

Enrique Tomás / Thomas Gorbach / Hilda Tellioglu / Martin Kaltenbrunner (Eds.)  
EMBODIED GESTURES

This book has been published in the context of the Embodied Gestures research project financed by the Austrian artistic research funds PEEK programme (project number AR-G399).

**FWF**

Der Wissenschaftsfonds.

Enrique Tomás / Thomas Gorbach /  
Hilda Tellioğlu / Martin Kaltenbrunner (Eds.)

# EMBODIED GESTURES



Academic Press 

Cite as:

Tomás, E., Gorbach, T., Telliöglu, H., & Kaltenbrunner, M. (Eds.). (2022). *Embodied Gestures*. TU Wien Academic Press. <https://doi.org/10.34727/2022/isbn.978-3-85448-047-1>

**TU Wien Academic Press, 2022**

c/o TU Wien Bibliothek  
TU Wien  
Resselgasse 4, 1040 Wien  
[academicpress@tuwien.ac.at](mailto:academicpress@tuwien.ac.at)  
[www.tuwien.at/academicpress](http://www.tuwien.at/academicpress)



This work is licensed under a Creative Commons Attribution-ShareAlike 4.0 International License (CC BY-SA 4.0). <https://creativecommons.org/licenses/by-sa/4.0/>

ISBN (print): 978-3-85448-048-8

ISBN (online): 978-3-85448-047-1

Available online: <https://doi.org/10.34727/2022/isbn.978-3-85448-047-1>

Media proprietor: TU Wien, Karlsplatz 13, 1040 Wien

Publisher: TU Wien Academic Press

Editors (responsible for the content): Enrique Tomás, Thomas Gorbach, Hilda Telliöglu and Martin Kaltenbrunner

Production: Facultas Verlags- und Buchhandels AG

Proofreading: Ross Ludlam

Design and layout: Enrique Tomás

# CONTENTS

---

Preface	xi
Contributors	xvii
Acknowledgments	xix
List of Figures	xxi
List of Tables	xxiii

## PART I INSTRUMENTAL GESTURE

<b>1 Creaking apples and singing chairs: On composing with objects, actions and sounds</b>	<b>3</b>
Cathy van Eck	
1.1 Using an everyday set-up as the corporeal origin for sounds	5
1.2 Changing the mapping between the corporeal origins and the imaginary origins	7
1.3 Composing structures for imaginary origins of sounds	9
References	10
<b>2 Instrumental infrastructure: Sheet materials, gesture and musical performance</b>	<b>11</b>
Louise Devenish	
2.1 Introduction	11
2.2 Instrumental sheet materials	12
2.3 Gesture as compositional material	15
2.4 Instrumental infrastructure and notation	17
2.5 Conclusion	18
References	19
Musical References	20

<b>3</b>	<b>Pre-gesture, gesture and sound on (no) piano: Music from Somewhere</b>	<b>21</b>
	Haize Lizarazu	
3.1	Introduction	21
3.2	The invisible: score and pre-gesture	22
3.3	The visible: gesture and space	25
3.4	Conclusion	27
	References	28
<b>4</b>	<b>Evolving musical expectations: Mutual correlation between a human musician and an AI musical instrument</b>	<b>29</b>
	Koray Tahiroğlu	
4.1	Introduction	29
4.2	AI-terity and the composition Uncertainty Etude #2	30
4.3	Achieving musical expectations	32
4.4	Musical expectations as a framework for composition	34
4.5	Conclusion	34
	References	35

## PART II EMBODIED OBJECT

<b>5</b>	<b>Timescales for sound-motion objects</b>	<b>39</b>
	Rolf Inge Godøy	
5.1	Introduction	39
5.2	Schaeffer's object focus	40
5.3	General object cognition	41
5.4	Sound object features	42
5.5	Continuity vs. discontinuity	44
5.6	Concluding remarks	45
	References	46
<b>6</b>	<b>Multi-form visualization: A method to compose acousmatic music</b>	<b>49</b>
	Virginie Viel	
6.1	Introduction	49

