

Designing DMIs for Popular Music in the Brazilian Northeast: Lessons Learned

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ABSTRACT

Regarding the design of new DMIs, it is possible to fit the majority of projects into two main cases: those developed by the academic research centers, which focus on North American and European contemporary classical and experimental music; and the DIY projects, in which the luthier also plays the roles of performer and/or composer. In both cases, the design process is not focused on creating DMIs for a community with a particular culture - with established instruments, repertoire and playing styles - outside European and North American traditions. This challenge motivated our research. In this paper, we discuss lessons learned during an one-year project called “Batebit”. Our approach was based on Design Thinking methodology, comprising cycles of inspiration, ideation and implementation. It resulted in two new DMIs developed collaboratively with musicians from the Brazilian Northeast.

Author Keywords

Practice-based research approaches/methods/criticism; Experiences with novel interfaces in live performance and composition; Musicianship of new musical interfaces; Novel controllers and interfaces for musical expression.

ACM Classification

H.5.2 [Information Interfaces and Presentation] User Interfaces — Prototyping; H.5.2 [Information Interfaces and Presentation] User Interfaces — User-centered design; H.5.5 [Information Interfaces and Presentation] Sound and Music Computing.

1. INTRODUCTION

Much has been discussed regarding the design of new interfaces for musical expression, also known as Digital Lutherie [9]. The approaches are generally idiosyncratic and most of them can be categorized into two main groups: One group comprises the projects happening on academic research centers, concentrated in Europe, US and Canada, whose culture in-

fluences the associated aesthetics and the way the new instruments are used (mostly on specific contexts of European and North American contemporary classical and/or experimental music). Another group is based on DIY projects, in which the DMIs are generally created for personal use, and the roles of luthier, performer and/or composer are blended.

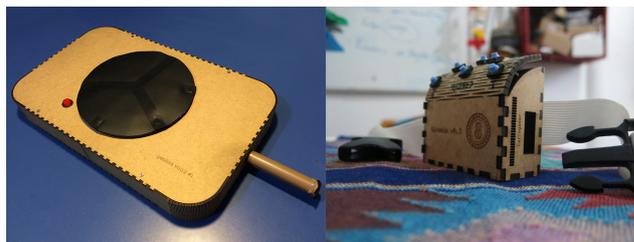


Figure 1: The Pandivá and the Giromin

In both cases, however, luthiers are not focused on creating DMIs to communities that have their own tradition, outside Europe and North America. We believe that these communities offer interesting challenges for Digital Lutherie because they have established: a) instruments, each one with unique playing styles; b) repertoire; c) gestures and accessories; d) recognized virtuoso musicians in the community, who are not often familiar with technology. Considering these points during the design might play a crucial role on the acceptance of a DMI by these communities.

One such community can be found in Pernambuco, Brazil. Musical movements such as the Mangue Beat [14] illustrate the potential Pernambuco has to fuse foreign techniques and aesthetics to local tradition, generating innovative mentalities, rhythms and genres, which are ultimately incorporated into its own identity.

How can we create DMIs to specific communities like this one? This challenge motivates our research entitled “Batebit”¹. We believe that this work may help inducing the emergence of new technologies and musical aesthetics.

Our approach to Digital Lutherie was based on Design Thinking methodology [2]. This allowed us to develop two new DMIs (shown in Figure 1) from continuous iterations working with the popular music community from Pernambuco. In this paper, we discuss: a) our motivation and related work; b) the research approach we adopted; c) an evaluation of the results; d) the main lessons we have learned.

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¹<http://batebit.cc>

In the context of this research, we use the term “popular music” to denote all kinds of music that: a) are outside the scope of classical music (including contemporary) and experimental music from Europe and North America; and b) have roots in popular culture (non-classical). Thus, we consider “popular music” genres such as ‘samba’, ‘frevo’, ‘maracatu’, ‘ciranda’, ‘coco’, ‘electronic’, ‘rock’, ‘folk music’, etc. On the other hand, genres such as ‘noise music’, ‘electroacoustic music’, ‘spectral music’, ‘art sound’, among others, are outside the scope of this research.

