

Self-reflections on the place of iteration in digital studies from the project Listening to Severo Sarduy

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My project analyzed and visualized the relationships between sound and literature. The project's central concept was transduction, understood as the process when a real sound object becomes an imaginary sound object or earcon, and vice versa. As in all human praxis, and particularly in artistic-literary praxis, these transduction processes are guided by a politics of meaning that, in these cases, we could call aural politics.

This project is very tied to the specific needs of my dissertation, although generalities applicable to other authors can be extracted. For example, a study of aurality in Cuban novels of the sixties would be a door to identify the sonic imaginary of post-revolutionary writers. This relationship between the digital project and my dissertation was fundamentally based on theory. That is why I must add the categories of soundscape and sonic imagery to those of transduction and earcon. All of them come from Sound Studies, although the peculiarity of my project is the understanding of these sets of real and imaginary sound objects as networks and the possibility of tracking these networks, particularly the sonic imaginary, in sources of a different nature: aural and text files. Interdisciplinarity is, then, another of the keys to this project since it intersects the fields of Sound, Media, and Literary Studies with the theoretical and methodological possibilities of Digital Studies and Methods.

I developed a protocol to analyze and visualize the transductive processes that mediate a writer's sonic imagery. What digital tools allow to identify sound objects and earcons? What dimensions of each of those elements are relevant to my project? Which of them allows data to be exported in comparable formats? What tools are more efficient in visualizing the coincidences and divergences of these data and the synchronic and diachronic transformations of that sonic imaginary?

My goals arose from a bigger research problem which is the transmediality of the archive of the Cuban writer Severo Sarduy. In order to study the aural politics of his creative praxis, I needed to identify aural and textual documents from the archive and determine the earcons and the relationships between them that made up his sonic imaginary. The development of aural politics is inseparable from their application to solving conflicts deeply centered on the here and now of the subject. In Sarduy's case, this was directly related to his status as a political exile, which caused a violent and definitive rupture with his native soundscape. It is also related, of course, to his work as a mediator of Latin American culture in Paris based on his work in such well-known publishers as Seuil and Gallimard and his thirty years of experience as a radio journalist on France Culture and Radio France International.

Questions and corpora

The research questions outlined above led, of course, to evaluation criteria. First, of course, the possibility of establishing a protocol to compare and visualize the sonic imaginaries of aural and textual archives, maintaining the spatial and temporal dimensions that govern the soundscapes that originate them. This macro-criterion can be divided into two fields: identifying sound objects and earcons and visualizing their relations. In the first field, it was critical for me to achieve a certain level of automation of the marking process and encode the contextual aspects (time, space, agent) associated with sound objects and earcons efficiently. In the second field, I particularly valued the ability of each visualization to reflect not only hierarchical relationships (frequency and co-presence) but also the transformations that occur in the material when transduction processes take place.

As for the corpus of research, I began with an ambitious project to study all the written and sound work of Severo Sarduy. One of the most significant learnings of these years has been maintaining the balance between the amount of data and the intensive application of the tools. Another significant challenge I faced was processing data from textual and aural sources as diverse as novels, essays, poems, radio shows, and personal recordings. In order to establish an adequate standard of data processing and application of digital tools, I reduced the initial corpus to five books (three novels, an essay, and a collection of poems) and ten radio broadcasts of various genres.

Iteration as an analytical tool

Another critical thing to learn while working on this project concerns the conception of the work as a work in progress and the acceptance of the intrinsic iterative character of digital studios. In the beginning, I formulated my project in three different ways. Each of these ways was related to my dissertation, a macro-project, and tribute to it as partial results generated from the application of various kinds of tools to my corpora's partial zones.

First, to better understand Sarduy's job in Radio France, I utilized the information provided on <http://inatheque.ina.fr/> to re-created the job network centered by Severo Sarduy there from 1963 to 1993. I understood each radio broadcast as a node linked to other nodes that contained the collaborator's names. The first kind of node had the date of broadcasting as an attribute, while the second one had as attributes the person's role in that specific broadcast.

In the case of directors and radio producers, this information would allow me to concentrate on them when looking for contextual information on the French ways of doing radio in that period. In the case of the presenters and radio actors, I was interested in the characteristics of their voices and the possible relations with the content of the texts they read. Also, I was particularly interested in Sarduy's castings because of his curiosity about voices and the relation between voice, body, and eroticism.

