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Introduction

Human migration leads to a radical change in our spatial and temporal embodied multisensory experience.¹¹ We have been interested in understanding more about the body's capabilities of keeping memory of place, and seeing whether it is possible to develop technologies that allow for *relational listening* between people that are physically dislocated. As developed by Lawrence,

The system implementation was a joint effort between researchers at RITMO, Centre for Interdisciplinary Studies in Rhythm, Time and Motion, and with the support of students from the Master's programme in Music Communication and Technology from the University of Oslo and NTNU in Trondheim. The performance counted on the generous technical and logistic collaboration from Ari Gautier from Melahuset and Kristin Norderval from Vox Lab in Oslo; Ángel Faraldo, Artistic Director from Fundació PHONOS, Xavier Favory and Nerea Tascón, students from the Music and Technology Department, and Germán España from the IT Department, at the University Pompeu Fabra in Barcelona; Eduard Solaz and Isa Ferri from Iklectik Art Lab, Cathy Lane and Matt Parker from CRISAP1 in London; and Diaspora Women in Barcelona and London. We are also thankful for the technical collaboration and advice from Sagar Sen from Sweetzpot AS, and for the work with the annotation of the oral archive to be processed by MEMENTO, developed by Lucia Nikolaia López Bojorquez. We thank the participation and deep involvement of improvisers and collaborators from the INTIMAL community: Anita Ramírez, Bruna Scott, Calu, Dr. Liliana Rodríguez, Janeth Rojas, Lucia Nikolaia, Lidia Franco, Manigua, Myriam Ojeda Patiño, Violeta Ospina, Silvia Esperanza Villalba Martínez, and Yamile Calderón Bermúdez. 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.

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¹¹ See Sara Ahmed, *Strange Encounters: Embodied Others in Post-Coloniality* (London: Routledge, 2000).

English, relational listening is understood here as an activity in which the psychological and technological processes are part of the possibilities of listening to others' listening.¹² This is further developed in INTIMAL as the possibility to listen to one's own vibrations, as inhabiting in-between distant locations, and to transmit these experiences across time and space in the context of human migration. Relational listening is inspired by Pauline Oliveros' embodied practice Deep Listening® and the possibilities of telematic communication, and allows people to engage in a *set of relations* involving dreams, oral archives, body expression, voice, and spoken language.¹³ The result is the interactive system INTIMAL, a physical-virtual embodied setup to be used in telematic sonic performances. The system invites people to listen to stories about their own migrations, and to collectively improvise with body movement and vocal sounds. The aim is to allow the participants to tacitly interrogate the *sense of place* and the *sense of presence*. Sense of place is here understood as the feelings that attach us emotionally to a place.¹⁴ Moreover, sense of presence as the feeling of others being present in the distance through technological mediations.¹⁵ In the INTIMAL system, emphasis on *sense of place* is intended for symbolically and holistically regaining *agency*, in the context of migration. Sense of agency is understood as "the experience of controlling both one's body and the external environment" and it is highlighted by Hanna Limerick, David Coyle, and James W. Moore as an important measure in human-computer interaction design: the more embodied an interface is, the human sense of agency is augmented.¹⁶

Nowak suggests that *co-presence* is about "sharing concepts with interpersonal constructs of intimacy, involvement and immediacy."¹⁷ In this logic, we might say that in INTIMAL, we explore "co-presence" through *relational listening*: the improvisers make relations between different sources of sound, and between their own stories. During this process, the perception of "sound" between distant locations, might expand to sensing "vibrations," which, as suggested by Nina Sun Eidsheim, helps us to delve deeper into sonic relations. Bringing physical acoustics, she suggests that listening, like singing, "should be defined as the transmission and transduction of

¹² See Lawrence English, "Relational Listening: The Politics of Perception," *Ear Wave Event*, 2 (Spring 2015), accessed September 29, 2015, <http://earwaveevent.org/>; Lawrence English, "Relational Listening: The Politics of Perception," *Contemporary Music Review*, 36, no. 3, (2017): 127–142.

¹³ Deep Listening is a registered trademark through The Center for Deep Listening at Rensselaer Polytechnic Institute; The Center for Deep Listening at Rensselaer, "The Center for Deep Listening – at Rensselaer," <https://www.deeplistening.rpi.edu>.

¹⁴ See Jennifer Eileen Cross, "Processes of Place Attachment: An Interactional Framework," *Symbolic Interaction* 38, no. 4 (November 2015): 493–520; Yi-Fu Tuan, *Space and Place: The Perspective of Experience* (Minneapolis: University of Minnesota Press, 1977).

¹⁵ See Kristine Nowak, "Defining and Differentiating Copresence, Social Presence and Presence as Transportation," in *Proceedings of the HCI international conference on human-computer interaction*, (Lawrence Erlbaum Associates, 2001): 686–690; International Society for Presence Research (ISPR), "The concept of presence: Explication statement," 2000, accessed October 1, 2019, <https://ispr.info/>.

¹⁶ Hanna Limerick, David Coyle, and James W. Moore, "The experience of agency in human-computer interactions: a review," *Frontiers in Human Neuroscience*, 8 no. 643 (2014): 1.

¹⁷ Nowak, "Defining and Differentiating Copresence," 9.

sound,” as sound “ultimately reverberates throughout the body that hears it.”¹⁸ In fact, this is the process that allows the listener to hear a sound. Vibration does not have a beginning or an end; it brings “relationality” as it involves the whole, or multiple ‘slices’, of the experience.