6.1.1	The perceptual process	49
6.1.2	Sensory engagement	50
6.1.3	The embodied experience	51
6.1.4	Musical perception: vectors of <i>qualia</i>	52
6.2	In my practice: the capacity to imagine	53
6.3	The use of multi-form visualization for An Ocean on the Moon	54
6.3.1	Building the project	54
6.3.2	The structure of the piece	56
6.3.3	The spatial composition	59
6.4	Conclusion	60
	References	61
<b>7</b>	<b>The ocularcentric objectification of musical embodiment in cognitive capitalism: Covid-19 as an allegory on the multiple senses of touch</b>	<b>63</b>
	Pavlos Antoniadis	
7.1	Introduction	63
7.2	The ocularcentric objectification of embodiment in contemporary musicology	63
7.3	Covid-19 as a catalyst for the ocularcentric rendition of embodied experience into data in cognitive capitalism	66
7.4	The last unassimilable frontier in cognitive capitalism: an enactive conception of touch	69
7.5	Conclusion: Zoom walls as a modern allegory on the multiple senses of touch	74
	References	75

### PART III EMBODIED GESTURE

<b>8</b>	<b>Embodied Gestures: Sculpting sonic expression into musical artifacts</b>	<b>81</b>
	Enrique Tomás, Thomas Gorbach, Hilda Telloğlu and Martin Kaltenbrunner	
8.1	Introduction: Sonic gestures and acousmatic music	81
8.2	Sonic gestures, artefacts and embodied cognition	83
8.3	The Embodied Gestures Project	84
8.4	Ideating interfaces from spontaneous cognitive mappings	84
8.5	Interface design	90

8.6	Musical outcomes	91
8.6.1	<i>Voices</i> : composition and live performance by Theodoros Lotis	91
8.6.2	<i>Magistri Mei - Bruckner</i> : composition for fixed media by Jaime Reis	92
8.6.3	Improvisation for Embodied Gestures instruments by Steel Girls	93
8.7	Discussion	94
8.8	Conclusions	96
	References	97
<b>9</b>	<b>Thomas Gorbach interviews Annette Vande Gorne</b>	<b>99</b>
	Thomas Gorbach and Annette Vande Gorne	
<b>10</b>	<b>Gestural and textural approaches with the Embodied Gestures instruments</b>	<b>107</b>
	Theodoros Lotis	
10.1	Introduction: gesture and texture	107
10.2	Voices	110
10.2.1	Typology of gestures in <i>Voices</i>	111
10.2.2	Typology of textures in <i>Voices</i>	112
10.3	The C4	112
10.3.1	Typology of gestures	114
10.3.2	Anatomy of a gesture with C4	116
10.4	Mapping network	117
10.4.1	Overdetermination	117
10.4.2	The C4 and weighting distribution in <i>Voices</i>	118
10.5	Codetta	120
	References	120
<b>11</b>	<b>Exploring polyphony in spatial patterns in acousmatic music</b>	<b>123</b>
	Jaime Reis	
11.1	Introduction	123
11.2	Space	124
11.3	Spatial polyphony	125
11.3.1	As a concept and in practice	125
11.3.2	Limits in the perception of spatial polyphony	126



11.4	Spatial polyphony in my music	127
	References	130
<b>12</b>	<b>User-centred design as a model-based co-creation process</b>	<b>133</b>
	Hilda Tellioglu	
12.1	Introduction	133
12.2	From sociotechnology as a principle to embodied interaction	135
12.3	User-Centred Design as a Model-Based Co-Creation Process	136
12.4	Example of a model-based co-creation process	139
12.5	Conclusions	141
	References	141



# PREFACE

---

We all learned how to communicate way before articulating our first words. Around the ninth or tenth month, humans begin to make requests with gestures. Eight months later children use both gestures and words at the same time. It is at this age when we find it useful to communicate different things with words rather than with gestures. We could assert that gestures help us to develop speech. Using gestures, children communicate ideas and obtain new words from adults in response to what they are calling for. Adults use gestures to communicate their ideas, needs, knowledge and feelings. This is why gestures are commonly understood as physical movements carrying information. Gestures are embodied language and cognition.

Gestures are well articulated movements. They usually have a clear beginning and an end we can easily recognize. Like any other communicative strategy, we can only understand what a gesture denotes in the context of a social or cultural practice. For this reason, gestures can even produce misunderstandings.

