

INTIMAL: Walking to find place, breathing to feel presence

Ximena Alarcón Díaz^{*}
RITMO Centre for
Interdisciplinary Studies in
Rhythm, Time and Motion,
Department of Musicology,
University of Oslo P.O. Box
1017 Blindern 0315 OSLO
Norway
x.a.diaz@imv.uio.no

Victor Evaristo González
Sánchez[†]
RITMO Centre for
Interdisciplinary Studies in
Rhythm, Time and Motion,
Department of Musicology,
University of Oslo P.O. Box
1017 Blindern 0315 OSLO
Norway
v.e.g.sanchez@imv.uio.no

Çağrı Erdem[‡]
RITMO Centre for
Interdisciplinary Studies in
Rhythm, Time and Motion,
Department of Musicology,
University of Oslo P.O. Box
1017 Blindern 0315 OSLO
Norway
cagri.erdem@imv.uio.no

ABSTRACT

INTIMAL is a physical virtual embodied system for relational listening that integrates body movement, oral archives, and voice expression through telematic improvisatory performance in migratory contexts. It has been informed by nine Colombian migrant women who express their migratory journeys through free body movement, voice and spoken word improvisation. These improvisations have been recorded using Motion Capture, in order to develop interfaces for co-located and telematic interactions for the sharing of narratives of migration. In this paper, using data from the Motion Capture experiments, we are exploring two specific movements from improvisers: displacements on space (walking, rotating), and breathing data. Here we envision how co-relations between walking and breathing, might be further studied to implement interfaces that help the making of connections between place, and the feeling of presence for people in-between distant locations.

Author Keywords

Breathing, walking, improvisation, telematics, migration, motion capture, sonification

CCS Concepts

•Applied computing → Sound and music computing; Performing arts;

1. INTRODUCTION

When engaging in the creation of interfaces for *relational listening* in telematic sonic performance, it is important to state the challenges that musicians and performers usually encounter with this medium. In non-visual network interface performances, Mills and Beilharz note that listening

^{*}PI of INTIMAL. Sound Migratory Artist Postdoctoral Researcher

[†]Postdoctoral Researcher, specialised in Biomechanics.

[‡]PhD candidate working with interactive systems for computational music.

and the semiotics of sound are the main mediators, in that they illustrate “the role of metaphor and embodiment in the perception of musicians creating and responding to musical signs in networked synchrony.”[17] In the field of performance art and technologies, e.g. in dancing, Birringer [3] suggests that telepresence and the experience of the body being somewhere else requires thinking of “different kinds of intuition”, even more if movement is understood as a “continuous current,” a new understanding of real-time flow bridging spaces across the network. In INTIMAL, we wonder what new understandings for telematic sonic performance can emerge when studying body as interface that keeps memory of place. INTIMAL system is a physical virtual embodied system for relational listening that integrates body movement, oral archives, and voice expression through telematic improvisatory performance in migratory contexts¹. Working with nine Colombian migrant women in Europe, to inform and test the system, two experiments were performed to explore: 1)how they express their narratives of migration, and 2)how they respond when listening to recordings with testimonies of other Colombian migrant women in the context of post-conflict. In the first stage of this project, the research looked at salient movements that could be meaningful for an interaction in physical locations (co-located) and also across the distance (telematic). We wondered how these movements account for key questions in the context of migration and dislocation: sense of *place*, and sense of *presence*. This collaboration explores one aspect of the project INTIMAL, discussing how collected data can be used in meaningful ways in relation to the conceptual design proposed by Alarcon [1].

2. ON WALKING AND BREATHING

Walking on any land accounts for connectedness to place. With a view on expanding design approaches for handheld technologies, Eslambolchilar et al suggest a vocabulary to engage in the qualities of walking focusing on our sensory experience such as: *sensuality*, associated with flow in the walk and decisions made in relationship with the land, *coincidence and narrative*, going forward from and going back to the place of departure, getting to know our paths and telling stories about these, *rhythms, synchrony and balance*, [12] [16] revealing the control of our body in movement, and *hybridity*, influenced by the physical space of the walk and other walkers [21]. Walking, also seems to keep track of our emotions, and it is part of our emotional body language [18] [11]. In talking, cognitive linguistics demonstrates the

¹<http://intimal.net>



Licensed under a Creative Commons Attribution 4.0 International License (CC BY 4.0). Copyright remains with the author(s).

