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The interaction of the flute with the Sampo device in the performance of mixed electro-acoustic music

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Abstract This article discusses the flute's interaction with the Sampo device in the performance of mixed electroacoustic repertoire with sound files or in real time in light of the experience of presenting a lecture recital at the international conference "Flute: Hands on Research 2017". Three pieces were adapted for flute and Sampo for the performance. The intention was that each piece should define a different mode of interaction with electroacoustic resources, with the objective of demonstrating the variety of its characteristics. The device was created in 2014 by Alexander Mihalic (composer and member of Musinfo in Saint Étienne, France), in order to facilitate the interpretation of electro-acoustic repertoire without requiring a technical assistant.
The article will also approach the processes of preparing, constructing and performing this repertoire, focusing on important aspects that include: the possibility of changing the parameters of the effects, stopping and starting the electronics with sound track and in real time, using the pedals (up to 7 pedals per device). The requirements of the sound production which arose throughout the preparation of the pieces and the interaction of an acoustic instrument with the Sampo device will also be discussed, in order to provide the performer with a greater involvement in the process of performing works which include electroacoustic elements.
Keywords mixed electro-acoustic music, flute, Sampo, interaction

Interpretative requirements in performing mixed electroacoustic musical compositions

Mixed electroacoustic music (a combination of acoustic and electronic instruments with a sound file or in real time) was developed in the early 1980s as a response to a certain dehumanisation and techno-cratism with which electro-acoustic music was beginning to be associated. At the same time, the increasingly user-friendly, high quality recording technologies established a high quality level of sound production. Works for acoustic instruments adopted some of these sounds (wind and percussion sounds, for example, in the case of the flute) and began to require a true virtuosity from the musician, who needed to be aware of these tendencies.

In the 21st century, 40 years after the advent of mixed electroacoustic music, it is fundamental for instrumentalists to know the repertoire of this 'tradition' and to develop the rigorous technique for the execution of this repertoire. The "relation" of the sound of acoustic instruments with electroacoustic sounds, which were created or modified through electronic equipment and instruments, such as synthesizers, digital recorders, computers or compositional software, require the instrumentalist to be especially careful of the sound and also, the technical skills for the pieces to be performed. The objective is that the performer develops the capacity to adapt to electroacoustic resources on stage as though in "synergy" with another musician such as during a chamber music performance.

The work of the musician is, at times, hindered by the lack of instructions regarding the process of interacting with the electroacoustic material. The indications are not always included in the performance notes of the score and the performer thus needs to invest a great deal of their time in the decodification of the material in order to construct a fluent interpretation with a high level control over all details – both musical and technical.

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> In electroacoustic music, there is often no score and if there is a score, as it is in the case of mixed electroacoustic music, it represents only partial aspect of the piece. In this case, the score reveals information mostly about instrumental part, the electroacoustic part is sometimes ignored (the score includes only time lines for synchronization or is represented by schematic graphical notation (time lines and graphical representation of some sounds and musical events important for synchronization). (Bachratá, 2010. p. 32)

The Sampo device and the advantages of its use for the instrumentalist

The Sampo device was specifically constructed in order to facilitate the preparation of mixed electroacoustic repertoire. The scores of these pieces, adapted to be performed with the Sampo, also include additional indications regarding the interaction between the device and the instrumentalist.
According to Finnish mythology, the Sampo was a magical object that could make its owner rich. “Today, Sampo is an object that produces sound transformations of acoustic instruments and contains the composers' wealth inside of it.” (Mihalic, 2015, para. 2nd Sampo - Mythology)

The Sampo is an electronic device created by the composer and inventor Alexander Mihalic for all instrumentalists and composers wishing to expand the sound of their acoustic instrument. It is designed to play all genres of music. Sampo can perform the repertoire of mixed music of the twentieth and twenty-first centuries. Sampo is aimed at professional musicians as well as amateurs (Mihalic, 2016, Mixed Music Distribution Network – Réseau pour la Distribution de la Musique Mixte).