Of course, the construction of any network to study any phenomena imposes violent restrictions on the reality I am studying before the moment of being constructed by any digital algorithm. It does not consider as a variable, for example, that all those persons were part of a team formed by Radio France and that the editorial policies of a radio station are not usually dictated by directors or producers, much less by actors. I believe, however, from my experience in radio, that each producer has a certain margin of freedom, and it was on that margin that I relied on establishing a framework from which to begin my studies in the productive context of French public radio, where Severo Sarduy was working from 1963 until his death.

After having advanced in this project area using Cytoscape, I realized that I was moving away from my research's central question. Even though the results obtained contributed to my dissertation, the network of human resources involved in the production of Sarduy's broadcasts is not directly related to the transduction processes that connect soundscapes and sonic imaginaries.¹ So I decided to abandon this line of work and concentrate on the project's goals. However, reconstructing that human resources network is part of another digital project that I am starting. I have begun to use the Nodegoat platform, which allows diachronic visualizations of networks. This new project is part of a macro-project on the editorial mediation of Latin

¹ At this point, I can say that one of the most repeated questions in this project's journal was, "Where does this lead?" Re-reading that journal taught me that you never start from scratch. The biggest challenge in moving forward with this project has been staying true to the research questions. No knowledge process is alien to changes, but when new methodologies and tools are experienced, it is easier to miss the forest for the trees.

American literature in France (MEDET LAT: <https://www.projet-medetlat.com>) conducted by the Université de Cergy-Paris.

On the other hand, the time invested in this line of work was not wasted time since when working on that network, I started re-thinking my main categories –soundscape and sonic imaginary- as networks of sonic events that can be reconstructed based on both the frequency and the co-presence of these events. I built a new network using Cytoscape with data on sonic objects (music, voices, silences) included in the radio shows. This new way of understanding soundscape implied a significant reduction: it was only based on frequency and co-presence, leaving aside something central to every humanist and the creator of the soundscape concept: "a writer is trustworthy only when writing about sounds directly experienced and intimately known [...] and such descriptions constitute the best guide available in the reconstruction of soundscapes past "(Schafer 100). Another essential element to consider is a humanistic component in studying these data that cannot be replaced by any digital tool. The analytical gaze of the researcher not only guides the collection of data and the choice of digital tools. The process ends with the interpretation of the new data obtained.

Another example of the iterative nature and the advances and setbacks of any digital project is related to the use of TEI. From my previous knowledge, I started exploring the possibilities of this language to visualize the transduction between two textual files. Unfortunately, this work with TEI was also abandoned by concentrating on the conception of sonic imaginaries as networks. Two years later, and using Versioning Machine 5.0, I returned to this line of work, and the results are part of the digital portfolio that I have now presented to users.

As I said before, the goal that I initially traced focused on the study of transduction between the two series of data, aural and textual, to understand the relationships between soundscape and sonic imaginaries. I also started a text mining process using NVivo's free trial as part of my initial explorations. The result was promising because this tool allows the analysis of content with high efficiency. However, NVivo had the disadvantage of being an expensive software, so I dedicated myself to exploring other similar tools. This search led me to Dedoose, a less expensive tool with similar capabilities. As can be seen in the digital portfolio of this project, this was the tool used to identify and label the earcons of the textual files.

At the same time, I was mining the aural files. I experimented with three different tools: Tony and Sonic Visualizer, developed at the University of London, and Audacity, developed at Carnegie Mellon University. Of these, only Tony was expressly designed to process spoken discourse since the others are oriented to musical analysis and creation. However, Tony's goal is particular: "high-quality scientific pitch and note transcription in three steps: automatic visualization/sonification, easy correction, and export" (<https://code.soundsoftware.ac.uk/projects/tony>). Unfortunately, the software does not work properly if more than one person talks, so most of my data cannot be processed. Sonic Visualizer and Audacity are software with similar purposes: "highly configurable detailed visualization, analysis, and annotation of audio recordings" (<https://www.sonicvisualiser.org/>); but Audacity has a much more developed and user-friendly interface, a wide and varied help network (manuals, forums), and a more extensive series of processing and analysis plug-ins (<https://manual.audacityteam.org/index.html>).

Each of these tools I tried helped me understand the material I was working with a little better. Once again, iteration was the keyword to understand the process that leads to choosing

tools and establishing an analysis method. Working with Tony, Sonic Visualizer, and Audacity helped me to classify the aural files into three groups:

- radio shows
- live recordings: made for creative and personal purposes
- musical recordings

In the materiality of the tapes —today .mp3 digital files— these types overlap and interrupt, so I needed to identify sound objects without breaking that materiality —because something tells us about how Sarduy related to his recording device, the moment and place where they were made. Moreover, the method used on Audacity to label the files allows the creation of various label tracks to analyze the overlapping parts on the same file. So this feature was a strong possibility when choosing this tool as the one closest to my needs.