“ubiquity of embodied metaphors” [14]; for instance, in the case of INTIMAL research, the metaphor used for participants’ improvisations has been the one of “migratory journeys”. In the specific context of human migration, we question our sense of *place*: ways in which we attach to place across time and space with affective bonds [6] [22]. In female narratives of migrancy, it is important to highlight the importance of movement and freedom, which defies the idea of women as settlers, bringing alternative perspectives on their absence and presence in native and host lands. In this context, Brooks and Simpson suggest how liminality, or “inbetween-ness” for migrant women can be seen as a transition between status (cultural, social) “on an uncertain journey towards new roles and understandings” [4].

In turn, the use of breathing in improvisation is essential part of Pauline Oliveros’ Deep Listening practice [20], which has been used with participants in the INTIMAL project. For instance, Oliveros invites people to begin a Sonic Meditation with observation of the breath cycle, and then to:

Listen to the environment as a drone. Establish contact mentally with all of the continuous external sounds and include all of your own continuous internal sounds, such as blood pressure, heart beat and nervous system. [19]

In the context of telematic improvisatory performance we explore here how breathing could create sense of *presence*. Presence (short for telepresence) is understood here as a “subjective perception in which even though part or all of an individual’s current experience is generated by and/or filtered through human-made technology, part or all of the individual’s perception fails to accurately acknowledge the role of the technology in the experience.”[10] In musical improvisation, Jeff Warren proposes how an “analysis of breath could reveal insights about how music and breath are formative to subjectivity and relationships with others”[13]. Although creative interactive works with visual and musical biofeedback have been developed for the controlling of breathing data [9] [7] [8], the use of breathing as bio-data in interactive systems is not very common due to its nature of being slow data and its difficulty to control for interaction. Lee and Sean Yeo [15], focus on the motional aspects of respiration finding correspondence between music and dance suggesting that “the inclusive flow or energy of entire body is more important than motion data of each body segments”(p.2).

Thus, with this conceptual and practical background, and INTIMAL questions, we have engaged in the analysis of data from: displacements on space (walking, rotating), for controlling the auditory playback in relation to *place*, and breathing data, exploring sonification for real-time improvisation in telematic sonic performance, in relation to embodied *presence* in the distance.

3. EXPERIMENTS AND DATA COLLECTION

Two experiments were performed by the INTIMAL participants: 1) performing a “migratory journey”, and 2) listening to fragments of oral archives. The “migratory journey” acted as an embodied conceptual metaphor, that offers participants in INTIMAL, a spatial structure to improvise between four spheres of migratory memory such as: *body stories*, *social relationships*, *native land*, and *host lands* (including relationships with nature, the soil and other sentient beings). These spheres originated in Alarcón’s research, by annotating the oral archives.² Thus, the journey involved

²Collected by <https://mujerdiaspora.com/>

displacement between these four different imaginary spheres in the lab (stage) space, and, in groups on three, they improvised with their body movements and their words, singing and abstract voice.



Figure 1: Still from Motion Capture, one participant improvising her migratory journey, and the two resonators to the sides

In Experiment one (in Figure 1), acting as the main improviser each participant used body movements, abstract voice and spoken word, while the other two, called the resonators, joined her in their own time. They stood in a triangle, with the main improviser at the point and the resonators to the sides. They were free to move all over the stage space. Their migratory journeys lasted between about three and eight minutes.

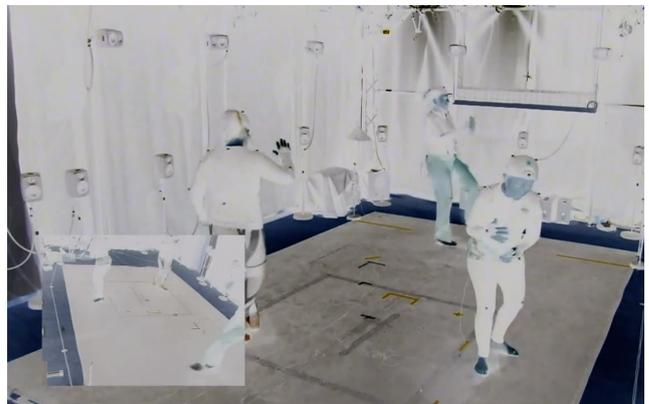


Figure 2: Still from Motion Capture, participants improvising with the archives

In Experiment two (in Figure 2), participants also used ear-buds to listen to the fragments of the oral archive. They did not face one another, so as to permit free reactions without direct influence from the others. Here it is important to note that cables were somehow obstructing the movement in-between performers, and that this experiment in the future should be better performed with wireless headphones. They listened to twenty-two minutes of fragments from the oral archive, with silences of forty seconds between the fragments to allow for a time to react through improvisation. The fragments were selected according to the four spaces of migratory memory.

