



Rethinking The Electric Guitar as an Augmented Instrument

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The research analyzes the main electronic and digital ensembles for electric guitar in the last decades. Through this, the sense of augmentation of the instrument is deepened, with special emphasis on its integration with the computer. A first section of the research is the interpretation of a series of case studies using Ableton Live software with MAX/MSP, together with a MIDI controller that homogenizes and allows performing the case studies selected for the thesis: *Electric Counterpoint* (Steve Reich 1987), *La cite des saules* (Dufourt 1997), *Trash TV Trance* (Romitelli 2002) and *Not I* (Prins 2007). A second section is the development of an augmentation proposal for e-guitar that consists of a separation in the hands-feet interface to be able to control effects, volumetric balances and samples and loops. Finally, a reflection is articulated around the augmentation in the electric guitar and its relationship with the concepts of post digital, Smart instruments, modular flexibility and obsolescence.

Keywords Augmented
Instruments, Electric Guitar,
Computer Music, Post Digital,
Contemporary Performance

1. Purpose of the Research and its Importance to the Field

The aims pursued by the research are the following: 1) To study the electric guitar from the perspective of augmented instruments (instruments configured in a sound chain with modular devices), 2) To analyse and document the different electronic and digital sets that have had the most impact in recent decades, 3) To study especially the sets that integrate the computer in the sound chain and apply them to the performance of contemporary music case studies and 4) To design an augmentation proposal for the electric guitar based on the problems that appeared during contemporary music performances.

In the history of the electric guitar, it can be seen how technical needs, social contexts and artistic pursuits have shaped instrumental and performative advances. The electric guitar has used the applications of science and technology to take different forms. The original application was to increase volume, which was succeeded by timbre control and expansion, memory (loops, samples), and level control and balance (volumes, multichannel volumes, effect degrees). Due to the different proposals and sets developed in the last decades, today multiple configurations coexist in the design of augmentation.

All this process of continuous transformation has redefined the meaning of augmentation in the instrument. The electric guitar has evolved faster than the understanding and reflection on its nature, construction, and sound possibilities. The combination of sets, sounds and possibilities have become complex to understand and around them problems and positions have been developed by the musicians. The integration of the instrument with computers and software oriented to the design of sound chains and live performance has been insufficiently explored, at least as far as textual, pedagogical, and academic references are concerned. Lastly, it would be interesting to analyse the electric guitar from the paradigm of post-digital framework (Schubert 2021), which integrates the analogical and digital worlds; also advances in Smart Instruments (Turchet 2018), have already focused a large part of their contributions on the electric guitar. Putting these concepts and their respective configurations in order is of great importance for the field of research.

In addition, in the practice of the instrument, many possibilities are discontinued, others are not put into operation due to lack of diffusion or artists who popularize them. Knowing the future and present needs of the instrument can lead to an understanding of the lines of development that the electric guitar can take and to form a criterion for the use of existing possibilities. Design proposals on future lines of development is another important task, which can be useful to instrumentalists and can help build bridges between advances in sound engineering, instrument development, and performance and artistic use.

2. Brief Survey of Background and Related Work

Publications related to augmented instruments and hyper instruments of various kinds, as well as new interfaces, have been main bibliographic sources. These include studies that have to do with the act of performance and musical gestures. Several articles consulted were presented or published on the main conferences and journals in the field: i) NIME (New Interfaces for Musical Expression) (Pakarinen and Puputti 2008), (Schiesser and Traube 2006), ii) Computer Music Journal (MIT) (Burt and Chadabe 1998), iii) Ircam – Center Pompidou (Bongers 2000), iv) Journal of New Music Research (Keller, Schiavoni, and Lazzarini 2019), v) European Review of Artistic Studies (H. Portovedo 2020). PhD dissertations on hyperflute (Palacio-Quintin 2011) or on augmented clarinet (Furniss 2017), Diegert and Artacho's article on Aubiome (Diegert and Artacho 2018) and works on Portovedo's augmented saxophone have also been consulted (Portovedo, Lopes, and Mendes 2018). Puckette's book on music and computers (Puckette 2007) and various studies on gesture and mapping such as Jansenius, Wanderley, and Godøy (2009) complete this summary of bibliographic references.

Another source of information is related to the electric guitar itself, including the study of various works and guitar sets. Noteworthy here are Lähdeoja's writings for NIME (Lähdeoja 2008) and Schneider's electric guitar book (Schneider 1985) as well as books by composers like Steve Reich (Reich and Hillier 2011), Elliott Sharp (Sharp 2019). Also, Mackie Banks's Thesis on Electric Guitar in Contemporary Repertoire (Mackie Banks 2013) and Thomas Jameson's Thesis on Electric Guitar (Thomas Jameson 2017) have been consulted.

