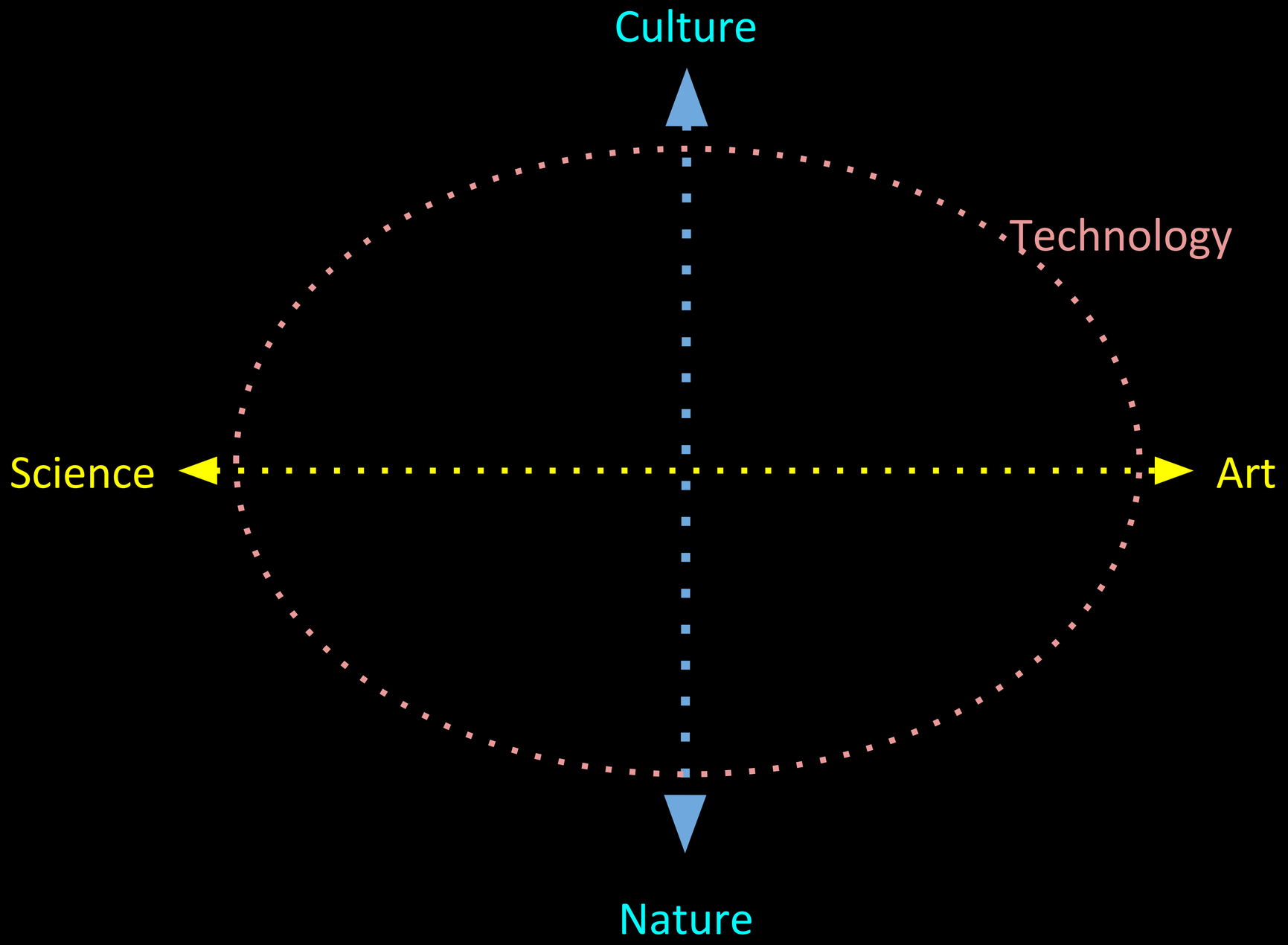
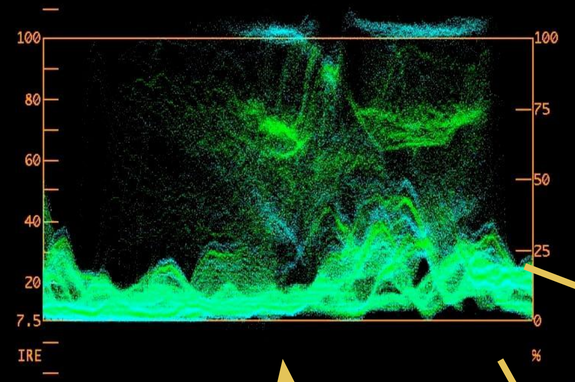
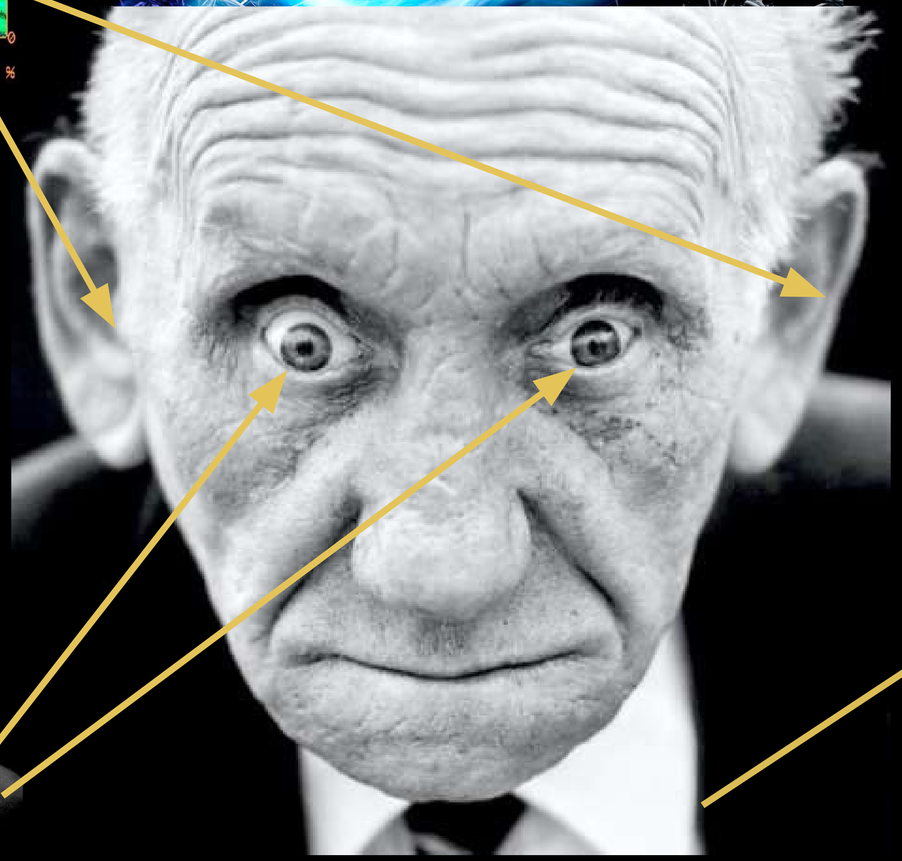
Music & Movement