3.1 Trajectories and Displacement

In order to track walking trajectories and displacement, the instantaneous position of reflective markers placed on each

of the listener's head and shoulders was recorded using a Qualisys infrared motion capture system (13 Oqus 300/500 cameras) running at 200 Hz. Motion data was recorded and pre-processed in the Qualisys Track Manager (QTM), and the analysis was done in Matlab using the MoCap Toolbox [5] and custom made scripts.

The instantaneous position of the participants were processed to obtain displacement and body orientation as shown in Figure 3, from Experiment 1, and in Figure 4, from Experiment 2, at a resolution of 200 samples per second.

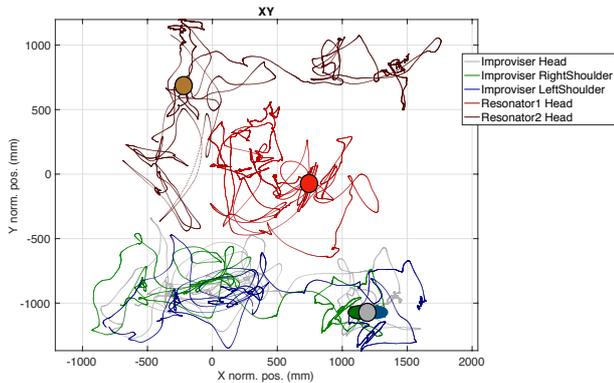


Figure 3: XY plot (top view) showing the instantaneous position from the improvisers during Experiment 1. Silhouettes of heads and shoulders show the participants' initial position and orientation.

As shown in the graphic representation of Experiment 1 (Fig 3), the “main improviser” head and shoulders are followed to see her individual trajectories, and in relationship to the resonators. As she is expressing her migratory journey, we might create a framework of analysis derived on her linear trajectory, and the many turns that emerge in her narrative. Also the moments in which she spends more time, in which places, and how these account in the vocabulary of her walking narrative namely sensuality, narrative, rhythm, and hybridity [21] (e.g. in a particular sphere of migratory memory and in-between spheres). Rhythm of her walk could be measured in the quantity and the frequency of steps, and these could have relationships with her vocal narrative and her breathing. In relationship with the resonators, we could speculate, for instance, on how much space the “main improviser” opens for herself, how resonators are influenced by her movements, and how in turn, the main improviser is influenced by the resonators.

Regarding the graphic representation of Experiment 2 (Fig 4), in which all of the improvisers have the same hierarchy, displacement in space, and variations in rotation, can account for togetherness and leadership within the improvisation, and how they cross influence each other (without seeing each other) occupying different spaces. One of the improviser's trace (the one that is being traced with head and shoulders) suggests to us the intricacy of what she is communicating with her movement and displacement to meet somehow the others, and to be central in the space, even if she is originally in a corner of the stage.

3.2 Sonification of Breathing data

In order to record the breathing data, we have used wireless breathing sensors strapped around the improvisers' ab-

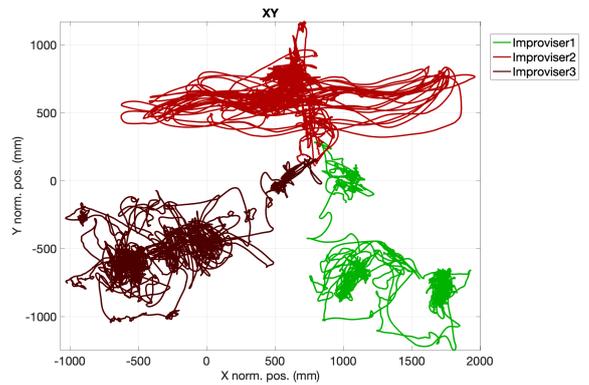


Figure 4: XY plot (top view) showing the instantaneous position from the improvisers' head during Experiment 2.

domen areas (FLOW Sweetspot³, Norway). The raw breathing data was collected at 20Hz and processed using the custom software interface of the sensors. Data sonification experiments were done in the *Pure Data* (Pd) environment.

