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WATERGAIT: Trusting the Senses to Walk on Water/ Uneven Steps on-and-in Water Immersion

Esthir Lemi

Helsinki Collegium of Advanced Studies, Finland.

lemi@esthir.info

Marientina Gotsis

Creative Media and Behavioral Health Center, University of Southern California, USA.

mgotsis@cinema.usc.edu

Vangelis Lympouridis

Creative Media and Behavioral Health Center, University of Southern California, USA.

axionbraindance@gmail.com

Abstract

Watergait explores the natural boundaries of aquatic immersion and investigates the physicality of integrating senses, sound, memory and interactive technologies to cultivate new kinaesthetic experiences. We present the technical, conceptual and philosophical background that inspired the Watergait project. For the realisation we used a holistic design model aiming to connect health science to an artistic process using minimum information focusing on body balance. The embodied interaction enabled by Watergait keeps the user to an entertaining experience, while at the same time the artificial soundspace functions like a corridor and threshold to movement and mindfulness, since the only action demanded by the user is to take a walk in some interior place while wearing headphones and take a leap after one minute and five seconds. This attempt to simplify a complex system of calculating navigation and foot-pressure for any user has proved to be a successful one for comprehending rhythm and balance, as well as cheering up levels of depression. We created a playground for any who might be interested to investigate his/her balance and transposition of weight in every step from right to left foot and so on via an artificial sound system of an idyllic walking across the shore, inside the water and dive-in to the water.

It seems that sound compositional structure based on progressive narrating models of ambience could be a functional model for therapy in various domains, as well as an entertaining model for gaming pleasure.

Keywords: Water Immersion Sound Design, Perception, Holistic Model, Epicurean Theory.

1. Introduction

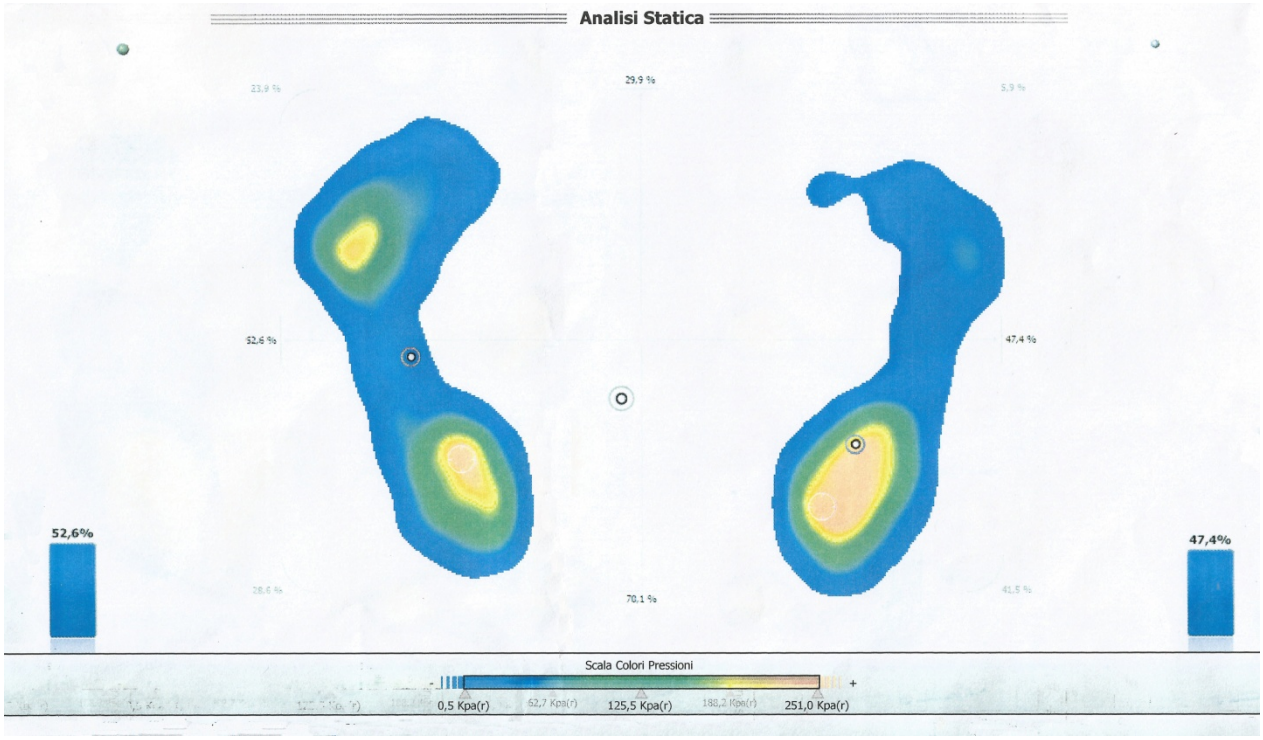
The measurement and translation of gait (one's manner of walking) into an interactive experience has numerous applications in neurodevelopmental and neurodegenerative disorders, such as autism or Parkinson's, as well as vestibular disorders related to chronic illness or injury. Walking produces a unique biological signature that expresses the sum of one's functional cognitive-motor skills, as well as real-time and long-term affective state (e.g. joy, depression) and contextual factors of environment (e.g., ground) and personalization (e.g., shoes). Humans can recognize the biological motion of other humans through a number of cues, including patterns, sound and rhythm. Mindful walking in nature, such as walking meditation has been practiced for centuries for leisure, but has shown benefits in improving executive function. Given the proliferation of screen-based technologies and sedentary lifestyles, walking, one of the most necessary and ordinary human activity merits augmentation and intervention through art and technology for the benefit of real-time human experience, as well as long-term human health and happiness. Ordinary and necessary activities, such as walking can be rediscovered through the introduction of hedonic pleasure through the senses, following a paradigm inspired by epicureanism, whereby pleasure is a pathway to "ataraxia", the absence of unnecessary physical and mental suffering which is a state of happiness.