2. CONTEXT

In literature, we can find several approaches towards Digital Lutherie. Overall, these approaches are idiosyncratic and there is no consensus on how the DMI design process should be conducted. We can find among them both common and divergent characteristics.

The series of articles published by Perry Cook is an example [4, 5]. Here, the author reflects about his own experience and presents some guidelines for creating new musical controllers. For Cook, the area “proceeds as more art than science, and possibly this is the only way that it can be done” [4]. Similar approaches, all based on trial and error and with little consistency between one another, can be found in literature [1, 9, 6, 7, 13].

A more general alternative approach is presented in the book “New Digital Musical Instruments: Control and Interaction Beyond the Keyboard” [12]. Here, a theoretical framework covers different views under common vocabulary (i.e., the notion of DMIs and mapping inputs to outputs). This resulted in a more technical view of the area, which might reduce the weight of personal opinions.

In our case, we are interested on an approach that could allow us to benefit from the characteristics of popular music.

In academia, attempts to match popular music and Digital Lutherie are rare. One of the few cases is Ajay Kapur’s PhD research [10]. Aiming to “digitize, analyze, preserve and extend North Indian classical music performance”, Kapur has developed musical controllers based on Indian traditional instruments, such as the Tabla and the Sitar. Recently, Kapur took part in a similar research, which aimed to extend traditional Korean music and dance [11]. As a result, three new DMIs were created. Other similar examples can be found in the literature [3, 15].

Outside academia, there are cases of popular musicians adopting DMIs. Examples include the Laser Harp, used by artists like Jean Michael Jarre, the Reactable, used by artists like Bjork and Coldplay.

In both cases, however, there is little (or no) discussion on how the Digital Lutherie was conducted - with the exception of Reactable [9].

3. METHODOLOGY

We used the ‘Design Thinking’ methodology as a basis for our Digital Lutherie approach. According to Tim Brown, Design Thinking is suitable for problems that “require a human-centered, creative, iterative, and practical approach to finding the best ideas and ultimate solutions” [2]. It can be divided into three steps: a) Inspiration; b) Ideation; and c) Implementation. Each step is composed by a set of actions, as described in the following section.

We stress that this methodology is not linear, but rather chaotic, cyclical and iterative (e.g., some interviews were conducted close to the end of our project, while some prototyping started during first months) [2]. Additionally, some actions can fit in different steps (e.g., ‘workshops on Digital Lutherie’ can be either in ‘Inspiration’, or in ‘ideation’).

4. INSPIRATION

This step aims to seek “circumstances that motivate the search for solutions” [2]. In our specific case, it consisted of the following actions:

4.1 Experiences inside local communities

In this action, we tried to better understand the relation the local popular communities had with music. For each community, we informally analyzed: a) the main instruments used and their respective playing styles; b) their repertoire; c) the main gestures, accessories and tools used. In total, we visited and analyzed four communities.

4.2 Interview with musicians

In this action, we tried to better understand the *modus operandi* of virtuoso musicians from local popular music community. We used semi-structured interviews [8] with the following questions:

- Tools: What “tools” do you use in your work? Why and how do you use them?
- Technical frustrations: Do you think you have any “technical frustration” as a musician? Which one? Is there anything you would like to do as a musician today that you can not?
- Experimentation: Do you usually experiment with new “tools”? Do you usually try new ways to use old “tools”? Describe an experiment whose result you found interesting.

In total, we interviewed 9 musicians. We chose examples that represent the diversity of genres and styles in popular music from Pernambuco. The interviews were recorded and are available on the internet².

4.3 Interview with researchers

As Digital Lutherie approaches are usually idiosyncratic, we decided to interview researchers from the field of DMI design to better understand their personal approach. We asked:

- What is your process for developing new interfaces for musical expression? Do other people also take part in this process? What role do they play?
- What are the main challenges in developing new interfaces for musical expression?
- “The interfaces we design are not used outside the academia”. What do you think about this statement?

