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VIA: A collaborative project integrating mobile technology, video-dance and computer-Assisted Composition in Rio de Janeiro

ABSTRACT
1. We present the mobile art project VIA, which combined mobile technology, video-dance and computer-assisted music composition. Its main goal was to endow specific locations of Rio de Janeiro with video-dance and computer music performances, accessed through locative media. Summarily, any user equipped with a tablet or smartphone with an Internet connection had free access to multimedia pieces while moving through specific points of Rio de Janeiro. Two technologies were applied: QR code and HiperGeo. The music accompanying the videos derived from Computer-Assisted Composition (CAC), Computer-Generated Assistance (CGA) and ‘Sonification’-related approaches. The music can be interpreted as a sound iconization, based on a computational methodology and assisted by the software OpenMusic, of topological properties of the landscape used as background for the dance. At the end, we speculate on the consequences of a responsive mobile technology applied to art projects of investigative mapping of urban space.

KEYWORDS
mobile art  
locative dance  
video-dance  
computational music  
art and urban space  
art and technology
INTRODUCTION

VIA is a project that combined mobile art, video-dance and computational music.1 Its main goal was to endow specific locations of the city of Rio de Janeiro with video-dance performances,2 accessed through locative media (smartphones or tablets). Summarily, any user equipped with a tablet or smartphone with an Internet connection had free access to experimental multimedia pieces of video-dance and music while moving through specific points of the city of Rio de Janeiro. We have used two different technologies: QR code and HiperGeo. QR code is a bar-code-specific, two-dimensional target that can be read by bar-code readers and camera phones.3 HiperGeo allows the user to associate various file types with the latitude and longitude, creating an ‘activation space’ in selected urban points.4 As a result, mobile technology users connected to the Internet were able to access the digital content of the project, experiencing environments in which information and virtual objects ‘overlap’ the physical reality. The multimedia content resulted from the collaboration between Daniella Aguiar (dancer and choreographer), João Queiroz (artistic director), Luiz E. Castelões (music composer), Adriano Mattos Correa (architect) and Guilherme Landin, Claudia Rangel and Alfredo Suppia (video-makers). Each multimedia product was the result of artistic investigation taking place between video-dance, computational music and the architectural richness of Rio de Janeiro’s urban space.

We have summarized the six project concerns and goals as follows: (1) to provide ‘exhibitions’ of video-dance and computational music for users equipped with smartphones and tablets with an Internet connection through multimedia devices at specific points in Rio de Janeiro; (2) to integrate the physical urban space of Rio de Janeiro to a mobile aesthetic dimension in video-dance and music performances; (3) to provide the population of Rio de Janeiro with a new option of an unconventional dance and music experience, through multimedia artefacts accessed through mobile technologies; (4) to encourage the users of mobile technologies (ordinary, foreign, student, experts) to ‘navigate’ through the city while experiencing video-dance and music ‘events’; (5) to bring the aesthetic experience closer to citizens by introducing it into the daily life of the city; (6) to support innovative and/or experimental cultural activities in Rio de Janeiro.

HOW VIA WORKS

The VIA website is the main route through which one can learn about the project. Visitors can navigate through different pages: ‘Vias’, ‘About’, ‘Team’ and ‘Support’ (Figure 1).

The page ‘Vias’ provides information, including a map, on the specific locations from which the user can access the content of the project. It is possible to have more information from each location, such as address, images from the videos, and so on.

Two routes can be selected on the map, ‘Via 1’ and ‘Via 2’. Each of them is a distinct path on the map linking specific locations (Figure 2) according to landscape features (as we shall explain in the next section). Although we suggest experiencing the work according to the routes, each viewer can decide how to do it. There is no precise path to experience the project. One can decide to access the content in one location and then leave. Others might want to visit all the locations, creating their own paths from one point to another.
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Figure 1: Homepage of the website via-locativeart.com.

Figure 2: Via 01 is shown in yellow.
QR codes are barcode-specific, two-dimensional targets that can be read by bar-code readers and camera phones.

Besides the website, the public can also learn about the project through the printed maps distributed in the city, especially in downtown where VIA is located (Figure 3). The maps distributed are the same as the website, except that there is no distinction between Via 1 and Via 2. It also includes the addresses of the locations in order to guide the viewer through the project.

Once the viewers decide at which location to start, they must walk to the specific location where they will find QR codes on walls, utility poles, trash cans and others. With a QR code reader application, they must frame the QR code bar and wait for the content to be loaded (Figures 4 and 5).
6. The patches developed for this work are freely available here: http://www.ufjf.br/comus/cac_patches/

7. In animation, ‘Mickey Mousing’ is a technique that syncs the accompanying music with the actions. The term comes from Walt Disney films, where the music works to mimic the motions of the characters.

