

AUGMENTED CHARANGO: AN INSTRUMENT FOR ENRICHING THE ANDEAN MUSIC SOCIAL ROLE

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ABSTRACT

Departing from Thomas Turino's research about the context of the charango (Andean stringed instrument) in rural Peru which is highly symbolic and relates to processes of courting and love and using it as an inspiration, our aim is to create a new interface design for the charango that expands its social possibilities yet to be determined. An electronic extension of the instrument will be incorporated which enables the player to get new layers of sounds serving as a new development of the NIME (New Instruments for Musical Expression), human computer interaction and computer music. Schachter's work on live electronics and the cajon (a Peruvian percussion instrument) and Escobar's expanded marimba from the Colombian Pacific coast as well as are all proper references for this research.

INTRODUCTION

This paper reports the first stages of an ongoing research devoted to build an electronic extension for the charango. First, the project points out some technical challenges since the device is intended to be portable, embedded to the instrument's body and operated in real time. Second, the creation of the digital audio processes will be guided by theoretical insights. The traditional charango sound will be transformed according to interpretative playing techniques recognized in musicological and ethnomusicological studies. As representatives of a particular social roles of the instrument, traditional techniques such as the strummed playing one, will inform some decisions in the signal processing. By including such theoretical concerns in an instrument-building reasoning, the project aims to propose methodological directions in sound and music studies. Conscious of the unconventionality of the procedure, we take into account both artistic and scientific perspectives of music

interaction, as well as links between theoretical and practical endeavours.

This work in progress research described in the paper is divided into four parts. In the first section we will present a historical context by recognizing pertinent references in our region concerned with indigenous music making and new technologies. Then we will have an explanation of the research project in the second section, here we will present the proposal of a four stage plan for the research. Afterwards we will talk about the strumming technique and justify why it is the focus of the research. Finally in the last section we will discuss some activities and procedures we envision in future stages of the project.

Julian Jaramillo Arango and Jaime Daniel Rojas Vargas are early career scholars from Colombia living and working in Brazil. While Julian is currently accomplishing a postdoctoral stay at the Núcleo de Sonologia that is part of the School of Arts and Communication at University of Sao Paulo, Jaime is currently living in Curitiba doing research in various projects, he holds an MA in Media Studies. They have both managed to work from a distance.

HISTORICAL CONTEXT

Definition of the instrument

The charango is a small Andean string instrument, its origins are speculated around in the 18th century around Peru and Bolivia in the high plains of the Andes mountains. Its creation was due of the contact between local and European cultures, this is an important input since there is a group of regional instruments from different countries with a similar mixed origin.

According to the Groove Music Online dictionary the charango is:

"It is shaped like the Spanish guitar but has a small, thin soundbox and short strings, giving a sharp, high-pitched sound. The neck has between five and 18 wooden, bone or metal frets. The soundbox may have a flat wooden

back of cedar or walnut, or a round back made of armadillo shell or a single piece of carved wood; its face, which has a round soundhole, is of pine, spruce, cedar or walnut and the bridge is cedar or walnut. The total length of the instrument varies from 45 to 65 cm. The instrument also exists in other forms; it has been made from a round gourd, in a pear-shape of wood or armadillo, and ornately carved in the form of a mermaid. The strings are arranged in four or, more commonly, five single, double or triple courses and number between four and 15; they are of metal, nylon or gut (now rare).”[1]

The evolution of the instrument is highly symbolic, it has even caused tensions between the countries of Bolivia and Peru, due to the fact that both claim that the instrument was invented in their territory. This makes no sense since its creation was before the establishment of the nation states. Julio Mendivil’s hypothesis upon the origin of the instrument is the following: “neither the European and American development of the string instruments was linear but dialectic, multi directional, loaded with interferences, struggles and loans that present elusive when trying to establish a historic reconstruction.” [2]

Ethnomusicological studies

It is Thomas Turino’s study entitled: “The Charango and the Sirena: Music, and the power of Love” [3] that serves as an inspiration for the current project. The study was published in 1983 and it explores the charangos symbolic functions in the courting cycle in the town of Canas in Cusco, Peru. In the stages of engagement of couples, a duality exists between desire and anxiety, the charango serves as an element that channels both the fear and the union between the couple. Young men decorate their instrument and rely on the Sirena for power to overcome the nervousness and to perform well. The ambiguity lies in the fact that the charango represents both good when young couples are single and court, but evil when one is married and uses it, here it is seen as *bohémio*.