The Watergait project team developed a prototype for an augmented walking experience that explored the epicurean notion of 'subjective truth'. In Watergait, body perception is absolute truth for the user, but can also be intervened on and shaped within a health context, for example if rehabilitation is necessary and consent in granted by the participant/ user. The focus of the Watergait project was to investigate how interactive sound production and sensory stimulation can result in a holistic body perception for

the user during locomotion in walking.

For this purpose, we designed and implemented a full body immersive experience based on a pair of interactive shoes equipped with four force-sensitive resistors (FSR) pressure sensors. The user was asked to wear headphones and walk around a space bigger than 5m2, clockwise so that they reach the same point every ~1 minute. Each shoe had four pressure sensors which measure the weight shifting on the foot and the balance of the walker. This allows for personalization as the initial few steps during calibration to detect differences in pressure between the two feet that are define each person's walking signature. We found that most participants walk asymmetrically while unaware of their own gait characteristics. The realisation of such an asymmetry can be demonstrated directly through adjusting the volume produced sound directly through the measured feet pressure. This direct effect becomes really informative to the user and initiates a playful relation with their imperfection. In Fig. 1 can be shown the asymmetry in foot pressure of a user under the age of 35 with regular sports activities and average weight.

During the walk the audio is produced in real-time in multiple layers. The room remains as is, and no content is projected in any visual form. Each step gets analysed and fed to a modular interactive system that produced dynamic sound. The whole narrative is built around the opportunity of an imaginary dive in the ocean. The experience begins with the participants listening to common sounds recorded at a beach such as seagulls and wind. Every step produces a sound of a step on sand in order to reinforce establishing the setting. After a certain amount of steps the walker realizes that every step now generates a splash in water. Almost all participants reported that they identified the experience as walking by and inside the water. Anecdotally, participants who had never experienced swimming or visiting the sea before, imagined that they were walking on dead leaves and interpreting seagulls as wild birds which was a familiar experience to them.



2. A Musical Structure Based on the Holistic Model of Epicurean Garden

2.1 Three Stages of Immersion

Part of the research of all three collaborators of the Watergait team has to do with the way the brain works. It is acknowledged that depression affects the body and at the same time the user has low level of interactive communication not only with the computer or other individuals but also with their own body.