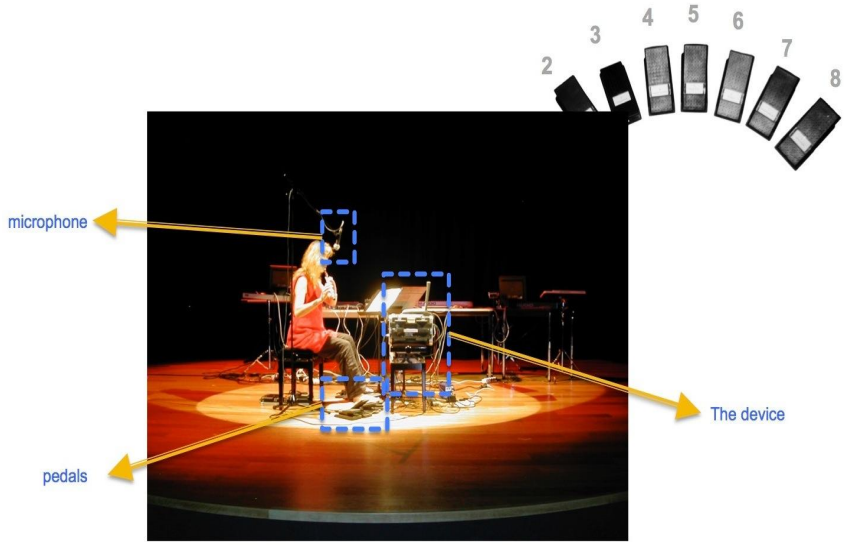

Figure 1 Sampo, the electronic device created by Alexander Mihalic in 2014. Photo from www.sampo.fr

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Figure 2 Composer Alexandre Mihalic - The composer Alexandre Mihalic studied at the Conservatoire of Košice and later at the Academy of Performing Arts, specializing in composition under Ilja Zeljenka. In 1988, he trained at IRCAM in Paris, under the supervision of F. Donati. In 1988-1989, he attended lectures by Iannis Xenakis at the University of Paris. He later studied at the University of Paris VIII, beginning at the Academy for Scenic Arts. In 1990-1991, he studied at the Ecole des Hautes Etudes en Sciences Sociales and at IRCAM. In 1991, he began to lecture at the University of Paris VIII and, from 1992 to 1997, at the École de Musique et de Danse in Vanves. In 1998, he gave lectures on new technologies and music at the Department of HyperMedia at the University of Paris. In 1998, he interned at La Londe. From 2000, he has taught technology and music at the Conservatoire of Dugny. Since 2001, he is the head of the IT department at the musical institution IMEB Bourges.
(Taken from: http://rfiea.fr/fellows/alexander-mihalic)

The simplicity and intuitive use of the device also allow for younger students to experiment with a variety of sonic transformations (reverb effects, echo and transposition, for example). The students listen to their own sound, modifying it through the simple movement of the pedals. Thus, from an early age, students can experience interactions with new technologies in a fun and creative manner. We consider this process extremely motivating as an introduction to the learning of contemporary musical language.

> Sampo is an innovative device meant for widening the sound field of an acoustic instrument. It is a device with several pedals (from four to seven) which allows the soloist to modify the sound of his instrument using simple gestures. Sampo is a very intuitive device. Every action affects the sound parameters of the instrument, allowing the musician to hear the results immediately. Its ease of use makes Sampo particularly interesting to teach electroacoustic music, contemporary music, jazz and improvisation at conservatories and music schools.(Mihalic, 2016, para. 14, Mixed Music Distribution Network – Réseau pour la Distribution de la Musique Mixte)

In 2017, the international pedagogical project Rédi-Musix, supported by the French Ministry of Culture through the “Services Numériques’ projects, that comprises the inclusion of this technology in music schools began in order to address the teaching of mixed electroacoustic music, which up until now has been scarce at best, and practically non-existent. In Portugal, this project is being developed in Porto, at the Curso de Música Silva Monteiro.

Software

> The management of Sampo is done by using a specific software. The musician and the composer each have their own interface to best suit individual needs. The software is used to set up the parameters for the composition and for the visualization of sound processing parameters. (Mihalic, 2016, Mixed Music Distribution Network – Réseau pour la Distribution de la Musique Mixte)

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Figure 3 Sampo display of the piece 'Dialog/No Dialog' by P. Jodlowsky
The display where all the Sampo configurations and their values are displayed. The performer can visually control the position of the pedals, the stage of the tape, the location, where the score is, and control the sound volume, the entrance and exit of the sound. The possibility of seeing the positions of the pedals is very practical, as is the possibility of identifying the markers with the numbers, identical to the score, sound files and time.
(Image from Alexandre Mihalic's archive)

Adaptation of existing pieces for flute and Sampo

For the lecture-recital presented at "Flute: Hands on Research 2017", three pieces adapted for flute and Sampo were selected for performance. The intention was that each piece would define a different mode of interaction with electroacoustic resources, with the objective of demonstrating the variety of its characteristics.

