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# THE SPATIAL EXPERIENCE OF MUSICAL SOURCES: TWO CASE STUDIES

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## *abstract*

*When listening to specific musical compositions in which physical space is employed with an aesthetic role, we can hear sound sources' spatial properties in the same way as we do it in the case of environmental sound sources. In this essay, I will expand the application of a model for the spatial experience of sound sources to the experience of listening to the musical sound sources of two musical compositions by the Italian composer Luigi Nono. In order to do that, I will briefly summarize how we experience sound sources' spatial properties in the case of environmental sounds; I will then mention the different kinds of physical space which we might be able to hear in the case of musical listening, and I will finally analyze Luigi Nono's "Hay que caminar" soñando (1989) for two violins and La lontananza nostalgica utopica futura (1988) for solo violin and 8-track tape to show how the model of the experience of environmental sound sources applies also to these musical cases.*

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## *keywords*

*musical sound, environmental sound, spatial perception, music, aesthetic experience, sound*

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In the contemporary debate in analytic philosophy on the location of sound we have three main groups of theories: the distal theory of sound claims that we hear sound as located where sound sources are so that sound and sound sources are heard as co-located (Casati & Dokic, 1994, 2005, 2009; Pasnau, 1999, 2000; O’Callaghan, 2007, 2009); the medial theory (Nudds, 2001, 2009; Smith, 2009; Sorensen, 2009) states that we do not locate sounds at their sources and so that sounds and their sources are not heard as co-located, but that sounds are heard as either spreading out from their sources or travelling like sound waves. Finally, proximal theories either locate sounds at the ears of the perceiver (Maclachlan, 1989) or consider sounds to be proximal stimuli (O’Shaughnessy, 2009). While these three different views differ in the matter of the location in which sound seems to be heard, they all agree on the fact that auditory experience is somehow spatial and that we are able to recover spatial information on sound sources through hearing. That is, claiming that auditory experience is somehow spatial and that there are spatial properties of sound sources which we might recover by audition is independent from specifying where sounds are heard as being located.

I (manuscript) suggested a specific model for the spatial experience of sound sources.

While, as just stated, the three groups of theories on the location of sound disagree on the spatial location they attribute to sound, they might perfectly agree on the way in which we experience the spatial properties of sound sources. The model for the spatial experience of sound sources which was originally conceived by taking into account only sound sources producing environmental sounds has been extended to sound sources producing musical sounds (Di Bona, 2017). In this essay, I will further expand the application of the model for the spatial experience of sound sources to musical sounds by analyzing how we experience space when listening to two musical compositions by the Italian composer Luigi Nono.

In order to reach my objective, I will briefly summarize (§1) how we experience sound sources spatial properties in the case of environmental sounds (Di Bona, 2017); (§2) I will then mention the different kinds of physical space which we might be able to hear in the case of musical listening (ibid), and (§3) I will finally analyze two compositions by Luigi Nono, namely, “*Hay que caminar*” *soñando* (1989) for two violins and *La lontananza nostalgica utopica futura* (1988) for solo violin and 8-track tape to show how the model of the experience of environmental sound sources applies also to musical sound sources. When listening to these musical compositions, we can hear sound sources’ spatial properties in the same way as we do it in the case of environmental sound sources.

