Kinetic Sound Sculptures
Stele and *Viola Spezzata*

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Abstract

We report about the aesthetic motivations and the technological strategies that governed the conception of the *Stele* and the *Viola Spezzata*, two kinetic sound sculptures realized by the author in 1998 and 1999. The main goal of the *Stele* and the *Viola Spezzata* projects was to assemble sound objects into sound sculptures with a strong spatial presence. The loudspeaker as a perceivable sound source with its own idiosyncrasy had to be overcome in order to create a plausible spatial identity of the sound sculpture. Rather than creating images of sound objects we were interested in creating the objects themselves.

1 Introduction

The starting point of the work described in this paper was the observation that the traditional way of using loudspeakers to project sound in space is the main limiting factor for a certain type of electroacoustic sound work. The kind of sound work we are referring to is rather aiming at creating sound objects than at projecting sound scenes. We are concerned with installation situations as opposed to concert situations.

1.1 Concert

In the concert, the audience is usually surrounded by a set of loudspeakers, which act as a kind of screen on which sound scenes are rendered. Sound objects can be localized on this screen, they can be given a certain spatial width and depth, and the illusion of movement can be created. The audience is immersed into a virtual acoustic scene, which usually competes with the real acoustics of the concert hall. In this situation, the loudspeakers are very often perceived as mediating entities adding their own characteristics to all sounds. This usually becomes most evident when acoustic instruments are used together with loudspeaker-projected sounds. In most cases one can tell very easily if an instrument is actually present in the performance space or if it is projected over loudspeakers. Surprisingly, we sometimes can even perceive this difference if we are not in the same room but witness the sound events from the room next door. This phenomenon, which is mainly due to the different radiation patterns of loudspeakers and instruments is quite well understood today. For the concert situation, various special sound projection techniques have been developed to create a sufficiently uniform acoustic space for mixed pieces. But all of these techniques assume that the listeners are located at a fixed point in the performance space and do not move. This is how their auditory perception system can adapt to the particularities of the listening position and perform the necessary "suspension of disbelieve" to perceive a homogeneous auditory scene.

1.2 Installation

Transferring this approach to installation situations is highly inadequate because there the listeners relate to the acoustic space in a completely different, much more dynamic way. They explore the installation by moving in its space. Therefore the traditional sound projection approach has to be replaced by a more refined use of loudspeakers as sound sources. The loudspeakers have to become a more integral part of the work, their characteristics and arrangement has to be more intimately linked to the processes of sound generation and processing. Sound processing and projection have to become a unit. There are no general solutions to this problem like the ones that have been found for the concert situation because every installation is different. The remainder of this paper will describe one particular solution we have chosen for the two closely related installation pieces *Stele* and *Viola Spezzata*. Even if our approach is only valid for a certain type of installation, the lessons learned in the process of creating the pieces are certainly of interest for similar projects.

2 Kinetic Sound Sculptures

The main goal of the *Stele* and the *Viola Spezzata* projects was to assemble sound objects into a sound sculpture generating a strong presence in space. The loudspeaker as a perceivable sound source with its own idiosyncrasy had to be avoided

in order to create a plausible spatial identity of the sound sculpture. Rather than creating images of sound objects we were interested in creating the objects themselves. Aiming at a unique sound experience, as we are familiar with from listening to acoustic instruments, we started experimenting with unusual loudspeaker configurations and special ways of driving them. Our approach was stimulated by research on sound radiation conducted at IRCAM in the mid-eighties. Special speaker configurations were used to mimic the complex radiation pattern of instruments. Differently filtered sound signals where projected by speakers facing into different directions in order to create certain frequency dependent radiation patterns. These experiments gave rise to an astonishing and vivid spatial presence of the sound sources, avoiding completely the mentioned "loudspeaker effect". Another stimulation came from a conversation with Miller Puckette at IRCAM in the early nineties where he mentioned the possibility of directing sound waves by arrays of loudspeakers emitting the same signal with different time delays. This possibility to dynamize the sound sculpture became an important aspect of the two projects - hence the attribute "kinetic".