We are here inspired by Eidsheim’s “formula” of relational activities:

“If [s] and [l] are [v] and [v] is [r]; and, if [b] is [v]; then, also [b] is [r].
[s]=singing; [l]=listening; [v]=vibration across bodies, causing change;
[b]=being; [r]= relational.”¹⁹

Our intention is to create interfaces that involve the physicality of the body, and the relations that are established between improvisers in a co-located setting. This is combined with the disembodied presence achieved by the INTIMAL system, aiming at achieving “vibration[s] across bodies, causing change” across the distance.²⁰

The INTIMAL system has been developed in close connection with nine Colombian migrant women living in the cities of Oslo, Barcelona and London. Early in the project, they participated in a research fieldwork involving Deep Listening® practice.²¹ They also participated in motion capture experiments at the University of Oslo, during which, we learned about the interaction parameters that could be used in a performance context.²² Here, we explored the participants’ “migratory journeys” as improvised narratives interrelating memories of migration and place across four spheres of migratory memory: *body stories*, *social body*, *native land* and *host land*.²³

In addition to the material gathered from the nine participants, the INTIMAL system also builds on the oral testimonies of other women. These testimonies were collected by the organization *Diaspora Women*, a grassroots organization focused on the historical memory of Colombian migrant women in Barcelona and London.²⁴ Their oral testimonies account for the women’s experiences during the armed conflict in Colombia and their subsequent migration.

We had two main research questions guiding our development of the INTIMAL system:

¹⁸ Nina Sun Eidsheim, *Sensing Sound. Singing and Listening as Vibrational Practice* (Durham, North Carolina: Duke University Press, 2015), Kindle Edition, Location No. 3884 of 6803.

¹⁹ *Ibid.*, Kindle Edition, Location No. 3884, 3898 of 6803.

²⁰ *Ibid.*

²¹ See Pauline Oliveros, *Deep Listening: A Composer’s Sound Practice* (New York, Lincoln, NE, Shanghai: iUniverse Books), 2005.

²² See Ximena Alarcón Díaz, “Conceptual design for INTIMAL: a physical/virtual embodied system for Relational Listening,” *Journal of Somaesthetics* 4, no. 2 (March 2019): 6–24.

²³ See Ximena Alarcón Díaz et al., “From collecting an archive to artistic practice in the INTIMAL project. Lessons learned from listening to a Colombian migrant women’s oral history archive,” *Acervo Revista do Arquivo Nacional* 32, no. 3 (Sept/Dec 2019): 48–63.

²⁴ See *Mujer Diáspora*, “Mujer Diáspora,” accessed August 4, 2019, <http://mujerdiaspora.com>.

1. How might we use the body to interact with an oral archive in a performance context?
2. How might we capture and transmit the presence of multiple performers between dislocated spaces?

Researchers at RITMO and students from the Master's program in Music, Communication and Technology supported the technological and artistic implementation of the INTIMAL system, which was premiered in a long-distance improvisation between Oslo, Barcelona and London on May 7, 2019 (Figure 1).²⁵



Figure 1: Stills from Long Distance Improvisation. Left: London; above: Oslo; below: Barcelona

In this paper, we describe the technological and artistic implementation of the performance setup. Then we reflect on how the developed interfaces facilitated or challenged the listening

²⁵ This is a two-campus Master's programme between UiO and NTNU, using and exploring various types of high-quality network-based multimedia connections. For more information, see UiO: University of Oslo, "Music, Communication and Technology (master's two years) – University of Oslo," accessed September 26, 2019, <https://www.uio.no/mct-master/>.

experience of the improvisers, their co-located and remote connections, and the exploration of *place* and *presence*. We have chosen to focus on the experiences of the participants in this paper. The audiences in these three cities also played very important roles in the performances. We will consider their experiences in a later publication.

Implementation

The implementation of the INTIMAL system used in the performance was split into three separate modules:

1. MEMENTO: a co-located, and “embodied” navigation system through the oral archives;
2. RESPIRO: a live, telematic transmission of breathing signals, which are locally sonified in each location;
3. TRANSMISSION: the solutions developed for audio streaming between the cities, performers, audiences, and an open broadcast.

The three modules will be presented and discussed in more detail in the following sections.

MEMENTO

In MEMENTO, listeners’ movements were symbolically understood as looking for directions for a *sense of place* within the migratory context. Specifically, in the context of the Colombian conflict, the longest armed conflict in the 20th century, and its subsequent diaspora, this tool was created to make relations between fragments of stories recalled by Colombian migrant women in the oral testimonies. Thus, the work reflects upon two types of dislocation experienced by them: one geographical, which involves their experiences of migration and the encounter with different cultures and geographies; and one historical, which brings to their memories many events associated with the armed conflict, both alive and buried, subtle and direct. These experiences, which are often intertwined, can emerge with a creative listening improvisatory practice, to collectively recall, understand, and heal.

MEMENTO development first involved a text mining application, which makes semantic relations between fragments of the oral archive, and second, an embodied interactive solution. The text mining application interrelates fragments of the oral archive, consisting of nine testimonies which have been previously annotated according to the *four spheres of migratory memory*.²⁶ The software interrelates these fragments according to similarities established between words (specifically nouns and adjectives), calculating how similar these words are between stories and assigning a numerical “distance” between them. It was developed with Python in conjunction with

²⁶ See Alarcón et al., “From collecting an archive to artistic practice in the INTIMAL project,” 48–63.

the spaCy part-of-speech tagger, using Python language and standard library facilities to process the XML input files containing the fragments.²⁷ The application permitted the identification of nouns and adjectives, and established information retrieval techniques (term vectors, tf-idf measures) to establish fragment similarities. The embodied interactive solution uses this information to allow the navigation through the oral archive by triggering the fragments according to improvisers' steps. Using mobile phones as sensors and the mobile app SensorUDP, these sent acceleration and gyroscope data from the mobile phones to the computer with UDP messages.²⁸ These messages were sent to a python script on the computer to determine the motions of the improvisers. To determine the steps taken by them, we used the jerk from the acceleration data; if the jerk went above a certain threshold, it would trigger as a step. To determine their rotation, we used the rotation data we received, and used two thresholds for triggering rotation.