On the other hand, Audacity allows identifying silences using a decibel scale that the user can manipulate according to the audio file's quality. Then, you can segment macro sound objects that can be separated from the main audio for later analysis. Each of these macro objects can be segmented into smaller sound objects. This feature was necessary for my project because, although some audio files coincided with a radio program, those coming from the Firestone Library archives contained a mix of audio records, and, in some cases, it was necessary to reconstruct a radio program from fragments found in various files. Labels can be distributed in different layers: one for the file's physical structure —boundaries between sound and silence—, one for its content's structure —intentional and accidental interruptions of a recording, continuity between two recordings made on different dates—, one for sound objects —the sound of the sea waves, a musical theme, the voice of an announcer—, and one for earcons —a comment on sea waves' sound or the qualities of a person's voice. Finally, all those labels can be exported in a table that registers the time duration data of the identified sound object and the label.

In this aspect, Audacity, conceived for the creation of sound files, could be improved as a tool for exploring this type of file. One possibility is to allow more complex labeling and relate those labels in more flexible ways. I built labels that suit my interests (as explained in my digital portfolio's rationale).

I concentrated on digitizing the text files in other iterations to incorporate them into my *capta*. Also, I explored text analysis tools compatible with the results obtained in previous iterations where the primary source of the data was the aural files. Since the beginning of this project, the main challenges building my *capta* were the null digitization of this author's published work and the restrictions of French audiovisual archives to consult their sound files remotely. Therefore, I digitized three of his novels —*De donde son los cantantes* (1967), *Cobra* (1972), and *Maitreya* (1978)—, an essay —*La Simulación* (1982)—, and a poetry collection —*Big bang* (1974). I have scanned, applied an OCR tool, converted it to RTF format, and standardized them. The procedure took a significant amount of time, which confirms the distance —quantitative and qualitative— that goes from identifying a research's corpus in Humanities to the construction of a *capta* to work in Digital Humanities.

My interest in agents and sound types came from the project's theoretical framework. My understanding of the soundscape as a network in which specific agents produce different sound types which affect each other both at the production and listening moments induced me to experiment again with Cytoscape. In the initial phases of the project, I used it not only as a tool to visualize the results but as a Network Analysis application. The goal was to identify the nodes —agents and sound types— of bigger centrality in that sonic network. The increase in data complexity —by incorporating data from text files— led me to a consultation with two

specialists in network studies with digital tools. Matthew Lincoln and Scott Weingart (CMU) showed me that the Cytoscape network analysis algorithm does not explain the types of connections that my hypothesis proposes. Those semantic relationships, mostly agents and sound co-presence, do not correspond to the exchange of information between agents usually explored with Cytoscape as a network analyzer.

Scott Weingart suggested that I could experiment with other visualization tools like alluvial diagrams. Those visualizations help illustrate comparisons. However, as Scott warned me, they become unreadable when the data is very diverse. The alluvial diagrams helped me visualize specific parts of my work before an audience unfamiliar with the project or with the DH in a general sense. However, these visualizations have scant possibilities for exploration. Therefore, I returned to Cytoscape only as a visualization tool for frequency and co-presence.

Once again, the notion of iteration contributed to the project's outputs. Taking the data from the aural and textual Indian Newspaper as a test file, I experimented with different ways of building that network, choosing different elements to function as nodes or attributes. This tool can incorporate up to six dimensions of each sound object. Based on the same .csv file, this tool can generate different visualizations. Network visualization in Cytoscape is based on link-connected nodes, but each of these elements can contain an attribute. Hence, in a single visualization, although not all visible at the same time, it is possible to incorporate the six dimensions: location (the file in question), location attribute (date), agent, agent attribute (keycode), sound type, and sound attribute (the quote or personal note made by me). Those dimensions can occupy the node or attribute position according to the exploration carried out. When studying the sonic imaginary of a file, it is unnecessary to incorporate the location and its attribute. When comparing it with another, the location must be kept as Source-Node and decide what the Target-Node and the Edge would be. When interested in exploring agency, I choose agents as node-target and sound types as edges; when diversity and sonic connections of these imaginary, the agents become the edges.

The goal was to find a tool with as many benefits as Audacity. The fact that Digital Humanities have been text-oriented since the beginning means that textual analysis tools abound. I decided on Dedoose, a platform with similar possibilities to NVivo but with more flexible payment options. Although files of different extensions can be processed on it, I have worked with the texts in the RTF format that I had ready. On this platform, it is possible to label the texts (Descriptors) and fragments, phrases, or words (Codes). As my project focuses on a single author, I only use the publication's date and literary genre as descriptors. The date was one of the attributes that I was using in Cytoscape.