Finally, studies related to research techniques, musical aesthetics, and sound engineering, which shape the broader framework of the current thesis, are those on artistic experimentation (Assis 2018), the concepts of post digital (Schubert 2021), Embodied Knowledge (Sodhi 2008) and ubiquitous music (Keller, Schiavoni, and Lazzarini 2019).

3. Description of the Proposed Approach

An important part of the approach is based on the analysis of case studies of the contemporary music repertoire of the last four decades to understand the proposals and aesthetics developed in the instrument, how does the integration with technological media works and what are its main problems. The approach also pays attention to the sets used by the most outstanding electric guitarists from various stylistic fields trying to clarify the electronic and interpretative heterogeneity of the instrument.

Although the proposal is clearly focused on the field of electric guitar, it considers the general context of augmented instruments and gestural theories

in contemporary performance to understand which are the particularities of the electric guitar.

Finally, part of the work consists of developing an augmented electric guitar proposal based on the needs arising from the interpretations in the case studies and inspired by ideas of new interfaces, to create an instrument configuration that provides flexibility when performing existing works, but that it is also modelled towards future forms of relationship between the instrument and music with computers.

4. Expected Contributions

1. Documentation and reflection on the chronological/historical meaning of devices in augmentation. Compilation of the main sets used in recent decades on electric guitar, their operation and their relationship with technical and artistic needs, the music in which they are framed and the problems that these sets tried to fix. Appreciation of the crucial importance of the final sound output device in the electric guitar instrument.
2. Digitization of contemporary mixed music repertoire for the instrument, using Ableton Live software with MAX/MSP, together with a MIDI controller that homogenizes and allows performing the case studies selected for the thesis: *Electric Counterpoint* (Steve Reich 1987), *La cite des saules* (Dufourt 1997), *Trash TV Trance* (Romitelli 2002) and *Not I* (Prins 2007). Development of works-studies that serve as a practice model for various techniques associated with augmented performance: live looping, effects control, track triggering or clock midi for ensembles. Preparation of a method of exercises and technical developments for interpretation of the augmented e-guitar with electronic means.
3. Reflection on the “state of the art” of the augmentation proposals in the performance, relating it to the concept of embodied knowledge and relearning of the instrument (for example, in the use of the feet or the control of the timbre and the effects with knobs). Also, discuss the fit of the augmentation proposal in the post-digital framework, the relationship with obsolescence, the evaluation criteria of the sets and the practice of the instrument.

5. Progress Towards Goals

Firstly, a progress was achieved due to the submission of papers to journals, some in review processes and others already accepted for publication (NCMM 2021, XPERIMUS 2022). Interpretation of the case studies and description of

all the sets of each work with its detailed explanation through descriptions and diagrams was the object of the first work cited before. The presentation of the split pedalboard prototype and its application to the performance of three case studies, highlighting “Trash TV Trance” by Fausto Romitelli, was the subject of the second reference.

Both works are connected directly with the work in the process of digitizing contemporary repertoire to focus their interpretation on a set with a MIDI controller and a computer on stage. For example, in the electronic digitization of the already mentioned work “Trash TV Trance” the physical devices of a complex looper, a distortion, a volume controller, a delay and a wah wah were replaced by the Ableton DAW, a sound card and a midi controller. This achieves a simple set, with fewer components and less wiring, reduction of parasitic noise and ease of assembly. It also simplifies the recording of the live work and control of the electronic levels by the performer.

Moreover, this same set could be employed for other electric guitar works and electronic media. It is important to note that the set is not only reusable in terms of its hardware components, but its software can also be used for other works due to the implementation of software environments that allow the performer to configure a repertoire of various concert works.

To obtain the greatest possible flexibility and expressiveness when performing case studies, as well as researching the creation of new sound material, the development of an augmented electric guitar prototype with the characteristic of a pedal split between hands and feet was implemented. In the proposal, some potentiometers are integrated in the guitar to solve the most outstanding problems of the instrument, such as: control of electronics, effect levels and tracks. There is also a capacity for modularity and expansion of the increased guitar set, that is, the set is not incompatible with other types of sounds and sets. The first prototype has already been developed and presented in the cited XPERIMUS.

In addition to the objectives based on technical and artistic needs, there is a constant communication and direct contact with composers and guitarists, mail correspondence with the experimental guitarist Elliott Sharp, the composer Stefan Prins and the professor of composition with technological means at the Real Conservatorio Superior de Música de Madrid (RCSMM) Julián Ávila. The research is also enhanced by recording at the most prestigious sound studios in Madrid such as Estudio Brazil and Estudio 1, including tests with more than ten different amplifiers from the last six decades.

Finally, a course related to the fields of research techniques (course of academic writing) has been undertaken and bachelor studies on sound engineering are currently under progress.

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