Thus, when taking a step forward, the improviser starts a course of navigation within a particular theme (selected words by the system), mixing different women's testimonies and spheres of migratory memory. The software provides a story related to the theme at each new step. As the improviser advances, moving further away from the theme's starting point in physical space, the similarity decreases between the initial story and each subsequent story presented by the software within the theme. Nevertheless, all stories presented within the course of navigating a theme will have some relationship with the initial story. For instance, in the following fragment located in the sphere of *Social_Body*:

“Mis **abuelos** paternos fallecieron, estaban fallecidos cuando yo **nací** pero mis abuelos maternos eran pues era muy **distintos** ellos dos.” (My grandparents from my father's side passed away, they were dead when I was born, but my grandparents from my mother's side were very different).

The system first identifies the words “*abuelos*” (grandparents) and “*nací*” (I was born) as a theme, and then highlights them in yellow, to bring the following most similar fragment that contains the word “*abuelos*” but from a different woman's story; in turn, if the listener steps forward again, s/he will listen to a fragment that has the word “*distintos*” (different), highlighted in green, and which has been found in a fragment from a different sphere of migratory memory: *Native_Land*.

When the improviser rotates to the right, she will immerse into one of the spheres of migratory memory. For instance, according to the example *Social_Body*, while rotating to the left allows

²⁷ spaCy, “spaCy · Industrial-strength Natural Language Processing in Python,” accessed October 1, 2019, <https://spacy.io>.

²⁸ We used Android and iPhones to run MEMENTO. However, we decided to run the performance only with Android phones to incorporate commercial apps such as Zoom and Discord, which we will later refer to in the paper; SensorUDP, “Sensor UDP – Apps on Google Play,” accessed October 1, 2019, https://play.google.com/store/apps/details?id=com.ubccapstone.sensorUDP&hl=en_GB.

her to immerse into the voice and history of the woman who has been heard, across any other sphere of migratory memory. Both developments were created in Python and are available as open source software.²⁹

RESPIRO

In INTIMAL, breathing is proposed as biodata to feel *presence* across distant locations, translating the *embodied* experience that we cannot see, and the voice that we cannot hear. This helps us with the exploration of web technologies for alternative forms of telepresence—to the visualization of body movements, or to the listening of human voice—and also with less demand on bandwidth capacity for the different venues.³⁰ Breathing also responds to the feeling of togetherness, which was evident in the motion capture sessions during the INTIMAL fieldwork.³¹ Recalling “co-presence,” breathing conveys *intimacy*, and *involvement* of the self and the others; also, as a voluntary/involuntary body movement, breathing can convey *immediacy* and an immersive approach to listening.³² Oliveros reminds us how breathing “is the bridge between the voluntary and involuntary—the sympathetic nervous system [for fight-or-flight response] and the parasympathetic nervous system [for rest and digest], the conscious and the unconscious, the inner and the outer.”³³ In her *Sonic Meditations*, she invites us to bring our voluntary attention to breathing, while improvising alone and with others, and to notice the effects that this practice has when we return to normal breathing.³⁴ Breathing, as a vital sound emerging from individuals in a collective expression, creates an “atmosphere” that surrounds us. With different rhythms, strengths and emotions carried by our breath, we acknowledge our and others’ breathing, and a shared condition of being there alive and present. When using not only breathing but data from breathing activity, and listening to its sonification, surrounded by loudspeakers, we are creating an immersive environment, in which improvisers can tune in and out from their breathing producing sounds, maintaining the awareness of others’ presence, locally and across the distance. When working with breathing data in interactive systems, we have the challenge of feeling interactive “slow data.”³⁵ Breathing action and breathing data could be understood in this context

²⁹ For the MEMENTO link on GitHub, visit GitHub, “INTIMAL/Memento at master · fourMs/Intimal · GitHub, accessed October 1, 2019, <https://github.com/fourMs/INTIMAL/tree/master/Memento>.

³⁰ In the INTIMAL Long Distance Improvisation, we nevertheless used a VPN solution to the University of Oslo server, to connect between the different venues, assuring a reliable bandwidth. In all venues, we also used Ethernet cable.

³¹ See Alarcón, “Conceptual design for INTIMAL.”

³² Alexander Refsum Jensenius, “Sonic Microinteraction in ‘the Air,’” in *The Routledge Companion to Embodied Music Interaction*, ed. Micheline Lesaffre, Pieter-Jan Maes, and Marc Leman (New York: Routledge, 2017): 431–439.

³³ Oliveros, *Deep Listening*, 10.

³⁴ See Oliveros, *Deep Listening*.

