

Computer Network Music Approximation to a far-scattered history

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Abstract

End of the 1970's, members of *The League of Automatic Music Composers* started to work with connected computers, and were the first ones who entitled their music 'computer network music'. 1986, *The HUB* was founded and became one of the most famous computer network music ensembles. Since then, an unclear number of computer network music projects were developed. The artistic and technological history of projects connected to computer network music was mainly examined in media art, internet art (net art), and web art. In computer music, there exists only a very small research.

In this paper, based on five aspects – terminology, a survey on the attention received by existing projects, established classification systems, ideational references, and an estimation of the general activity in computer network music – progressions, correlations, influences, and historic directions are outlined and discussed.

Introduction

In 1976, John Bischoff, Jim Horton, and Rich Gold, started to experiment with connected Commodore KIM-1 computers in order to create music performances. (cf. Weinberg 2005: 25) One year later, the California based musicians founded *The League of Automatic Music Composers*, (cf. Perkis 2007: n.p.) which they called a "computer network band" (Weinberg 2005: 25). In 1986, Bischoff and Tim Perkis initiated the ensemble *The HUB* which debuted in 1987 using "microcomputer as a mailbox to post data [that was] used in controlling their individual music systems, which was then accessible to the other player." (Brown 2005: 382)

Beginning of the 1990's, *The Hub* started to use MIDI in addition to sending text messages. According to *The Hub*-member Scot Gresham-Lancaster, with this development, *HUB 2* came into being. (cf. Gresham-Lancaster 1998: 41f) Since then, many computer network music projects emerged. Due to the fact that the projects were situated in very different art scenes and followed diverse aesthetics and ideals, they have been researched in different historic and artistic contexts¹. In musicology, the artistic and technological history of music in computer networks was rarely examined. This may be caused by formal constraints such as programming skills, little historic documentation on technological, especially digital

¹ See here for example Frieling, Rudolf and Dieter Daniels (eds.), *Medien Kunst Netz / Media Art Net*, Vienna, Springer 2004 or Weiss, Matthias, *netzkunst*, Kromsdorf, VDG Weimar, 2009.

developments, and the state of source material, which means that there exists hardly any score, and often only web documentation. The research is also complicated by the fact that many computer network music systems and their documentation existed only for a certain period of time. In computer music, the research on computer network music has been done mostly by composers or developers of computer network music systems. Papers often consist of a combination of historic references and classification systems, and may also include a link to systems or projects developed by the author. For example, the historic outline serves as a base on which a new system is presented. (cf. Kapur 2005: 210 and Young 2001:n.p.)

Due to the fact that there seems to exist no homogeneous development within the field of music in computer networks, progressions and correlations are outlined and discussed based on five separate aspects.

1. Terminology

In projects related to music and computer networks, different terms or differently defined terms were used to entitle and describe the systems.

The general term ‘computer network’ can stand for the physical network system that connects data stations, the structure of a data network, or entitle the entire setup. The particular definition of the term depends on the special field, but also on the single example or established system.

The musicologist Golo Föllmer for example referred to ‘computer network music’ as ‘music in the internet’. ‘Internet’ for Föllmer had become an undefined entity – a net, which was constituted by individual computers. Based on this definition of internet, he defined ‘Netzmusik’ as:

Musik [...], die spezifische Eigenschaften des Internets strukturell reflektiert. [...] Das unspezifischere ‘Netz’ wird gegenüber dem konkreteren ‘Internet’ bevorzugt, weil damit auch nichtöffentliche, lokale und temporäre Netzwerke eingeschlossen sind. (Föllmer 2005: 1)²

Also Peter Manning talked about ‘internet music’ or ‘internet-based music networks’. (cf. Manning 2013: 474, 477). In this research, however, ‘internet’ was defined as the world wide web. Therefore, projects using other network systems were not considered.