Gestures are spontaneous acts. It is not easy to identify where a gesture originates. Could all bodily movements be interpreted as gestures? Do we concatenate gestures while walking on the streets? What transforms the painter's moving hand into an artistic gesture? If gestures are embodied communication, why do we need them when we are alone? Gestures reinforce our inner thoughts, fears, reflections, etc. Gestures allude to mental imagery and memory. For instance, within the fields of music and visual arts, gestures are employed to describe musical pieces and artworks. Indeed, we are often invited to discover the gestural traces left by the artist with the paintbrush. In a similar fashion, Jimi Hendrix's gestures around his Stratocaster are already part of the social imaginary. His gestures carried communication but they mostly served Hendrix in driving his emotions on stage. These gestures were bonded to a flux of cognitive processes shaping the way he played.

Gestures are so deeply personal that they can be used to elaborate cartoonish representations. We can recognize people from their gestural pose. It seems that human life is driven by all these bodily movements we cannot easily control or understand. Just like the impossibility for Glenn Gould to forego chanting and whispering while playing Bach at the piano. Probably for Gould, musical scores triggered a complex sequence of mental images resulting in words, symbols and facial expressions that were absolutely necessary to define his sonic outcome. A good example of how much our mind and body are embodied in music and vice versa.

This book uses the following hypothesis as its departure point: humans tend to deduce gestural and sensorimotor activity from auditory perception. In other words, we are inclined to determine both sound context and sound-producing gestures. First, we all instinctively have a tendency to identify potential threats from sonic events. Second, listening is not a passive action just happening to us. We need to actively learn how to give meaning to what we are hearing. In the embodied mind theory perception is not something we receive. It is something we actively do. During the action-in-perception loop, external stimuli would be incorporated as mental simulations, as reenactments of what we perceive. It is particularly important that these simulations can involve sensorimotor activations. That would mean that we all may have an internal representation of movement acquired from former experience that can be accessed from various sensory information. This cognitive model understands auditory perception partly as simulation and control of compatible gestures and bodily movements. We could say that listening extends aural information towards sensorimotor action. In fact, the opposite also occurs. We often find our feet tapping to rhythmic music. This spontaneous action results from our previous encoded sensorimotor simulations. Interestingly, this phenomenon can also be observed in other animal species. For instance, parrots who, without training, impulsively tap and shake their heads to the musical tempo.

The lack of appropriate language for describing auditory events forces us to verbalize changes in sound perception through gestures. For instance, people intuitively represent sonic changes by tracing imaginary lines in the air. This action—sound tracing—has been well studied. High frequencies are usually associated with gestures above our head. Low frequency sounds are located somewhere below our hips. Perceived temporal changes in sound—often called sonic morphologies—also refer back to sensorimotor sensations.

It is often said that sound and music have the power to create mental images, haptic sensations and artistic associations. This possibility affords artistic creation. It is the framework where composers and sound artists develop their practice. How has ‘gesture’ shaped the way we produce and understand music since the 20th century, especially since the experimental electroacoustic period? The development of technologies for audio recording, edition and reproduction inaugurated a new era for music research. Recorded sound could be edited in pieces and organized in time. In the 1960s, Pierre Schaeffer proposed a method for musical composition and analysis that departed from the auditory perceptual features of recorded sound. Schaeffer, influenced by Edmund Husserl’s phenomenology, proposed separating the sound source from its context. Sound became disregarded from any external significations. Schaeffer built a musical solfège for recorded audio based on the notion of ‘sonic object’, the minimal auditive auditory perceptive unit, equivalent to the minimal perceivable sonic intention listeners can perceive. Sonic objects were characterized and classified depending on their perceptive character. This separation between object and subject originated a new kind of perception, the ‘acoustic listening’, decoupled from the context in which the sound was recorded. As a reaction, Guy Reibel and François Bayle pointed out how this Schaefferian ‘reduction’ would interrupt the natural flow of communication between music and listener. For them, even in a reduced listening situation, listeners always associate sound with mental images, irremediably connected with their physical origin. Yet Reibel and Bayle proposed the extension of the notion of ‘sound object’ towards the concept of ‘sound gesture’.

With this strategy, it would be possible to overcome what they called the ‘Schaefferian Sound Bazar’. They would use the listener’s musical imagination as the channel of communication between composer and recipient. To this end, Reibel and Bayle proposed a compositional methodology based on the extensive use of sound produced as result of an action. Indeed, François Bayle, together with Jean-Christophe Thomas, wrote a book called *Diabolus in Musica*, in which around 150 different examples of the composition of sonic gestures are analysed and explained.