In total, 31 researchers were contacted. Only 7 responded our contact and were interviewed by email. The result is available on the internet².

5. IDEATION

This step aims to “generate, develop and test ideas that may lead to solutions” [2]. In our case, we have generated ideas, prototyped them, and tested them with musicians. This step consisted of the following phases:

5.1 Brainstorming

In this phase, we generated ideas that could later become new instruments. In the end, a set of nine proposals were recorded and can be found online³.

²<http://batebit.cc/processo/entrevista>

³<http://batebit.cc/processo/ideacao>

5.2 Exploratory Prototyping

In this phase, we have implemented some of the proposed ideas. The goal was to transform sketches into something concrete that could be tested and evaluated. Three exploratory prototypes were developed: the ‘Sandbox Wow’⁴, the ‘Pulsar’⁵, and the ‘Chuva, Suor e Cerveja’⁶.

5.3 Evaluation with musicians

In this phase, we collected feedback from musicians about the developed prototypes. Our main interest was to determine: a) What aspects of the prototype did properly work? b) What aspects of the prototype did not work? c) General comments and feedback. The tested prototypes were the ‘Pulsar’⁷ and the ‘Sandbox Wow’⁸.

5.4 Workshops on Digital Lutherie

In this phase, we aimed to interact directly with the local community. We performed two workshops, each one 20 hours long, counting 20 participants in total (majorly, musicians or technologists). As a result, many instruments were collectively developed. Some examples are: the ‘Pianumanu’⁹ and the ‘Rodas em Coité’.

6. IMPLEMENTATION

This step aims to “chart a path to market” [2]. In this project, the selected prototypes were improved with constant feedback from musicians, culminating in two new instruments and a public performance.

6.1 Giromin

The Giromin¹⁰ is a musical instrument based on dance. It reflects a strong relationship between movement and sound that can be found in local communities and in the work of some interviewed musicians. It is a small wooden box with wireless connection, which could be worn between the abdomen and the chest, and was designed by the third author.

The instrument works as a sequencer whose notes are triggered by the motion of the musician/dancer around the spinal axis. Five different buttons can change the pre-recorded sequences. Forward and backward movement control the intensity of the notes as well as manipulate a frequency filter, increasing the cutoff frequency of a low-pass filter. When the spine moves towards right, Giromin triggers a pitch shift effect. Moving towards left, it varies the amount delay feedback. The rotation along the axis also changes the pan, giving the impression of the sound following the musician/dancer movement.

We evaluated the Giromin with three dancers and three percussionists. Our goal was to collect general feedback on our design. The specific results about the instrument is outside the scope of this research. However, the sessions were recorded and are available online¹¹.

6.2 Pandivá

The Pandivá¹² was inspired by different instruments used in the local community. By using the posture of a guitar player, it allows musicians to trigger sounds using the playing gestures of Pandeiro, and to control pitch by using a

⁴http://youtube.com/watch?v=_y1fpPwf5A4

⁵<http://youtube.com/watch?v=dXx4jdW2tWQ>

⁶<http://batebit.cc/prototipo/exploracao/>

⁷<http://youtube.com/watch?v=PqjB0nhfHu0>

⁸<http://youtube.com/watch?v=42FrieWW63U>

⁹<http://youtube.com/watch?v=naaHBr1Jb1E>

¹⁰<http://batebit.cc/instrumento/giromin>

¹¹<http://batebit.cc/processo/avaliacao>

¹²<http://batebit.cc/instrumento/pandiva>

slide, similar to a trombone. This DMI was designed by the second author.

The musician triggers notes by playing one of the three pads located on the instrument body and, by moving the slide, the pitch shifts up and down.

In this instrument, we tried to explore how gestures that are familiar to some musicians could be transferred into a new instrument. Our goal was to make easier for musicians to get used to the new instrument based on gestures that they already know.