The term ‘computer network music’ was defined by Scot Gresham-Lancaster as the “enclave of experimental composer/performers who have worked consistently to use the latest breakthroughs in musical hardware and software advances.” (Gresham-Lancaster 2013: n.p.) Gresham-Lancaster connected this term to the history of *The Hub* as well as general developments in California:

The social climate and cultural atmosphere of the San Francisco Bay Area in the late 70’s early 80’s plus the emergence of the nascent microcomputer industry made for a social network [...] fostered the creation of a new type of collaborative electronic music ensemble with techniques that have come to be known as ‘Computer Music Network’. (Gresham-Lancaster 2013/2: n.p.)

² In the citation Föllmer explains that for him ‘Netzmusik’ stands for music, which reflects the characteristics of the internet. He prefers to use the unspecific term ‘net’, which also implies private, local and temporarily existing networks, instead of the specific term ‘internet’.

Even though the term ‘computer network music’ seems to become common especially in academic music publications³, there is no universal terminology for music which is based on using computer networks.

2. Projects that received much attention – quantitative survey

Assuming that projects, which receive much attention gain also a strong influence on following projects, the number of references within the documentation of artworks and the quantitative presence in the existing literature can indicate historic associations.

In a survey of publications related to music in computer networks, it turned out that in eleven papers and books (the focus was on overviews and historic or compendium articles), which have been published within the last 10 years, there have been mentioned 61 projects – 41 of them only once⁴.

The most discussed project was *Auracle* by Max Neuhaus, which was mentioned in seven of the eleven publications. Sergi Jorda’s *Faust Music Online FMOL* and Chris Café’s *SoundWire* were mentioned six times, *Brain Opera* by William Duckworth five times, and *quintet.net* by Georg Hajdu four times. All other projects were mentioned three times or less.

Due to the fact that the presentation of the projects was treated unequally, it was impossible to map the result of this quantitative study on to a common two-dimensional grid or table in order to give an overall picture.

Additionally, there appeared a new aspect: besides of being developed in divers artistic environments and realized with various technologies, the projects were designed on different structural levels. The levels ranged from individual single systems to web applications and basic systems, which were developed in order to provide the technical base for further artistic projects. The same time, some projects were mentioned several times, but in different classifications. There appear to be two quite obvious reasons for this: the project's structure was multi-layered and/or changing over time and therefore not clearly classifiable, or the classification systems based on very different aspects.

3. Classification systems

In 2005, Andrew Hugill edited an issue of the *Contemporary Music Review* entitled ‘Internet Music’⁵. In his introduction, he outlined five “popular conceptions of Internet music” (Hugill

³ See also chapter 4 of this article.

⁴ For the quantitative study, these publications have been considered: Barbosa, Álvaro, “Displaced Soundscapes: A Survey of Network Systems for Music and Sonic Art Creation”, *Leonardo*, 13, 2003, p. 53-59; CARÔT, Alexander, Alain B. Renaud and Pedro Rebelo, “Networked Music Performances: State Of The Art.,” in: *Proceedings of the AES 30th International Conference*, Saariselkä 2007, pp. 131-137; Duckworth, William, *Virtual Music. How the Web Got Wired for Sound*, New York, Routledge, 2005; Föllmer; Hajdu, Georg, “Quintet.net: An Environment for Composing and Performing on the Internet”, *Leonardo*, 38(2), 2005, pp. 23-30; Kapur; Manning; Rohrhuber, Julian, “Network music”, in Nicolas Collins (Ed.), *The Cambridge Companion to Electronic Music*, Cambridge, Cambridge University Press, 2007, pp. 140-155; Traub, Peter, “Sounding the net: Recent sonic works for the internet and computer networks”, *Contemporary Music Review*, 24(6), 2005, pp. 459-481; Weinberg; Young.

⁵ Authors in this issue were Golo Föllmer, Helen Thorington, Peter Traub, Andy Harrower, Randall Packer, Michael Casey, Andrew Hugill, Dante Tanzi, and Rosemary Mountain. (cf. Hugill 2005)

2005: 429): ‘Music that Uses the Network to Connect Physical Spaces or Instruments’, ‘Music that is Created or Performed in Virtual Environments, or Uses Virtual Instruments’, ‘Music that Translates into Sound Aspects of the Network Itself’, ‘Music that Uses the Internet to Enable Collaborative Composition or Performance’, and ‘Music that is Delivered via the Internet, with Varying Degrees of User Interactivity’. (cf. Hugill 2005: 433ff) Hugill’s categories based on the use of the internet meant as world wide web in order to create or distribute music.

