
ANALYTICAL PERSPECTIVES

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**BEING FASCINATED WITH MUSICAL SPACE-TIME:
PIANO WORKS BY BRANKA POPOVIĆ (*SOLITUDE:
SELF REFLECTIONS, WITHIN A DENSE MOLECULAR CLOUD
AND FROM RAYLEIGH TO MIE*)**

Abstract: The piano works by Branka Popović (1977) appear as a unique and independent group in her oeuvre, as well as in the context of Serbian music of the current century. The question of the relation between the composer and *musical space-time*, which can be experienced directly, during the act of listening and indirectly, during the analysis of the piece of music, emerges as an essential point for understanding and interpreting Branka Popović's piano works. Under the assumption that this relationship is in the realm of unconsciousness and intuition, my goal in this article is to discover the hidden places that show how the musical space-time manifests, in this case, in the piano writing of Branka Popović. To achieve that, I will use an interpretative musical analysis, in which I will point out the specific compositional technique that Branka Popović employs and by which she 'regulates' different musical dimensions and, more precisely, musical components and their elements (specifically rhythm, timbre or tone color, harmony, motivic/thematic structuring, and dynamics) in the act of shaping the musical space-time.

Keywords: Branka Popović, piano music, musical space-time, the perception of the piece of music, musical analysis

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00:06 – 00:20 *Pure, perceptually sharp sound in the highest register repeating itself. Does it pulsate? Where is it moving?* 00:20 – 00:30 *Sounds are repeating and following one another... Gradually accelerating in movement... Where are they now?* 00:30 – 00:45 *They melted together in one sound! I can't recognize the individual sounds anymore...* 00:45 – 01:10 *Here is another sound, slightly lower than the previous ones. Like two drops dripping regularly and tenaciously onto the solid, metal-like surface...*

01:00 – 01:44 *A rather tense sound. It is approaching... almost like it is in front of my eyes...* 01:45 – 02:25 *Yet a new sound, clearer and more precise. It's vibrating... Rays of light on the water's surface...*

02:47 – 03:24 *Harp? Isn't this a piano piece? Oh – rich glissandi are just creating the impression it is a new timbre... They are overflowing...*

Those are just a few selected impressions I experienced while listening to the piano pieces *Solitude: Self Reflections* (2005), *Within a Dense Molecular Cloud* (2008) and *From Rayleigh to Mie* (2019/2021)¹ by Branka Popović, which could be described with a similar vocabulary. These impressions refer to all three pieces; although they have rather different musical material and identities, I experience each of them as an intense, exciting, and 'plastic' musical flow.²

¹ *From Rayleigh to Mie* is recorded in 2019 on CD *Arrhythmia – Piano Compositions by Contemporary Serbian Authors*, performed by Neda Hofman-Sretenović (available at: <https://soundcloud.com/neda-hofman/sets/arrhythmia-piano-compositions-by-contemporary-serbian-authors>); the score has been published in *From Rayleigh to Mie*, for piano [score], Belgrade, University of Arts, Faculty of Music, (2021). *Solitude – Self Reflections* was performed at a concert dedicated to the works of B. Popović, which took place in SKC (Student Cultural Centre) in 2017, by the pianist Bojana Šumanjski (available at: <https://www.youtube.com/watch?v=CZmF8OQsq-Q>), as well as in 2007, by the pianist Stephen Gutman (available at: <https://soundcloud.com/brankapopovic/solitude-self-reflections-for-piano>). *Within a Dense Molecular Cloud* is still in the form of a score (not recorded). All three compositions are, by far, the only pieces which Branka Popović wrote for solo piano.

² The music of Branka Popović is, overall, extremely sensual and audibly rich. Her imaginative and masterly way in working with rhythm, tone color, and dynamics, and, secondly, with texture and orchestration leads to an additional 'vitality' in her compositions. This specific sound 'identity' of her oeuvre has been recognized by several authors: Ksenija Stevanović, "The String Quartet *Out of Nowhere* by Branka Popović", *New Sound International Journal of Music*, 35, I/2010, 66–69; Ksenija Stevanović, "Poetical mechanism of *Lines and Circles*: compositional understatement of Branka Popović", *New Sound International Journal of Music*, 50, II/2017, 73–77; Srđan Teparić, "Temporality and movement in the composition of *Toba* by Branka Popović", *New Sound International Journal of Music*, 50, II/2017, 175–187; Milica Lazarević, "14:30 by Branka Popović: A