We can describe extensively the way in which we experience spatial properties of sound sources through audition by focusing on the sources producing environmental sounds, which are commonly considered to be the sounds which surround us in everyday listening, e.g., the sound of a door slamming, cars running in the street or people talking. Given that we seem to be able to tell where sound sources are located and to recover information on their distance and direction with respect to us (Blauert, 1997), the question is what spatial information about them we exactly get. We can auditorily experience the spatiality of sound sources analogously to the way in which we visually experience the spatiality of sound sources (Di Bona, manuscript). Nudds (2009), on the contrary, claims that the way in which we experience spatial properties through audition is more similar to the way in which we do it through touch, and his argument is based on Martin's account on the difference between the visual and the tactual experience of space (1992). According to Martin, when seeing an object we experience space in three modalities: 1) we see the spatial region where the object is located; 2) we see the space between the parts the objects is constituted of; and 3) we see space *itself*, namely the space where the object is seen to be, which is also the space where an object can potentially be seen. Following Martin's three modalities for the visual perception of space, Nudds claims that the auditory experience of spatial properties which relate to sound sources differs from the visual experience of objects in space since, even if we do experience the spatial region where sound sources are and also the space between different sources, we do not experience space itself in audition, namely space *heard* as potentially empty or occupied. Expanding on Nudds' view, we can claim that the way in which we experience spatial information of sound sources through audition is similar to the way in which we experience the space of objects in vision. Therefore, in audition we can not only 1) hear the space where sound sources are and 2) the space between different sources, but also 3) hear space itself, that is, space as something which can be perceived as potentially occupied or empty. In order to show that, we can describe the auditory experience we have when listening to the sound produced by a Russian matryoshka when someone shakes it (Di Bona, manuscript). Imagine to listen to the woody sound emitted by a matryoshka doll empty of all the small dolls inside it except from the medium-size doll. When listening to this woody sound, one might hear 1) the spatial region where the dolls are; 2) the space between the external matryoshka and the medium-size matryoshka, which is to say that one can hear the distance between two sources which are the bigger external matryoshka and the medium-size matryoshka inside it; and shaking the matryoshka several times and changing the size of the matryoshka which is inside, one can also experience 3) the space within the matryoshka, and also the spatial region where the matryoshka is located, as a space that might be potentially filled by or empty of other material objects. Actually, we can tell the "quantity" of space which might yet be filled (Di Bona, 2017, p. 96). The conclusion is that the ways in which we get spatial information about sound sources by audition are analogous to the ways in which we see an object as located in space. The analogy does not go as far so as allowing to justify that the acuity of audition is comparable to the acuity of vision: auditory acuity is still relatively poor when compared to visual acuity. The analogy is only a starting point to show that our auditory experience of the spatiality of objects is alike to the visual experience of the spatiality of objects.

Before applying the "matryoshka model" to two musical compositions by Luigi Nono, we need to distinguish between two different ways of listening to musical space. When listening to music we can experience space *metaphorically* (Macedo, 2013-2014; 2015, p. 242) – when musical features of a composition, such as melody, harmony or rhythm, evoke a space (e.g., if one hears a 'rising' or 'falling' melodic line) or recall concepts related to an imaginary spatial scene (Scruton, 1983, 1997; Budd, 1985; Davies, 1994; Levinson, 2006; Peacocke, 2010; Kania, 2015);

## 1. The space of environmental sound sources

## 2. Different roles of space in music

or *literally* (Macedo, 2015, p. 243) – that is when one focuses on the interaction between the physical reality and sound. The four literal uses of space that Macedo identifies are location, acoustic space, sound spatialization, and reference. When focusing on the spatial information related to the specific venue where music is performed, composers usually employ space as *location*. The literal use of space as an *acoustic space*, underlining the specific acoustic effects of the environment on sound, is employed when composers pay attention to the resonances and the natural or artificial reverberation of the environment where sound propagates. Finally, when compositions take into account direction and motion, and give space more importance than the usual compositional means, such as harmony, melody and rhythm, they exemplify the literal meanings of space as *sound spatialization* and *reference* (Macedo, 2015, pp. 245-247). Space as sound spatialization or reference generates the dissemination of sources throughout the performance venue producing the experience of being in imaginary places that are completely different from the one where the music has actually taken place.

Not only we can listen to space in music metaphorically and literally, but we can also focus on the physical space we can have an experience of when concentrating on the spatial properties of sound sources, namely, the spatial information concerning the spatial regions where sound sources are located and the relative distance between the various sound sources with respect to each other and with respect to us. There is a way of having an experience of musical space literally which is strictly related to the auditory experience of physical space. Actually, composers take into account spatial information about sound sources and spatial features which are related to the motion and reverberation of sound when writing their music. We can distinguish, indeed, between three different aesthetic roles of physical space in music (Di Bona, 2017, pp. 97-98).

When composers consider in their compositions musicians' position with respect to each other and the audience, they use space with a *minimal* aesthetic role. Composers through almost the entire history of Western classical music have been using space with a minimal aesthetic role. Space is employed with a *weighty* aesthetic role when composers pay attention not only to the positions of musicians with regard to their relative placement and the audience, but also to the acoustic effects of natural or artificial reverberation generated by sound reflection, diffraction, and resonance. From late Renaissance music in Venice up to the 20<sup>th</sup> century, we find composers that give space a weighty aesthetic role. When having a weighty employment, space starts to play the same crucial role as the traditional aesthetic characteristics which are melody, harmony and rhythm. From the beginning of the 21<sup>st</sup> century, in the fields of electronic music and sound art, space was considered as a *prominent* aesthetic element to the point that it overshadowed harmony, melody and rhythm. In these cases, space has been investigated for the possibility of generating imaginary landscapes due to the effects based on the motion of sound. Compositions in which space plays a prominent role have been written by Karlheinz Stockhausen, György Ligeti, Luigi Nono, Jean-Claude Risset, Bernard Parmegiani, and György Kurtág. Also the genres of *field recording* and *soundscape composition* employ space with a prominent role. These genres explore the concept of space in order to create imaginary soundscapes which are completely different from the soundscapes usually generated in the specific venue where music is performed; they also include music that gives the impression of dispersing sound sources throughout the performance venue.