Table 1 Modes of interaction and technologies involved

	Mode of registering the electronics on the score	Adaption of the piece for flute and Sampo	Electroacoustic material involved	Interaction with the Sampo device	Control of the processo f performance/functions used
Petra Bachratá: Luminiscence (2016)	The electronics are registered in the score	Alexander Mihalic, Musinfo (2015)	One pre-recorded tape during the piece (sounds derived from the flute and the human voice	Start the tape at the beginning and stop at the end with pedal 2, balance the flute sound with the tape material with pedal 3	Employment of a chronometer incorporated in the Sampo device and visible on the display
P. Jodlowski: Dialog/ No Dialog (1997)	The electronics are graphically registered in the score	Alexander Mihalic, Musinfo (2015)	19 pre-recorded tapes started by musician during playing	Start the segments of the tape at the points marked in the score with the 2nd pedal and balance the flute sound with the tape material with pedal 3	Use of click track incorporate in the Sampo device
Ch. Bochmann: Cadenza (1982)	The electronics are not registered in the score (graphic score)	Monika Streitová, INET-MD, Musinfo (2016)	"DNA" patch, developed by A. Mihalic	"loop" effects, echos and transposition thorugh the use of pedals	x

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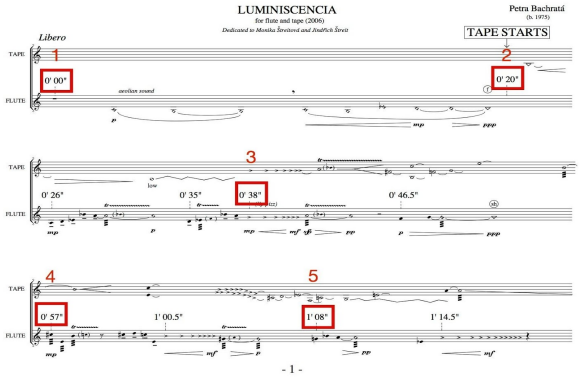

Figure 4 Petra Bachratá: Luminiscence for flute and electroacoustic sounds. (2006)
Excerpt from the piece
"The composition *Luminisence* for solo flute was inspired by the impulse of the photographer Jindrich Streit when preparing the exhibition entitled "People of the *Trinec* Steamworks which took place at the Václay Spala Gallery in Prague. Darkness, beams of light mixed with the shine of the lamps, the people – little lights, emerging from the darkness, dust, smoke and noise, all of this captured by the sensitive lense of the photographer...a piece of discovered poetry...this, but not only this, reflects Luminiscence. It was dedicated to Jindrich Streit and Monika *Štreitová." (Bachratá, 2006, p.15)*

Preparation of the piece

The score of "Luminiscence" by Petra Bachratá is exemplary in its organisation. It includes indications regarding all the symbols relating to the contemporary techniques used in the music, and also contains the tape material. The electroacoustic sounds blend perfectly with the sound of the flute in this piece, as many of the sounds are very close to those of the instrument or are derived from the flute sound. The possibility of being able to follow both voices in the full score also facilitates and orients the performer in joining with the tape. The original score also features time indications to coordinate with the chronometer.

The interpretation of this work requires all of the qualities associated with classical music – the production of sound with body, uninterrupted phrasing, control of the air flow, extreme dynamics, flexibility of the embouchure etc.

Specific sound requirements:

- to adapt the sound to the electroacoustic effects (wind sounds, *smorzato* vibrato and percussive sounds);
- to be mindful of phrasing, despite the numerous changes of sound colour within individual phrases;
- to adapt to the intonation of the pre-recorded material;
- to control the volume (using the microphone) and to always ensure a dynamic level that allows the best balance according to the structure of the piece and the musical gesture.

Interaction

Flute (an amplified acoustic instrument) with tape (electroacoustic sounds on a pre-recorded tape). The interaction of the flute with the electroacoustic material is similar to chamber music. Click tracks are not used, hence the synchronisation is more fluent and intuitive. The

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tape material is begun by the flautist at the beginning of the piece and is stopped at the end with the help of the 2nd pedal of the Sampo. The flutist follows the chronometer on the device's display. The 3rd pedal serves to increase the volume of the flute's sound, should the electronics become too loud. The volume of the tape is controlled by the movements of the 4th pedal. Registering the levels of the pedals in each piece before each concert is highly recommended, to ensure the same balance as in rehearsal.