I hear the *echoes of some longer and more beautiful melodies*³ which are very 'active' within the musical flow. They are moving even when they are 'standing still' or when repeated on one tone, in a form of precisely noted rhythmical patterns of triplets,⁴ quintuplets, sextuplets, septuplets⁵, or as tremolos⁶; in some cases, they are only *ad libitum* rhythmical patterns of the same tone,⁷ where the performer determines how many times they will be repeated. Furthermore, thematic fragments are spread over the entire sound register of the piano. At the beginning of these works, the fragments are mostly located in the higher or the highest piano register,⁸ perceptually disclosing that the actual size of the musical object we are listening to is enlarged and surrounding us at almost every given moment. Or maybe we are standing in front of that object and admiring its size? Even when we hear same motifs being repeated, it is not a mechanical and fragmented repetition, but, in a strange way, is embedded in the thread of the musical flow, contributing to its unity. It is clear to me that from the beginning till the very end of each of the piano pieces I am *the part* of the musical flow: my experience of space and time is united with the space-time of the piece of music. Moreover, it is also clear to me, first as a listener and then as a musicologist, that the overall sound quality, i.e. pitch height, timbre, intensity, and duration (in sum, every basic physical element of the musical sound) is in the focus of Branka Popović, especially in her piano pieces selected for this article.

Game of 'Musical Chronos', *New Sound International Journal of Music*, 57, 1/2021, 53–72; Zorica Premate, "Autogram", Radio Belgrade 2, aired on November 19th, 2021, <https://www.rts.rs/page/radio/sr/story/24/radio-beograd-2/4581067/branka-popovic.html>.

³ I paraphrase the composer's statement on why she mostly uses short motivic cells as the primary content in her compositions. From a private conversation with Branka Popović, conducted online via *Zoom* on December 23rd, 2022. I would like to express my gratitude to Prof. Popović for the interview and valuable insights into her piano works, some key points of her poetical and aesthetical approach and, overall, an inspiring conversation about the music in general.

⁴ Noticeable in *Within a Dense Molecular Cloud*.

⁵ Noticeable in *Solutide – Self Reflections* and *From Rayleigh to Mie*.

⁶ Crucial for *From Rayleigh to Mie*, where tremolos appear in two different forms: as 'standard' marks (embellishment) and as notations for the actual sound results, in the form of thirty-two notes.

⁷ Occasionally, in all three pieces.

⁸ With the exception of *Within a Dense Molecular Cloud*, which opens in the lower register.

On musical space-time

Even though my experience as a listener is valuable in commenting on these works, unfortunately, it is not sufficient when it comes to my musicological interpretation. To be fully adequate, the second, musicological experience requires an additional theoretical and methodological foundation. However, the literature on the subject of musical space-time is quite vast; the subject has been elaborated from different scientific disciplines and within different methodological frameworks. Therefore, in this article, I will use the term musical space-time to interpret the phenomenon that is immanent to the music as an art form, regardless of the poietic, aesthetic, and stylistic context in which a piece of music has been created or the influences of this context on the composer himself. I understand musical space-time as the reflection and presentation of the piece of music itself, which implies that the musical form can also be interpreted as a musical space-time. The dimensions and characteristics of space-time in music are similar to the experience of physical space-time at the metaphorical level, which manifests itself in the language of music (pitch height, tone leap, higher/lower register, etc.) and also in the way in which the composer approaches the musical components and their elements when creating a piece of music.

Besides this interpretation, there are some other and more unique views on musical space-time; the most appealing being the one advocated by Maria Anna Harley. Her Ph.D. thesis is focused on the phenomenon of *spatialization*, which defines one precise and rather niched aspect of the manifestation of space-time in music.⁹ According to Harley, “the presence of spatialization can be recognized in every situation in which spatial extensions, positions (directions and distances) of the sound sources as well as the acoustic quality of the

⁹ Maria Anna Harley, *Space and Spatialization in Contemporary Music: History and Analysis, Ideas and Implementations*, Ph.D. thesis, Faculty of Music, McGill University Montreal, 1994, 4. Defining musical space-time by means of the analysis of the musical components is the most common approach in the field of phenomenology, aesthetics, and music theory, particularly in Anglo-Saxon and German literature on the subject. What Harley concluded in the part of her research dedicated to the history of the idea of musical space is that the authors (Ernst Kurth, Gisèle Brelet, Roman Ingarden, Hermann Helmholtz, and others) mostly question the issue of ‘inner’ musical space, a hidden phenomenon or structure which ‘resides’ in a piece of music, and reveals itself through listening (or partially, the score, added by M. B.), especially through certain perceptually distinctive aspects of spatiality.

performance space are given compositional significance¹⁰. It can be the acts of using musical 'dimensions', such as rhythm, timbre, dynamics, pitch height (i.e. the motivic/thematic level of the piece), and harmony, but it can also be the acts of unique seating settings for performers or listeners during the concert, performing music in a precisely designed space, the use of technology (i.e. loudspeakers) in achieving specific, and above all, spatial effects, etc.

