Recording the Sound of Installation Art Objects

The sound of modern installation art can be an important and integrative element of artworks. In such cases, a separate and professional documentation of the sound is necessary. Starting with the most important fundamental considerations, basic concepts for the practical realization of the sound recordings will be presented here.

1. When Is It Necessary to Document the Sound of Installation Art?

It is not necessary in all cases to conduct a separate documentation of the sound. For me, there are three categories for the significance of sound:

1a. Sound is an integrative element of the artwork and can be influenced by constructive measures. A good example here is the installation *potion* by Martin Walde (fig. 1). A liquid similar to a soft pudding in its consistency is found in three containers. An electronically steered air pump is mounted under the containers that causes the liquid to bubble in alternating rhythms. The sound of the installation can be manipulated by various means, such as the consistency and amount of liquid or viscosity and rhythm of the air current from the pump. It is important to have a good recording of this installation to document the sound intended by the artist as accurately as possible.

Fig. 1. *Potion* by Martin Walde recorded with an AB microphone array
Sound example: 01 potion totale.mp3

1b. Sound is an integrative element of the artwork and cannot be influenced through constructional measures. The installation *frantic diggers* by Christiaan Zwanikken (fig. 2) also heavily relies on the sound of the many small mechanical moving parts that are located in this virtual landscape. By using the original components of this installation, the sound is, however, preset and cannot be manipulated. Nevertheless, a separate documentation of the sound is necessary, as the work only thus can be captured as a whole.

Fig. 2. *Frantic diggers* by Christiaan Zwanikken
The two microphone stands, the cables, and I are not part of the installation ☺
Sound example: 02 Frantic diggers totale .mp3

A second example of this category is *Frigo* by Jean Tinguely. An apparently normal refrigerator activates, on opening the doors, the howling of an original American fire engine siren installed inside the refrigerator. Likewise, the noise cannot be manipulated. Having said that, a documentation of the noise is very helpful if something should go wrong, as the original sound can serve as a reference for assessing a repair or as a model for a possible replacement of the siren.

Figs. 3, 4. Jean Tinguely's *Frigo* with door closed and door opened
Sound example: 03 Frigo soundman mic.mp3

1c. The sound of the artwork is generated by mechanically moving components, it is, however, an inevitable by-product and therefore not relevant for the documentation. No examples will be given of this case, as such a decision should ideally be made in agreement with the artist.

2. The Significance of the Size of an Object for the Acoustic Perspectives

If one is to document the sound of an object, one has, in addition, to pose the question about the context between the size of an object and the acoustic perspectives which result out of that for the hearer / observer. With smaller objects (see *potion* or *Frigo*), it is possible to capture the sound completely from relatively close up. That also has consequences for choosing the position of the microphone, as we will see later.
Frantic diggers is quite different. The work expands over a large space, and is full of small, ringing detailed constructions. In this case, it is not possible to make a sufficiently accurate recording of the complete sound with just one microphone position. In fact, it is necessary to take a separate recording of every individual ringing object, which is then documented with a corresponding photograph.

3. The Acoustics of the Exhibition Space

The significance of the acoustics of the exhibition space is varied. With mobile installations, which are shown in various places, the resulting acoustics of the space are independent of location and rather coincidental. Thus, one must be careful to catch as little background noise as possible and as much sound from the object as possible with documentation.
It is different with objects that form part of the permanent collection in an exhibition space. Here it makes sense to record the sound of the object in that space.

4. Microphones and Their Directional Characteristics

Microphones have different directional characteristics. The choice of the most suitable directional characteristic depends on the desired sound result.
In principle, one distinguishes between three directional characteristics:

4a. Omnidirectional

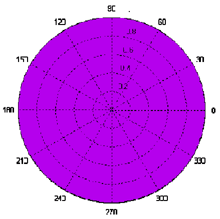

Fig. 5. Polar pattern omnidirectional

An omnidirectional microphone will pick up the same amount of sound and generate the same output signal independently of the direction of the sound.

4b. Bidirectional

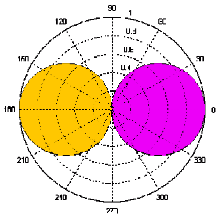

Fig. 6. Polar pattern bidirectional

A figure-eight microphone picks up sound from the front and rear equally but phase-reversed.

4c. Cardioid

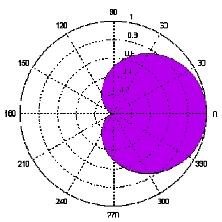

Fig. 7. Polar pattern cardioid

The cardioid microphone shows a heart-shaped polar pattern and has the lowest signal output for sound sources directly behind the microphone. Special types of cardioid microphones have wider (wide cardioid) or smaller (hypercardioid) polar patterns.

