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RECORDING SYMPHONIC ORCHESTRA[1]

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Abstract: *The paper reviews basic existing methods of recording a symphonic orchestra. Sound recording systems and microphone techniques are explored with the intention to demonstrate advantages and disadvantages of different approaches, and to assess effectiveness in terms of good sound quality. Acoustics principles and physical sound behavior are revealed in order to analyze and establish successful orchestral recording practices. The article summarizes the author's work and experience as a long-time recording engineer in the field of classical music. It covers many aspects connected to symphonic sound and acoustical recordings starting from spatial placement of musicians, microphone set up, recording and mixing orchestral music.*

Keywords: *sound, recording, microphone, sound quality, timbre, musical instrument, orchestra*

INTRODUCTION

The symphony orchestra is a naturally balanced acoustic sound source. As an ensemble it has been formed over several centuries to reach its current state. Empirically, its structure is formed and supplemented with the aim of sound leveling and equality of all orchestral groups. The string section is the core of the orchestra, which has been the earliest one to set up itself as a separate ensemble unit. From an acoustic point of view it is a choir of multiple homogenous elements – representing four major instruments: violin, viola, cello and double bass. This is acoustically justified and necessary in view of the difference of the intensity in the sound level between string and woodwind instruments and its leveling – woodwinds are on average 10 dB louder than string instruments, whereas brass ones exceed strings in sound level by up to 20 – 25 dB. The groups of woodwinds in double or triple numbers, and brass instruments in the same proportions have gradually been established in the structure of the orchestra (without commenting on the exceptions of large-scale composers' ideas and the too rich instrumental selections that are needed for them). Chronologically, percussion instruments are the last ones to join the orchestra, with the exception of the timpani, which have found place among the constant orchestra timbres relatively early on. During the twentieth century, the orchestra sporadically expanded its ensemble to its maximum, including almost all known professional and ethno-folk instruments. In the second half of the twentieth century, all material objects and bodies, which, regardless of their professional purpose, have some phonic and acoustic value and can be incorporated into music and orchestral activity, are interpreted as sources of sound.[2] "In music, the practice of creating with the help of "anything" and "anywhere" is widely used by street musicians, as well as by professional percussionists during concerts, and is primarily aimed at demonstrating the effects, the variety of timbres through the use of sound sources, which we perceive much more trivially in our everyday life" (Stefanova, P., 2018). All of the considerations and assertions in this report refer to the conventionally established double - sized symphony orchestra, made up of traditional professional music instruments with each exception being explicitly stated.

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[2] An early example is Concerto for orchestra and solo typewriter by Leroy Anderson from 1950.

EXPOSITION

The main prerequisite for a successful recording product is the presence of a quality sound model in the mind of the sound engineer, a clear "sound goal" to whose achievement all subsequent actions are dedicated. The fundamental considerations and artistic grounds are the next leading aspects of the sound production algorithm. This reflects the experience, knowledge and the aesthetic understanding of the sound engineer. What follows is the technological planning and the technical development of the project so that it is possible to create the most successful, predictable and controllable recording situation. These four steps are the premises of a number of leading philosophical concepts as the basis for the realization of any creative process. They can be defined in the following way: 1.Idea; 2.Principle; 3.Project; 4.Realization (Gochev, Y., 2017, page 5).

Each naturally balanced sound source requires an appropriate sound recording approach. The most important task involves a realistic, detailed and complete recreation of the original audio image in the secondary audio environment. Another important question is the level and purpose of the audio product, respectively the resources and the degree of detail in the realization. This document will only comment on a situation in which all possible seriousness and professionalism are taken into account in view of an optimal intended result.

The natural balance should be maintained as much as possible in the secondary sound environment, with improvements made only to increase transparency, optimize the sound picture and enhance the ensemble's natural phonics. The microphone setup used, as well as the spatial microphone arrangement is crucial. The recording practice over the last century has reaffirmed the main microphone as a major tool used in acoustic recording. The main microphone is a prerequisite for achieving a valuable stereophonic sound picture, which is properly constructed and comprehensively secured with information. The main microphone is positioned at a focal point that unites the sound of the whole ensemble and gives summary information with reference to timbre, volume and acoustics. Most often this is the area around and above the place where the orchestra conductor stands. The specific choice of stereophonic microphone sound recording equipment is dictated by a combination of acoustic and artistic considerations. The most important parametres in the spatial arrangement of the main stereophonic system are the distance to the sound source, the height and the internal distances between the individual microphones within the technical equipment (where available).

The phase microphone sound recording techniques result in a more comprehensive contact with the volume, reflecting more comprehensively the acoustic response of the space, along with a thorough and generalized image of the sound body. Their main advantage is the remarkable volume of the sound, increased sense of spatial presence, air and width in the picture. However, the created sound image does not always have the necessary stage stability, the localization clarity are not as precise and unambiguous as possible, which is something natural for the time-phase basis of spatial methods.

The intensity stereophonic microphone settings are in some respect a source of more limited acoustic material. The information obtained is highly coherent, accurate and graphic. The lack of phase differences is an advantage in terms of the localization curve and the accurate stage representation of the image. At the same time, their specificity neglects to a greater or lesser extent the background sound volume, the localization acuity is achieved at the expense of a lack of contact with the acoustic determinants of the hall.