The coding process can be accelerated once the codes to be used have been established. This process is flexible since codes can be added or removed at any time and from different places in the interface. Furthermore, these codes can be organized as a family. In my case, based on the experience mentioned above, I organized them into four families: Agent, Gender, Sound Type, and Territory. The inclusion of this last attribute responds to one of the initial hypotheses of the project: the soundscape is influenced and, at the same time, affects our notions about territory. Hence a decolonizing aural politic can be generated. However, later I decided to focus only on the notions of sound and agent due to the difficulty of attributing a gender and a geocultural origin to the earcons and sound objects in the aural files.

Each of the other families —Agent and Sound Type— are composed of codes established previously but have been transformed. Processing the first text —the novel *Cobra*— I found that sonic imaginary's diversity in Sarduy's fiction was superior to any of the broadcast's sonic

imaginaries. The codes 'noise' and 'sound' began to grow disproportionately. Everything sounds or makes noises in those texts. I decided to set smaller semantic fields. The 'music' code was divided into three: 'music', 'singing', and 'percussion'; animal sounds, previously grouped under the 'sound' code, became independent of human sounds and sounds produced by artifacts. The most remarkable transformation occurred within the 'noise' code since, in this novel, sonic emissions characterized as unpleasant or high-volume emissions are standard. To give just one example, the hit produced by the impact of a shoe on the ground —'zapatazo': 23 applications in four books— is as common as the act of coughing —'tos': 28 applications.

Dedoose's search tool helped in this code multiplication process. A new code was established if an earcon had more than ten realizations among the four texts. This happened with the family of the word 'estallido' (blast). Then a Dictionary of Synonyms and Antonyms was used to search the texts for the synonyms of that word —boom, explosion, etc. Finally, all mentions of those sound objects were grouped under the same code. The re-coding process turned the initial six codes (legacy system of Audacity) into 34.

Once the coding process was finished, the results were filtered according to the descriptors, codes, and combinations. One of the most useful Dedoose tools was the code co-occurrence table. This table lets you know who produces which sound types and which of those sounds is associated to a territory. Another important tool was the possibility of exporting all this information, including the fragments of the texts that have been coded or the texts themselves with the codes applied following a different color scale.

Dedoose results can be interrogated in a similar way to a database. In my case, those interrogations have generated answers and new questions. For example, if we review the co-occurrence of the 'human' agent with the sound types, we see that it is associated with laughter, crying, music, singing, screaming, and hitting (golpear). While the association between humans as agents and laughter as sound is not too questionable, the high coincidence of 'human' and 'hit' (bang, knock) is curious. It led me to the question of how Sarduy handled that relationship. Dedoose allows you to access all excerpts on one page and read each in context. I was able to determine that most of these relationships were produced from a metonymy where 'human' actually means body and, in most cases, a fragmented body. What hits something or someone is not always the human, but mostly the hand, the foot, the head. Sarduy's aural politic seems to be related to the reflection on the body studied in his work by other scholars.

During those months, my personal journal emerged as one of the most efficient thinking tools. The use of exploration/visualization tools led to reflections in the journal that show me that much of the transduction's analysis has begun there. In fact, I used quotes from this journal to answer questions from my dissertation committee about the usefulness of Digital Studies and Methods in my research project. Another exciting result of the work in those months was the deepening of network analysis. It led to a change of focus in the use of Cytoscape and the very understanding of the structure of a soundscape. However, my work with Cytoscape was not over.

From this experience, it is deduced the importance of thinking about work plans with more realism and with medium-term goals that do not imply the completion of a single task but rather progress on several fronts: data processing with exploratory tools, visualizing results, and comparing analysis between sound objects and earcons, which, in the end, is the main project's goal.

At that point in the project, I valued better the concept of iteration itself and the greater usefulness of *Listening to Severo Sarduy* as a thinking tool. I realized that each iteration should include initial goal setting, data construction, and exploration of various processing tools. Only

in this way are the methodological implications of this mechanism revealed. The iterations not only seek to expand the project —incorporate and process more data, obtain more results— but, especially in that first year of work, delve into the reflective aspects of those processes. Each iteration then involved revisiting the initial methodological and theoretical phases — questions, concepts, *capta* — as each tool's effectiveness was assessed and *capta* size increased.