Following this methodology, Annette Vande Gorne, founder of the Studio for Musique & Recherche in Brussels, has been responsible for the development of new compositional methods based on the notion of ‘sonic archetypes’. She described these major archetypes as: percussion-resonance, friction, accumulation of corpuscles, rebound, oscillation, swinging and swaying, flux, pressure-deformation, rotation, and spiral. For Vande Gorne, these archetypes would constitute a vocabulary of models, especially connected with the perception of physical features, which can be used to describe and design listening experiences. These sonic archetypes denote a flow of movement and sensorimotor action. Vande Gorne’s influential methods can thus be understood as practical embodied cognitive research.

In parallel to Vande Gorne, Denis Smalley proposed a framework to describe the rich variety of sonic contents in electroacoustic music. He called it ‘spectromorphology’ and it consists of a set of tools for ‘understanding structural relations and behaviours as experienced in the temporal flux of music’. Within this framework, the spectromorphology of a musical piece (i.e. temporal spectral flux of music) is mostly discussed in relation to gesture. For Smalley, gesture is an energy-motion trajectory creating spectromorphological life. Smalley specifically describes how listeners always tend to deduce gestural activity from sound and introduces the notion of ‘gestural surrogacy’, a scale of relationships between sound material and a known gestural model (e.g. first-, second- or third-order and remote surrogacy). For instance, in his third-order surrogacy level, gestures are imaged in the music. In the case of ‘remote surrogacy’, music is articulated from gestural vestiges. Developing his framework further, Smalley explains that listeners always attempt to predict the directionality of a morphological change. To illustrate this phenomenon, the author describes a sort of image schema (e.g. onsets, continuants, terminations) with possible metaphorical interpretations (e.g. for onset: departure, emergence, anacrusis, attack, etc). Smalley also illustrates processes for typical motion and growth processes (unidirectional, reciprocal, cyclic, multidirectional) and texture motion (streaming, flocking, turbulence, convolution). Similar categorizations are made in relation to spectral and spatial changes.

Some scholars argue that Smalley’s image schemas are implicit embodied cognitive theory. The same would apply to Vande Gorne’s methods. Under this hypothesis, electroacoustic and acousmatic music could be considered as embodied cognitive praxis extending its current theories. The practice of acousmatic music assumes the mental simulation of sound-producing gestures. A key aspect of Smalley’s theories is that different types of gestures have different embodied-functional associations and, hence, causal dynamics.

With this book, our intention is visualizing how similar and compatible are the notions employed by scientists working in the field of embodied music cognition and the artistic discourses proposed by musicians working with ‘gesture’ as compositional material.

'Embodied Gestures' is also the name of the artistic research project developed between 2017 and 2021 by the editors of this book. Our aim was to study a new paradigm of interfaces for musical expression especially designed to emphasize a performer's gestural embodiment within an instrument. In order to achieve this goal, 'Embodied Gestures' explored the possibilities of shaping the physical affordances of designed digital instruments with the intention of inspiring particular forms of gesturality. Specifically, our objective was to study the implications of designing musical interfaces that can afford the same type of gesturality that a particular sound inspires. For instance, in order to control a sound passage composed from the circulation of 'rotating' sonic movements in space, we designed musical interfaces that afforded by themselves, and through their physical affordances, similar 'rotating' physical gestures to their performers.

Throughout the years of this artistic research project, we often found ourselves at an intermediate place between embodied music cognition, musical performance practice and musical interface design. After this project, we see both Smalley's gestural surrogacy and Godøy's sensorimotor models as complementary explanations towards describing the human tendency to deduce sound-producing gestures from what we hear. However, artistic practice can often better incorporate experiential aspects of the topics under research. Artists create knowledge by showing us unexpected realities and embodiments of sensory information. In the case of music, composers and musicians can question our understanding of why we use gestures, where they originate and their economies of production. For this reason, this book compiles manuscripts by researchers who have approached the issue of 'gesture' from both the scientific and artistic practice.

