

"Space"

Introduction:

Nowadays we are witnesses of a revolution in studio and audio technology that has taken place in recent decades. Electroacoustic music, and in particular multichannel production, has profited a great deal from this revolution. The term "space" should be positioned anew in this virulent context. On the one hand "space" did play a central role in the (short) history of the EM, and on the other hand its sustainability has to be critically examined. In particular arise questions about the orientation of values contrary to the "revolution" of those values, which will still fascinate future generations: **movement of sounds as well as degrees of depth of the sound sources, from an acoustic horizon almost reaching the listener's head – without today's surround standard.**

Reductions in stereo & surround: why?

Looking into a "common" EM production, it is striking at first sight, that the used original sounds were recorded in mono or mostly stereo. True surround recordings, meaning sounds recorded using a multichannel system, are rather rare. A consequence of this fact is that there is no get away from the stereo sound.

From this follows a "left-right" thinking, which becomes apparent in multichannel assignments: the left channel remains on the left, the right channel on the right. There is hardly ever a center choice nor a sum up on one channel. We easily recognise assignments in quadraphonic or octophonic works where the loudspeaker arrangement is set in "pairs left – right" without a center in the front (or in the back). From this follows the problem of assignments in the surround standard: it is difficult to find a convincing octophonic channel assignment that takes into account the center channel. Therefore it can be said that the surround standards contradict the traditions of EM by using the even-numbered and by four divisible quantities of audio channels.

Now the following question: why **does** EM **use** these rather useless industry standards anyway? And: why **do** we constantly **use** spaces and technical facilities we actually reject? Is it only due to finances? Or could it be because these technical standards are not at all so relevant?

First of all we should point out: **art production does not take technical possibilities from the point of view of technicians, scientists and theoreticians, but quite practically from its own perspective. This perspective, as is well-known, sets the main focus somewhere else, perhaps surprisingly away from techniques.**

In many cases we notice that:

- everybody thinks that stereo is better than mono (that was the fact decades ago) and that quadro is better than stereo and that 5.1 surround is even better than stereo!!
- the experienced person also knows that one can arrange five surround channels quite differently as prescribed by the norm. And also, that it mainly depends on the relative connections to our own experiences/perceptions/wishes/expectations: Everything is becoming **better**, **more** beautiful and **faster** in comparison to something **less** quick and **less** beautiful ... but what could that be??

- at reducing standards, artists and producers become strangely soft, lax and willing: they are terribly fond of **publishing** the production (even in view of painful restrictions) !! **Publication** is the dominant criterion which sets aside other reasonable criteria.!
- some EM composers have found a way out by fundamentally rejecting the multichannel option and persisting on the classical stereo option (this point of view e.g. is represented by Trevor Wishart - and for this I admire him very much – his only multichannel piece, the quadraphonic version of Vox 5, is, by the way, more dull than the stereo version!).

The sense of multichannel, spatial references, spatial perception

I have already referred to the fact that stereo products considerably reduce multichannel productions to a left – right orientation. Let us now see the following functional principles in loudspeakers and examine multichannel options:

- the loudspeaker is part of an instrumental concept and is regarded as a musical instrument. It has a fixed position in a room like a musician, and neither moves nor leaves its place; there can also be several “loudspeaker musicians”
- the loudspeaker presents a discreet sound source (mono); it represents an acoustic place
- the loudspeaker presents a discreet sound character in relation to other characters (acousmatic)
- the loudspeaker functions as part of a pair in a left-right system (acousmatic)
- a loudspeaker produces together with other similar loudspeakers different degrees of depth between near and far (acousmatic)
- a loudspeaker produces together with other similar loudspeakers a spatial perception in the horizontal and vertical levels (“Klangdom”, multichannel EM presentation) in relation to a sweet spot
- a loudspeaker is part of a linear or a flat array (WFS), it does not have any discreet function

2. Space and movement

Arguments have already been provided about the fact that the perception of space is experienced from the perspective of the listener and not from the perspective of the developer (in other words “what we should hear”). Space in itself seems to us the field in which *small* and/or *clear* changes of time take place:

small changes happen in the sense of

- nearly static, rather unnoticeable location changes. Reverberation masks to a certain degree tonal details which are sort of “removed” or pushed away.

- minimalist spatial movements of sound objects which make clear their position for location and sound. Without these minimalist changes of musical / sonic parameters the result remains totally static / synthetic. This is – by the way – a characteristic which has always been associated with and blame EM.

clearly changes that happen in the sense of:

- moving sound objects which are naturally and very intensively captured and experienced by the ear and other senses (each acoustic movement signals a certain danger, the closer the more threatening!). The movement of sound objects is a very rare procedure in traditional music as well as in contemporary instrumental music (how could music instruments move??). However, it is a common means of expression and common effect in EM and film. It is now and again used with excess.
- sound objects racing through the space – similar to those cinematic exaggerations where small animals on the IMAX screen acquire huge and menacing proportions.

What parameters play a shaping role in "clear" movements?