Contemporary music in Latin America

Even though our inspiration comes from the studies of popular music, our area of expertise has been around contemporary music. In order to introduce our references we will first present a brief synthesis of the historic context of Latin American contemporary music and its efforts to constantly integrate with both indigenous influences and new technologies.

Historical synthesis

The genre of contemporary music in the region underwent major transformations throughout the twentieth century, the Mexican revolution that began in 1910 meant the breakdown of colonial domination on the

continent. This fact was reflected in the music. According to American musicologist Deane L. Root:

“Composers in these countries motivated by the awakening of a nationalistic conscience, began the use of melodies, rhythms and indigenous and creole instruments in their music.” [4]

Since the emancipatory feeling towards Europe was shared even in the United States and Canada, the Pan-American Association of Composers (PAAC) was created in 1928 with the aim of promoting the musical appreciation of the entire continent: North America, Central America and South America. The board of directors was composed of: Edgar Varése, Henry Cowell, Carl Ruggles and Carlos Chávez. In this organization, the results of the musical works were characterized by incorporating native elements, however they still had the European basis. Unfortunately the PAAC lasted very little and in 1934 due to lack of funds and hit by the "Wall Street Crash" it could not continue.

The Second World War brought to Latin America a period of musical imitation, there were no great autochthonous works, later the idea of musical integration of South, Central and North America breaks down because the United States in Cold War times begins to intervene intensively in the political affairs of the Latin American nations with the pretext of fighting communism. In 1959 the Cuban Revolution opens the possibility of changing this trend. One of many emblematic works that achieves a break is: *Cantata for Magic America* by Alberto Ginastera. When using the word *magic* refers to the pre-Columbian stage, as a support, he used the poems of the first Christian priests who toured the Mayan, Aztec and Inca cultures. The composer gives an epic intention, the end of the work represents the greatness and the destruction of some fantastic cultures. It is a daring and forceful bet that really breaks the history of contemporary Latin American music in two. Now, nothing will be the same. [5]

Taking advantage of this impulse, the Latin American Center of High Musical Studies (CLAEM) of the Torcuato Di Tella Institute was created in Buenos Aires, Argentina between 1963 and 1971. The center had the latest inventions in electroacoustic music with equipment such as tape recorders, microphones, oscillators among others. This program was amazing because it managed to fund students from all over Latin America to travel to Argentina and with all stipends for two years with access to the studios for creating works. Many of the pieces done during the program involved the treatment of the indigenous and popular cultures giving continuity to Alberto Ginastera’s ideals. The attendees later went to influence a new generation of composers. This was the case for Graciela Paraskevaïdis from Argentina that attended the CLAEM and later went to influence Bolivian composer Cergio Prudencio who created the first native instrument orchestra in the region. He acted as both composer and director with different sets of

zampoñas (Andean pan instruments) interpreted by its members. He also composed pieces for charango, voice and electroacoustic music.

Named Orquesta Experimental de Instrumentos Nativos (OEIN) it revolutionized contemporary music because it switched the paradigm of approaching music from a hierarchical European centered perspective. This is by far the starting point and the most prolific of many attempts in the region to make new music with what surrounds us, in this it is case is the indigenous cultures.

Departing from the OEIN, the Orquesta de Instrumentos Autóctonos y Nuevas Tecnologías (Orchestra of autochthonous instruments and new technologies) was created in 2004 in Buenos Aires at the Universidad 3 de Febrero. The main premise of this project is to erase the boundaries between composer and interpreter allowing all members to create and execute and even build instruments. This posture has been of great controversy with experts being for and against, mainly arguing that the quality of both the interpreters and the compositions is not good enough due to this matter. What is important is to state that it is a good reference since it involves new technologies and indigenous instruments.