5. **Microphone Recording Techniques**

On the basis of the different directional characteristics, there are also various recording techniques. Here only those recording techniques relevant for the applications mentioned in sections 2 and 3 will be explained:

5a. XY stereo

XY stereo setup is a coincidence stereo technique indicating in which two microphones are placed at the same point. The most commonly used XY setup consists of two first-order cardioid microphones typically at a ninety-degree angle to produce a stereo image. Theoretically, the two microphone capsules need to be at exactly the same point to avoid any phase problems resulting from the distance between the capsules. As this is not physically possible, the best approximation to placing two microphones at the same point is to put one microphone on top of the other with the diaphragms aligned vertically.

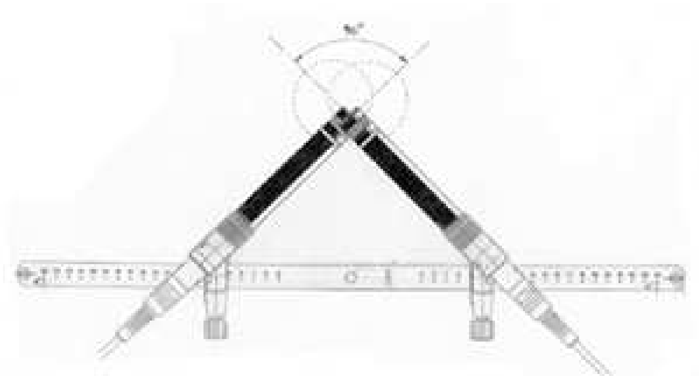

Fig. 8. XY Microphone Array

This recording technique is suitable at a short distance to the object for a relatively direct sonic perspective which nonetheless reproduces the left-right level very precisely.
The overall sound of an object is reproduced very well without the background noise of the exhibition space entering into the foreground very much.

5b. MS Stereo

Mid **S**ide technique employs two microphones aimed directly at the sound source.
The Mid mic can be of any pattern, but is most often of a cardioid or hypercardioid design.
The Side mic is a bidirectional or figure-eight pattern.
The M/S matrix takes the sum information **M + S**, and sends it to the **L**eft channel,
the difference information **M - S**, is sent to the **R**ight channel
the mono sum is **M** information only: mono = **L**eft + **R**ight = (M + S) + (M - S) = 2M

Fig. 9. MS Microphone Array

The advantage of MS stereo is that the signals can be matrixed in postproduction. The relative gain of the two signals can be adjusted to provide varying degrees of stereo width. You get two acoustic perspectives (M = close perspective of the sound source, S = spatial acoustics) with a simple two channel recording. The only problem is that postproduction should be done by a professional sound technician who has the knowledge and tools to do this.

This recording technique is particularly suitable if one wants to record both the isolated sound to be documented and the surrounding context of this isolated sound with a single take. The following example should clarify this possible application:

Fig. 10. MS microphone array above the white pot of Martin Walde's *potion*
sound example: 04 potion white pot.mp3

In this case, the upper microphone (M, cardioid) is pointed straight at the white container and mainly records this sound. The lower microphone (S, bidirectional) captures the sound of the surroundings.

5c. AB Stereo

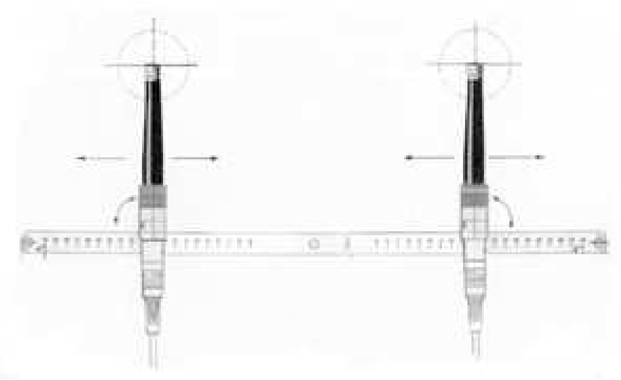

Fig. 11. AB microphone array

The A-B Stereo Technique—or Time Difference Stereo, as it is sometimes called—uses two spaced (often omnidirectional, sometimes also cardioid) microphones to record audio signals. The microphone spacing introduces small differences in the time or phase information contained in the audio signals (according to the relative directions of the sound sources). As the human ear can sense time and phase differences in the audio signals and use them for localization, time and phase differences will act as stereo cues to enable the listener to "capture the space" in the recording and experience a vivid stereo image of the complete sound field, including the positioning of each separate sound source and the spatial boundaries of the room itself.

This recording technique is particularly suitable for documenting sonic events together with their spatial context.

One application of the AB miking is the recording of Martin Waldes *potion*
The method AB was chosen in this case, in order to arrive at a share of direct sound from each of the three containers that is as even as possible sound level. The "cardioid" direction was chosen to prevent the level of the reverb of the exhibition space from becoming too large.