The studies and articles which deal with the concept of space-time in art music are aiming to prove the existence of musical space-time and its manifestation in the piece of music by examining the role of movement. More precisely, the primary premise here is the existence of the energy within the musical flow, because the movement, the change of positions, the distance, etc. are identified as spatial dimensions of height and width. Here, the *geometrical model of space-time* has been equated with the musical space-time, which in the further elaboration by M. A. Harley is shown as inadequate, especially when it comes to interpreting the space-time in music. However, it is crucial to emphasize this fact precisely because the writings of musical theorists, aestheticians, philosophers, as well as composers are mainly focused on the idea of musical space-time as a geometrical model, which subsequently influenced the relationship between the composer and the musical space-time; for some of them, the musical space-time was seen as a literal translation of the physical/scientific concept of the space-time into music.

Lastly, there is another significant approach to the subject of space-time in music, which relies on the premise that space-time is inseparable from the form and the content of the piece of music. For the musical theorist and composer Berislav Popović, musical form and musical content are in a close interrelation, making it impossible to think about one without thinking about the other. Only together do they participate in creating a space-time continuum. Furthermore, the author focuses on the question of energy and overall dynamism of the musical flow as one of the pre-defined criteria for the piece of music, and his interpretation of gravity, as one of the essential questions of space-time in general, also has a fundamental place in his theory of musical form.¹¹

¹⁰ Ibid. The author's focus is on the subject of spatiality because, in her opinion, the subject of musical time is already thoroughly analyzed in the literature.

¹¹ Berislav Popović, *Muzička forma ili smisao u muzici (Music Form or Meaning in Music)*, Beograd, Clio, 1998, 18, 21, 39, 61, 69, 89, 100. For Popović, motifs are "generators of the musical flow", since they store the potential to initiate and maintain the movement within the musical flow.

On perceiving musical space-time

The scientific representation of space-time, which, since the introduction of Albert Einstein's theory of relativity,¹² is a four-dimensional model of space-time, is not something quite possible to audibly recognize in the piece of music. Don Ihde, for example, argues that it is rather false to even think about the entire World (as the space-time, added by M. B.) in the terms of scientific models, bearing in mind that we are dealing with both phenomenologically and perceptually complex phenomena, which is impossible to perceive with one sense only.¹³ To be able to perceive (and experience!) the World in all its complexity one must rely on all the senses, only in a somewhat different ratio. What Ihde points out as questionable is that, since the time of Plato and Democritus at least, human perception has been conditioned solely upon the sense of vision.¹⁴ The fact that vision dominates and regulates our perception has also influenced how we perceive music: we *watch* the performance and *read* the score, which makes our understanding and experience of music harder, especially at the most primal, phenomenological level, especially concerning the nature of the music itself, i.e. her acoustical representation.

If we succeed in overcoming the sense of vision as the dominant sense to perceive the World¹⁵ and experience, in a way, the holistic perception of the

¹² The credit for the idea of four-dimensional space-time belongs to the mathematician Hermann Minkowsky. For a detailed insight into the history of the idea of space-time in science, cf: Max Jammer, *Concepts of space. The history of theories of space in physics*, Cambridge, Harvard University Press, 1954; Lawrence Sklar, *Space, time and spacetime*, Berkeley: University of California Press, 1974; Bas C. van Fraassen, *An introduction to the philosophy of time and space*, New York, Columbia University Press, 1985.

¹³ Don Ihde, *Listening and Voice: Phenomenologies of Sound*, second edition, State University of New York Press, 2007, 11. Ihde emphasizes that *all* our senses participate in the perception of the World, at any given point, only that theorization and rationalization lead to the impression that we use only one specific sense (for example, the sense of vision) in perception. For an in-depth elaboration on the domination of vision in (Western) philosophy and culture, cf. *ibid.*, 6 onwards.

¹⁴ *Ibid.*, 9 onwards. Vision, potentially, has the dominant role in the perception of space because the terms related to spatiality are mostly connected to the visual experience (for example, distance, height, width, and depth). However, the bodily experience that we are 'in a space' is also involved in the perception of this phenomenon. On the other hand, time is primarily and almost exclusively perceived with the body, i.e. the 'inner clock' sense for time. Visually, time can be perceived by looking at a watch, calender, etc.; however, those are rather ways to quantify time, not the experience of the time itself.

¹⁵ The dominance of the visual in Western culture is deeply related to the phonetic type

phenomena, the difficulty with listening seems to emerge as problematic. According to Ihde, listening as a phenomenological act "...is more than an intense and concentrated attention to sound and listening", therefore it implies that during the listening act, we are aware (more or less, added by M. B.) of the interference of our beliefs, values, and judgments in the process of 'just' listening, or hearing things as they are, on the phenomenological level.¹⁶ In that case, it could seem impossible to find a way to perceive reality as a pure phenomenon, without the 'imprint' of the listening subject. Would that type of phenomenological experience be even authentic and valid?