The same year, Golo Föllmer published the only musicological research on the topic in german language. The musicologist and curator gathered many examples of computer music network projects and described their technical setup and artistic developments. Föllmer established five categories based on artistic idea and structure. The categories’ titles referred to the realization of the performances or projects: ‘Das Forum’ includes projects using the internet as a platform for exchange, ‘Das Spiel’ deals with software that was designed along game-like rules, ‘Algorithmus und Installation’ is dedicated to projects accentuating the inherent algorithms or can be experienced like an installation, ‘Instrument und Werkstatt’ refers to applications which are structured like instruments or provide assistance for working with audio, and ‘Performance’ subsumes time-based happenings with processual character. (cf. Föllmer 2005: 77-171)

Gil Weinberg, who closely worked together with Tod Machover and the Hyperinstrument Group at MIT Media Lab, considered the technical structure as base for the artistic realization. He established four categories to describe the network’s structural data flow entitled ‘Server’, ‘Bridge’, ‘Shaper’, and ‘Construction Kit’ for online networks. ‘Server’ stood for Server-Client-networks, in which music-relevant data could be distributed without a direct connection between the clients. No direct interaction between the single clients was possible. ‘Bridge’ described a network where all clients are equally connected. This would e.g. be the ideal of a virtual rehearsing room. In ‘Shaper’ systems, music-relevant data was stored at a central network storage and accessed by the connected clients, which collectively worked together on the same material. The ‘Construction Kit’ system entitled a superior structure onto which the clients were connected. In this system all single clients had equal positions and could interact directly. According to Weinberg, a combination of ‘Construction Kit’ and ‘Shaper’ system turned out to be the most used. (cf. Weinberg 2005: 26ff) Additionally, he also established categories based other technical structures such as the size or the topology of the networks, and the intended interactions.

These classification systems are established upon a combination of technical and artistic aspects. Furthermore, there exist some categories that include also historic aspects.

4. Ideational (analog) references

William Duckworth combined in his book *Virtual Music* categories based on case studies and chapters describing historic developments. In his opinion, this smoothed the way for his idea of what he called ‘virtual music’ – music in the world wide web. In the introduction, he wrote:

So, when I began to consider the possibility of writing a book about music on the web, I thought I had a pretty good idea of its scope and the range of topics it ought cover. But as I wrote, the topics, as I said, kept changing, and I kept deleting and rewriting as the

first draft turned into a second and a third. [...] I eventually came to realize [...] I was putting too much emphasis on the technology, and as it changed, so did the book. Eventually, I came to see that it is the people with the ideas who make the story interesting. (Duckworth 2005: XIV)