Figure 4: At the location the viewer will find a QR code bar and must have a smartphone or a tablet connected to the Internet. Image: Daniella Aguiar.

Figure 5: With a QR code reader application, the viewer must frame the QR code bar and wait for the content to be loaded. Image: Daniella Aguiar.

MUSICThe sounds/music accompanying these videos derive from Computer-Assisted Composition (CAC), Computer-Generated Assistance (CGA) and Sonification-related approaches (see, for instance, Malt 2006, 2010; Cope 2008). They consist of Image-to-Sound Conversions using patches developed in OpenMusic (OM). These conversions employ, as input images, a collection of photographs previously taken from the locations where the dancing took place (see Figure 6). The compositional action involved consists mainly of normalizing the x-y axis data extracted from the contours of these images within audible ranges. There has been no further compositional manipulation of the input data — such as displacement, editing, looping, etc.

General questions discussed during the project’s earlier stages included the choice of a method of music applied to dance best suited to our purposes. The hypotheses of the adoption of a previously composed soundtrack (totally independent from the dance and the images used for this project) or, on the other hand, of a soundtrack that strictly followed the dance body movements — i.e., ‘Mickey Mousing’ — were both discarded.
Instead, we chose the method of image-to-sound conversion (albeit avoiding a real-time conversion, which would inevitably result in Mickey Mousing), and more specifically converting the visual contours of the locations where the dance took place. Starting from photographs taken in these locations, their visual contours were redrawn by hand (i.e., through a computer mouse) with a certain degree of freedom and the resulting x-y axis coordinates were then reinserted as input data to image-to-sound conversion algorithms implemented by the composer himself in OM.

In general, the kind of image-to-sound conversion used for this project followed the logic already present in traditional musical writing; that is, the x (horizontal)-axis supplied rhythm-related data, subdivided into onsets and durations, whereas the y (vertical)-axis supplied pitch-related data, within a variable pitch space – flexibly normalizable – seeking not only ‘sonification’ – that is, the ‘translation of non-audible data to the audible frequency range’ (Cope 2008: xi) – but also that this sonification generated satisfactory musical results (‘satisfactory’ according to the subjectivity of the particular musician who ran the programming, the algorithm, and the whole process of converting images to sounds). Other musical parameters, such as intensity and instrumentation/orchestration, were generated based on the same x- or y-axis input data, although with different algorithms (i.e., algorithms that were not directly related to the aforementioned conversion algorithms).

Five fundamental questions that were posed and tentatively answered during the compositional stage of the project included the following: (1) what is the space of musicality intended by this project? (2) What is the magnitude of music-making (especially as compared to the amount of data generated by image contours)? (3) If this magnitude is ‘complex’, or at least ‘complicated’, how does the composer relate to this complexity, and what are the best ways to obtain it and orient it towards an intended artistic goal? (4) How does the magnitude of this music-making relate to the independently developed images of a choreography as one eventually unites sound and image (within an audio-visual product)? (5) How does one obtain minimally human-like
musical results as one makes music exclusively through a non-human device such as a computer?

1. Space of musicality refers here to the musical space one wishes to occupy with a certain work; more specifically, starting from the imagination of musical extremes (e.g., highest degree of stability opposed to the highest degree of instability), one then predetermines the musical/auditory segment one wishes to occupy for a given musical work – for instance, a musical space characterized by a high degree of repetition, or by the alternation between repetition and contrast, or by mathematism, etc.; for the current project, a space of musicality was chosen that offered a middle ground between the high degree of communication/redundancy of Pop Music and the high degree of information and contrast that is proper to contemporary ‘art’ music – that is, a space of musicality that is both intelligible and enjoyable by either the non-musician, or the young, or the specialist.

2. The magnitude of music-making (especially as compared to the amount of data generated by image contours) denotes the amount of data that is necessary to produce each space of musicality, each musical work; in any given creative project that involves image-to-sound conversion, one may observe a significant discrepancy between the amount of data generated by image contours and the required, or desired, amount of data to create a certain space of musicality; in the specific case of VIA, where the resulting musical excerpts should be no longer than one minute, the aforementioned discrepancy did occur occasionally – that is, the amount of data generated by image contours was of a significantly larger magnitude than the amount of data required, or desired, to create the intended space of musicality for this project. This fact motivated the development of criteria intended to render adequate the amount of data generated by image contours and the magnitude of the music-making in question; these criteria included the use of just the opening musical excerpt that resulted from a given image-to-sound conversion, or the simplification of the image contouring done by hand (Figures 7 and 8) in such a way that the conversion of these contours generated fewer data; in sum, the creative work using image-to-sound conversion implies adjusting the magnitude of image-derived data to the magnitude of the intended resulting music.