The mixed stereophonic techniques are a combination of the two basic design principles for creating a stereophonic image. They combine the spatial volume of the sound with clear localization and precise sound picture. The resulting picture is more accurate, more comprehensive and more complete than the standalone results of the two types of stereophony. Naturally, the use of mixed settings implies a very high-quality acoustic volume and an extremely accurate choice of the microphone position.

Regardless of how much high-quality and reliable information can be obtained with the help of a main microphone, building a detailed and full-colour sound picture of an orchestra is not possible without the use of spots. They are the necessary technological extension of the microphone system to achieve the optimum artistic completeness finish of any sound recording product. Despite their advantages, acoustic characteristics and sound capabilities, the main microphones, when used alone, remain, in the best case, at the level of professional artistic sound documentaries. The detailed interpretation of the acoustic body, the detailed orchestral imagery and the precise sound imagery are only achievable by adding spots to the selected and properly positioned main microphone. Naturally, the opposite is also true– a sound picture built only by using spots suffers from the lack of a unifying centre. In other words, there is not a basic stereophonic unit that can unite the ensemble with reference to space and timber and that can organize it in terms of sound and vision and consolidate it within the stereo picture.

The combination of a main microphone and spots should be designed very carefully, taking into account a variety of artistic and technological considerations. The specific characteristics of the orchestra interpretation and the type of used instruments determine the parametres of the decision for the exact number and arrangement of spots in the orchestra. In this situation the function of the sound engineer is even more important than that of the conductor. The former has to interpret and render the musical score again, to accomplish one more additional step towards the visual realization with regard to the orchestral sound. "The infinite variety of the art of reading and interpreting the musical score consists of the specific details, or in other words, in the particular composition of the mix at any given moment". (Gochev, Y., 2019 page16).

The ratio between the main microphone system and the spots requires a clear concept for mixing and positioning of the individual pieces of audio information within the whole sound picture. The signals of the spots should complement, clarify and refine the main audio image. Their task is to increase the graphic clarity and refine the characteristic pattern of the sound detail. The distribution of the information from the spots with reference to the stereobase must be in line with the common localization palette outlined by the main microphone system. The balance of the individual microphones with reference to the main one is realized on the basis of the specific timbre balance and sound authenticity, the semantic and artistic importance of the given element, as well as the actual influence of the individual sound source within the whole sound picture.

It is the particular instruments included in the orchestra that dictate the presence of spots. As a rule, every major group in the orchestra needs a spot. Sometimes the first violins can be "supported" by more than one microphone given the section's extremely important semantic and thematic role in the music composed until the end of the nineteenth century. The individual spots of each string group are justified acoustically – of all instruments strings emit sound energy in the most unfocused form and this creates difficulties in obtaining detailed sound information about the group as a whole. Woodwind instruments are subject to a more generalized interpretation with the help of one joint microphone system functioning as a spot. Of course, it is always possible, and sometimes even essential, to use separate microphones for each instrument. In such cases, considerations of expediency and acoustic viability should be taken into account. When a certain critical maximum of receivers, positioned among the musicians, is exceeded the overall result begins to suffer from excessive crosstalk and degradation of transparency.

The percussion instruments are generally always supported by spots. For the overall sound it is vital to have these instruments with sufficient information about the initial transitory processes. Otherwise, their sound envelopes the overall orchestral image and by being present mainly as a diffuse but overactive component it acts more as a destructive phonic unit. String instruments, that are played by plucking, such as the harp or harpsichord, also require individual spots so that it is possible to register the sound being produced and also given their limitations in intensity and sound level.

When there is a solo element – voice or instrument –artistic imagery imposes additional arguments in the construction of the picture. The solo element is leading, it enjoys a privileged status. The solo is always provided with enough support microphones to capture the most comprehensive audio information. In electroacoustics, it is positioned equivalent to the actual placement of the musicians in the music hall. The balance between the orchestra and the soloist obeys the fundamental semantic paradigm. Particularly important is the in – depth perspective, the development of the correct auditory perspective of the soloist in relation to the whole orchestra.

CONCLUSION

Acoustic recording of orchestra performances is a complex and multifold matter. Knowledge, auditory experience and skills are required in different areas of acoustics and sound engineering. This article outlines only briefly a few aspects of the overall issue. The choice of stereo set-up and the way it is combined with the supporting microphones is crucial for the resultant quality of the electro-acoustic sound picture. In addition to the aspects listed, there are many other lines of reasoning, considerations and arguments, which have fallen outside of the scope of this report. The spatial arrangement of the orchestra members, the sound recording itself, the approaches to the organisation and structure of the recorded material, the way of mixing, the selection of takes and the production of the assembly score, every aspect of post-production – frequency, dynamics, spatial organisation, and finally mastering of the finished product – all of this illustrates the complex nature and the level of difficulty of this task. But the overall justification of the whole process lies in the aesthetics and nature of the sound recording as a specific "technological" art form. All stages of production and the end result are justified only if the artistic criteria and the aspiration to achieve a sound canvas of the highest quality and value are the leading ones.

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