We evaluated the Pandivá with three percussionist and one guitarist. Again, our goal was to collect general feedback on our design. The evaluation sessions are available online¹¹.

6.3 Jam Session

In this phase, we informally investigated the usage of our instruments during one important moment in the popular music context: the public performance. We invited musicians involved with our project to take part of a public jam session that happened in November 30th, 2014. We provided them two days in advance for rehearsals and sound checks. In total, 9 musicians participated, with an approximate audience of 300 people. The public reception was warm. The jam was recorded and is available online¹³.

7. DISCUSSION & LESSONS LEARNED

Considering the adopted Digital Lutherie approach and our initial motivation, did we fulfill our goals?

In the end, we developed two new DMIs based on constant iterations with local popular music community. We consider that is already a good result. However, some aspect regarding our approaches should be highlighted.

7.1 DMI as an unit

The continuous contact with local musicians showed us how we should think our DMIs in a more holistic perspective. Musicians see their instruments as an unit, which means that timbre, gesture control interface, ergonomics and appearance are inseparable. This continuous contact allowed us to distance ourselves from a more technical perspective (i.e., what sensors and input technologies should we use?), and to get closer to the reality of musicians. This has already been discussed by [1] and was the most important lesson we have learned.

During our process, we focused more on developing the input and mapping modules, rather than the output module. Although understandable from a technical perspective, this point was problematic because musicians were unable to separate sound and interface, resulting in poor/negative feedback. We had the same problem while evaluating the exploratory prototypes.

Considering this, we should have prototyped since the beginning, reducing the ‘ideation’ step and focusing more on iteration and evaluation with musicians. We should also have built prototypes that could had stayed with musicians for weeks, deepening their relationship with the instruments and resulting perhaps in more interesting musical results.

The sense of a public presentation (i.e., the Jam session) motivated musicians to explore more musical possibilities of our instruments. We should have focused more on this phase (i.e., it could have happened more frequently).

7.2 Output module as composition

We also noticed that developing the output module of a DMI is closely related to the process of composing, play-

¹³http://youtube.com/watch?v=n-Zs-_0pivQ

ing a crucial role in its acceptance. Developing the output module means defining in advance most of the musical possibilities of an instrument. In the end of our 2nd Workshop, for example, participants said they were discouraged by the output module we chose (8-bit sound synthesized on Arduino), as they related the sound with video game music. This problem could have been avoided if we had chosen the output module more carefully.

Considering this, we should have included sound designers, composers, and musicians themselves in the development of the output module. In our process, we actually delegated the choice to musicians by using MIDI protocol. However, the majority of the musicians involved in our research was not familiar with this choice.

7.3 Design guidelines

Finally, we also believe that our approach could have benefited from clear design guidelines from the beginning. The guidelines would have been useful to guide our actions (e.g., they could serve as criteria for evaluations).

After our experience in this project, we suggest the following guidelines for people interested in designing DMIs for a particular popular community:

- The DMIs should be somehow related to the instruments (and their respective playing styles) used inside the community;
- The DMIs should allow musicians to perform the community's standard repertoire;
- The DMIs should allow musicians to use the community's standard gestures and accessories.

8. CONCLUSION

We presented the lessons we have learned during the one-year project 'Batebit'. The project allowed us to create a bridge between Digital Lutherie and the popular music community of Pernambuco, situated in the Brazilian Northeast. We used the Design Thinking methodology that comprised cycles of 'inspiration', 'ideation' and 'implementation'. In the end, we developed two new DMIs based on continuous collaboration with the local popular music community. The entire process was fully documented and is available online on the project website¹⁴.

There is still much to be done. As future work, we will continue refining - technically and aesthetically - the DMIs developed in collaboration with musicians. For similar approaches in the future, we also plan to incorporate the lessons we have learned during this project. Most importantly, greater effort needs to be placed on reflecting on how DMIs can be used to create new musical aesthetics and languages, which could potentially enrich and further diversify the culture of Pernambuco.

9. ACKNOWLEDGMENTS

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¹⁴<http://batebit.cc>