3. If this musical magnitude is complex, or at least complicated, how does the composer relate to this complexity, and what are the best ways to obtain it and orient it towards an intended artistic goal? VIA’s space of musicality ideally sought the musical complexity that is proper to hand-made crafts, proper to human activities (even though, perhaps paradoxically, its music was entirely realized by means of a computer); in VIA, the strategy for obtaining the desired musical complexity consisted of starting from data that were already complex and working from macro to micro, instead of obtaining complexity by working all the way up from small building blocks. Besides, we did not seek complexity per se, but more accurately the kind of complexity that possessed musical logic. Nevertheless, it is necessary to remark that (a) the totality of the characteristics that make up such (musically logical) complexity has not been thoroughly formalized through the image-to-sound algorithms developed for VIA; instead, such desired complexity is simply ‘encountered’ and ‘chosen’ by ear among the several musical results furnished by the aforementioned algorithms. This complexity is partially
Figure 7: Top: original photograph of a dance location (Beco das Cancelas). Photo: João Queiroz; Bottom: Corresponding simplified image contouring done by hand so that this image’s contours generated fewer data. Image: Luiz E. Castelões.

Figure 8: Similar to Figure 7 albeit in a different dance location (MAR – Museu de Arte do Rio de Janeiro/RJ). Photo: João Queiroz. Image: Luiz E. Castelões.
analysed, managed, sculpted, and these stages contribute to the continuous refinement of the original algorithms, an ongoing and potentially endless work in progress. (b) In VIA, the composer does not control the whole process from the start, but rather exerts gradual and partial control over the encountered-and-chosen-by-the-ear complexities (i.e., the complexities that had been previously generated by image-to-sound conversions). (c) The production of musical results in this case is therefore significantly open to unforeseen structures. (d) To a certain extent, the final musical result is as much ‘found’ as ‘created’, or perhaps more ‘found’ than ‘created’ – in this context, music composition becomes the intellectual–auditory discovery of a pre-musical object, an abstract object with a highly musical potential.

4. How does the magnitude of this music-making relate to the independently developed images of a choreography as one eventually unites sound and image (within an audio-visual product)? Given that VIA is to a great extent an audio-visual project, there is certainly a resignification that takes place as the finished musical component, which – let us suppose – was satisfactory enough when heard alone, eventually joins the video component (which in its own turn contains the images that served as abstract data provider to the musical component). Even though VIA’s main goal has never been to subject music to image throughout successive stages, there has been in fact a limited space for feedback; summarily, the composer had access to an early mix that, albeit without the final versions of music and video, has allowed for some learning about this particular twofold association (between sound and video as well as between sound and dance). One of the main conclusions drawn from this dialogue was that music and choreography seemed to be more directly related inasmuch as the musical component was dense and intricate. In other words, in the early mixes that had soundtracks with more empty spaces, more silences, the artificial aspect of the audio-visual collage became more apparent and, given that this effect was not intended, it looked/sounded like a mistake, a technical flaw. This finding has further motivated the search for complexity within the musical component, as previously delineated in (3).

5. How to obtain minimally human-like musical results as one makes music exclusively through a non-human device such as a computer? How to make Computer Music that sounds as if humans performed it, or even improvised by humans? Here, the computer’s role as a musical tool is emphasized, without necessity for allegiance to a machine aesthetic, one in which the ‘watermark’ (Caesar 2008) of the employed technology becomes too apparent, thus rendering the musical work that employs it obsolete even before the technology’s own programmed obsolescence. The strategies for obtaining this human-like-yet-through-the-machine sound profile include the ongoing refinement of the musical problems’ formalizations and the implementation of algorithms that provide human-like musical results (which will inevitably involve sound-to-sound intensity variation and frequent tempo fluctuation). Again, the emphasis on complexity (for the more dense and intricate the algorithm output is, the less often one perceives/hears the small-scale limitations of the employed technology), the search for asymmetrical rhythmic sequences, obtained effortlessly as one contours an image by hand (or with a computer mouse) and at will, and the search for varied instrumentation models (e.g., with fifteen different musical instruments) combined with the use of aleatory orchestration, which simulates spontaneity and surprise, or orchestration by register, as usual in instrumental chamber music.
**VIDEO-DANCE**

Two types of locations were chosen to create the routes. In the first type, the chosen locations, although varying from open spaces as squares (e.g. Largo da Carioca) to narrow streets (e.g. Beco das Cancelas), share the property of being places with ongoing movement of people. The second type is characterized by the building interspaces, independent of other architectural characteristics.