2.1 *Stele*

The artistic intention of the *Stele* project was to conceive a situation, which allows for the experience of the intimacy and complexity of a certain kind of instrumental gestures created with string instruments. This approach was inspired by experiments with listening to very feeble and instable sounds produced on an alto and by moving the ear in very close proximity over the instrument while it was played. Recreating such an experience for a larger audience by developing an adequate recording, processing and especially sound projection technique became one of the obsessions of the project. Another important driving force was our interest in the interaction of visual art and music, which led to the idea of building a sculpture with a visual and a sonic appearance.

The solution we came up with is a kind of acoustic antenna built with eight Genelec 1030 loudspeakers positioned one on top of the other such as to form a 2.5 m high column. In this column, sonic and sculptural elements are blended to form a hybrid object. The sculpture's static visual aspect and its dynamic acoustic appearance form thereby a powerful contrast, which mutually intensifies the two components. On the one hand, the eight loudspeakers piled up to a fragile column serve as building blocks of a minimalist (archi)tectonic sculpture, on the other hand their linear arrangement constitutes an acoustic prism with very peculiar sound radiation characteristics. The acoustic radiation pattern of this antenna can be controlled dynamically by means of a specially developed DSP program. The particular acoustic characteristics of the Stele account for its enigmatic air brought about by a new approach towards projecting complex sound textures in space.

The sound material for the *Stele* was conceived and recorded in close collaboration with Vincent Royer, a professional alto player who is very experienced with contemporary playing techniques. The control program was developed with Max/FTS running on an SGI computer with 8 digital audio ports (ADAT format), each of which driving a speaker of the *Stele*. The processing of the sound material is most conventional and comprises transposition, filtering and some stochastic processes to build clouds of sounds and layered structures. The originality of our approach lies in the independent control of the 8 loudspeaker using varying time delays in the ms range. This approach permits to independently direct or distort several first wave fronts and thus simulate movements (e.g. varying inclination) of the sculpture. The resulting complex acoustic excitation of the room is characterized by very ambiguous localization cues and moving phantom sources.

The main compositional work consisted in mapping the movements inherent to the recorded and arranged sound material to the sonic movements of the *Stele* - a process which proved to be highly empirical and could only be done *in situ*, i.e. with the *Stele* installed in a proper room. This process has been carried out at the *Kubus* Studio of ZKM | Center for Art and Media Karlsruhe (fig. 1). The result of our approach is a vivid sonic appearance, which does not sound as if it was produced by loudspeakers. Rather a quasi-tactile experience of the physical resistance inherent to the sound production process on string instruments can be perceived. The described effects disappear immediately when reproducing the sound material over normal speaker setups.

The *Stele* was produced in spring 1998 at GMD and ZKM and has be presented in public for the first time in June 1998 at GMD's Birlinghoven Castle (fig. 2).

2.2 *Viola Spezzata*

The *Viola Spezzata* is a further development of the *Stele* adapted for the installation in the Kunstmuseum Bonn, the contemporary art museum of the city of Bonn (June 2nd - July 11th 1999). Whereas the *Stele* was conceived to be presented in a larger and empty space with well-balanced acoustics (e.g. ZKM's *Kubus* studio and concert hall), the *Viola Spezzata* is inscribed into the particular acoustical, architectural, aesthetic, and social setting of the Kunstmuseum Bonn. The vertical structure of the *Stele* was not any longer

pertinent in this new context and a horizontal arrangement was chosen instead.

Surrounded by visual artwork, the *Viola Spezzata* seeks the confrontation between the visual and the auditory senses (fig. 3). Being a hybrid object in itself, with a static visual and a dynamic sonic appearance, it provokes an unusual synaesthetic experience drawing its energy from the tension between its visual and auditory aspects.

Every hour, the *Viola Spezzata* performs a variable sound composition for about nine minutes, unfolding differently every time it appears. Dense sound textures are produced, movements inherent to the sounds created by viola player Vincent Royer are magnified, spatialized, and fragmentized - the inner tensions of the sounds are intensified. As with the *Stele*, the material resistance of the instrument in the chaotic process of tone production is one of the leitmotifs of the composition.