Influences

So far we have looked at the evolution of contemporary Latin American music and seen a couple of examples of orchestras that incorporate the indigenous and new technologies. Now we are going to look at works from individuals that deal with indigenous instruments from a compositional and technical perspective as well as from an interactive art installation perspective.

Argentinian composer Daniel Schachter [6] does a musical composition in 2009 for the Peruvian Cajon which is a box shaped percussion instrument with real time processing and electroacustics. Based on Bregman's Gestalt principles as well as Denis Smalley's Espectromorphology, Schachter builds the content of the real time processing engine with the software *MAX*. He uses the following processes: Reverb, Reson (Resonant Filter) and Delay. A well structured score, as well as the patches accompany this creation.

Regarding examples, with interaction and gesture with aboriginal elements, there is Daniel Escobar's *Expanded Marimba* [7]. The Marimba is an indigenous instrument from the Afro-Colombian populations in the pacific coast. Its constructions is made in an artesian way. What the Colombian artist does, is to create an interaction with electronic and digital technologies so that video and lights accompany the trigger of the instrument resulting in an multi sensory experience involving video mapping using *Arduino*.

THE EXPANDED CHARANGO PROJECT

Interaction Design

All these previous experiences have given a theoretical background to start our musical interface project. As it was mentioned earlier, our goal is supporting ourselves on musicological insights to develop a technological device. While the idea of using musicology to guide a practice based process can be seen rather unorthodox, in the field of musical instrument building it can offer an opportunity to observe the results in the context of research. As we have noted in the work of Cergio Prudencio's OEIN or even in the Daniel Schachter experiment with the cajon, the construction of new interfaces or instrument extensions is frequently intended to the experimental music performance. The same occurs with some technological devices devoted to traditional music created under the NIME (New Interfaces for Musical Expression) umbrella where the vernacular context of the instruments is not taken into consideration. While social aspects of the instrument or even traditional techniques are usually neglected in the construction of new devices and interfaces, they are rarely incorporated in the traditional music arena, or in the folkloric music one. In this regard, Franinovic and Salter warn about some assumptions present in the NIME model by stating that:

“The main issue is the almost formulaic understanding of interaction as a series of input-output processes: a gesture or action triggers an appropriately stored or mapped series of sonic responses that may be adjusted based on the range of expression of the input. This assumes an already fixed set of relations among the user/interactor, the object/instrument/sound-making body, and the environment in which the interaction with sound takes place”. [8]

Under our vision, extending the charango capabilities has to do with taking into account a set of relations where its social role can be identified. The techniques developed along the charango evolution are being examined in order to find appropriate digital audio processes for the device. Our interface is intended to operate in a twofold way, by increasing the intensity and by transforming the sonority without de-characterizing the charango's acoustical and musical identity.

Methodological considerations

With this in mind, we payed attention to the methodological aspects of the research. In the same way that in other recent projects [9, 10, 11], we expect to include the creative process in the core of the research agenda, by integrating artistic and scientific procedures. Based on design research methodologies [12, 13, 14], we have traced a one year plan including four stages: 1. Analysis 2. Synthesis 3. Experiment, and 4. Evaluation. We prefigure a research program foreseeing periods

devoted to theoretical (Analysis, Synthesis) and practical activities (Experiment and Evaluation) in order to accomplish a transdisciplinary approach to creation.

The analysis stage has been dedicated to typify the instrument by scrutinizing relevant musicological, ethnomusicological, historical and theoretical sources and recognizing previous works committed to similar objectives. In addition, we have been taking personal instruction with professional charango players, studied playing methods and exploring available online lessons as a source of oral transmission knowledge. As it was reported in the Historical Perspectives section we have identified a nationalistic bias in some musicological studies concerning Andean traditional music and particularly the charango. Turino's claim about the duality between desire and anxiety in the hearth of the charango's social role is taken as an inspiration to flee from the nationalistic tendency.

In the next section we will discuss findings related to the synthesis stage that deal with determining the charango playing techniques in order to strengthen the interface. We have implemented spectral analysis as a procedure to determine acoustical profiles and timbral identity. We also associate the charango's strumming playing technique with the duality established by Turino. In the section titled *future work* we will describe the envisaged activities for the experiment and the evaluation stage.