The same phenomenon may occur when we experience high levels of anxiety. Our project involved a lot of walking and watching numbers and in itself was a meditation. We ended up researching if it is possible to construct happiness through an immersive artistic installation. We aimed to produce an underwater illusion based on filtered and spatialized audio as whales sound are heard. We agreed that we would create one more piece of interaction and exhibit the work in a community event which was named: “Watergait: a non scandalous sonified garden experiment”. The decision of using the sound of the whale impacted both the (artificial) immersive reality in the lab and our ordinary life outside, which helped us consider this attempt to construct happiness to be successful.

We structured the compositional process as follows: We established an one minute prelude condition in which the user engages in walking on the beach and comprehend his/her foot asymmetry. One minute was enough time to evaluate their body cognition and start playing with their balance while keep walking

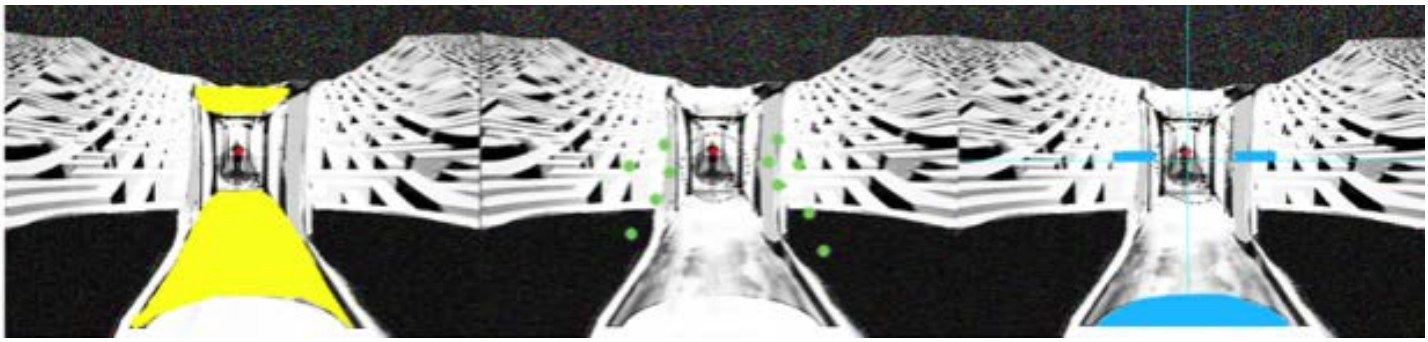
(stage 1/depicted as yellow stage).

Then we asked the user to leap forward with both feet. In order to achieve this they must take a small pause, until they decide to jump (stage 2/ depicted as green stage) during what we call a connective passage (of still silence of body movement while the old information from ambience is still actual).

The last stage (stage 3/ depicted as blue stage) is the underwater scene where the user ends up walking around as an open ended choice to stop when they want to stop (although they now have been placed at the bottom of the ocean), as seeing depicted on Table.1 where the three stages of immersion in Watergait Project are described:

Stages of Immersion	Activity
1. Shore	Walking and listening to seaguls. The mild wind and sea waves as well as users steps on the sand are audible (realistic).
2. Dock (springboard)	Jumping into the water. This demands a small pause in movement that actually recharges the body for a deeper immersion. Same sound information of the environment occurs though.
3. Ocean	Heavy steps inside water (unrealistic). Distant cry of whales.

From the very beginning of being submerged, they can hear a whale cry someplace distant. Depending on the time spent wandering around we value their ability in self entertaining and mediating without the need of visual stimuli. Walkers chose when to transition from their own subjective experience of underwater walking to ‘objective’ reality without a prompt. Thus the piece remains either unfinished or open-ended depending on one’s definition of agency and tolerance for lack of closure. In Fig. 2 is depicted how in every stage a different perception of the surrounding and corporeal correspondence occurs.



