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Functions of amplified music: a theoretical approach

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ABSTRACT

In this paper I focus on the relation between the amplification level and the (musical) function of that amplification. By establishing this relation as a subjective musical parameter I aim to open up the complexity of amplifying music .

INTRODUCTION

The use of sound amplification technology is common in many different domains. The profession and the tools professionals use have greatly developed over the past decades. Interestingly enough the question of when and why we use amplification, other than from a technological point of view, is currently not an obvious research topic. Even a history of its application in such a well-researched discipline as music has to be compiled from many different sources. This is surprising as the ways we communicate, including through music, becomes more and more modulated by the technology we use for communicating. Linguist and semiotician Theo van Leeuwen (1999) suggests that amplified sound becomes a separate semiotic parameter. Technological choices (for instance type and location of microphone) not only have an influence on speech perception but also on the way we perceive someone's voice, and therefore on this persons message. An example is a panel discussion where some voices are amplified louder than others, extending the natural differences in dynamics of a debate into the realm of the argument. Another significant example of how amplification technology becomes more than just making things louder is the rise of Nazism in Germany in the twenties. Adolf Hitler's first amplified speech was as early as 1928 for 15.000 people in Berlin (Ehlert 2004). The significance of amplification as a semiotic parameter in speech communication may be very straightforward, but do similar processes occur when amplifying music? My research focuses on the question how music is changed by the use of amplification technology and whether it can be described as an independent semiotic parameter.

Background

My research in this field is driven by a number of questions from a diverse background. To put the argument in this paper in context I will briefly describe this background. Trained as a recording engineer and musician I ended up not working in the recording industry but as a 'live' sound engineer. Much of this work took place in a famous 19th century' classical concert hall with unravelled acoustics for the romantic orchestral repertoire. Often amplifying music in this hall's famous acoustics proved to be problematic. Both members of the audience and concert hall staff would occasionally express their wondering how amplified concerts can sound so bad in such famous acoustics. In response I often wondered how amplified music ended up in a concert hall that was build to accommodate a symphony orchestra rather than a truckload of loudspeakers. While finishing a master in Art Management I worked for this same hall's concert production staff as an intern. The thesis I wrote for that master looked into how (partly amplified) jazz concerts came to that hall in the 1950's. In order to make that thesis more critical rather than historical I tried to find literature that covered possible theoretical approaches to amplified sound. Finding very little, and let alone systematic, resources this topic became the focus of my PhD thesis[1].

Why at an acoustics conference?

Having learned some theoretical backgrounds to room-acoustics during my studies and learning much more from working at many different sorts of halls and venues I developed what I see as a sound engineer's heuristics of acoustics. As has been pointed out to me by an acoustician on one occasion, these heuristics bear very little relation to the complex physical processes that go on in a room. One of the aims of my research is to objectify the amplification of music, it is therefore very important to find a sounding board for my approach in the acousticians community. With amplification being very common more detailed theoretical knowledge of this subject may inform choices in the design of future concert halls and other venues.

Subjectivity

Amplification, when used for music, is often considered as one of the subjective factors of music appreciation. It is a matter of taste whether we consider a concert too loud (the opposite occurs rarely), or sounding bad, suggesting the sound engineer must be deaf. But, same as for music, most technological and physical parameters of that amplification are objective. The subjective part is limited to the listener's physiological response and sensory experience. This suggests that there must be a way of talking about things like the Level of Amplification (L.o.A.) subjectively, if we relate it to the production of music rather than to it's perception. In this paper I describe a way of doing so by looking at amplification as a musical function. Before that it is necessary to look at ways of describing the relation between acoustic sources (the instruments or voices being amplified) and electronic

[1] At the University of Technology Sydney, supervised by Professor Theo van Leeuwen and due in December 2012.

sources, the loudspeakers. A third, less objective, parameter I would like to incorporate in this discussion is Social Distance, different degrees of spatial intimacy as described by Edward Hall (1966), and operationalized in this context by Theo van Leeuwen (1999).

Scope

For the scope of this paper I will concentrate on the amplification of acoustic musical instruments and vocalists that need microphones as a transducer. Although amplification extends musical dynamics this paper considers the L.o.A. a separate parameter. Electric and electronic instruments that rely on loudspeakers to produce sounds form a special category that fall outside the scope of this paper. Unless stated otherwise amplification is realised with loudspeaker systems to the left and right to the performers, as common in many different applications.