Fig. 12. AB microphone array above Martin Walde's *potion*
sound example: 01 potion totale.mp3

5d. Multiple Miking

In addition to the main microphone techniques described thus far, in which the overall sonic event is captured with one stereo microphone configuration, it is also possible to record all the sonic details with separate microphones in the case of larger objects. These individual signals can then be mixed together. This permits a very detailed map of the original sound. This technique, often applied in music production, is, however, normally too much effort for our purposes. Nevertheless, it can be sensible to record details of an installation individually, and to document the microphone position with appropriate photos and descriptions of their positions, as shown in the example of *frantic diggers* (see section 2).

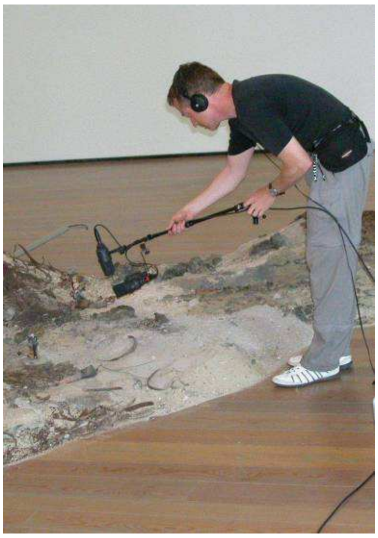

Fig. 13. *Frantic diggers* (detail) example 01
sound example: 05 Frantic diggers detail 1.mp3

Fig. 14. *Frantic diggers* (detail) example 02
sound example: 06 Frantic diggers detail 2.mp3

5e. Dummy Head Microphones

With dummy head microphones, the microphones are installed into the ears of a form shaped like a human head (fig. 15). Alternatively one can use special microphones which one places in one's own ears like headphones (fig. 16). The special quality of such recordings—namely, the attempt to recreate optimally lifelike human hearing—is, however, only observable during playback with headphones. This does, however, result in a surprisingly authentic reproduction of the original field of sound. This recording technique is suitable for documentation of sounds in context with their spatial surroundings. If the small special microphones are used together with a compact recorder, one can also move around the room very easily during the recording and thus document various hearers' perspectives very accurately, provided the recordings are played back through headphones.

Fig. 15. Dummy head

Fig. 16. Soundman microphone

6 Useful and Professional Recording Tools

Nowadays, very high quality recordings can be made with compact, easily transportable devices. In order to be able to realize all the recording techniques presented one needs a set with two microphones whose directional characteristic can be adapted. Small-membrane condenser microphones are most suitable, on which the microphone capsules are exchangeable. Such a set consists of two microphone preamplifiers, two capsules with omnidirectional characteristic, two capsules with cardioid characteristic and one capsule with bidirectional characteristic. Beyond that, one needs a stereo-microphone bar which is flexible enough to fix the various microphone fittings mechanically. In addition, the special miniature microphones just mentioned can be used for dummy-head recordings.

Fig. 17. Microphone capsule and amplifier.

Fig. 18. Stereo microphone bar

Various transportable small devices have now been designed as recorders, which save the audio data either on portable devices (e.g., SD card, compact flash) or an internal hard disk. The data are transferred to a computer via USB for post production. There are also various programs both for PC and Mac audio post production. The recorder should fulfill the following specifications: good microphone preamplifiers with 48V phantom feed, WAV audio format (which is both PC and Mac compatible) and a sampling rate of 44.1 or 48 kHz at 24-bit resolution.

Fig. 19. Compact digital recorder

7. Procedure for Recording the Object to Be Documented

Listen very closely to the sound of the object from different positions and then decide where you receive the best overall impression. Place the microphones there.

Start with the miking method which seems most suitable to you.

Adjust the recording level of your recorder.

Should you later want to synchronize the recordings with a simultaneously recorded video, be certain to choose frequency 48 kHz for sampling, the audio format of all digital video cutting programs. Start the audio and video recording with one single clapperboard.
If the audio data is only to be saved onto CD, choose frequency 44.1 kHz. for sampling.

To assess the sound delivered by the microphones, plug closed headphones into the recorder and set it loud enough that you cannot hear any sounds from outside. Judge whether the sound from the headphones meets your expectations. If not, first try to optimize the position of the microphone. If you still cannot achieve the desired result, try another miking method.

Record a short take from all microphone positions that appear plausible to you and document these recordings. You can then decide later which recording is best.

8. Postproduction, Audiovisual, Storage Media

The finished recordings (audio files) are copied onto computer for postproduction using appropriate software (e.g., Steinberg Wavelab, Samplitude). That includes cutting, adjusting recording level and dynamics, and possible sonic corrections.
If you have not yet had any experience with this, it is as a rule easiest to have this last step of the project performed in a sound studio.

Import the corresponding audio files with their pertaining video recordings into your video cutting program for synchronization. Adjust the individual audio files until the noise of the film clapper and picture are exactly synchronized.

On completion the audio or audiovisual data can be saved onto the in-house server and be made available for download. The data can also burned be to a data DVD as backup. In addition, an audio CD or video DVD of the documentations can be produced for play on normal domestic players.