THE STRUMMING PLAYING TECHNIQUE

The strumming playing technique is done by swinging the whole wrist really fast while playing all the strings with either the middle or the index finger. The effort is done in the forearm and virtuosity is essential since it involves high speed while controlling the movement and being efficient in terms of motion in order to maintain the sound for some time. The translation of the technique in spanish (and portuguese) is *repique*, (as it is popularly known). According to Turino: "The overall effect is a high-pitched piercing timbre with an unclear rendering of the melody and strong rhythmic drive" [15].

It is a style attributed to the "campesinos" (peasants) and associated with dances and ceremonies. Its importance shifts in the cities, where a new technique called the *t'ipi* or *rasgueo* was developed, in english it means to pinch the strings with the thumb upwards and the rest of the fingers downwards. It is common in the charango repertoire to combine both the strumming and pinch techniques for accompaniment purposes.

The strumming is commonly played using a three, four or five rhythmic pattern and usually in the measures of: 2/4, 3/4 and 6/8. Normally, the first movement is from bottom to below, the second from below to above respectively. Off course, the first movement can start

above and many combinations of 3, 4 or 5 shifts can be achieved. Figure 1 shows how a four movement strumming is written. This same pattern seen on a spectrogram is shown in figure 2.



Figure 1. Strumming playing technique main rhythmic pattern.

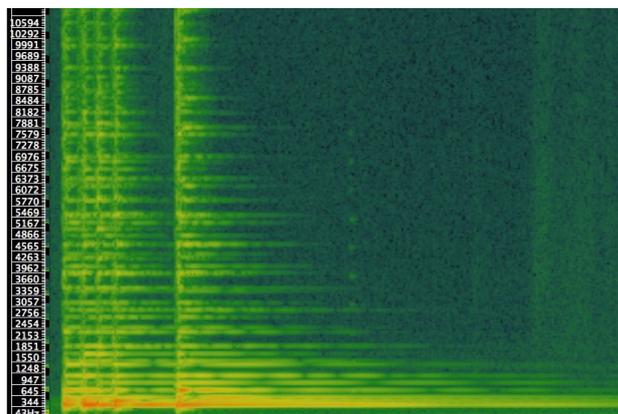


Figure 2. Rhythmic pattern spectrogram.

What can be established from the spectrogram is that the most intense frequencies are the ones around 200-700hz. Further analysis has to be done by looking at the spectrum of several strumming variations in measure, speed and changing chords in order to get valuable insights. We see a lot of potential in the rhythmic patterns that are achieved through the strumming playing techniques since they are hard to achieve and represent the greatness and uniqueness of the instrument.

FUTURE WORK

Although the practical stages of the research have not started yet, in our plan we have some previsions about the materials, the configuration and procedures we will adopt. In these phases the interface will be built and a short evaluation of it will be carried out. In order to provide a whole picture of the research we will report some technical aspects concerning the experiment and evaluation stages.

Device setup

The device will comprise modules of hardware and software. The hardware component embraces an electroacoustic system able to capture, process and reproduce the charango's acoustic signal. It is intended to

be embedded in the charango's body in such a way that the player has no need of being plugged to an external audio amplification system. A user interface composed by knobs, buttons, lights and a touchscreen will allow the interpreter easily control the digital audio processes, by balancing between the acoustical and electronic signal and by increasing or decreasing other parameters' levels. While the portability of the device is one of the main challenges in the design architecture, a rechargeable direct current power supply will also be required.

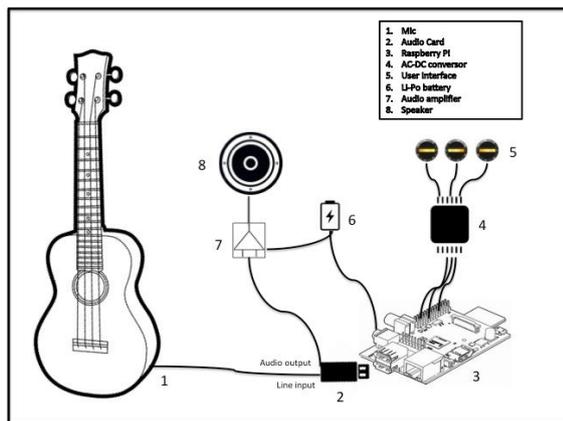


Figure 3. Components of the Charango's interface

We chosen Raspberry pi [16] platform as the main processor since it offers an open community of coders and makers in which the project can be supported. We expect that other luthiers and tinkers, mainly those committed with South American music and its instrumental tradition, can built our interface in their laboratories or studios. In this regard we favor available and affordable materials along with open hardware and software.