In the *Viola Spezzata* installation, music is perceived in an open but still focused situation that is much less constraining than the concert ritual. The exquisite architectural setting and the carefully designed permanent exhibition at the Kunstmuseum Bonn offers the visitors a perfect context for experiencing the emergent relationships between visual artwork, sound and space.

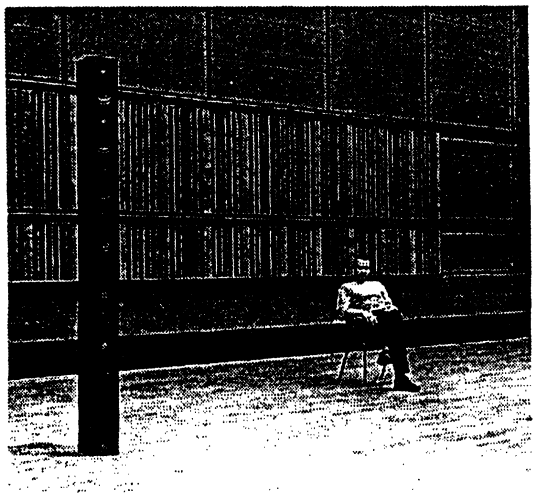

Fig. 1: The *Stele* installed in the *Kubus* studio at ZKM Karlsruhe

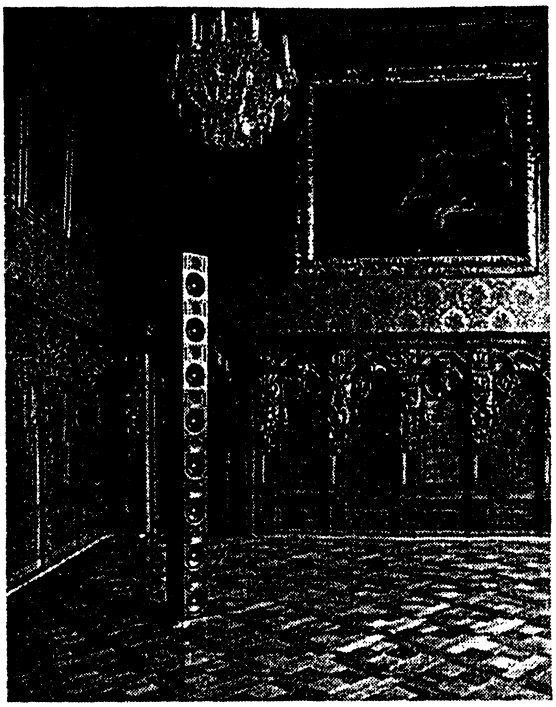

Fig. 2: The *Stele* installed in the Red Hall at Birlinghoven Castle (GMD headquarters)

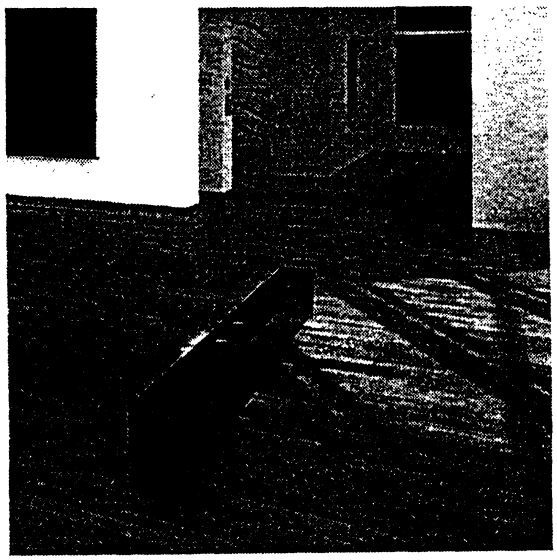

Fig. 3: The *Viola Spezzata* installed in the Kunstmusem Bonn

More detailed information and sound examples can be found at http://viswiz.gmd.de/~eckel.