In stage one, the perceptual truth emphasis is placed on the ground and the sky. In stage 2, we shift to the auditory transition between the breach of water surface. In stage 3, our focus is on the entire leg movement, heavy dragging us down to the bottom of the ocean floor, as well as the search for whales at the plane of our ears.

2.2 “All Senses Are True” Perceptive Model

The work has been developed in a five day workshop at Garden, named after Epicurus’ famous garden in Ancient Greece, which is the physical collaboratory of the Creative Media & Behavioral Health Center at the University of Southern California. Epicurus defined “ataraxia” as a kind of happiness that is obtained through being undistributed by unnecessary physical or mental suffering. The philosopher withdrew from the bustle of Athens into a school and garden that housed students and friends of the school in order to practice the pursuit of happiness, which he equated to the pursuit of virtuous pleasure (hence the name of the lab, the Garden). One cannot attain pleasure if they don’t appreciate Epicurus’ reliance on the senses and knowingness that prior belief (or experience) shapes perception. Contemporary analysis as Vogt claims (Vogt, 2011) that sense-perception if factive based on Lucretious’ writings because the notion of truth was first created by the senses. She explains that life and safety depend on trust in the senses. Objective truth then extends to what our measurements can measure and what our mutual consensus for interpretation of such truth is. While using water in our project as an element to work (and walk on and inside of it) we figured that apparently zero degrees is the freezing point of water and that is what the Celsius temperature interval is based on. Many people had noticed that water freezes. Not many wanted to convert that into a number and design a thermometer. This process of thinking that is considered as a scientific model can be also be provest to compositional models since we work with the body as an instrument and sensors trigger human movement connected with sound metaphor.

3. The Sound Metaphor Through Three Stages of Development

3.1 GAIT

The promenade in history abounds in immersion. The pilgrimage, known from Western to Eastern religion as a pathway to spiritual enlightenment and a deepening relationship between self and god, involves the process of the breathing as well as the thinking processes behind the repetition of walking. Personal gait betrays/reveals data about personality, intent and health status. The human gait is as unique as the human fingerprint (Stevenage et al., 1999). Indeed the kinematic fingerprint has recently been advocated as a means of security screening at international airports. There are artists who identified them-selves (their artistic identity) thorough walking projects. As art is an in-between space between ordinary life and religion (the spiritual metaphysical) these walking processes defended the boundaries of leisure vs. purposeful walking. The privilege to wander around without significant purpose was not approved of easily by society since it was connected to madness (Foucault, 1965). Sensors added on shoe soles achieve to engage human history through metaphor and at the same time to set the whole body into an activity that mostly not only re balances navigation but also eases levels of anxiety. We propose here a calibration of the system based on a holistic model.

3.2 Sound of Water

The Greek and the Latin words for immersion (εμβύθιση, plumbum) are related to the act of diving. Water theme is common in stage design in contemporary choreography. One of the most famous musical scenes that depicts the musical perspective “of a brave approach to life no matter what” is the Gene Kelly’s “Singing in the Rain” scene, “though meteorologists were reproached for getting away from the lived experience of walking in the rain or sunbathing (Wollen, 1969)”. In Figure 4 stage two is depicted where the user takes a leap and dives into the water.

Pina Bausch, Pilobous and Alvin Ailey among others have used water as an emblematic element to their cho-reographies. Bausch added real water on stage in a playful manner indicating that: “it has a lot to do with what children do in rehearsals and in performance you are usually only allowed to do as a child-splashing in the water, getting dirty, painting your face, playing. I think it is great that we get to do that again, even bigger on stage” (Climenhaga, 2013). Water as a sound sample material used via sensors in order to mark movements and make them audible serves a playful phenomenological perception of experience. The four elements of life (fire-water-wind-earth) is a useful palette of backup knowledge to research based on where the action stems from and where it begins for both viewer and user.