Accepting the view that the perception of space-time and the perception of music is a complex cognitive activity, we could easily ask ourselves how is it possible to perceive one complex phenomenon (space-time) in the context of the other complex phenomenon (music). More precisely, in which way do we perceive space-time in music or pieces of music? The question is intriguing but it requires a broader discussion, which is not the subject of this article. In this article however, we can rely upon and accept the premises that during listening to the music we experience the musical space-time based on how the musical flow is shaped, or the role of certain musical components in perceiving the musical flow as musical space-time.

The manifestation of musical space-time in the piano works by Branka Popović

Reflecting upon the history of Western art music and the changes in musical language in a broader context, the fact that the characteristics of the sound, i.e. pitch height and duration (which were crucial in music up to the end of the 19th and the beginning of the 20th century), and gradually afterward, timbre or tone color and dynamics or intensity (which were, up to that time, only secondary!),¹⁷ up to the musical components and their elements, had a significant role in the manifestation of space-time in music. In other words, the characteristics of sound are related and equated to dimensions of musical space-time, thanks to how they appear in a musical flow and which percep-

of our letter, whereas Eastern cultures use idiosyncratic types of letters. Tijana Popović Mladenović, *Muzičko pismo. Muzičko pismo i svest o muzičkom jeziku sa posebnim osvrtom na avangardnu muziku druge polovine XX veka*, drugo izdanje, Beograd, Fakultet muzičke umetnosti, 2015, 33–44.

¹⁶ Ihde, op. cit., 49.

¹⁷ This is inseparable from the changes in musical notation and musical writing. Cf. Popović Mladenović, op. cit., 44–46.

tual effect they evoke, i.e. in which way the composers are ‘using’ them when creating a piece of music. Therefore, to understand how we experience space-time in piano works by Branka Popović, the musical analysis will aim to show the role of musical components and their elements in the experience of musical space-time. For a comprehensive overview of the way the composer relies on musical components and their elements, and how they influence our perception of musical space-time in her piano works, the analysis is focused on the technique employed when working on specific components. In some cases, we can hear only one component or element as leading at a given moment; however, it is often the case where almost every if not all components and their elements create a certain musical effect.

Rhythm

Rhythm, along with meter and speed (i.e. tempo), is a direct manifestation of the musical time. In the piano works of Branka Popović, it regulates the musical flow from several planes. Firstly, it captures the actual duration of the piece of music, and then regulates the *density* of musical space-time.¹⁸ Furthermore, the rhythmical dimension in *From Rayleigh to Mie* (mm. 41–66), along with the dynamics, intensifies the musical flow, leading to the culminating point and a new segment of the piece. In the segment from mm. 81–128 (especially, mm. 125–128), besides rhythmical, we see also metrical changes, which is the next level of manipulating the duration. From mm. 1–40, rhythm regulates the acceleration of the musical flow; the figures are complementary (in the right hand, eight notes, often in the combination an eight note and an eight pause; in the left hand, this underlying eight note beat is enriched with thirty second notes), which creates the impression of the field within which the composer elaborates the musical content by alternating the motifs in both hands and regulating in that way the density of musical space-time as well. On the other hand, in *Within a Dense Molecular Cloud* we notice two differentiated rhythmical ‘flows’, which is the central axis in contrasting between the segments of the three movements of this piece.¹⁹ In the first movement, for example, we can clearly notice two different rhythmical

¹⁸ Considering the fact that musical space-time always contains musical objects and events, which subsequently affect the appearance of the musical space-time itself, it cannot be empty, even when it contains only a rest.

¹⁹ Besides the richness of the rhythmical component, pitch height (thematical-motivic dimension), dynamics, and registers also play a crucial part in creating contrast between formal sections.

‘profiles’: in mm. 1–46 the profile consists of quintuplets and short rhythmical figures, while from m. 47 onwards and till the end of the movement, triplets are the elementary rhythmical pattern (followed by the change in texture, register, and dynamics).²⁰ Moreover, the composer also adds *ad libitum* patterns, usually indicating the indefinite number of repetitions, which can be interpreted as the dilatation of musical time, followed by numerous oppositions within the rhythm.²¹ These oppositions are represented in opening motifs of *Within a Dense Molecular Cloud*.

In all three piano pieces, the composer also uses the metrical component, creating mostly linear polymetrics. This can be noted in mm. 61–84 of *Solitude – Self Reflections*; the section leads into a culmination (mm. 85–88). In some places we can also notice vertical polymetrics, most transparent in *From Rayleigh to Mie*. The speed in the piano works of Branka Popović is the only component which remains unaltered; interestingly, there are only a few parts written in *rittardando* (*Within a Dense Molecular Cloud*, II, m. 40 onwards), without any traces of *accelerando*. On the other hand, in *From Rayleigh to Mie* the rhythmical component is compressed (which leads to the acceleration of musical time) until the shortest rhythmical units (again, thirty two notes), which transforms into a resonating glissando at the end.

