

SONIFICATION IN MUSIC

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ABSTRACT

Seen from the vantage point of cultural history, contemporary sonification is essentially characterised by two aspects that to date have seldom been considered in combination: the first aspect is sonification as the transformation of the inaudible into the sphere of the audible, and the second its use as an instrument for gaining knowledge via the concrete listening experience.

One of the aims of the research project "Denkgeräusche" ("Sounds of Thought"), conducted at Bern University of the Arts, was to make a contribution to a (yet unwritten) cultural history of sonification. With this target in mind, a database was compiled of historical and contemporary musical compositions in which procedures associated with sonification were employed.

1. INTRODUCTION

Throughout the history of music, reproducing data by means of sound has played a role, without however being explicitly referred to as "sonification". In retrospect, many compositions that at the time of their inception were classified in categories such as "transformation", "analogy", "numerical games" or "algorithmic composition" can be identified as "data music".

Millennia music was, namely, understood above all in terms of arithmetic. Ever since Pythagoras of Samos was believed to have established proof of a basic correspondence between the visible and the audible world about 500 BC with the help of the monochord, it was considered an unquestionable fact that the cosmic order was based on harmonic proportional intervals. However, the conviction that music was the predominant, overarching art of arts remained confined to theory and was not implemented in the practice of musical composition. After Pythagoras, the ear was hardly ever involved in metaphysical number speculations for far more than 2000 years. Not before the Renaissance, when the "beautiful proportion" was increasingly applied as a compositional principle in the creation of secular art, did the gap between theory and practice narrow.

1.1. Media History

The prehistory of sonification can also be told in terms of the development of media technology. The invention of the stethoscope by René Laënnec (1816) allows us to auscultate the human body without injuring it. The aim is to obtain information on heartbeat, blood flow, lung function etc.

Around 1940 Leon Theremin developed a concealed microphone, or "bug", thus transferring the method of auscultation to the realm of military and communication technology. Here the aim is to obtain information on the doings of subversive elements. In line with this approach to "making

sense of data", sonification can also be understood as auscultation of a "virtual body of data" (Volmar 2007).

A parallel media history of sonification can be established beginning with the invention of the telephone and the loudspeaker by Alexander Graham Bell (1876) and the phonograph by Thomas Alva Edison (1878). In fact, storage, reproduction and transmission of sound are prerequisites of sonification, which instead of reproducing recorded sound waves, acoustically reproduces measurement curves.

1.2. Cultural History

In 1919 Rainer Maria Rilke wondered what sounds might possibly be heard if a run along the coronal suture of the human skull were acoustically reproduced (cf. Dombois 2002, p. 89). After this early idea for an audification, other noteworthy audification precursors emerged during the 1920s.

In 1923, the Bauhaus artist László Moholy-Nagy proposed cutting graphic signs directly into gramophone discs (Kahn 1999). Since the acoustic results remained unsatisfactory, he switched his experimentation in the early 1930s to the medium of film. This time, he drew his abstract forms directly onto the optical sound track, which, when played back, generated electrical impulses by means of a photocell that were then in turn converted into sound (Manning 2003).

Beginning in 1932, Oskar Fischinger, too, followed this approach in reference to the "visual music" of abstract cinema that emerged as a synthesis of music and painting (Schoon 2006). After World War II, the Scottish-born Canadian filmmaker Norman McLaren reverted to drawing on the optical sound track of films directly, perfecting this principle in subsequent works such as "Synchrony" (1971).

In music history, precursors of sonification appear around the middle of the 20th century: From 1948 on, musique-concrète composer Pierre Schaeffer recorded the noises from industry and the environment and edited them in his studio by such means as montage, altering the playback speed, etc. Schaeffer separated the noises from their original context and classified these "objets sonores" according to their structural properties. As a counter-model, electronic music emerged in Cologne in the early 1950s. Among its early exponents was Karlheinz Stockhausen, who for his "Studie II" (1954) used sine tones only (Holmes 2002). In line with the principles of serialism, his aim was the "total determinacy" of all sound parameters.

The electronic "data music" of the early 1950s was generated by applying sound-synthesis methods. Given its stringently structured form, it can be regarded as a model for the application of sonification to the realm of scientific representation.

From the 1960s on, the field of sound art has offered equally close associations to sonification. In an aim to heighten audience awareness of their acoustical environment, numerous artists have devoted themselves to representing data and their phenomena acoustically: light is converted into sound; the inaudible is transposed into an audible frequency range; sounds are transposed from their usual settings to a new context, or are generated from data on atmospheric humidity and temperature. Physical and psychoacoustic principles of music came increasingly into focus (cf. de la Motte-Haber 1996, Benary 2001). Musicology tends to treat sonification only tangentially, however—probably in part because in sonification the composers' creativity plays only a subordinate role, with focus shifted instead on perception and on cultural techniques of listening (Mauss 1997, Sterne 2003).

The "sonification-based music" genre has now been growing for some years within the field of sound art. While in the early days of electronic music the musicality of non-tonal sounds was 'the' subject of discussion, today the issue of the relationship between the composer's subjective intention and the given data that constitute the base for his composition has been foregrounded. The question arises whether aesthetic strategies have been changed by the knowledge gained from sonification research, which then in turn flows back into artistic production. To answer this question, we need to be guided by a clear definition of the concept of sonification (cf. Hermann 2008), which will enable us to distinguish between the prevalent use of scientific methodology and possible cases of sheer inspiration that emanates from the data.

