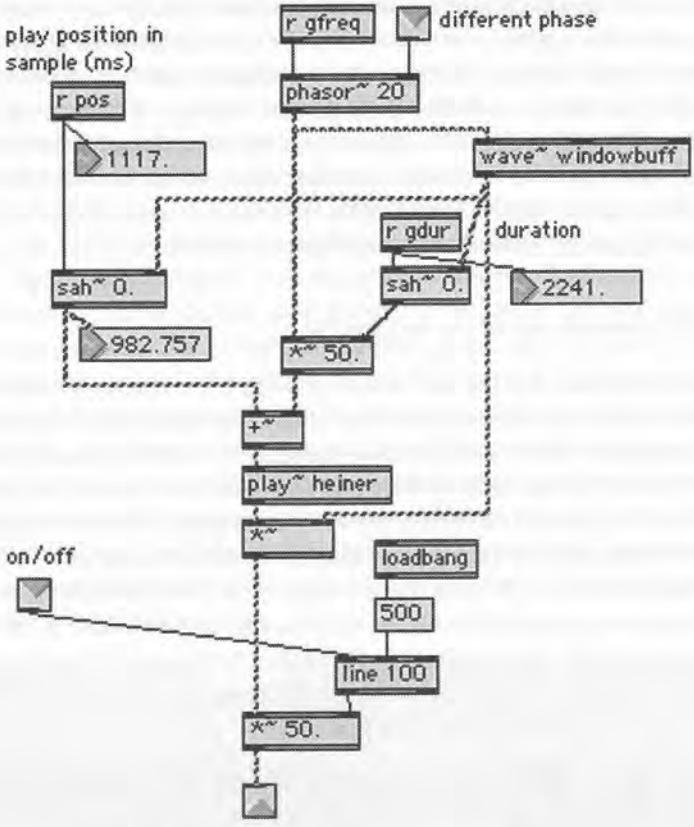

Figure 33: Subpatch "voice window1," which generated a time window with a show/hide window function and played it as a looped text excerpt (according to a granular synthesis program created by Nobuyama Sakodna).

b) Appearance of the full-voiced reading and vocal multiplication

The looped text passage was produced three times (Figure 31: *triple voice*) using generators with different phases, displaced by 0.8 and 1.3 seconds. The multiplied voices were not played permanently, however, but only in whispering mode, or if there was movement on the text route.

The speaking voice was transmitted via the horn loudspeakers as described above. Through the trebling, the single voice became a tapestry of whispers whose individual parts, through the six-channel distribution, sounded from different spatial positions that could be in constant change. If the sensor area was crossed, the whispers became clearer through the speech filtering. If a passer-by now paused on the text route, the corresponding text passage was played through the hi-fi speakers with a delay of roughly one second. The

speech sound became full-voiced and the synthetic background sounds vanished, so that the spoken text filled the entire space (Figure 31: *space voice*).

After a certain time, a further voice with delay could join this voice and disappear once more, controlled by a random function (Figure 31: *subpatch on/off double space voice*). If the passer-by continued along the text line, this also triggered a second voice with a smaller delay, which had the effect of an echo (Figure 31: *transition voice*). Thus any movement was certain to cause a vocal multiplication, while standing still calmed it down.

c) Internet transmission of the text control

The interactive control of the text flow on site had effects not only in that actual location, but was also transmitted to the other urban space via an Internet line. Both languages—Polish and German—mingled in a shared sound space, in which at times the one, at times the other emerged more clearly. The programming of the text control system, however, was adapted to the individual locations with their different acoustic conditions and different spatial distributions of the loudspeakers. In Warsaw the acoustic constellation was more favorable, as the space was substantially higher and less diffuse than in Berlin. Taken as a whole, the acoustic side constituted a fluctuation between speech as sound and speech as meaning, which was further emphasized through the choice of two similar, low female voices for the two poems.[8]

Figures 34, 35 & 36: Text line/sensor route in Warsaw with passers-by

The interactive variation of acoustic starting material constituted the central musical procedure in both *TRASA* and *transition*. In total there were three modes that produced variation: a mode *uninfluenced* by the listeners, in which the variations resulted from changes in the environment (the weather, the light or the traffic) and computer-controlled random functions, a second mode in which further processes were simply *triggered* by the passers-by, and a third in which the visitors could consciously *act on* and influence the acoustic processes. The combination of these three modes of random and non-random variation shifted the interactive possibilities from a simple stimulus-response schema to a more complex structure in which each individual visitor is part of the overall process.

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The sonic result of this process can only be described and documented in rudimentary terms, as it is not predetermined and is designed for a large period of time. Dealing with this openness is one of the difficulties, but also one of the challenges of such a project. Over the course of several months, there can be less interesting moments as well as especially exciting and intense ones. That depends on the momentary sonic situation and the behavior of the listeners. The work evolves in relation to their activity, both mental and physical.

In *TRASA*, the possibilities of audio-visual interaction transformed these spaces, which were normally used in a purely transitory fashion, into an aesthetic space of communication: a bi-medial contact space. The restrictions and defamiliarizations in the contact possibilities demanded communicative resourcefulness, a playful interaction with the other person. The space in front of the projection wall became a stage. The installation fed off the participation of the audience, who here became protagonists. It was precisely the separation of the two elements—the acoustic-literary medium and the silent visual one—to create an independent coexistence that demanded the physical participation of the visitors. In a setting of the most modern medial processing and transmission resources, the passers-by were dependent on an age-old means of communication: body language.

Figure 37: Gestural communication between visitors in Warsaw (left) and Berlin (right). Projection wall in Berlin, made—unlike that in Warsaw (see Figure 20)—of green-tinged bricks. Through the direct projection, the walls in both urban spaces were made permeable and turned into medial windows.

In *TRASA* and *transition*, real physical movement within a real space led to movement in an immaterial space—the *sound space*, and then in *TRASA* also the *visual space*, which developed virtually through the medial connection of two urban spaces. In both works the interplay of sound and movement, of corporeality and immateriality is the decisive factor. It is in the incorporeality of the electronic devices and media that the body is brought into play once more.