The important part of the rhythmical design of the musical flow in these works is a rest. Usually interpreted as a signal of stopping or ending,²² the rest within the musical flow always brings a certain level of tension, because the listener is never completely certain what comes afterwards (the final ending of the piece or just a temporary hold). However, in the piano works by Branka Popović, the rest is not only an important agent of the musical dramaturgy, its musical-semantic meaning and value is created within the context of the overall rhythmical design.²³ For example, in *Solitude – Self reflections*, the rest

²⁰ Referring to her approach to musical material, the composer disclosed that she uses “time condensed” material, which then serves as the nucleus for the dramaturgy and outline of the entire piece. Private conversation with B. Popović.

²¹ This is also an act of segmenting the musical flow, therefore the rhythmical changes also have the role of marking the shifts between the formal segments.

²² Cf. Zofia Lissa, „Tišina i stanica u glazbi”, u: *Estetika muzike /ogledi/*, prev. Stanislav Tuksar, Zagreb, Naprijed, 1966, 145–168.

²³ The unique approach towards the musical time (rhythm and tempo) is also noticed by other authors, in other works by B. Popović, especially: Lazarević, op. cit., 56, and Teparić, op. cit., 185. Lazarević compares the composer’s approach to the approach of Anton Webern, which is confirmed by the composer herself, in the statement about “time-compressed” musical material.

is a part of the very structure of the motif: it appears in the precise beats and at a precise location within the musical flow (Example 1a), which is the same technique used in *Within a Dense Molecular Cloud* (Example 1b).

Example 1a: B. Popović, *Solitude – Selfreflections*, mm. 1–6.

Nervous and sparkling $\text{♩} = 104$

The musical score for Example 1a consists of four systems of music, each with a piano (Piano) part and a piano solo (Pno.) part. The tempo is marked as 'Nervous and sparkling' with a quarter note equal to 104 beats per minute. The key signature has two sharps (F# and C#), and the time signature is 4/4. The piano part is marked *pp* and features a complex rhythmic pattern with many beamed notes. The piano solo part features a similar rhythmic pattern with some triplet and quintuplet markings. The score is divided into measures 1, 3, 5, and 6. Measure 5 includes an asterisk (*) above a dense cluster of notes. The piano solo part in measure 6 is marked *cresc.* (crescendo).

* irregular fast note repetition, play as many notes as possible

Example 1b: B. Popović, *Within a Dense Molecular Cloud*, I, mm. 1–10.

I
Energico ♩ = 88

leave it to ring

Piano

ff

5

3

5

leave it to ring

Pno

5

3

5

leave it to ring

Pno

5

3

5

Tone colour

Even though all three pieces are composed for the piano, the composer's approach to the instrument and its colour in all three is different. There is a common characteristic in the way in which B. Popović approaches the sound of the piano, which reflects her devotion to the instrument and focus on the detail. On the other hand, we can notice that she explores different sound nuances within the parts of her compositions, which often results in transforming the sound of the piano into a new sound.²⁴ In that sense, the following techniques are employed: 1) the precise and intentional use of different registers in achieving a certain tone colour (higher registers sound sharp and

²⁴ In our conversation, the composer revealed her (intimate) passion for the instrument; in her opinion, the piano represents “the source of never-ending possibilities in exploring sound and experimenting with it”.

‘dry’, while lower registers reflect depth and ‘fullness’; also, the sound in higher registers is always easier to perceive, since we can clearly distinguish between different pitch heights, which is not the case with the sound in the lower registers – often, we hear only a sound mass instead of differentiated pitch heights), 2) the musical material which *simulates* the tone colour of some other instrument by the technique of melodic – rhythmical transformations (i.e. the sound of the harp in *From Rayleigh to Mie*, mm. 67–80), 3) the distinctive compositional/performing technique which transforms the sound of the piano into the sound of percussions (in *Solitude – Self Reflections*, with the assistance of the rhythmical component and the register in which the motif is displayed, mm. 1–40; at the end of *From Rayleigh to Mie*, when the pianist performs left-hand glissandi on the F string within the piano, while simultaneously performing the *ad libitum* part in the right hand, mm. 146–154), and 4) instructions on leaving the tones to ring, which is marked in the score but also indicated with the use of the right pedal, longer rhythmical notes and an arpeggio that is ‘written down’ (*Within a Dense Molecular Cloud*, I, mm. 1–12 or *From Rayleigh to Mie*, mm. 129–135). What is intriguing is that there are almost no cross sections within different registers in the pieces: it appears that the composer has a clear intention to focus on tone colour and sound quality, rather than the position of the sound in the musical space-time. Therefore we can notice the longer parts of these pieces where the musical flow is located within one specific (for example, high) or nearby registers, which changes only in the moments of culmination and leads to the separation of registers, and subsequently the perception of the actual volume of the musical flow.