Non-tool will exactly answer questions from the humanities, where ambiguity is often central. Most of the hermeneutical exercise corresponds to us, still. Nevertheless, it is also our responsibility to reflect on how our knowledge is codified in those algorithms. *Listening to Severo Sarduy* has allowed me to question some tools to take advantage of them. In the process, questions continue to come up that rebuke my hypotheses and the tools themselves. These tools are not a substitute for content analysis; they incite it. Everything they do can be done, explored, thought with graphite and a lot of sheets of paper, maybe. Does anyone believe that these are not tools, with their possibilities and limitations? Is one of Hubble's lenses the convex and frontal lens of Galileo's pernicious telescope?

Dissemination and sustainability

To end these reflections, I would like to comment on some aspects of the process of disseminating the outputs of this project. The first space for socializing these results has been the work team for the Certificate in Digital Studies and Methods. Being a humanist for almost 20 years, much of my investigative work had been carried out alone. This project has taught me the advantages of teamwork and, above all, the limitations that derive from the typical isolation of humanists. In the DSAM community, we established a joint work habit and a frequency of exchange of tools and knowledge that was beneficial. Some of the tools I have applied here were not found by me on Internet, but were suggested by other colleagues.

Another critical aspect of disseminating the results was the creation of a blog to share the goals, methods, and partial findings and these reflections. Throughout these years several renowned scholars in the field of Cuban studies and the work of Severo Sarduy have approached me to inquire about the project and offer me their impressions. In addition, professors such as Andrés Sánchez Robayna and Enrico Mario Santi have used these reflections on Sarduy's work in their courses. Finally, the sister of the writer and creator of the Fundación Cultural Severo Sarduy, has invited me to collaborate with her to incorporate these methods into the foundation's website.

The third space for socialization has been, of course, the Department of Hispanic Languages and Literatures at the University of Pittsburgh, in whose program I have developed my dissertation. Notwithstanding, I must say that, as in many other departments focused on literary and cultural studies, there is still mistrust of digital study methods. Sometimes, they approve of using these tools only for the online publication of texts. That is why there is no chapter in my dissertation dedicated entirely to this digital project. Although my analysis of the relationships between literature, aurality, and politics is based on this project, the academic narrative that I have generated to obtain my PhD contains only non-systematized information on it. An exception to this is my fourth chapter, which focuses on transduction as a feature of the creative process and in which examples abound from my application of the Versioning Machine 5.0 tool to the *Diario Indio* genetic dossier. Once again, in the arena of online publishing, an audience such as this one was best prepared to assimilate the application of digital tools to cultural studies. I must say, however, that it is not an opposition but a lack of knowledge of these methods. A lack of knowledge that, unfortunately, starts in some areas of the faculty and expands to a large part of the graduate students.

As can be inferred from the comments above, the audience for this project has been entirely academic. It derives from my conception of this project as a tool to think about the subject and not as a platform to share the results with audiences outside these research fields. An essential part of this decision—which today I consider a limitation—lies in copyright. Particularly sensitive is the field of copyright on aural archives since they involve radio broadcasts that are the property of French public institutions. That is why I have only been able to share small fragments of those files on my blog. In the same way, I have had to reduce the exemplification of the study of textual archives even though I recognize the usefulness it would have for scholars of Sarduy's work to have a version of the novels that I have analyzed in which all the earcons were marked.

Despite these limitations, I became aware of the need to offer users increasingly interactive results during the project. This intention also influenced my return to TEI and my use of the Versioning Machine 5.0. Today, my blog user has access to the online publication of the two versions that we have of the "Diario Indio" and can verify for himself the changes that occur during the transduction. Another path for the socialization of the results that I began to explore during the defense of my dissertation is sonification. Despite focusing on aurality, the results of this project have been socialized through visualizations and textualizations. In my doctoral defense, I included a minute of audio in which I mixed fragments from the aural files to exemplify the dissonance and multiphony that characterize Sarduy's sonic imagery [listen]. I will continue working in this sense with a criterion adjusted to diachrony to visualize how this imaginary changes throughout the three decades that Sarduy lived in France. Another field of socialization in the same sense is the creation of a playlist of the music that Sarduy used in his radio broadcasts and mentions in his texts. These playlists are a work in process today.

I should add a final word on my project's sustainability. My association with the MEDET LAT project of the Université de Cergy-Paris contemplates my insertion into a team that already works and has obtained results in the field of digital humanities. At the same time, Mercedes Sarduy, the writer's sister, has put the resources of the Severo Sarduy Cultural Foundation at the service of my project. Also, I have managed to negotiate start-up funds to continue this project with the institution where I will continue my professional life. The goal is to find partnerships to expand the depth and diversity of participants in this project, broaden the audience and impact, and solidify the financial sustainability with inter-university collaborations.