The three aesthetic uses of the physical space in music match the literal meanings of space pinned down by Macedo (Di Bona, *ibid*). The minimal aesthetic role of space corresponds to the literal meaning of space as *location* since both take into account, in a broad sense, the venue where music is performed. The minimal aesthetic role of space includes the spatial information recovered by the locations of musical sources, their relative placement and the placement with respect to the audience.

The literal use of space as an *acoustic space* perfectly matches the aesthetically weighty role of sound, being that it underlies the specific acoustic effects of the environment on sound: when employing the literal use of space as an acoustic space, we attribute space a weighty aesthetic role which is conveyed by taking into account the resonances and the natural or artificial reverberation of the environment where sound propagates. Finally, the prominent aesthetic role is employed in the compositions exemplifying the literal meanings of space as *sound spatialization* and *reference* (ibid., pp. 245-247), where musical space generates imaginary landscapes.

I have described so far the roles of space when employed with an aesthetic intent and found correspondances between those roles and Macedos' literal senses of space. Now, we can verify how the modality in which we experience the space of environmental sound sources is similar to the modality in which we experience the space of musical sound sources. I will therefore focus on the compositions in which space plays a minimal and a weighty aesthetic role.

When listening to the environmental sounds produced by specific sources we experience space in three ways: 1) we hear the space where sound sources are; 2) we hear the space between different sources; and 3) by hearing the space which separates sound sources, we hear space itself, that is, space as something which can be potentially perceived as occupied or empty. I will show now how this model works also when listening to musical sound sources by applying it to the listening of specific music compositions in which physical space is employed with the minimal aesthetic role and the weighty aesthetic role. As an example of a musical composition in which space is employed with a minimal aesthetic role – that is, when a composer takes into account musical sources' locations with respect to each other and the architectural features of an intended performance venue – I analyzed a composition for string quartet, W.A. Mozart's *Divertimento* in D Major K 136 (1772) (2017, p. 100). The analysis of Mozart's composition shows that the matryoshka model works in that case. The weighty aesthetic role of space is employed when space is used with the literal sense as acoustic space and I showed that we can experience musical sound sources analogously to how we experience environmental sound sources through the analysis of Giovanni Gabrieli's motet "In Ecclesiis" from Book II of *Symphoniae sacrae* and Alvin Lucier's piece *I am sitting in a room* (ibid., pp. 101-102). I will extend my analysis to two compositions by Luigi Nono, "*Hay que caminar*" *soñando* (1989) and *La lontananza nostalgica utopica futura* (1988).

Both compositions were conceived by Nono in order to explore the concept of sound in space in relation to the different ways of making space "resonating" through music; in both cases, Nono created dynamic acoustic atmospheres, trying to develop the potentialities of musical space. I will show that when listening to both compositions we experience musical sources in the same way as when we experience environmental sound sources, namely, by: 1) hearing the space where sound sources are; 2) by hearing the space between different sources; and 3) by hearing the space which separates sound sources, we hear space itself, that is, space as something which can be potentially perceived as occupied or empty.

"*Hay que caminar*" *soñando* is a composition for two violins. Nono asks explicitly the performers to change their positions while playing. They usually do it by displacing music stands in different places of the concert venue. Moreover, Nono asks the violinists to constantly vary the intensity and the way in which they create sounds in order to produce many different nuances in terms of volume and timbre (Haas, 1991; Petazzi, 1993). In the first part of the piece, there are many different degrees of "pianissimo"; in the second, there are more contrasts at the level of volume. The third part starts, instead, with a strong and intense musical passage and ends with seconds of silence as the bow of both violins remains in position. Imagine listening to a live performance of "*Hay que caminar*" *soñando* performed in a medium-sized