When combining his approach with the quantitative study, there appear to be two main references: John Cage's *Imaginary Landscape No. 4* and Max Neuhaus' early broadcast works. But the authors mentioned either Cage or Neuhaus and also the work examples did not always correspond: For Weinberg, Cage's *Imaginary Landscape No. 4* was the "first electronic interdependent musical network" (Weinberg 2005: 24) as it was based on wiring musicians and a net of radio stations as well as two players and one radio. Additionally, Weinberg mentioned *Cartridge Music*, in which for him Cage established a "musical network focused on tactile generation of sounds and intra-player, amplification-based interdependencies" (Weinberg 2005: 24). Concerning internet-based music, Manning referred to Max Neuhaus' late 1960s and early 1970s broadcast works. (cf. Manning 2013: 475) Duckworth bridged these approaches in his chapter 'history of interactive music'. He named Cage, but mentioned the compositions *Imaginary Landscape No. 5*, *Williams Mix* and *Sounds of Venice*. (cf. Duckworth 2005: 10) Neuhaus' works, Duckworth claimed as forerunners to projects of the chapter 'Cell Phones and Satellites'. Under 'Music on the Web', Duckworth referred to the ensembles *The League of Automatic Music Composers* and *The Hub*. (cf. Duckworth 2005: 60ff, 62ff, 104ff) These ensembles also served as references for other directions in computer network music. Manning for example titled them as pioneers for 'Laptop Music and Related Activities', (cf. Manning 2013: 417ff) but not for music in the internet. Föllmer explained this difference by establishing historic lines, which emerged in parallel but followed up different interests. According to Föllmer, music of 'The Academic line', which included the two early ensembles, was usually titled as 'computer network music'. The set-up included laptop orchestras, web-based platforms, self-contained LAN-systems, as well as radio-inspired systems. Projects of this category were mainly non-commercial and developed in collaboration or affiliated with a university or a research institute. Therefore, there exist research papers, publications and usually an accessible documentation concerning the projects. The concepts of these projects often depended on techniques, which have been used also in algorithmic composition and interactive environments. This, so Föllmer, connected them closely to the academic tradition of computer music and experimental music which derived after Cage. Besides the 'Academic Line', Föllmer proposed four more historic lines: The 'Line of Media Artists' contained early radio projects and the works of Neuhaus – according to Föllmer, this line directly resulted in internet radio projects. The 'Line of Pop Music', which for Föllmer aimed in direction of electronic (experimental) popular music, the 'Intermedial Line', which covered all projects that implied concepts from other art genres and media but were realized in the internet/www, and the 'Line of Performance'. (cf. Föllmer 2005: 441)

5. Activity

Independently from the classification systems, references or established historic lines, Alexander Carôt noticed a wavelike rise and fall concerning the general interest in computer network music. In 2007, he located two phases of high activity, the first around the year 2000, and a second around 2005-2007. (cf. Carôt 2007: 132, Kapur 2005: 218) From 2002 to 2007

the interest in gathering and classifying existing projects grew⁶. Carôt stated that the second peak was affected by a strong believe in the artistic potential as well as a broad public interest, which was reflected in papers, published works and working systems. Between 2007 and 2010, there came up very few publications on computer network music. In the last two years or so, the interest on music projects using computer networks seem to grow and to lead to a new rise of activity in terms of publications and presentations.

Outlook

Since the beginning the mid 80's, there emerged a lot of projects somehow related to music and computer networks. The research in this field followed different aims and perspectives, and was influenced from very different artistic ideas. Also the technological developments, which are not discussed in this paper, strongly influenced the artistic works and the interest in the field. New established technologies were quickly integrated in projects, technical deficits were covered within artistic ideas, e.g. there emerged a lot of strategies to deal with latency. Beside approaches based on technological aspects, artists positioned themselves in very personal chosen historic contexts.

Currently, the interest and activity in computer network music seems to rise. New technical standards like Wifi-transmission standards and appropriate protocols were established. Network technology is accessible for everyone and relatively cheap. Within the last years, two general developments seem to become apparent: On the one hand, there takes place a specialization within the broad field of music and computer networks, e.g. web-based projects, music in the internet and also making music connected by internet are on to establish their own separate niches and terminologies. On the other hand, there emerge a new interest in self-containing LAN-systems structured almost like chamber ensembles that refers to the term 'computer network music'.

From the recent point of view it is not yet possible to prove this impression, and it is also hardly predictable how the development continues. Therefore, Hugill's introduction from 2005 is still up-to-date:

The importance of this music, however, should not be underestimated. We are witnessing nothing less than the growth of new musical forms and new means of musical expression. These will not survive on novelty value alone, but rather through the power of the work that is done within them. In this respect, we can expect great things and Internet music is at the forefront of developments, exploring interactivity, communication, shared musical experience, and collaborative or devised composition, as well as new means of creating digital and computer music. (Hugill 2005: 433)

⁶ See Chapter 3 and 4. The history of technological developments concerning internet or network technologies were not considered.

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