This book is structured in three parts called Instrumental Gesture, Embodied Object and Embodied Gesture. The first section includes four manuscripts. Cathy van Eck's 'Creaking Apples and s Singing Chairs: On Composing with Objects, Actions and Sounds' introduces two pieces by the author: *In Paradisum* and *Empty Chairs*. Van Eck explores the question of what are actions and objects to make music with, and what not. How do movements by the performer relate to what is sounding? And when all kinds of actions can be connected to all kinds of sounds due to the use of electricity, how do we decide which connections to use? Louise Devenish's 'Instrumental Infrastructure: Sheet Materials, Gesture and Musical Performance' discusses the entanglement of instrumental materials and gesture as compositional material in contemporary music, a field that increasingly explores the sonic and musical potential of a vast range of instruments, objects, materials and surfaces. Haize Lizarazu's 'Pre-gesture, Gesture and Sound on a [no] piano: Music from Somewhere' describes the process of performing a pianist work with 'no piano'. In it, the author demonstrates how by eliminating the instrument, composer and performer are able to focus on those prior moments to the production of visible gesture, the 'pre-gesture'. Through this artistic tactic they visualize a clue concept linked to memory during the study of a musical piece. The fourth manuscript of the first part explores ways to incorporate the notion of embodied gesture into Artificial Intelligence and User Interface Design. Koray Tahiroğlu's 'Evolving Musical Expectations: Mutual Correlation between a Human Musician and an AI Musical Instrument' provides an overview of the current experiential techniques the author has used towards performing with artificial intelligence. Both his reflections as an artist and a musician are presented. In this article, Tahiroğlu refers to a new technological-theoretical framework that can offer insight into the creation of compositions for musical instruments that are fully or

partly autonomous, or autonomous in an unusual way. Through the composition, *Uncertainty Etude #2*, he discusses the use of artificial intelligence methods and a perspective from which a creative practice can be proposed to explore unusual musical expectations in a music composition.

In the second part of this book, Rolf Inge Godøy presents ‘Timescales for Sound-Motion Objects’. This article departs from a radical understanding of music as multimodal art, consisting of fragments of combined sound and body motion. Godøy extends the classical Schaefferian ‘sound object’ towards the notion of ‘sound-motion-object’. The main idea is that timescales of Schaeffer’s sound objects are closely linked with the timescales of body motion, and that thinking multimodal sound-motion objects in music would be useful for both analytic and creative work. Virginie Viel’s ‘Multi-form Visualization: A Method to Compose Acousmatic Music’ challenges the instinctive and natural tendency to draw connections between sonic and visual stimuli. In this chapter, Viel proposes to us an examination of the perceptual process, allowing us to examine the perception of qualia in music. Finally, the author demonstrates how conceiving the perceiver’s mind as embodied could be the key towards the development of compositional practices based on the idea of multiform visualization, a personal method developed by the author. Pavlos Antoniadis’s ‘The Ocularcentric Objectification of Musical Embodiment in Cognitive Capitalism: Covid-19 as an Allegory on the Multiple Senses of Touch’ is an essay triggered by the Covid-19 pandemic. This paper attempts a problematization of the notion of touch in musical performance. The de facto crisis of musical haptics due to physical and social distancing is here considered in the context of a wider phenomenon, namely the ocularcentric objectification of musical embodiment. By revealing a crisis of touch, the ongoing sanitary crisis invites us to further reflect on the meaning of musical haptics beyond the visual properties of embodied gestures and beyond tactility in the design of tangible user interfaces. In that sense, Covid-19 becomes a modern allegory on the multiple senses of touch, similar to the allegories of the senses in Flemish Renaissance painting.

The third part of the book is dedicated to presenting articles produced in the context of our Embodied Gestures project. In the first of these chapters, Enrique Tomás, Thomas Gorbach, Hilda Tellioglu and Martin Kaltenbrunner present ‘Embodied Gestures: Sculpting Sonic Expression into Musical Artefacts’. In this chapter, the authors describe the results of introducing a new paradigm of musical interface design inspired by sonic gestures. In particular, the authors discuss the beneficial aspects of incorporating energy-motion models as a design pattern in musical interface design. These models can be understood as archetypes of motion trajectories that are commonly applied in the analysis and composition of acousmatic music. The evaluation through composition and performance indicate that this design paradigm can foster musical inventiveness and expression in the processes of composition and performance of gestural electronic music. The second chapter in this section consists of an interview with Annette Vande Gorne conducted by Thomas Gorbach. During a summer workshop in 2020, Gorbach recorded the spontaneous and inspirational answers given by Vande Gorne to the question of how to engage the notion of gesture in acousmatic music. Additionally, she reflected on the possibilities of introducing the idea of energy-motion models into the physicality of the instruments employed to produce acousmatic music. Theodoros Lotis’ ‘Gestural and Textural Approaches in Composition and Performance with the Embodied Gestures In-