³⁵ Ximena Alarcón, Víctor Evaristo González Sánchez, and Çağrı Erdem, “INTIMAL: Walking to feel place, breathing to feel presence,” in *Proceedings of the International Conference on New Interfaces for Musical Expression*, (Rio Grande do Sul, June 2019), 247.

as “media,” following John Durham Peters, who divides it into *techniques* and the *technologies* that affect the breather and the atmosphere.³⁶

Thus, in RESPIRO, we had two challenges:

1. the sonification of breathing data in a meaningful and interactive feel for the improvisers, transmitting presence across distant locations; and
2. the connection between the SweetZpot AS breathing sensors to send data as OSC messages to a Max/MSP patch, to transmit these in real time.³⁷

Both challenges are posed in *technologies*, as interfaces that might develop the feeling of presence, and might raise awareness on improvisers breathing *techniques* or patterns.

Artistically, RESPIRO was built around a conceptual trichotomy with three performers each in three cities, and the resulting sonification draws upon inspiration from each city to make them distinguishable. Derived from earlier exploration of breathing as a “drone,” sounds were further developed to characterize each city: for instance, rapid movement in London (“drone”), wind in Barcelona (“wind”), and inner listening of breathing in Oslo (“scraping sound”).³⁸ When collecting data from the three improvisers at the same time, the value extremes in the Max patch become bigger if the performers are in-sync. Conceptually, togetherness enhances and strengthens the sonification. Three loudspeakers were used: one for the local sound, and the other two for bringing respectively the sound of the distant city 1 and the distant city 2. RESPIRO interface connects three Bluetooth breathing sensors in each venue, with a computer receiving data with Web Bluetooth API in Google Chrome and relaying the data as OSC messages to a Max/MSP patch. This patch receives, transmits and sonifies the data from all nine sensors, enabling the browser to connect and communicate with Low Energy Peripherals (Figure 2).³⁹ Due to network latency, the signals were slightly delayed, but synchronous enough to bring the feeling of presence with the improvisers’ breathing activity, across the distance.⁴⁰

³⁶ John Durham Peters, “The Media of Breathing,” in *Atmospheres of Breathing*, ed. Lenart Škof and Petri Berndtson (Albany: State University of New York Press, 2018), 190.

³⁷ Kraig Becker, “The SweetZpot Flow is the fitness device that encourages you to just breathe,” *Digital Trends*, February 27, 2018, accessed September 25, 2019, <https://www.digitaltrends.com/outdoors/sweetzpot-flow-wearable/>.

³⁸ Alarcón et al., “INTIMAL: Walking to feel place,” 247-248.

³⁹ Bluetooth Low Energy is a single-hop solution for short-range communication between devices that uses little energy and is suited for use in monitoring various human activities; Carles Gómez, Joaquim Oller, and Josep Paradells, “Overview and evaluation of bluetooth low energy: An emerging low-power wireless technology,” *Sensors* 12, no. 9 (2012): 11734-11753.

⁴⁰ Although we did not measure signal latency here, we can estimate having less of one second latency on signals. If we compare it to the 5 to 10 seconds breathing patterns, the sonification could be perceived as synchronous enough.

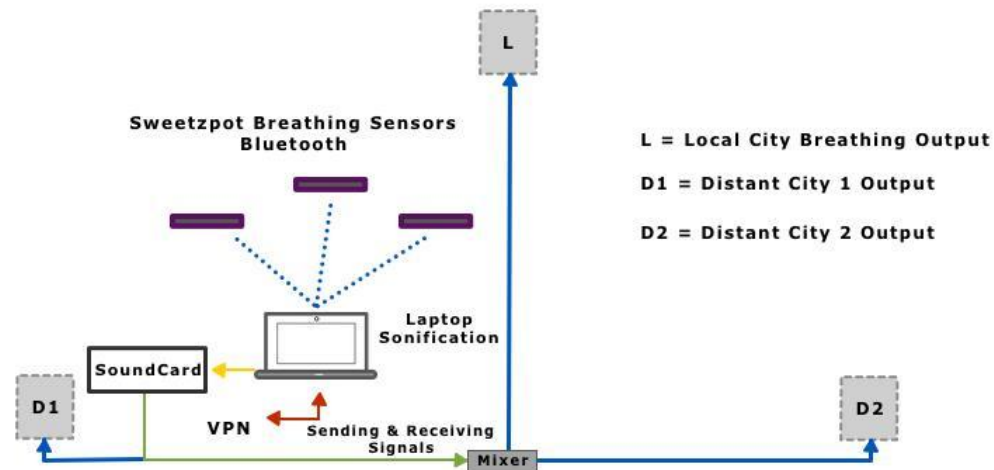


Figure 2: Signal flow of RESPIRO

Transmission for Collective Listening and Voicing

The TRANSMISSION module of INTIMAL involved private listening shared between three improvisers in each city via headphones and heard through mobile phones. After having tested different kinds of mobile apps for transferring sensor data through UDP, we chose Sensor UDP as the most stable, though not able to run in background mode. The sound was transmitted via streaming from a local computer to the mobile phones using the Zoom software, which has a low latency, is multiplatform, and is free to use.⁴¹ The sound quality of such videoconference technologies is compressed, but for this purpose, the “telephonic sound” of the system added a dimension of authenticity to the performance. In addition, feedback cancellation in Zoom was not an issue during the performance, because firstly, improvisers were listening through headphones to the streaming from MEMENTO, and secondly, they were not using Zoom to transmit their vocal responses. These were transmitted to a common server through the Discord app, which ran in parallel to the Zoom transmission. Although the setting was not very user-friendly, as each of the participants had to make their own user account to join a conversation, we were able to have several different technologies working at the same time on different devices. From a troubleshooting perspective, such a multitude of different (commercial) solutions was not ideal, but it served our aim of having a fully wireless setup, allowing for free movement of the body of the performers. The positive side of using mainstream software apps running on regular mobile