Working with an adapted score

The score of piece, adapted by Alexander Mihalic (2015), contains rehearsal marks that serve to orient the performer. The numbers of these marks correspond to the rehearsal marks on the tape material, which in similarity to the score, is divided in parts. During the performance, these markings can be displayed on the Sampo. The adapted tape material is installed on the device in such a way as to allow the musician to go back and forth within the tape material as required, according to the rehearsal markings and using the 2nd pedal. This function is extremely useful, in order to allow for the repetition of certain passages and the possibility of altering the parameters of the effect in addition to the ability to stop and start the recorded electronics. https://www.youtube.com/watch?v=bDaRv13ZRj4

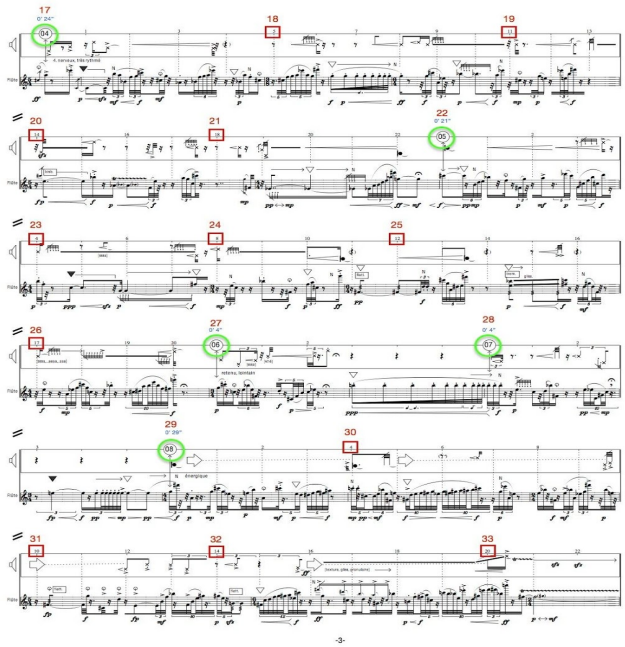

Figure 5 P. Jodlowsky Dialog/No Dialog para flauta e sons eletroacústicos. (1997)
Excerpt from the piece *"Un peu comme un duo au théâtre, deux situations, deux acteurs.*
Dialog : deux personnages sur scène. Figures, entrelacs, jeux de séduction et rapports de force. Tensions et réconciliations dans l'espace des gestes et des timbres. Nous pouvons parler ensemble, à condition que l'on s'écoute !

No dialog: renfermement sur soi, dialogue intérieur. Simultanéité fragile, la longue observation des adversaires, étendards et couleurs au poing, non loin du champ de bataille...

Les protagonistes:
• La flûte, sur scène. Véloce, bavarde, attendrie ou violente. Jeux de timbres, du son au souffle, jeux de registres et de vitesses, tension de l'écriture et transformations électroniques pour une projection dans l'espace.

• La voix, virtuelle. Dans ses apparitions dans les haut-parleurs, elle est chuchotée, chantée, parlée et articulée par l'intermédiaire des manipulations effectuées en studio ; elle se démultiplie, se métamorphose en phénomènes dynamiques, induit un champ (chant) harmonique et cherche, plus que tout, la rivalité et sa propre autonomie.

Cette œuvre est dédiée à Elise Caron (enregistrements du matériau vocal) pour son énergie, sa patience et ses idées, à Catherine Bowie qui en est la première interprète, et à Véronique, pour son courage, son soutien et sa confiance…" (Pierre Jodlowski, programme des concerts du Cursus de composition de l'Ircam, 29-30 septembre 1997 Espace de projection de de l'Ircam). Retrieved from: www.pierrejodlowski.fr/site/index.php?post/Dialog-/-No-Dialog

Preparation of the piece

The score of "Dialog/No Dialog" by Pierre Jodlowski, also contains indications regarding the symbols of the contemporary techniques used in the score, as was the case of the previous piece. The tape part is included in the score. The author used all possible sound colours to musically describe the two opposing characters. According to the composer, the contrasts are not only between the flute and the "virtual voice" but are also within the flute part itself: aggressive (*sforzatos*, slap, high register) and intimate (*pianíssimo*, wind sounds, low and medium registers, rests).
Before beginning the task of joining with the tape, the musician needs to have studied the instrumental part with rigour, in order to fully understand the complex rhythmic proportions. It is also important to have studied the electronic material, correctly deciphering the graphic writing and all the symbols used by the composer. I recommend dividing the work in segments, and then considering the musical characters and the sound colours employed in each, while always adopting a steady pulse in order to develop maximum independence from the click track.