### 3. Two Luigi Nono's compositions

concert hall or in a church. When listening to this piece in a live concert, you can tell where the sources of sounds (the two violinists) are with respect to you and with respect to each other. Namely, you can tell if they are, say, in front of you on your left or on your right. And you can also tell when they change position as when moving from a music stand to another. Very often in this piece, there are pauses between the end of a short music sentence played by the first violin and the following music sentence played by the second violin. Already at the beginning of the piece, for example, the first violin opens the section and, when he/she concludes it, there is a long pause (“corona”) before the second sentence played by the second violin begins. The same happens in the connection between the third and the fourth bar: again, there is a long pause between the end of a sentence played by a violin and the beginning of a new sentence played by the other violin. The piece is disseminated by examples like this. Now, when experiencing these moments of silence, in which eventually the last note of one violin resonates before fading away, we experience the space between the instruments in a way that can help to tell whether they are very distant from each other: sound tells us about the space between sound sources. Moreover, we come to experience also aspects of the actual place where sound sources are heard to be, just because musicians are constantly changing their position. Therefore, we can tell if the space where sound sources are can potentially be still occupied by or empty of different objects. That is, we get the “potentiality of filling” (Di Bona, 2017, p. 100) of the space where musical sources are heard to be, which corresponds to experiencing space itself.

The weighty aesthetic role of space is employed when space is used in the literal sense of acoustic space. The perception of acoustic space (Macedo, 2015, p. 243) depends on the acoustic effects of the performing environment, effects which are generated by reflection, diffraction and resonance. *La lontananza nostalgica utopica futura* is a piece for solo violin and eight channels of pre-recorded violin and other sounds, such as strings being tuned, scrapings of furniture, random environmental sounds, people talking between takes and so on. All the sounds are modified through frequency shifting, reverberation, delaying and other technological modulations. The violin sounds Nono recorded and analyzed were produced by the violinist Gidon Kremer. Nono turned them into an auditory material played through the eight channels. The material was constituted by a mixture of violin sounds with different styles of playing and noises from the studio; violin sounds made of high-pitched melodies played in harmonics, *spiccato* and fast tremolos at the point of the bow, and other effects created by the modulation of environmental sounds. During the live performance, the electronically modulated sounds are distributed among loudspeakers that are activated live by a sound technician, who is usually free to start, fade up, or silence each channel at any time. The soloist then interacts with the tape sounds and has the freedom to decide where to begin playing the score, how long to pause, change the rhythm and performing positions on or off the stage. Nono described *La lontananza...* as a madrigal for several “wayfarers” who join in play. Each player’s score is also distributed among three music stands in different location of the performing space. The soloist part is divided into six parts whose order is fixed. During the piece, the performer walks from one stand to another. Few additional stands are left empty to add more freedom to the soloist creativity. Natural reverberation generated by the interaction between the sound of the solo performer and the eight channels alter the spatial perception of the positions of all sound sources. Nevertheless, imagine to listen to a live performance of *La lontananza nostalgica utopica futura*. One can tell where the sources of sound are located and also when they change position, as when the violinist plays from a different place from where he played before, since he moved from one music stand to another. Of course, also the loudspeakers, which are other sound sources, are spatially identifiable. Being *La lontananza* a piece that leaves room to improvisation, it is unpredictable when there will be

silence. However, very often in the piece, we are supposed to hear when a channel ends and start another one, and to experience moments in which also the solo part is silent. Now, when listening to these moments of silence we might experience the space between the different sources, at least that between the sources which are eventually located in the opposite sites of the performing space. Finally, when a loudspeaker ceases to play or the soloist himself/herself ceases to play, we can experience the space where he/she or the loudspeakers are located as something which can still potentially be filled by other material objects, which is a way of experiencing space itself.

I did not talk about cases in which space has a prominent aesthetic role, which is the role of space in the cases of sound spatialization and reference. There is some skepticism, indeed, about the possibility of providing an analysis that shows the similarity between the perception of musical sound sources and their localization, and the perception of non-musical sound sources and their localization when musical sounds are put in a way to create imaginary environments having imaginary sound sources (Di Bona, 2017). The skepticism is justified by the fact that the experience of space we have in these cases, in virtue of evoking imaginary sound sources, seems to be quite counterintuitive. Auditory experience is supposed to let us track and identify “real” sound sources. I will leave the justification of this skepticism to further research. For the time being, having showed a similarity between the spatial experience of sound sources and the spatial experience of musical sound sources when listening to two specific compositions of contemporary music is already a way of enriching the list of analogies between the two kinds of experiences with the aim of providing a unified conception of the auditory experience of sound sources.

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