⁴¹ Zoom, “Video Conferencing, Web Conferencing, Webinars, Screen Sharing – Zoom,” accessed October 1, 2019, <https://www.zoom.us>.

phones, is that the system is easily scalable and movable to new contexts. We are exploring more advanced technologies for telematic transmission such as LoLa, Ultragrid, and TICO, but would like to continue working on mainstream solutions for accessibility.⁴²

For the improvisation, we used three stories out of nine possible options. These were heard in the cities, and randomly triggered according to the movements of the listeners in each city. When MEMENTO identified a fragment that has been already heard, it triggered “*Soplo de Agua*,” (“blow of water”) a composition created by Bruna Scott, who is a member of the INTIMAL community.⁴³ The sound offered a pause for listening in-between many words and stories that might have been emotionally hard to listen to. Also, it sonically connected the experience of listening to the oral archives with the experience of listening to the sonified breathing. After the triggering of that sound, MEMENTO restarted with a new fragment (Figures 3 and 4).

⁴² Low Latency AV Streaming System, “LoLa,” accessed October 1, 2019, <https://lola.conts.it/>; UltraGrid, “Software for low latency and high-quality video network transmissions,” accessed October 1, 2019, <http://www.ultragrid.cz/>; and TICO Alliance, “TICO Lightweight compression technology,” accessed October 14, 2019, <https://www.tico-alliance.org/technology.html>.

⁴³ To listen to the composition, visit “*Soplo Sueño Agua 1*,” SoundCloud audio, 4:57, posted by “intimal,” May 2019, accessed October 14, 2019, <https://soundcloud.com/user-62717487/soplo-sueno-agua-1>.

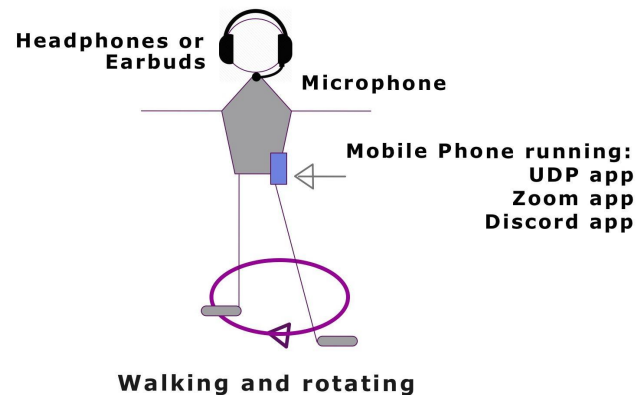


Figure 3: Interaction MEMENTO: walking and rotating

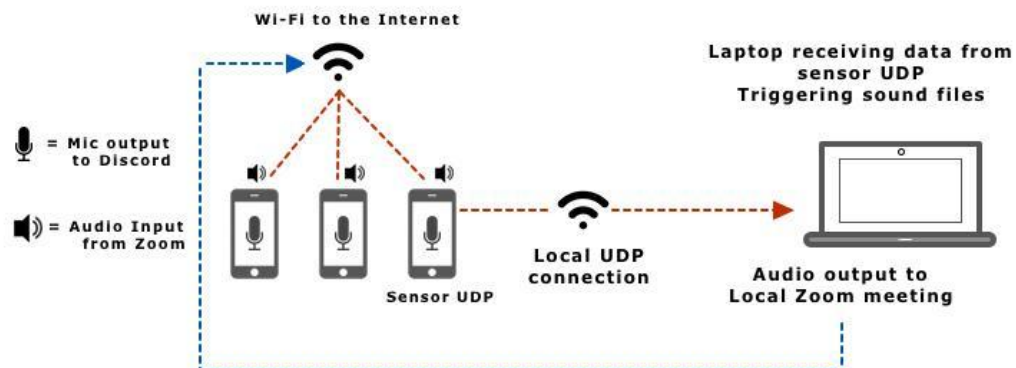


Figure 4: Signal flow of MEMENTO.

Location, Network and Broadcast

The telematic improvisation took place in collaboration with three venues: the Melahuset in Oslo, the PHONOS Foundation in Barcelona, and the Iklectik Art Lab in London.⁴⁴ For the functioning of RESPIRO, the dimensions of each space were important, as to allow Bluetooth connections

⁴⁴ Mela, "Mela," accessed September 25, 2019, <https://www.mela.no/>; Phonos, "Phonos (UPF)," accessed September 25, 2019, <https://www.upf.edu/web/phonos>; IKLECTIK, "IKLECTIK," accessed September 25, 2019, <https://iklectikartlab.com/>.

between the main computer and the breathing sensors. For the use of MEMENTO, we needed similar floor dimensions in each venue to allow space for improvisers to move, as well as to position the loudspeakers. The audiences surrounded the improvisers in a full circle (Barcelona and London), and in a semicircle (Oslo). Loudspeakers were positioned in a triangle, enveloping improvisers and audience. The circular setting was intended to create a feeling of commonality (Figure 5).