Besides creating a goal-oriented sound experience, B. Popović’s use of registers also contributes to the experience of musical space-time. For example, the first part of *Solitude – Self Reflections* and *From Rayleigh to Mie* is located exclusively in the higher registers, which can be associated with the impression of one high and wide space. A similar impression appears at the beginning of *Within a Dense Molecular Cloud*: the lower register is experienced as a dark, gloomy space located underground or gradually opening in the direction of the underground.

The dimension of harmony

The dimension of harmony appears to be secondary in the experience of the musical space-time, at least in the perception of the phenomenon. The semi-tones and non-triadic chords are employed in shaping the timbral dimension

of the musical space-time, rather than in the positioning of the vertical as the structural point of the piece.²⁵ The most transparent harmonic thinking is seen in the third movement of *Within a Dense Molecular Cloud*. There we trace the harmonic structures which are seventh chords but spread out in both hands. Interestingly, these chords do not make any progression: they are only repeated in a specific pattern and are not in any way related or dependent on the following chord. One is intrigued to think whether these parts of the musical flow are even thought-out as (traditionally) harmonic or, on the other hand, they contrast the previous voice-leading manner²⁶ of presenting the musical material. The conclusion is that the vertical, i.e. harmonic dimension in the selected works is not an important part of the overall structure of the musical form, rather it marks only some points for the more powerful melodic line.²⁷

Motivic/thematic structuring

The composer approaches the musical material primarily from the developing principle, i.e. the principle of developing variations. She uses one motivic nucleus, which appears to be the central one in shaping the musical flow, to create all subsequent motifs, mostly using repetition and interrelation. In the perception of all three piano works, what is the most striking is how we experience the unity of musical flow within its essentially fragmented design. The experience of perceiving how the distinctive motifs freely move throughout the musical flow, mark the shape of musical space-time in different piano registers and dynamic nuances. The most common technique is the unison repetition of a selected motif (which is paradigmatic for *Within a Dense Molecular Cloud*) or alternation of the motifs of similar design and content (which is paradigmatic for the other two piano pieces). In *From Rayleigh to Mie* (Example 2), the effects which evoke the thriller and tremolo are especially intriguing: this musical content creates the impression of a vibrating

²⁵ In that context, the piano works of Branka Popović most closely resonate with the orchestral works from the 1960s, particularly *Atmosphères* (1961) or *Lontano* (1962) by György Ligeti, and *Jeux vénitiens* (1961) by Witold Lutosławski.

²⁶ Here, it is more accurate to use the term monothematic, considering the fact that motivic cells are spread out in both hands, creating the impression of one entity that is continuously developing either by adding new material or, on the other hand, by repeating the familiar material but altering other components and elements of the musical flow. This type of development is applied in all three piano works.

²⁷ Cf. Stevanović, op. cit., 2017, 68, footnote 3.

and sparkling musical flow, along with a striking visual experience. After this, one could say, 'endless' tremolo, the musical flow continues in a form of glissandi, followed by the change of the tone colour (the harp). That way, the musical flow has reached balance; two seemingly different movements – two types of light! – join in the same flow until the end of the piece.

On the other hand, in *Solitude – Self Reflections* we can notice one primary motif (mm. 1–30), which appears to have the leading role in the musical flow: in this case, the basic motif continuously spreads out within the musical space-time, reaching the peak point in mm. 8–15. Perceptually, we experience it as if only this singular motif *is* the musical flow, which continuously growing in size and volume.

Example 2: B. Popović, *From Rayleigh to Mie*, mm. 40–57.

Ben articolato =  88



51

Pno.

54

Pno.

56

Pno.

Dynamics

Of course, the molding of space-time in the selected piano works of B. Popović cannot be fully comprehended without analyzing the role of the other components and elements of the musical flow. These other components and elements mostly participate in emphasizing some other component, for example rhythm, or assist in making its influence perceptually transparent. Besides that, the other components and elements also participate in building thematically contrasting sections (for example, in *Within a Dense Molecular Cloud*, the structure of which is basically rooted in duality, thanks to the juxtaposition of the two opposing materials, found in all three movements of this piece) and different formal sections.

