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Analysis of electroacoustic and interactive music works: *Solo* by Karlheinz Stockhausen, an example of performance analysis

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Abstract

Electroacoustic music is no longer just an art, but has become a means to communicate. The musical works composed using electroacoustic media, interactive works as multimedia installation, are a great part of music creations today. In order to understand the characters and structure, as well as the processes that leads to its realisation, the traditional analysis does not always work. That is particularly evident in music works composed recently, but also some works created in the past have an unconventional conception and representation. These are more performance events than events to be fixed permanently in a score. To understand how some musical works that have maintained their essence while changing over time, can be taken as an example of the influence of technology and for analysing them we need a new analytical approach.

In the present project I have chosen for the analysis *Solo,* a work composed by Karlheinz Stockhausen in 1966 using analogic techniques for the realisation of the live electronics. I further investigate recent interpretations of that work. Starting from 1990 and just now, the piece has been performed with digital techniques and recently with interactive technologies. Also that piece can be analysed as a performance event communicating emotions in which technology plays an important role.

The aim of this study is to analyse examples from different performances of that piece and investigate differences in interpretations of *Solo* by relating score segmentation with the analysis of performers' gestural interaction. An additional level of my research will be to explore the effect of musical structure on communication of emotion and the role of technology in the whole interpretation and communication process.

Background

Solo for a melodic instrument and feedback was composed in 1966 and performed for the first time in the same year. The score consists of six pages of notes and six 'Formschema' for the realisation of the feedback and other live effects. These six pages defined by the composer Formschema also contain indications on the pauses and on the relationships of musical materials between them. At the time when the work was composed, several assistants were needed for its performance because live electronics were still experimental. The performer could not deviate much from the indications of the score because it was already very complex to be able to stay precisely in the times indicated in order to obtain exactly the overlap of the

delays and the requested feedbacks. The evolution of digital technology has made it possible to perform works like this in a more agile way.

Aims and methods

Aim of the project

The aim of this project is to show how the evolution of technology can influence the change of the character of the composition over time. Technology becomes an instrument through which can be created an interaction with the performer. The latter acquires a creative role through the simplification of the technical part. Analysing some versions of the piece we can follow this evolution and get to describe the differences between interpretations.

The analysis is conducted in more steps:
1. description of the score and of the composer's indications contained in it;
2. analysis of different score versions: interpretations by different performers using a own version of the score;
3. analysis of the same score version, with different live electronics interactions between the player and the live electronics.

The first step of the analysis is focused on the composer's indications. The score of *Solo* consists in fact of six pages of score and six pages named Formschema for the realization of the feedback. Each performer has to choose one version of the score (an own order of the six pages or of fragments of pages and a Formschema. In this way each version of the piece will be different from the other. For example in the versions considered in this paper, we have a case in which the performer changes only the order of the pages, and other ones in which on the contrary, the performers changes even the order of the fragments inside them. In the second step of the project these differences are considered and described. The third step of the analysis involves problems regarding the evolution of technology. When Stockhausen composed *Solo*, for the performance was necessary to have the collaboration of four assistants. In the digital age, the performer can play the piece even without a sound direction. One of the first versions of *Solo* realized with digital technology was developed and discussed by Benny Sluchin[1]. From then until now there have been many versions until you get to be able to perform the piece interactively.

Description of different versions

In the history of *Solo* there have been many examples of very interesting digital versions. One of the first, the one already mentioned by Benny Sluchin, was a milestone on which there is also an article of the author. However, precisely because this version was widely discussed, in my project I considered other ones:
1. a flute version, by Dietmar Wiesner (official recording for the Stockhausen Verlag 1995);
2. a double bass version, by Enrico Francioni performed with the application SOLO n. 19, created by Alessandro Petrolati and Enrico Francioni in 2014;
3. my own violin version used as a demo for the second version of the app SOLO n. 19, released in 2016.

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[1] Benny Sluchin, "A Computer-Assisted Version of Stockhausen's Solo for a Melody Instrument with *Feedback*", Computer Music Journal, 24(2), 2000, p. 41.

4. a soundscape improvisation, created by Alessandro Petrolati, Laura Muncaciu, Enrico Francioni and others in 2014 in the port of Ancona using the application SOLO n. 19 and wireless technologies.

In all the considered versions we observe substantial differences in order to segmentation of the score and of management of the live electronics: in the flute version of 1995 the performer changes only the order of the 6 pages of the score and uses the Formschema V for the live electronics. That implies for example a longer duration of the whole piece. On the other hand in the double bass version the performer changes even the order of musical fragments inside the pages of the score and chooses for the feedback the Formschema I. The duration of the piece results shorter. Finally, the violin version and the improvisation 'Waterfront' are built on the Formschema II and follow the same principle of a score fragmentation that we can observe in the double bass version. This implies that the versions of the piece are really very different from each other: not only the score organisation, but even the duration and the character of the composition will change. For example the whole duration of the piece in the double bass version is 10'39, in the flute version 17'6 and in the violin one 12'49. Other differences are in the combination of musical episodes and in the distribution of silences, all elements depending from the Formschema's indications. The possibility of significantly modifying the score is also determined by the simplification of the technology which makes it possible to fragment the score and manage the execution in a more agile manner. This last observation also leads us to the consideration that the improvised 'Waterfront' version can be performed with more performers given the relative simplification of the technology.

Employed methods.

The analysis of the proposed versions was carried out as well with the description of the score and the composer's indications, and with listening. A verification of the results is obtained through the analysis of the signal. The latter one is based on the CQT (constant Q-transform) method which describes the differences in time and dynamics between the performances. Signal analysis confirms the conclusions reached in the previous levels of the analysis. For example, by comparing the version of the flute with the one of the double bass, it can be noted that the choices of the performers are functional to the idea that they want to transmit. The flutist choosing to maintain the order of events given by the author in the 6 pages of the composition and using the Formschema V with a longer duration, will to emphasize the dynamics variations in respect to the time variations. This is confirmed by the analysis of the signal obtained applying the CQT method. On the contrary, both the versions the one of the double bass and the violin one, choosing to fragment the musical elements by modifying the score and using a Formschema with a shorter duration, emphasize the temporal and agogic differences more than the dynamic ones. This is also confirmed by the analysis of the signal.

Conclusion

These are some examples of the results obtained in my research work. The conclusions obtained so far in my project can be summarized in some points. Mainly we can say that:
1. the composition *Solo* is a work that involves an active participation in the performance;
2. technology has a very important role and from it depends largely the creation of the piece;

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3. technological progress made it possible to facilitate technical implementation and this made it possible for the interpreters to become more creative;

4. we can say that *Solo* has become a performative event and therefore that technology has had such an influence. Currently the performer can manage the whole piece by itself and we have also got improvisations and soundscapes as in the case of 'Waterfront'.

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