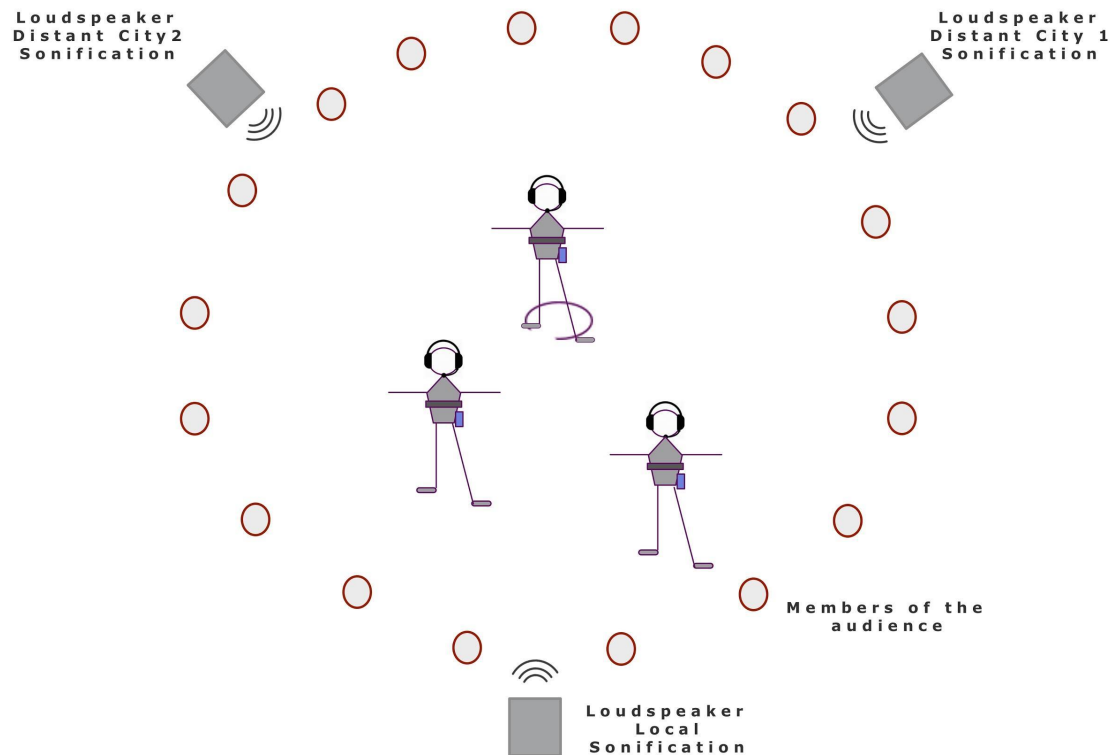


Figure 5: Stage setting with audience

For creating the network and the broadcast, a Cisco Ipsec VPN located at the University of Oslo was used to make virtual local connections. This acted as a bridge between the venues, relying on the same network from the different locations. It also helped in setting up UDP connections between the computers without needing public IP addresses. The intention was to transmit the embodied experience by using audio means only, and removing the visuals, thus intensifying the listening experience. We used Open Broadcaster Software (OBS) to broadcast the sonification

of breathing and the voices to YouTube for an online audience. The broadcast worked well, although we experienced loss of signal from some improvisers with the Discord App.

Score

The score (Figure 6) was composed for three improvisers in each city and a helper (called *tiempa*) who marked the time; such information was discussed with them, and adjusted for their clarity and needs. In the first half of the improvisation, each improviser had 1'30" to express her "migratory journey." The other two, in each city, acted as "resonators" of those stories. The ones in the distance, when hearing the name of the improviser (voiced by the *tiempa*), sent her sounds or movements understood as "sonic gifts" that were based on memories of this person (built during one-year Deep Listening® practice). They were also improvising following words or movements of the others. In the second half of the improvisation, improvisers used MEMENTO, activated by only one of the improvisers in each city, called *brújula* (compass). The others could "resonate" freely to what they had heard, and could interact with the *brújula* to decide together the path of the stories. The *tiempa* also announced the "closing ritual" for improvisers to understand that the improvisation time was coming to an end. After the improvisation, the three cities connected with voice audio transmission for a Q&A session about their experience.