From these other components and elements, the *dynamics* have the most prominent role; not only do they affect the perceptual value of the other components in the course of listening, but they also emphasize the experience of musical space-time. The sections performed in the piano dynamics create the impression that the musical objects we perceive are actually distant

from our standpoint, while the sections performed in forte and fortissimo are experienced as if the musical objects are right before us. Moreover, the dynamics have a distinctive role in the dramaturgical layout of these compositions: the changes in dynamics are usually linked with the peak points or with the process of graduation and tension building. In *Solitude – Self Reflections* we notice these types of changes in the dynamics in the first part of the piece (mm. 1–33); in mm. 1–32 the gradual tension building through the dynamics is achieved by using piano and pianissimo, then a slight crescendo (m. 6 and 11), then a decrescendo (m. 19) and finally, settling in pianissimo (m. 32). Here, the dynamics are also involved in the experience of ‘fading out’, followed by the gradual ‘decomposing’ of the motivic thread, which is then experienced as a slowing-down moment (a sort of structural decrescendo). However, a sudden change takes place in the next measure, signaling the next formal section of the piece (mm. 34–60). A similar technique is used in *From Rayleigh to Mie*, mm. 58–66, where the central dynamic nuance (piano) gradually reaches pianissimo, and then forte, accumulating the energy which will be released in m. 67, in the glissandi section. In *Within a Dense Molecular Cloud* (Example 1b), the forte dynamics at the beginning of the piece help in perceiving the sense of spatiality, together with a lower register and the sound shape of the initial motif, which continues to resonate (instructed in the score with the “leave it to ring” mark). This particular gesture brings us to the horizon of silence, which in mm. 47–73 enters the field of echo, expanding in that way the timbral dimension of the musical space-time.

Somewhat more profound dynamics can be noted in the second and third movement of the mentioned piece. The intersections between piano and forte happen within the same motif (II movement, mm. 1–2 or mm. 13–14, III movement, mm. 1–2 or mm. 15–17), which makes the perception of the musical space-time more intense (Example 3a, 3b). These fast changes in dynamics are experienced as if the group of several motifs (although, there is only one!) are moving in different directions and at a different range in regard to the listener, which subsequently creates the impression as if there are more than one musical object located at different positions of the musical space-time. This type of multi-directional movement of the objects in all possible directions within the space-time is typical of post-tonal music.

Example 3a: B. Popović, *Within a Dense Molecular Cloud*, II, mm. 1–2.

II
Sparkling ♩ = 88

Piano

ppp *ff*

♩

Example 3b: B. Popović, *Within a Dense Molecular Cloud*, III, mm. 15–17.

15

Pno.

ff *ppp* *ff* *ppp* *ff* *ppp*

17

Pno.

ff *ppp*

3

Articulation and phrasing; articulation marks

The prominent role in shaping the musical flow and, therefore, the musical space-time, besides dynamics, belongs to *articulation and articulation marks*. The composer employs these elements in order to make a certain musical object more solid and perceptually distinctive (for example, the accentuation at the beginning of the III movement of *Within a Dense Molecular Cloud*, together with forte, results in a sharp, penetrating sound effect). The articulation marks also contribute to the experience of the musical space-time in these piano works, because they are linked with the tone quality, i.e. timbre (‘resonating’ motifs followed by the mark “leave it to ring” and the use of echo, the marks which define the interpretation, such as “sparkling”, “myste-

rious”, “nervous”, “angry”, etc.). However, these subtle nuances suggested by the composer can be noticed only when reading a score; in the performance, those nuances cannot be easily perceived.²⁸ Moreover, the important role in the experience of musical space-time belongs to the technique of piano playing, i.e. the use of the right pedal (primarily to create resonance and therefore to manipulate the timbral and rhythmical dimension of the musical space-time), the use of tremolos and glissandi, as well as staccato (in *From Rayleigh to Mie*, the staccato is an inseparable part of the new form of expression, while in *Within a Dense Molecular Cloud* it shapes the character of the motifs, making them sound sharp and dry).

Concluding remarks

The analysis of the piano works by Branka Popović reflects the complexity of musical space-time, not only at the primary, phenomenological level of perception, but also at the analytical/musicological level as well.²⁹

By comparing all three pieces, certain common characteristics appear, especially in the treatment of sound, the musical material and musical components, which can be related to the relation between the composer and the phenomenon of musical space-time.³⁰ Evidently, the essential focus is on the matter (more precisely, atoms and the particles) and light, which is most obvious in the last piece of this selected group of her solo-piano works, *From Rayleigh to Mie*.³¹ However, even without the explicit interest for the matter and light, the way in which the composer approaches the musical material in her composition reveals her fine-tuned sensibility for musical space-time.

Therefore, the understanding of the manifestation of space-time in music is possible through an insight into shaping the musical flow and the musical

²⁸ We can notice when the musical flow becomes more dramatic and tense, or when a certain section sounds sparkling or radiant.

²⁹ Musical space-time is the phenomenon which is deeply rooted in the existence of the music itself (especially, Western music), and it can be experienced in every piece of music, to a different extent. Therefore, the analytical procedure which, in this article, is conducted in the analysis of piano pieces by Branka Popović can be actually applied to any other piece of music, which is written in the score (captured in musical writing).