The software component, in which digital audio processes will be implemented, is being developed in Pure Data [17]. We have been creating prototype patches with phase based processes, such as phaser, chorus and flanger as an strategy to deal with the rhythmic patterns of the strummed playing technique. By thickening the signal's attack time we expect to provide alternative timbral colours to the charango traditional sound. The implementation of Pure Data patches in Raspberry Pi is eased by libPD library [18], and the user interface is being programmed in Python.

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REFERENCES

- [1] Turino, Thomas. "Charango". in *Groove Music Online*. A. Edited by Deane Root. Accessed 20/04/2018. <http://www.oxfordmusiconline.com/grovemusic/view/10.1093/gmo/9781561592630.001.0001/omo-9781561592630-e-0000005445>
- [2] Mendivil, Julio. "Apuntes para una historia del charango andino," in *Método de Charango: Federico Tarazona*. Abril Ediciones Musicales, 2004. Translation made by the authors.
- [3] Turino, Thomas. "The Charango and the "Sirena": Music, Magic and the power of love," in *Latin American Music Review*. 1983 pp 81-119
- [4] Root, Dean. "The Pan American Association of Composers (1928-1934)," in *Anuario Interamericano de Investigación Musical*. 1972 pp. 49-70
- [5] Paraskevaïdis, Graciela. "Las venas sonoras de la otra América," in *Proceedings of the Simposium La Otra América*. Germany, 2009. Translation made by the authors.
- [6] Schachter, Daniel. "Composición interactiva en un entorno de Aleatoriedad Controlada," in *Proceedings of the 12th Week of the Music and Musicology*. Buenos Aires 2015.
- [7] Escobar, Daniel. "Marimba-Expandida," Accessed 20/04/2018. <http://danielescobar.co/marimba-expandida/>
- [8] Franinović, K., Salter, C. "The Experience of Sonic Interaction," in *Sonic Interaction Design*. MIT Press, Cambridge. 2013. Pp 39-76
- [9] Arango, J.J., Melán, D. "The Smartphone Ensemble. Exploring mobile computer mediation in collaborative musical performance," in *Proceedings of NIME, New Interfaces for Musical Expression*, Brisbane, Australia. 2016
- [10] Gutierrez, M. P & Arango, J. J. "AirQ Jacket, design process for wearable technologies and urban ecology," in *Proceedings of the International Seminar on Electronic Arts. ISEA*, Manizales, Colombia. June 2017.
- [11] Arango, J. J., Esmog Data. "Interpreting Air Quality Through Media Art and Design," in *Leonardo* April 2018, Vol. 51, No. 2, pp. 183. DOI: LEON_a_01515
- [12] Findeli, A. "Research Through Design and Transdisciplinarity: A Tentative Contribution to the

Methodology of Design Research,” in *Focused -- Current Design Research Projects and Methods*, Swiss Design Network, pp.67-91

- [13] Jones. J. C. “Design methods”. John Wiley & Sons, London (1992)
- [14] Manzini, E. “Design ethics and sustainability”. Dis-Indaco-Polit cnico di Milano. Milan (2006)
- [15] Turino, Thomas. “The urban mestizo charango tradition in southern Peru: A statement of shifting identity” in *Ethnomusicology*. 1984 pp 253-270
- [16] Raspberry Pi. www.raspberrypi.org
- [17] Pure Data. <https://puredata.info/>
- [18] Brinkmann, P., Kirn, P., Lawler, R., McCormick, C., Roth, M., Steinser, H.-C.: LibPD. “Embedding pure data with libpd,” in *Proc Pure Data Convention*. 2011