- the objects change their position, so that auditory and optical **localisation** plays a role in every case. The motto for localisation is: the more loudspeakers the better!
- the objects move in different **distance** ranges with certain characteristics. Of course, close movements happen quickly and distant movements very slowly (that is one of those characteristics of distance). The distance ranges are:
 - the immediate, quite unpleasant and dangerous vicinity which automatically causes defensive reflexes. These are distances of a few centimetres (near field) where, e.g. a fly or a wasp causes violent defensive reactions. It is also the distance of "whispering". The smallest movements of our head lead to different perceptions.
 - the distance of interpersonal communication, in which we notice each detail of the sound attentively and without fear. This range lies approximately between 1 and 8 metres and represents so to say our living room characteristics; it could be considered to be a chamber music distance. It is a distance within the reverberation radius where the senses perceive each movement of the sound object, even with head movements.
 - the middle distance is the acoustic area in which there is no direct communication. It is the "normal" distance of presentation in classical concert halls, with a specific mixture of direct waves (almost plane waves) and reflections. The listener is partly situated within the reverberation radius and partly outside of it. Movements of one's own head become unimportant for localisation, but provide details about the space response.

- I define the area existing beyond this middle distance as "acoustic horizon". It lies outside any acoustic communication, beyond the sounding radius. It exists "outdoors" in nature or in very big spaces (cathedrals). Our urban life is incessantly polluted by "noise coming from all directions" from the acoustic horizon. Its level is usually soft. It can even be "ignored". Consciousness gets used to it and in the end does not perceive it any more. Sometimes this horizon is also called "Athmo". The waves that affect the listener are plane. The listener's head movements are hardly of any importance.¹

It is interesting that all the above mentioned areas or ranges can be represented with the loudspeaker and that of course EM operates intensively with this. A palette of different loudspeakers, differing in depth (installation of loudspeakers varying from a few meters apart up to very far away "at the walls") can simulate these ranges or areas (acousmatic performance). Alternatively one can simulate different distance ranges by sound manipulation and reproduce them through wide distant projecting loudspeakers. These loudspeakers should, if possible, be set up evenly and at equal distance around the listener. This is, so to speak, the standard case in EM performance: the optimal listener's "sound image" is found in the middle, the sweet spot. The acoustic response of the performance space restricts the possibilities of range representation.

- Another parameter for the understanding of movement is the one that works permanently in our acoustic everyday world and for which hearing provides a good experience: it is the **Doppler shift**. Without this phenomenon a movement seems unnatural, even when many loudspeakers are used. The dominance of the Doppler shift is impressing: the "movement" takes place for our ears even if the channels are interchanged. It still works, if the all-round acoustic projection is reduced to a line, if it is reduced to stereo, and even if it is switched to mono. The Doppler shift dominates the perception of movement

3. The power of imagination by means of loops / repetition

¹ additional comment to the "acoustic horizon":

as mentioned above the acoustic horizon acts from all directions mostly in a similar shape. He consists of thousand sources. We know this for example from a soccer stadium with tenthousand of people; the sound of wind going through the wood; the sound of waterfalls, the ocean, fire. All this sounds feature a extremely impression of space, where the individual sources cannot be localized; it is rather the general impression of numerous non-descreet sources - mention above the definition of the WFS-Loudspeaker! The listening to that emergences is fascinating to pur ears, we can hear to them for long!

The EM is able to generate similar processes, we use them more and more: dense soundclouds / sounddust composed of numerous self-similar sources made first of all by granulation. Minimal changes by chance are used - same as in the examples above (water, fire, soccerfield). Waveoverviews of different channels of such works seems to be very similar, but they contain a fabulous space image.

Such EM have the same feature we have descibed to the acoustical horizon - but the sound can reach high levels by contrast to the normal acoustical world.

Often we can hear how eagerly the ear gets involved subjectively into experiences which have appeared in the course of life or got established in the learning process, even in a chronologically short succession of **repetitions**.

Having a look at a typical EM production, the process of repetition is omnipresent. One checks the sounds over and over again, one repeats passages to correct them or to be able to understand them. In our context it has to be considered that the repetition of sounds and sound passages triggers a habit process. Exaggerated, we can say that a structure we do not listen to only once or twice but instead a hundred times also works differently. Our attention concentrates on recognising or re-recognising certain characteristics / patterns. In this process certain expectations become gradually fulfilled. For example the expectation that a sound, by means of using a particular tool, should perform a circular movement. After repeated listenings and a willing attitude this movement is definitely perceived by the listener as a circular movement. This is something which possibly does not work at all when listening only once, or something that an inexperienced listener will not be able to understand.

Looking back at the development from mono to stereo and to multichannel – we honestly have to admit that we have imagined a great deal. At least I am claiming this for my person. While listening to older works produced by myself, I am often surprised with the fact that my memory differs from what I am listening to now. It is also a cover-up of inferior quality reproductions; during the seventies in the Quadro-space created by those monster loudspeakers, we were convinced that sounds would travel through space because theoretically we did the right production. **The truth of perception results from the faith that the technical realisation is perfect.** But technical possibilities develop from one perfectionism to the next one. Therefore it has also to be questioned again and again.

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