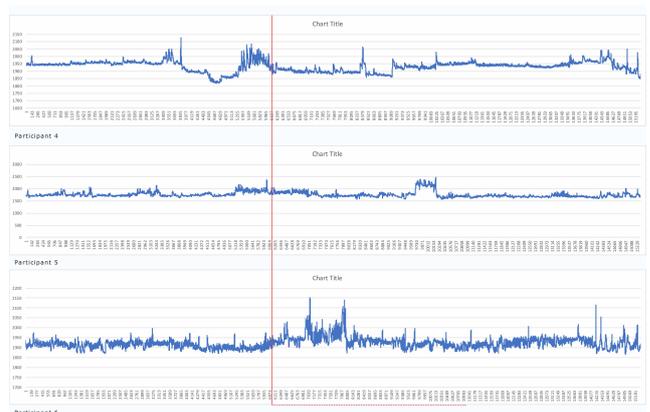


Figure 5: Breathing data to be sonified

We framed our sonification design strategies around the idea of droning sounds that incorporate an intrinsically embodied behaviour, as inspired by Oliveros' Sonic Meditation (see above). When considered from an ecological perspective that breathing is already a built-in sound phenomenon for the body, we avoided abstract techniques for sound synthesis and utilized physically-informed models instead, specifically the *windkarman~* and *scraping~* objects of the *Sound Design Toolkit (SDT)* library [2].

We observed that each sound object incorporates a distinct perception-action link with the breathing as an autonomous exertion of the body⁴. The sound of the *windkarman* object, which is originally described as the *air turbulence across thin objects*, can evoke a similar feeling to the internal air-flow during the inhalation and exhalation, but, that is experienced outside of the body as opposed to the inside. On the other hand, the sound of *scraping~* evokes a sensation of rather internal, visceral vibrations.

It should be noted that the mappings we have applied so far are largely based on the *one-to-many* scheme. These

³<https://www.sweetzpot.com/flow>

⁴Audio excerpts for the sonification of this data can be found at <https://archive.org/details/sonificationofbreathing>

are expected to evolve throughout a practice-based design methodology of exploring various feature extraction, mapping strategies and sound synthesis techniques, while mainly drawing on the subjective experiences and evaluations of the performers.

4. DISCUSSION: VISION FOR A TELEMATIC SONIC IMPROVISATION

In order to perform a retrieval of the oral archive in correlation with the individual migratory journeys, we envision the INTIMAL system sensing displacement and orientation data from the improvisers, allowing real-time playback of the oral archives. These might trigger the expression of improvisers' individual stories (as in an individual "migratory journey"), or might bring improvisers together in the sharing of collective memories. Co-relations between the ways of walking of each improviser, could influence the triggering of the archive, the silences in-between each fragment is triggered, as well as the relationships with the other improvisers as they navigate through stories that belong to different spheres of migratory memory. In depth co-relations between displacements, rotations and spoken language might question different aspects of narratives and expand our knowledge of embodied sensibilities. The INTIMAL system in turn, will sense the breathing and transmit data telematically to be sonified in each location. Sonification for conveying information is not the end goal of this project; for us it is rather a tool used as part of the creative process. For instance, in the sonified data we used some time-based effects (reverb and a bit of delay) to enhance the feeling of a drone, which may reduce the directness goal of some sonification practices. The improvisers may choose to use the breathing intentionally, using it as a "drone", allowing pauses between the listening of the archives, as well to extend their performances involvement walking, spoken and abstract voice. Thus, the oral archive and the memories that it brings, as well as individual intricate memories as expressed on body movement and voice, become the full environment to be heard, as listening to others' listening. Here, we infer that breathing and displacement in space, potentially augments improvisers' agency to find *place*, and to sense *presence*, in the context of human migration. A technical development will be tested publicly connecting the cities of Oslo, Barcelona and London, in May 2019. Overall, working with body movement data is opening options to know how best quantitative analysis can be used for interface development, implementation and further study of the sensory experience on embodied listening, co-located and across the distance, for expanding spaces for free expression of narratives of migration.