struments” discusses a work composed for ‘Embodied Gestures instruments’, describing how they facilitate the creation of rhythmical structures and looping processes, since many of their gestural typologies occur as repetitive patterns. In his opinion, apart from the evident approach of the gestural behaviour, the instruments could also be used for the control of the spectral/textural evolution (micro- and macro-structural) of sound objects or sonic structures. Jaime Reis’ ‘Exploring Polyphony in Spatial Patterns in Acousmatic Music’ introduces the readers to the use of space as a parameter in acousmatic music—along with some of the main perceptive features involved in such practice. After a brief description of acousmatic music techniques, Reis discusses these relations in regard to gestures. Finally, the author describes how he has enhanced spatial polyphony through the use of Embodied Gestures instruments in his compositions. Finally, Hilda Tellioglu’s ‘User-centred design as a model-based co-creation process’ reviews the iterative user-centred design (UCD) process as an adaptive and agile life-cycle for open innovation and successful development of socio-technical systems. In UCD, the user acceptance and usability of a digital system are central and determine the way to proceed at several stages of a design process. The question presented in this chapter is how to ensure a successfully realized user experience in a new design. In other words, how to proceed in a design project to understand the target users and their context, including their past experiences, and to consider this insight in the design of artifacts and interactions provided as part of the new design. The author’s answer to these questions is applying modelling in all phases of the design process by creating models of all findings gathered after studying the target users and their past and current contexts, as well as by preparing and accompanying the design process as a reflective and self-critical practice.

We hope this book contributes to the ongoing discourse and discussion around creative technologies and music, expressive musical interface design, the debate around the use of AI technology in music practice, as well as presenting a new way of thinking about musical instruments, composing and performing with them.

ENRIQUE TOMÁS

*Linz, Austria  
October, 2021*



# CONTRIBUTORS

---

## **Pavlos Antoniadis**

Humboldt Stiftung Fellow, Audio Communication Group, TU Berlin, Germany

## **Louise Devenish**

Sir Zelman Cowen School of Music and Performance Monash University, Australia

## **Rolf Inge Godøy**

RITMO Center for Interdisciplinary Studies in Rhythm, Time and Motion, Department of Musicology, University of Oslo, Norway

## **Thomas Gorbach**

Artifact-based Computing & User Research (ACUR), Institute of Visual Computing & Human-Centered Technology, Faculty of Informatics, TU Wien, Austria

## **Martin Kaltenbrunner**

Tangible Music Lab, Institute for Media, University of Art and Design Linz, Austria

## **Haize Lizarazu**

Performer and Researcher, Universitat de Girona, Spain

## **Theodoros Lotis**

Department of Music Studies, School of Music and Audiovisual Arts, Ionian University, Greece

## **Jaime Reis**

ESML / IPL - Escola Superior de Música de Lisboa, Instituto Politécnico de Lisboa, IDI&CA; INET-md / FCSH-UNL - Instituto de Etnomusicologia - Centro de Estudos de Música e Dança da Faculdade de Ciências Sociais e Humanas da Universidade Nova de Lisboa, Portugal

## **Koray Tahiroğlu**

Department of Media, School of Arts, Design and Architecture, Aalto University, Finland.

## **Hilda Telliöglu**

Artifact-based Computing & User Research (ACUR), Institute of Visual Computing & Human-Centered Technology, Faculty of Informatics, TU Wien, Austria

## **Enrique Tomás**

Tangible Music Lab, Institute for Media, University of Art and Design Linz, Austria

## **Annette Vande Gorne**

Composer, Association de Musiques et Recherches and the Métamorphoses d'Orphée studio, Belgium

## **Cathy van Eck**

Department of Music, Bern Academy of the Arts, Switzerland

## **Virginie Viel**

Composer and researcher, Paris, France

# ACKNOWLEDGMENTS

---

Publishing this book was possible thanks to the funding received from the Austrian Programme for Arts-based Research (FWF PEEK). The same programme financed four years of the Embodied Gestures artistic research project (PEEK AR-399).

We greatly appreciate the comments and contributions of our anonym reviewers and TU Wien Academic Press. We also thank Ross Ludlam for his exhaustive work proof-reading these articles.