³⁰ The composer revealed her genuine interest in nature and its phenomena, especially those in relation to space-time and the universe. From Private conversation.

³¹ This piece focuses on two different light phenomena, embodied in two distinctive thematic materials, shaped as a duet. The composer brought my attention to this compositional manner, in our Private conversation.

components of the musical flow. In that sense, the analysis of Branka Popović's piano works revealed this complex phenomenon from the aspect of its 'dimensions': duration, timbre or tone color, pitch height, and dynamics or intensity, as well as the musical components and their elements (rhythm, meter, and tempo; motivic/thematic structuring and harmony; articulation marks, agogics, and articulation). What is the most striking and appears as a manner is the composer's relation to the dimensions of duration, especially rhythm, meter, and speed; we could trace and hear that the rhythmical dimension is highly developed, which directly evokes the effects of compression or dilatation of musical time. The composer achieved this by a rich rhythmical outline of her works, using different figures and patterns, often organizing the rhythmical flow as duets (in *From Rayleigh to Mie* or *Within a Dense Molecular Cloud*) or, on the contrary, as a unique metro-rhythmical thread (in *Solitude – Self Reflections*).

The timbral dimension is another important aspect of the manifestation and shaping of the musical space-time. Here we also trace and identify the composer's sophisticated and elegant taste and sensibility towards the piano and its sound in particular. Her imagination in treating the instrument can be noticed in the manner of transforming the piano sound into the sound of a harp (*From Rayleigh to Mie*) or percussions (*Solitude – Self Reflections*). Furthermore, the composer uses the registers on the piano with the precise intention to create a unique sound effect: the higher registers sound with a sharp, penetrating, and perceptually distinctive sound, while the lower registers sound more gloomy, darker, and indistinctive.

Lastly, the dynamics, i.e. the dimension of intensity, also have a significant role in shaping the musical space-time. This particular dimension regulates the size and volume of the musical objects in musical space-time, and therefore their position regarding the listener. In that sense, the objects that appread on the horizon of piano dynamics are perceived as distant and almost audibly unattainable, while the objects in forte are perceived as nearby. However, the musical space-time can be fully and authentically experienced only as the mutual interrelationship of all the musical components and their elements; in the listening act, certain components and their elements can appear as perceptually more distinctive than others, or we can, willingly, perceptually distinguish and separate one component from the others.

In the overall listening experience, the piano works of Branka Popović, in the context of perception, interact intensively with our senses, making the listener awaiting for the next event in the musical space-time, which captures

his attention and occupies his perception. Listeners are involved in the musical flow and events within it, and the composer's craftsmanship and delicate musical language are what take us through the unique experience of the musical space-time of her piano works *Solitude-Self Reflections*, *Within a Dense Molecular Cloud* and *From Rayleigh to Mie*.

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Summary

In the main focus of the present article is the phenomenon of musical space-time, in the context of the piano works by Serbian composer, Branka Popović. The concept of musical space-time is defined as the mode of presentation of the piece of music, which implies that the musical form can also be interpreted as a musical space-time. The dimensions and characteristics of space-time in music are identified with the experience of physical space-time at a metaphorical level, which is noticed in the language of music (pitch height, tone leap, high/low register, etc.), and in the way in which the composer manipulates the musical components and their elements in the musical flow. In the musical analysis, however, the parameters of the sound are identified with the dimensions of musical space-time, thanks to their appearance in the musical flow and the perceptual effect they create, i.e. the way in which the composers 'make use' of them when creating a piece of music. In this article, the musical analysis of Branka Popović's piano works revealed this complex phenomenon from the aspect of its 'dimensions': duration, timbre or tone color, pitch height, and dynamics or intensity, as well as the musical components and their elements (rhythm, meter, and tempo; motivic/thematic structuring and harmony; articulations marks, agogics, and articulation). In the piano writing of Branka Popović, we can notice that she relies especially on rhythm, tone color and dynamics when shaping the musical space-time; other components and their elements are noticeable in peak moments, as well as in segmenting and achieving the unity of the musical flow. It should be noted, however, that musical space-time can only be fully comprehended and experienced in the entirety of the musical flow, through the unity of the musical components and their elements; in the listening act, certain components and their elements can appear as perceptually more distinctive than the others, or we can, willingly, perceptually distinguish and separate one component from the others. In the overall listening experience, the piano works of Branka Popović, in the context of perception, interact intensively with our

senses, therefore the listener awaits the next event in the musical space-time, which captures his attention and occupies his perception. Listeners are involved in the musical flow and events within it, and the composer's craftsmanship and delicate musical language are what takes us through the unique experience of musical space-time of her piano works *Solitude-Self Reflections*, *Within a Dense Molecular Cloud* and *From Rayleigh to Mie*.