Specific sound requirements

- to master the quick changes of dynamic levels and of character while performing the work;
- to achieve a stable and homogeneous sound in the low and medium registers which permits the audibility of all the notes in the rhythmic passages and in the leaps between registers;
- to clearly distinguish between the two types of wind sounds (just air, a mixture of air and sound and the passages between one type of wind sound and another);
- to adapt to the use of the Alt Flute and to dedicate oneself to exercises which facilitate the execution of the low register;
- to execute the percussive sounds with a greater sound projection in order to maintain the necessary balance with the magnetic tape:
- to create fluid, coherent phrases.

Interaction

Flute (amplified acoustic instrument) with tape (electroacoustic sounds registered on the pre-recorded tape). The interaction of the flute with the electroacoustic material is similar to chamber music. The original version does not include a click track. I propose that the click should be used in order to achieve better synchronisation, and since 2016 the Sampo has also included this function, with an incorporated click track. The taped material is controlled by the flautist, with the use of the 2nd pedal of the Sampo in certain passages. The flautist follows the process of performing the piece not just by following the score, but also by

following the device's display. The 3rd pedal serves to augment the volume of the flute, should the electronics dominate. The tape's volume is controlled by the movements of the 4th pedal. Registering the levels of the pedals in each piece before each concert is highly recommended, to ensure the same balance as in rehearsal.

Working with an adapted score

The score of the piece adapted by Alexander Mihalic (2015), also contains rehearsal marks to orient the performer. The rehearsal marks correspond to the rehearsal marks on the tape, which in similarity to the score, are divided in parts. These markings can be displayed on the Sampo during performance. The adapted tape material is installed on the device so that the performer can control the tape material using the 2nd pedal, going backwards or forwards as required. https://soundcloud.com/monikastreitova/dialognodialog-p-jodlowski

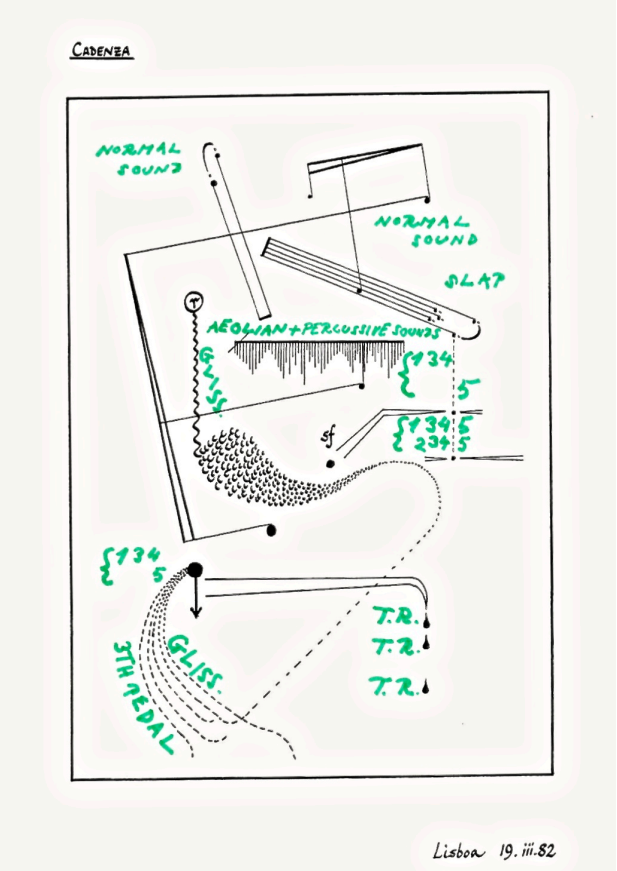

*Figure 6 Christopher Bochmann: Cadenza (1982) "*Originally, the graphic page Cadenza was part of the piece Gestures II. The work itself is for choir but can (evidently!) be performed by any instrument. The whole piece, and this page in particular, is the resulto f a profound reflection on musical notation and its function. Here, the notation avoids the established code and focuses on the suggestive/psychological aspect. This aspect has its beginnings in the works of Beethoven (quaver = darker; minim = lighter). It can be seen very clearly in the works of Max Reger and of Webern, among others. The experience recognises that notation is the form of communication between the composer and the performer; not "a work" in itself. (Ch. Bochmann)

Preparation of the piece

"Cadenza" by Christopher Bochmann was not originally written idiomatically for flute, as the composer explains "it can be interpreted by any instrument". As it is a graphic score, the

performer needs to create their own methods for deciphering the images. The work “avoids traditional codes”, although we tend to attribute to the images the durations, dynamics and gestures equivalent to graphic classical music. The piece can be played from left to right, but the page can also be read on the horizontal, from the right. We opted for the simultaneous reading from both directions. Apart from the classical sound used at the beginning of the piece, we opted for the inclusion of contemporary techniques which were chosen to enrich the interpretation through effects that we considered most appropriate for some of the gestures.