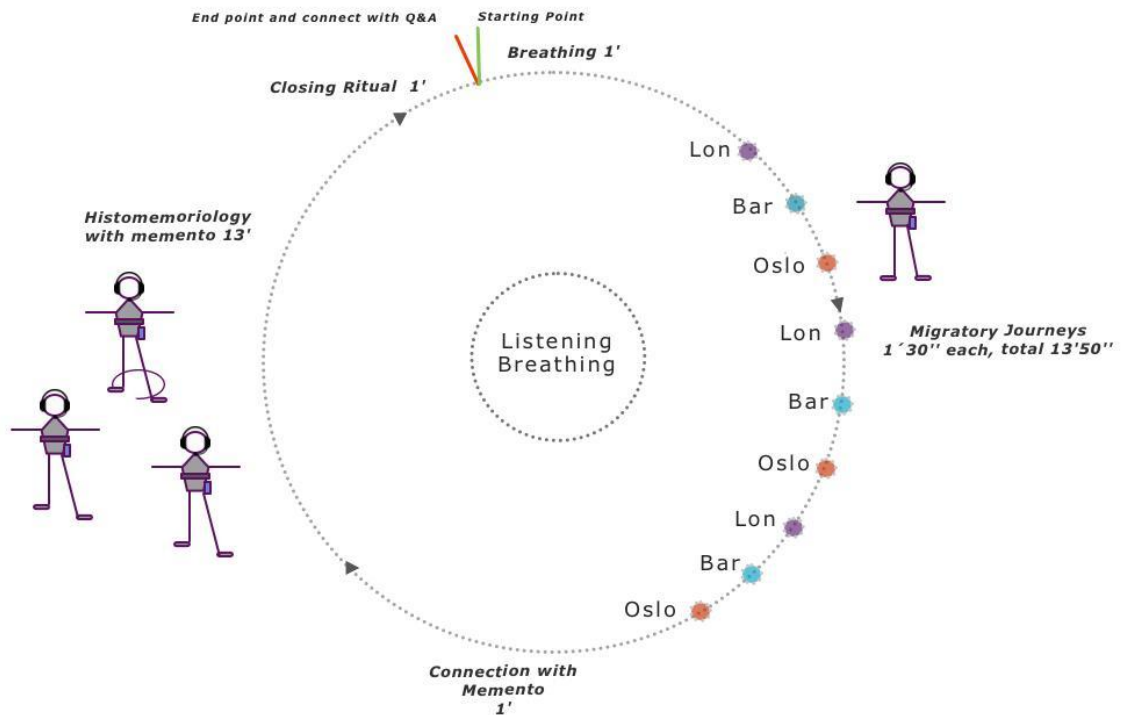


Figure 6: Graphic Score sequence of Improvisation

Embodied Interactions

The final performance took place between the cities of Oslo, Barcelona and London at 7pm (London time) and 8pm (Barcelona and Oslo time). We agreed to start ten minutes past the hour at the three venues, giving the audience and improvisers a chance to fall to rest in each space. We had members of our team in each of the three cities, and divided tasks regarding the functioning of MEMENTO, RESPIRO, and TRANSMISSION between the team members.

Prior to the performance, the improvisers, who were mostly non-trained performers, established agreements on how to communicate during the improvisations. They combined different types of expression styles, such as conversation, theatrical expression, spoken poetry, and various types of dance. This happened independently in each city; hence the three groups created their own "signature." In Oslo, they focused primarily on the spoken word. In Barcelona, they used body movement in combination with more experimental speech. In London, they created a mixture of interaction with body movement, spoken word and voicing.

For Place

Improvisers' experiences with the interaction with MEMENTO brought interesting questions of agency and control regarding the search for *place*. We might say that the person acting as *brújula* could have agency regarding the triggering of the stories by focusing on her body movements (steps and rotation). However, for the improvisers, the choice of being this guiding "character" during the improvisation involved personal and performative choices regarding control and freedom of their body movements. For instance, one improviser did not want to be the *brújula* as she considered she was not a "good guide," while another wanted to focus her attention to the triggered files, rather than have the responsibility of triggering the files for others. Control (either controlling their own movements, for instance, the directions where to step on, and the strength of the step (needed to activate MEMENTO), or controlling what others are listening) was mentioned by two participants as something they wanted to avoid; they rather wanted to focus on listening through others' movements and resonances. These responses bring to us a distinction between agency and control. While agency relates to people's experience of controlling their body and the environment at once with the mediation of technologies, "control" is implied as the control of the environment, which involves others who do not share the same agency to the given technology. In this specific case, agreements to work with the available technology need to be made. For instance, one of the *brújula* improvisers, LR, felt that she was given "trust and autonomy in her actions" by the others, and did not hesitate to move freely in responding to others' responses to the archives.

In Barcelona, listening to rhythms of the words of the archives, and the need of transforming words into movement, and resonating with the different accents, was key to frame their improvisation. In Oslo, conversations with the archive and with the words of the improvisers, silencing, laughter, screaming and whispers, were not only part of theatrical forms, but also of a spontaneous response to stage fright and the temporary disconnection with MEMENTO. In London, the sudden proposal of a nursery rhyme initiated by one improviser converted the London space in a playground taking improvisers to a strong moment of childhood that surprise them, specifically as how fast the reaction and interconnection between them happened.

A video file can be accessed through this link: <https://vimeo.com/368031898>.
Note that the video is also embedded on the last page of the article.

MEMENTO as a prototype has helped us think of how speed and freedom of movement, in contrast with the required movement to activate the application, adds and removes levels of agency in the participants. Studying a vocabulary of walking and displacement, as suggested by Alarcón, González, and Erdem can open very interesting forms of interaction, where they could fully explore *sense of place*, and develop agency (individual and collective), while making relations

with the oral archive.⁴⁵ This could allow improvisers to feel the freedom to move in different ways, while MEMENTO waits for them to regain stillness, or for any other “step” signal to activate the triggering of the archives.

For Presence

Improvisers’ experiences regarding the RESPIRO interface, were summed through specific questions they answered regarding the listening experience to the sonified breathing data locally and the sounds heard from data from the distant locations. In the three cities, improvisers reported a strong emotional reaction when they heard the amplified signals of their breathing for the first time, as well as their synchronization, and found interesting how a vital signal that is usually imperceptible becomes amplified in that setting. One improviser was looking for immediate interaction with the system, and realized that the sound did not have necessarily an immediate response. She also wondered if one person was affecting the whole sonic experience, or if it needed to be affected by collective breathing.

Reflecting on listening across the distance, and improvisers’ experiences of telepresence and co-presence supported by RESPIRO, the experiences in the three cities were quite different. For instance, in Oslo, one of the improvisers, LL, recalled the breathing sounds as a “harmonious changing company.” Another improviser perceived the sound as interesting but needed to be louder for them to feel the presence of others in the distance. In Barcelona, they reported how pleasant it was to hear the other cities and their feelings of getting ready to start the performance. The loudspeakers were described by one improviser, VO, as “actors with lots of presence,” which created for her a big distance from the other events that were happening; for instance the responses of the other improvisers. The lack of voices in the loudspeakers and the reliance only on breathing for telepresence “felt so cold” for one participant, SV, and she “couldn’t connect with the others.” VO coincides with this point as she only felt telepresence when the voices appeared in the Q&A session, which followed the improvisation. As a contrast, improvisers in London had strong feelings of everyone’s presence through breathing only; they regarded the sonification of breathing as very important to feel presence:

“Even if we were throughout the distance with the other two cities, for some reason I heard their presence, it is something difficult to explain ... I felt their latent presence, and even if we didn’t see what was happening, when we were here, the three of us, creating the material that we created, I never forgot that there were people in the other places, at the same time, doing something that could be similar, or at least connected in some way with what we were trying to do, and as it was a specificity in what we were going to do; then, I knew that we were in the same space, even if geographically we were not in the same place, but we were in

⁴⁵ See Alarcón et al., “INTIMAL: Walking to feel place.”

the same space. In the same emotional space, in the same space of story, of response, of communication, of constant listening, of what was happening through the headphones, and what was happening with the *compañeras* [companions] that were physically present. Then, it was very interesting, because for me, it enriches what we understand as physical presence, and as a presence in the space.” (MO)

There, the experience of telepresence was strong to the point of “listening laughter” (LR) without the amplification of the voice, which is a very interesting question regarding perception perhaps through the gesture of breathing:

“We laughed; there was a moment in which someone from one of the other two cities laughed and we in London heard that through the headphones. I know we heard it because when that happened, Calu (another improviser) and I looked at each other, astonished. We realized we could hear them, and we started to laugh (laughter is contagious). Myriam (another improviser) joined us. It was clear, they were there, we were all there ...” (LR)

Technically, the fact of transmitting sound from their voices input was not set for the improvisers. Within the subjectivity of listening experiences, what is most interesting is that in the other two cities, improvisers also expressed laughter simultaneously, as can be heard in the online broadcast.

An audio file can be accessed through this link:

<https://soundcloud.com/user-62717487/intimal-excerpt-online-laughter>.

Note that the audio file is also embedded on the last page of the article.

Thus, we might say that emergent telepresence and co-presence with RESPIRO was created by different aspects: firstly, the amplitude of the sounds and acoustics of each venue, which envelop them with abstract sounds, meeting the improvisers’ voices, their body movements, and the oral testimonies they are listening through headphones; secondly, the emotional links between improvisers and their many levels of intimacy (e.g. headphone listening, body movement and vocal improvisation, camaraderie, and amplification of breathing signals); thirdly, the expectation of listening to each other through alternative forms of telepresence, removing the audiovisual and live voice transmission, but with the awareness of being in different locations following the same score at the same time.

This experience prompted us to envision research in the transmission of breathing data, and the understanding of breathing as media, involving artistic techniques to raise the awareness of breathing (voluntary), and to listen to the involuntary shapes that might come with a varying degree of improvisers’ breathing expressions. In turn, the technologies, involving breathing sen-

sors, sonification and amplification, can interactively be shaped for the transmission and “sensing” as listening of presence between distant locations.

Discussion

The performance presented above, which was the first large-scale test of the INTIMAL system, showed the potential of this type of long-distance improvisation. Overall, we believe that we succeeded in creating a setup in which the performers (and audiences) experienced a *sense of place* and *sense of presence* between the three cities. This was shaped by a mixture of many factors, including the technical setup, and the artistic techniques used in the performance.

On the technology side, we see that the MEMENTO module was successful in letting the performers navigate in the oral archive, using their body movement for interaction. We still see that there is potential to develop the motion sensing further, as well as advancing the *agency* of the system. In RESPIRO, we see that it may be beneficial to further explore the subtleties of the sound features. It would be particularly interesting to explore how amplification of the signal can be achieved when improvisers join into a similar breathing pattern. While such a “joint” breathing would show the coming together of the performers on stage, it would also be relevant to fine-tune the sounds, so that it is possible to get a sense of their individual presence on stage. For both MEMENTO and RESPIRO, we also see that it is important to continue developing different “signatures” of walking and breathing. This may make it easier to use the system with new users in the future.

We were happy to see that the artistic idea worked well during the performance. In the Q&A session following the performance, both performers and audience members reported on their experiences of an intimate virtual space between the three cities. This seems to be composed by the shared emotions that directly responded to the improvisers’ experiences of conflict and migration. In future performances, we will continue to develop the artistic techniques employed, and in particular fine-tuning the score and work more on the connections between distant locations.

All things considered, we envision further developments of all the INTIMAL modules, as well as the development of scores in agreement with the improvisers. Even though they have been developed as part of one system now, we also see that the modules could work as separate entities, stimulating focus on the specificity of the actions that each development invites us to perform.

The rich outputs experienced during the performance stimulate us to continue with its different developments. The feedback on the system and the performances so far, have shown us that this type of long-distance improvisation can have a major positive effect for the migrants. We see that the INTIMAL system helps them to express their emotions, and it facilitates the crea-

tion of *new spaces*, detached from the physical *places* that they are located within. This expanding awareness of the self and others amplify the *presence* in both co-located and distant locations.

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Abstract

INTIMAL is an interactive system for *relational listening*, which integrates physical-virtual interfaces for people to sonically improvise between distant locations. The aim is to embrace two key aspects in the context of human migration: the *sense of place* and the *sense of presence*. This paper reflects on the use of INTIMAL in a long-distance improvisation between the cities of Oslo, Barcelona and London in May 2019. This improvisation was performed by nine Colombian migrant women, who had been involved in a research process using the Deep Listening® practice developed by Pauline Oliveros. Here we describe the performance setting and the implementation of the first two interfaces of the system: MEMENTO, an “embodied” navigator of an oral archive of Colombian women’s testimonies of conflict and migration; and RESPIRO, a sonification system that transmits and sonifies live, breathing signals between distant locations. We reflect on how the two interfaces facilitated and challenged the improvisers’ listening experiences and connections.