DETACHEMENT

Although serving different purposes, technology used in sound amplification has some things in common with recording technology. The most obvious difference lies in the fact that in the case of amplification a sound is played back through a loudspeaker in the same room, almost instantaneously, instead of being recorded (or broadcasted). One thing these two processes have in common is the transduction of acoustic sounds into electric signals. This very basic step can, from a non-physics point of view, be described as detachment. The detachment of sounds from their acoustic sources by means of technology is well researched from theoretical points of view. Pierre Schaeffer (1966) developed his theory of reduced listening around the concept of the Acousmatic (see also Mulder 2009). Murray Schaffer (1980) sees detached sounds as Schizophonic. Michel Chion (1999) extends Schaeffer's notion of the Acousmatic to the realm of movies, voices or other sounds we hear while not seeing their causes. In amplified sound we come across a special situation of detachment: a sound is detached from a source and played back instantaneously while we can see (and often hear) the acoustic source. Simon Emmerson (2007) uses the term Ambiguous Spatial Dislocation to describe this phenomenon (I will go into his work further in the section about functionality).

Ambiguous spatial dislocation

In the case of amplification the amplified sound is often as loud or louder than the acoustic sound, establishing an altogether different relation. The way in which we perceive the detachment or spatial dislocation is mainly depending on the L.o.A. There are of course other factors such as the distance from the listener to both sources and (off course) a room's acoustics. In some theatrical or musical applications sound designers and engineers try very hard to make the amplification as natural (by limiting the amount of spatial dislocation) as possible, often delaying the amplified sound to make use of the Haas effect. This Haas or precedence effect only works within a limited (often quoted as 10 dB) range of difference between the levels of source and loudspeaker.

Complexity

There is a wide range of factors involved that are more or less of influence to the result of the applied amplification. We have already identified room acoustics and L.o.A. but for instance the use of monitoring systems (artists' fold back) can severely influence what an audience hears. There is a clear-cut relation between musical genre and performance practice, (a string quarte in a small hall a symphony in a large hall a band in a rock venue or a stadium) which resonates in the functionality of amplification. But sometimes a rock band end up in a concert hall and an orchestra in a stadium, providing for interesting challenges. By looking at functionalities of amplification in different situation (of musical performance) I hope to open up this complexity a little bit.

FUNCTIONALITY

One of the few authors to write about this subject is composer and scholar Simon Emmerson. In his book *Living Electronic Music* (2007) he writes about ambiguous dislocation when the acoustic source of an amplified sound is still audible. Within the boundaries of auditory-visual temporal integration (i.e. the Ventriloquist effect) this spatial dislocation "becomes part of the composers range of options". In listing this range of options he describes six musical functions of amplification that he considers vital to discussing "live music requiring electronic technology for its presentation". Some of these functions are valuable for this discussion.

Table 1 Emmerson's Functions of Amplification

1	Balance	Correcting acoustic imbalances
2	Blend	Integrating timbres
3	Projection/ Spatialisation	Zooming in perceptually/intentional dislocation.
4	Perspective	Creating virtual spaces
5	Coloration	Intentional distortion
6	Resonance	Use of feedback

The list is very detailed in the nuances that are possible when amplifying musical performances. For the scope of this paper the functions balance, blend and perspective are most important. For balancing amplification it is necessarily that acoustic sources are still (partly) perceivable. In many contemporary performance situations the L.o.A. is so high that the acoustic sources are drowned out by the sound of the loudspeakers. For instance, in situations where amplification is used to make a performance available to a large audience. To denote this kind of amplification I would like to add (for the scope of this paper) another functionality to Emmerson's list: Mediatisation.

Balance

Balancing instruments or voices with a larger ensemble is probably one of the earliest musical applications when this technology became available, first and foremost in the U.S.A. In the 1920's Jazz bands became bigger and louder and vocalists needed support in order to make themselves heard[2]. Another early example comes from Duke Ellington's orchestra; apparently he started amplifying the acoustic bass as early as the late twenties[3]. Balance amplification is still very common, for instance a band playing in a bar: vocalists are usually amplified while louder instruments like horns and drums are un-amplified.

[2] Before electronic amplification singers in the 1920's would occasionally sing through a (non electronic) megaphone.

[3] Interestingly, E.J. Berends (1953) mentions this in the chapter about bass players in the first edition of his famous 'The Jazz Book', in later editions this quote disappeared, perhaps there was no reliable source.

Blend

A common application of blending is when an ensemble playing acoustic instruments is combined with a non-acoustic source such as pre-recorded (electronic) music or samplers and keyboards[4]. In west-European 20th century art music there are several examples of *Mixed Music* for instance works by Luigi Nono or Karlheinz Stockhausen[5]. Acoustic instruments are usually amplified in order to blend with the pre-recorded electronic music. Philippe Lalitte (2006), Simon Emmerson (2007) and Pierre Alexandre Tremblay (2009) go into the specific problems of mixing acoustic and electronic musical sources which to some extent is similar to the problem (if at all) of ambiguous dislocation.

Perspective

By adding artificial reverb to an (amplified) ensemble virtual spaces (Blesser 2007 p.166) can be created: " In the world of virtual spatiality acoustic space and sound location are no longer based on the laws of physics; acoustic objects can change their size and location instantly". Perspective can be altered independently of the L.o.A. but becomes easier at higher levels with the amplified sound being louder than the natural acoustic response of a room.