Specific sound requirements

- to accurately perform the multiphonics, wind sounds, glissandi and percussive sounds (such as tongue ram);
- to quickly change the sound colours
- to adapt the dynamic levels in order to achieve a balanced sound (the balance between the sounds modified in real time).

Interaction

Flute (amplified acoustic instrument) with Sampo (electroacoustic sounds in real time). The interaction of the flute with the electroacoustic material is similar to a walk in the forest. Click tracks are not used. In order to achieve the effects of the various “layers” of sound, the DNA patch, created by Alexander Mihalic is used. The functioning of this patch is begun by the 2nd pedal of the Sampo, turned on at the beginning of the piece. The flautist also turns on the 6th and 7th pedals that allow for a “loop” effect. This permits the creation of various “layers” of sound, recording and repeating the material. The 3rd pedal, which transposes, serves to achieve the glissando effect. The execution of this piece that involves the Sampo device ends with the 6th and 7th pedals in the “off” position.

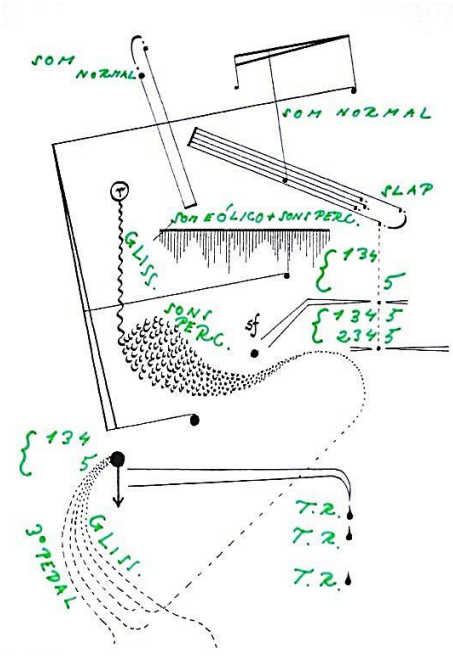

Figure 7 Adapted score. The graphics were attributed musical gestures using contemporary techniques which from our perspective correspond to the image. We introduced: normal sound, slap tone, glissandi, multiphonics,

key sounds (key clicks, Jorge?) and tongue ram. The performance is based on free improvisation and has a duration of approximately 35 seconds. The duration depends on the distance of the gestures developed in a certain amount of time. We sought clarity of sound and avoided a mixture of effects and excessive reverb. https://soundcloud.com/monikastreitova/cadenza-chbochmann

Benefits of the interaction of the Sampo device throughout the preparation of the repertoire

Throughout this work on the repertoire, namely on the three pieces adapted for flute and Sampo and electroacoustic sounds, we have verified the following benefits:

- the interaction with the Sampo device is very intuitive and creative;
- the musician is more involved in the process of interaction with the electroacoustic elements;
- the musician can control the tape material during the performance;
- it is possible to rehearse chosen passages; it is possible to gain audio feedback in relation to the gestures;
- the musician can immediately hear the results;
- each action affects the parameters of the instrument's sound;
- the musician becomes independent from the technical assistant;
- it is of particular interest for the teaching of electroacoustic music and contemporary music in conservatoires and music schools;
- it can be used in jazz and improvisation performances
- it is portable and can be used anywhere;
- it is possible to perform existing works.

Conclusion

The experience of preparing the three pieces was very special for me. The possibility of controlling the entire process of interaction with electroacoustic elements was extraordinary, but also very demanding. It required greater attention to detail (control of the interpretation of the pieces, the necessity of following the progress of the tape material on the device's display throughout the performance, while controlling seven pedals). The combination of these factors and the need to react correctly at any given moment, requires, in my opinion, intellectual and motor skills that should be developed and regularly practiced. The capacity to interact with technology during the performance of electroacoustic/improvised music not only represents a challenge for the musician or the teacher, but also provides us with an opportunity to go beyond our limits.

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