In science, many transdisciplinary research groups worldwide are investigating sonification. In such groups, scientists from the fields of medicine, the natural sciences and the humanities collaborate with musicians and media artists on research projects. At Bern University of the Arts, e.g., such teams are working on the sonification of earthquake and EEG data.

This work is accompanied by a growing interest in the investigation of issues involving the aesthetics, language and methods of sonification, not only from a contemporary but also from a historical vantage point. Such collaborations are also initiated with an eye to current developments in the field of cultural sciences, where a kind of "sound" science is developing parallel to the existing "visual" science (cf. Meyer 2008, Schulze 2008).

2. DATABASE ON THE SONIFYER WEBSITE

Historical research into the subject of "Sonification in Music" was carried out as part of the two-part research project "Denkgeräusche" ("Sounds of Thought", 2006-2008).

2.1. Description

A total of over 150 musical works and projects have been examined as to their genesis and their artistic and scientific contents. We included works in which contemporary sonification methods had been used under at least one of the following guises:

1. Transformation from the inaudible into the audible frequency range.

2. Use of the sense of hearing in order to gain knowledge.

3. Development of listening techniques to be used in the context of scientific inquiry.

In view of its broad scope, it has proved helpful to structure this research by choosing selections according to rigid criteria. In the end only such compositions were included on the shortlist for which sonification had undoubtedly been employed. This also implied some explicit exclusions: for instance, works such as soundscape recordings were not considered that merely aim to attract the listener's attention to subtle or particularly inaccessible sounds or sound phenomena. Suitable objects for investigation were identified among early electronic-music works of the 1950s, among them Lejaren Hiller's "Illiac Suite", an audification of electric voltage fluctuations. In 1961/62 John Cage wrote his well-known piece "Atlas Eclipticalis" using star charts as source material for his composition. EEG sonification is the field where Alvin Lucier created his arguably most famous artistic work. For the piece "Music for Solo Performer" (1965) he played an ensemble of percussion instruments, which he operated with the alpha waves of his brain. Related configurations were explored by Richard Teitelbaum and David Rosenboom in the 1960s and 1970s.

While such sonification-related methods were evidently applied even before the scientific community and its concepts were established, the number of compositions implying the use of sonification rose rapidly, starting in the early 1990s. One case in point is the Berlin-based artist and composer Christina Kubisch, who has contributed to an expansion of the discourse on sonification with numerous works such as "Dreaming of a Major Third", in which she converts sunlight into the sound of bells. In her piece "Magnetic Nets" she employs electromagnetic headphones to examine different anti-theft devices used on different continents. She analyses their sounds and how they change—and which of them are only fake.

In 2001 Florian Dombois developed a virtual 3D environment of the Indonesian volcano Mt. Merapi by correlating audified seismograms with geophysically calculated visualisations. The Cologne-based artist Jens Brand endeavoured to create an audification of the earth's surface via satellite with his "G Player" (2004) and offers corresponding devices for domestic use in a kind of postmodern sales show. "Navegar é Preciso" (2006) by Alberto de Campo and Christian Dayé traces the route of the first circumnavigation of the globe led by Magellan (1519-1522) by sonifying social statistics of the countries along the way. With his piece "Séance Vocibus Avium" (2008), Wolfgang Müller ventures beyond the scope of scientific verification: Müller asked musician friends to recreate the calls of extinct bird species, taking historical descriptions as a base.

Meanwhile, also in English-speaking countries, countless artists employ sonification methods in their work, among them Andrea Polli and Joe Gilmore, who sonify meteorological data in order to illustrate climatic change. Steven Roden composed his sound installation "ear(th)" from seismic data in 2004, and Adam Overton sonified EEG and ECG measurement data for his meditative performance "Sitting.Breathing. Beating.(Not)Thinking". The artists' methods and acoustical results are as disparate as are their opinions on their own position in a field that spans from art to science.

The results of the "Sonification in Music" research can be viewed under www.sonifyer.org. Recordings of the compositions listed in the database have been acquired on sound-storage media as far as available and made accessible at the music library of the Bern University of Arts.

2.2. Image

SONIFICATION IN MUSIC

Christina Kubisch

Dreaming of a Major Third

1997 / North Adams, Massachusetts / Parameter Mapping / Meteorological Data



Dreaming of a Major Third ist eine interaktive Klanginstallation für den Glockenturm des Massachusetts Museum of Contemporary Art. Sie nutzt Solarzellen bzw. Sonnenkollektoren, um Ereignisprozesse des Werkes zu steuern.

In Dreaming of a Major Third übermitteln die Sensoren Informationen über die Intensität des Sonnenlichts und die Position der Sonne bzw. die Richtung der Sonneneinstrahlung an einen Computer. Ein speziell entwickeltes Softwareprogramm reagiert auf die übermittelten Daten und stellt entsprechend Aufnahmen zuvor aufgenommener Glockenklänge zu kleinen Kompositionen zusammen.

Ausschnitt anhören (00:30)



Aufnahme

Dreaming of a Major Third
a composition for the clocktower of MASS MoCA

Medium

CD

Dauer

44'34"

Herausgeber

Christina Kubisch

Verlag

Edition RZ (ed.RZ 10006) LC 8864

Erscheinungsdatum

1997

Datensatz:5

← zurück

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Source:

www.sonifyer.org/wissen/sonifikationmusik/

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