Finally, the editors would like to thank the contributors of this book. We are deeply grateful for your work and commitment during these difficult COVID-19 times.



# LIST OF FIGURES

---

1.1	In Memoriam Michel Waisvisz (version 2015) <i>by Nicolas Collins</i>	6
1.2	Empty Chairs <i>by Cathy van Eck</i>	8
2.1	<i>The instrumental setup of</i> Permeating Through the Pores of Shifting Planes	13
2.2	<i>Non-tactile activation of the silver acetate sheets via microphone and loudspeaker feedback loops</i>	15
2.3	<i>Excerpt of the score</i> Permeating Through the Pores of Shifting Planes <i>showing hybrid notation</i>	18
3.1	Music from Somewhere <i>by Fran MM Cabeza de Vaca</i>	22
3.2	<i>Gestural notation on</i> Music from Somewhere <i>(Score excerpt)</i>	23
3.3	<i>Traditional musical notation on</i> Music from Somewhere <i>(Score excerpt)</i>	23
3.4	Music from Somewhere: <i>screenshots of the video documentation during the study process</i>	24
4.1	<i>AI-terity instrument</i>	30
4.2	<i>Studio recording of the composition</i> Uncertainty Etude #2	32
6.1	<i>First attempt to represent the breathing cycle of the waves</i>	56
6.2	<i>Curved line, resulting from a gesture</i>	56
6.3	<i>The mind-maps used during the recording sessions: qualia of calm (subfigure a) and qualia of violence (subfigure b)</i>	57

6.4	<i>Different textures imagined before starting to record the improvised sequences</i>	58
6.5	<i>Proposal of structure of An Ocean on the Moon</i>	59
8.1	<i>Resume of the Embodied Gestures user-study</i>	85
8.2	<i>Participants of the Embodied Gestures study miming control of acousmatic music and explaining the mock-ups produced</i>	86
8.3	<i>Examples of mock-ups produced for four different energy-motion models</i>	87
8.4	<i>Embodied Gestures interfaces produced</i>	89
8.5	<i>Theodoros Lotis performing Voices with the friction interface</i>	91
8.6	<i>Taxonomy of motion profiles and gesture fields as they were used by Theodoros Lotis in Voices</i>	92
8.7	<i>Steel Girls performing with oscillation, granularity and flexion interfaces during the Embodied Gestures premiere concert</i>	93
9.1	<i>Annette Vande Gorne in her studio performing a play-sequence with a ‘sound body’</i>	101
9.2	<i>Annette Vande Gorne’s objects for producing play-sequences</i>	102
9.3	<i>Embodied Gesture Instrument: The ‘friction’ interface</i>	103
9.4	<i>Embodied Gesture Instrument: Vessel interface for granular control</i>	103
9.5	<i>Embodied Gesture Instrument: The ‘bending’ interface</i>	104
9.6	<i>Embodied Gesture Instrument: The ‘oscillatory’ (noisy-rotation) interface</i>	104
10.1	<i>Prosodic characteristics of phonetic segments in Voices</i>	110
10.2	<i>Graphic score of Voices</i>	112
10.3	<i>C4 interface prototype</i>	113
10.4	<i>Gestural curves for pressure and rotation with the interface</i>	114
10.5	<i>Page 2 of the action score for scenes 1, 2 and 3</i>	115
10.6	<i>A gestural paradigm for Voices</i>	116
10.7	<i>An example of weight distribution in Voices</i>	119
12.1	<i>The iterative process of user-centred design</i>	136
12.2	<i>User-centred design in relation to use, system, and interaction models, and assigned methods</i>	137
12.3	<i>Artifacts created as models during the User-Centered Design process in the project ReHABITAT-ImmoCHECK+</i>	140

# LIST OF TABLES

---

2.1	<i>Activation techniques used on the sheet materials in Shifting Planes</i>	16
6.1	<i>Sensory features and qualia featured in the visual materials collected for An Ocean on the Moon</i>	56
6.2	<i>Final inspirational guide designed to compose the piece An Ocean on the Moon</i>	61
8.1	<i>Repertoire of sound-producing actions per energy-motion model observed during the Embodied Gestures user-study</i>	88
8.2	<i>Solutions adopted for designing Embodied Gestures interfaces</i>	90