For each location type, dance constraints were established to orient the dance action for the video shooting. In places with ongoing movement of people, the dancer performed an uninterrupted improvised sequence of small and angular movements favouring the arms. In the building interspaces, the action was to

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*Figure 9: Location type that characterizes ‘Via 1’, with an ongoing movement of people, associated to the dance constraint of ‘improvised sequence of small and angular movements’. Photo: João Queiroz.*

*Figure 10: Location type that characterizes ‘Via 2’, in the building interspace, associated with the dance constraint of ‘moving from right to left’. Photo: João Queiroz.*
move in a small line from the right to the left, toing and froing, decreasing the movement amplitude so that the action of the dancer is not easily perceived. The constraints were aleatory choices, but they established clear relations between the dancer actions and the space where the videos were shot, which are also the places where the viewer accesses the videos. In this way, places with ongoing movement of people establish ‘Via 1’ (Figure 9) and building interspaces establish ‘Via 2’ (Figure 10).

Video shooting and editing followed strict methods that built the videos with the same structure, independent of the location type and dance constraints. In all locations the videos were shot with a still camera and three relative distances between the camera and the dancer, which we informally called ‘far’, ‘average distance’ and ‘near’. In the edition, a duration for each distance was established in a random way: for ‘far’ – eight seconds; for ‘average distance’ – five seconds; and for ‘near’ – three seconds. A sequence of alternations between ‘far’ (A), ‘average distance’ (B) and ‘near’ (C) was established by chance to structure each video. In this way, the sequence is AABBACCAA. The transitions between the video sequences are abrupt and based on direct analogies between the movements from one frame to the next. The editing is rigorously metric and based on the organization of parts in regularly juxtaposed sequences. Such artifice, combined to a constant reiteration of the dance vocabulary, highlights the urban and architectonic landscape.

How does urban space constrain the morphology of bodily movements? How does location provide regulatory or restrictive information for the selection of bodily movements? Such questions were faced during the development of the project. The space, or the local spatial section where dance takes place, is endowed with many properties (volumetric and topologic, chromatic, light and sound properties, semiotic, sociocultural, etc.). We have opted for a solution that works backwards – the same typologies of movement associated with two found classes or categories of urban space were fixed, with no apparent variations regarding dynamics, form, intensity or rhythm. The goal was to provide more noticeable focus and concentration to the perception of the physical environment. As in a research protocol, certain invariances, distributed among the most relevant components of the video, such as the register of the body in movement, act to stress the perception of space.

CONCLUSION

This was a pioneer project in Brazil. Through the combination of virtual and physical ‘objects’, VIA created a peculiar aesthetic ambience – a real and digital ‘integrated’ environment, resulting from the ‘overlapping’ of virtual collection of objects (video-dance and computational music) and the real world (urban and architecture landscape). The main objective of the project was to produce multimedia content, combining video-dance and computational music, to be accessed through mobile technologies such as smartphones and tablets in specific points of Rio de Janeiro. Its main goal was to endow specific locations of the city of Rio de Janeiro with video-dance performances, accessed through locative media (smartphones or tablets) – any user equipped with a tablet or smartphone with an Internet connection had free access to experimental multimedia pieces of contemporary dance and music while walking through specific points of the city of Rio de Janeiro.

The dance movements were developed in strict relation to the chosen locations. In this way, the dance was created in relation both to the buildings...
and to the passing people. The music was conceived through OM software, designed and developed by the IRCAM Music Representation research group. It is a visual programming language based on CommonLisp / CLOS. Each route corresponds to a series of video-dance and music events experimented in the urban space of the city centre. The audio-visual language is based on discontinuous approaches and withdrawals from the ‘theme’ (performer), which irregularly repeats short, alternated and cyclic movements. The music is a sonorous reimagining of urban space properties found by the performer and the user, based on a computational methodology, assisted by OpenSound software. The video editing is rigorously metric and based on the organization of parts in regularly juxtaposed sequences. This method fixes and highlights invariant properties of the landscape algorithmically translated by the music.

If mobile technology currently imposes a ‘disconnection’ with the immediate physical space – a ‘teleportation’ of the user – VIA associates with projects whose emphasis is the exploration of the location and physical surroundings – smartphone becomes a device to explore public space, more than to extract the user from it (Farman 2012: 116). VIA explores the repetition and fixation of diverse formal solutions in every level of organization of the examined pieces (visual vocabulary of the videos, editing of the videos, motor activity of the performance), refreshing the idea of localization of the immediate physical space. Besides, this project potentiates, in a radical way, a new modality of aesthetic activity, related to a deep experience of landscape spaces – the ‘real’ space ‘densified’ by ‘superposed’ information. It transforms the relationship between citizen and city because it provides the user with a novel set of information on the surroundings by providing free access to the digital content, the project democratized the scope of the video-dance performance accessibility.

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**SUGGESTED CITATION**


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