3.3 Whale Sound

Stage three is dominated by the whale cry. For the selection of whale sounds we discovered a treasure of work on electroacoustic music inspired by this idea. The user is navigated by this sound that attaches a profound sadness, like all sad songs do: It is a cry that calms at the same time our senses and give the user a meditative rhythm. Huron's research in prolactin levels that arise when listening to sad music has some similarities with the state divers meets when they go too deep into the ocean. The whale sound, localized or unlocalized, can be used as a great navigating element as it can function as a "real" or imaginary compass to where the user is safe to go, that is inside the water and not outside the call. When we tried to experience Watergait with the eyes closed, it turned to be difficult even for well trained dancers to follow the procedure without an amount of additional fatigue and instability. The whale sound relaxes the body and creates the "homey" feeling of a friendly surrounding. When the workshop ended we headed to a Malibu beach in California where we experienced the actual scene of a whale cry through two whales traveling back to Antarctic near the shore. The baby whale came fairly close to shore and stared at us for quite some time— looking above water to us we could not join below. We reflected on this actual scene that bridged the artificial with reality as the symbolic manifestation of the fact that the constant research in communication and calibration of our senses could probably better activate our skills to connect with nature. This whale encounter was rare for all three artists of Watergait, as none of us had this experience before.

4. Constructing Happiness Against Depressive Models

The neurophysiologist V. Ramachandran found that people's palms sweat when they experience pleasure in a particular piece of art or architecture, such as Picasso's cubist portraits of women or Taj Majal even if they state that they do not like the first one. Palms sweat before you make an interpretation that may be filtered through what you think you should say. It is also common that we aren't very fast to notice that our senses are being stimulated. We are numb to input consciously, but are bodies are taking in an enormous amount of information. How can we experience pleasure if we don't even know what our senses taking in?

The Garden collaboratory combines transdisciplinary with disciplinary practices, engaging artists, researchers, scholars, practitioners, scientists, clinicians, and technologists towards the creation of interactive entertainment that seeks to measure and highlight the senses, or the absence thereof, as well as engage the imagination and its powers towards healing the disturbances to human health and happiness. We describe the new study and its results by proposing the holistic model as a possible way to connect further research in art, science and medical health and sound stimuli play an important role in it. The postwar

model of the soul suffering in anxiety is highly developed through electroacoustic music but also in performance where human grief was considered as an intellectual experience; entertainment was considered a superficial one. In the 21st century, the imagination is a powerful tool for integrative emotional experiences, connecting science and innovative technology to all possible artistic processes available to any user. Watergait is a literally and metaphorically small step (leap) into these uncharted waters.

5. Conclusion

In this paper we presented a holistic model proposal for working with sensors and audio stimuli. We started by a selection of sounds based on the element of water that could define gravity by walking. We used technology to trigger some basic parameters that could affect human locomotion attached to sound as well as coordination and sense of gravity. The installation has been set in a space that enables a circular movement around a room that soon long enough to invoke the feeling of immersion when diving into water and meeting (via sound) swimming whales. Concurrent research in contemporary dance, movement and aesthetics has strengthened our belief that it is possible through art for humans to appreciate the embodied cognition of the body and senses working as a whole, trusting their senses, cultivating communicative schemes, and experiencing pleasure and quite possibly, creating the opportunity for some happiness.

6. Acknowledgments

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7. Endnotes

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Biographical Information

Esthir Lemi is a visual artist and composer. Her work focuses on documentation of the artistic process and reality, as well as on the complementarity of art forms, and how technology interferes with its schemes. Her research, based on haptics, is aimed at a broad public in order to create an easily accessible innovative platform for both artist/engineers and the audience.

Marientina Gotsis has a broad background in arts, design and engineering with a special interest in interac-tive entertainment applications for health, happiness and rehabilitation. She founded and leads USC's Games for Health Initiative since 2007, connecting health profes-sionals with innovation in various forms of interactive media. She is co-founder and director of the Creative Media & Behavioral Health Center, an organized research unit between the School of Cinematic Arts and the Keck School of Medicine.

Vangelis Lympouridis research explores “Design Strategies in Whole Body Interaction” for applications in Interactive Art, Digital Music, Dance and Performances. He is focused on the potetial of real time sonification of movement within an artistic, theatrical context.

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