5. ACKNOWLEDGMENTS

The INTIMAL project received funding from the European Union's Horizon 2020 research and innovation program under the Marie Skłodowska-Curie grant agreement No. 752884, and has been partially supported by the Research Council of Norway through its Centres of Excellence scheme, project number 262762.

6. REFERENCES

- [1] X. Alarcon-Diaz. Conceptual design for intimal: a physical/virtual embodied system for relational listening. *Journal of Somaesthetics*, 4(2), mar 2019.
- [2] S. Baldan, S. Delle Monache, and D. Rocchesso. The sound design toolkit. *SoftwareX*, 6:255–260, 2017.
- [3] J. Birringer. *Performance, Technology and Science*. PAJ Publications, New York, 2008.
- [4] A. Brooks and R. Simpson. *Emotions in Transmigration. Transformation, Movement and Identity*. Palgrave Macmillan, London, 2013.
- [5] B. Burger and P. Toiviainen. Mocap toolbox-a matlab toolbox for computational analysis of movement data. In *10th Sound and Music Computing Conference, SMC 2013, Stockholm*. Logos Verlag Berlin, 2013.
- [6] J. E. Cross. Processes of place attachment: An interactional framework. *Symbolic Interaction*, 38(4):493–520, nov 2015.
- [7] Y. Y. Diana Siwiak, Jonathan Berger. Catch your breath - musical biofeedback for breathing regulation. In *NIME09*, Pittsburgh, PA, 2009.
- [8] B. et al. Music-based respiratory biofeedback in visually-demanding tasks. In *Proceedings of the International Conference on New Interfaces for Musical Expression*, Baton Rouge, LA, USA, 2015.
- [9] K.-T. L. et al. (Eds.). Flow of qi: System of real-time multimedia interactive application of calligraphy. In S.-V. B. Heidelberg, editor, *MMM 2011 : International Conference on MultiMedia Modeling*, volume Part II of *LNCS 6524*, pages 432–441, 2011.
- [10] I. S. for Presence Research. The concept of presence: Explication statement., 2000.
- [11] G. J. Hicheur Halim, Kadone Hideki and B. Alain. *Modeling, Simulation and Optimization. K. Mombaur and K. Berns (Eds.)*, volume COSMOS 18, pp. 71-85., chapter The Combined Role of Motion-Related Cues and Upper Body Posture for the Expression of Emotions during Human Walking. Springer-Verlag Berlin Heidelberg, 2013.
- [12] . V. J. Ingold, T. *Ways of walking: Ethnography and practice on foot*. Ashgate, Farnham, Surrey, UK, 2008.
- [13] W. Jeff. *Soundweaving - writings on improvisation*, chapter Breath and Improvisation. Edited by Franziska Schroeder and Micheal O hAodha, 2014.
- [14] R. W. G. Jr. Walking the walk while thinking about the talk: Embodied interpretation of metaphorical narratives. *Journal of Psycholinguist Research*, 42:363–378, 2013.
- [15] W. S. Lee, Jeong-seob & Yeo. Real-time modification of music with dancer's respiration pattern. In *NIME'12*, University of Michigan, Ann Arbor., 2012.
- [16] H. Lefebvre. *Rhythmanalysis: Space, time and everyday life*. Continuum, London, UK, 2004.
- [17] R. Mills and K. Beilharz. Listening through the firewall: Semiotics of sound in networked improvisation. *Organised Sound*, 17(1):16–27, 2007.
- [18] C. A. Montepare Joann M., Goldstein Sabra B. The identification of emotions from gait information. *Journal of Nonverbal Behavior*, 11(1), 1987.
- [19] P. Oliveros. *Sonic meditations*. Smith Publications Baltimore, MD, 1974.
- [20] P. Oliveros. *Deep Listening A Composer's Sound Practice*. iUniverse, Deep Listening Publications., Lincoln, NE, 2005.
- [21] A. C. Parisa Eslambolchilar, Mads Bodker. Ways of walking: Understanding walking's implications for the design of handheld technology via a humanistic ethnographic approach. *Human Technology*, 12(1):5–30, may 2016.
- [22] Y.-F. Tuan. *Space and Place: The Perspective of Experience*. University of Minnesota Press, Minneapolis, 1977.