Mediatisation

At a pop, rock or sometimes even opera concert[6] in a stadium the scale of amplification goes beyond the subtle modifications in Emmerson's list. Beginning with certain jazz concerts[7] getting out of hand but certainly with Elvis Presley and the Beatles mania, loud amplification became necessarily to allow for the music to be heard over the singing/clapping/screaming audience. In this situation the scale of a concert and the use of technology puts the whole relation between performers and audience in a different perspective. This is what Philip Auslander (2008) refers to as mediatised performance. Not just the sound, often also visual is mediatised by big video screens showing live image of the proceedings on stage. I propose to use this term in situation where the detachment is complete: the amplified sound completely overpowers the original acoustic sounds produced by the performers.

[4] There is a big difference there, pre-recorded music has no visible source whereas a keyboard player is still visibly playing a synthesizer or sample-keyboard.

[5] Examples are Nono's *La Fabricca Illuminata* or Stockhausen's *Kontakte*.

[6] Or even André Rieu's Wiener Waltz circus.

[7] For instance the concerts of Lionel Hampton in Europe in the fifties that would occasionally have crowds going wild and end in riots. See for instance Hamptons (1999) biography p.108 or in Dutch Mulder (2008).

Table 2 L.o.A., Dislocation and Function

L.O.A.	Venue	Spatial Dislocation or Detachment	Function
Very Low	Small hall	None, Haas effect helps localisation	Blend
Low	Medium hall	Minimal, localisation less precise, threshold of Haas effect	Balance/Blend
Med	Large Hall	Audible	Balance/Blend
High	Medium or Large rock venue with monitoring and backline	Ambiguous, some sounds from stage, some from loudspeakers.	Blend/Mediatisation
Very High	Stadium, Loudspeakers overpower all sound on stage	Complete	Mediatisation

In all these cases, depending on distance and visibility, auditory-visual temporal integration helps localisation. As suggested in the above table we can look at different levels of amplification in relation to the perceived spatial dislocation or detachment. This may support dealing with amplification levels as a function of the music that is being amplified.

SOCIAL DISTANCE

Dennis Smalley (2007) arranges different levels of spatial interrelation amongst performers and between performers and an audiences into different spaces. These spaces are loosely defined by Edward Hall's (1966) classification of proximity, also known as social distance[8]. In Smalley's observations these range from the most intimate 'Gestural Space' (a performer with an instrument) to a more personal, social 'Ensemble space' to an 'Arena space' in which bring performers and audience together. This 'Arena' is not to be confused with a big arena like a sporting stadium. For such situations Smalley adopts Auslander's use of the term Mediatisation, as described above. The Mediatised performance space is a product of the Gestural and Ensemble space of a performance, mediated by technology.

Sonic social distance remains intact in detached sounds

As Theo van Leeuwen (1999) points out the social distance that is encoded in a sound remains intact when we detach that sound from its source. Either by recording it or by amplifying a sound, a whisper remains a whisper; a scream remains a scream, no matter how much louder we make it. In amplified music this is a very important factor, for instance when we consider the perceived intimacy of fans being close to their idols on stage in a huge stadium, together with tens of thousands of other people. At a concert without amplification there is less emphasis on the sonic social distance and the level of intimacy is defined by different parameters such as room acoustics and size, audience number and distance to the performers. Both Smalley's notion of different intimate spaces in musical performance and Van Leeuwen's point that Social Distance is sonically encoded are independent of the L.o.A., although often emphasised in mediatised performances of pop and rock music[9]. This is important because the

[8] For an elaborate description of Social Distance and acoustics see Blesser (2007: 34/5).

[9] For instance by amplifying singers 'dry' i.e. without artificial reverberation.

way we perceive these intimacies is subjective whilst we can express these notions in relation to some objective physical parameters of sound amplification. The perceived intimacy at an amplified concert supports the suggestion that physical distance to the performers can be overcome and, to some extent, the dislocation of sound sources related to these performers disappears. Although both approaches to social distance are independent of the L.o.A. they become more apparent (and possible more meaningful) at higher levels.

Future research

In the future I hope to empirically establish the relation between spatial dislocation and social distance, and a possible interrelation with auditory-visual temporal integration

CONCLUSION

In this paper I evaluate amplified music from a perspective of production rather than perception. This will allow an objective approach to the questions: when and why do we amplify music. By stressing the relation between amplification levels and the spatial dislocation, or detachment, of an amplified sound source it becomes possible to classify different musical functions of amplification (after Emmerson 2007). The function of amplification in a certain situation is determined by the level of that amplification in relation to the level of the acoustic source. The level of amplification has no influence on the social distance between the individual performers, the audience and the way it is expressed musically, allowing it to be considered as a separate semiotic parameter.

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