MUS2006 - 2017

Teaser
Info
--
Warm-up exercises
--
Our research (fourMs, Mari, Alexander, RITMO)
Music Moves


Culture
Technology
Science
Art
Nature





“music”

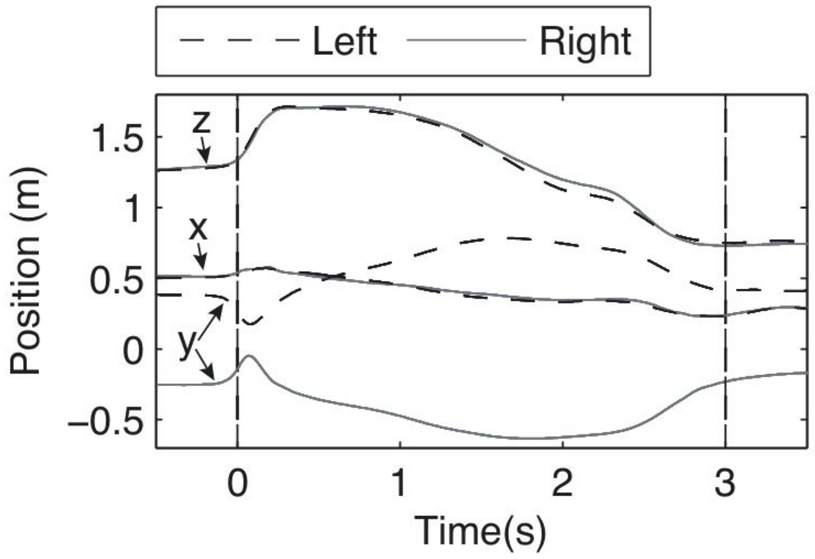
embodied music cognition

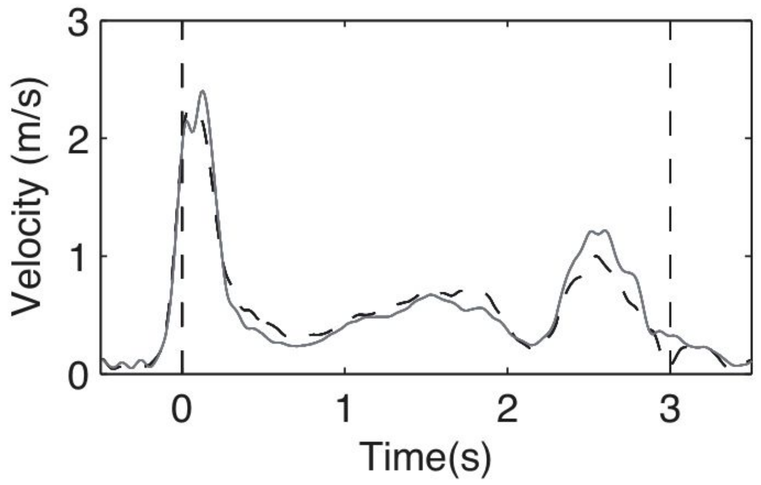
?

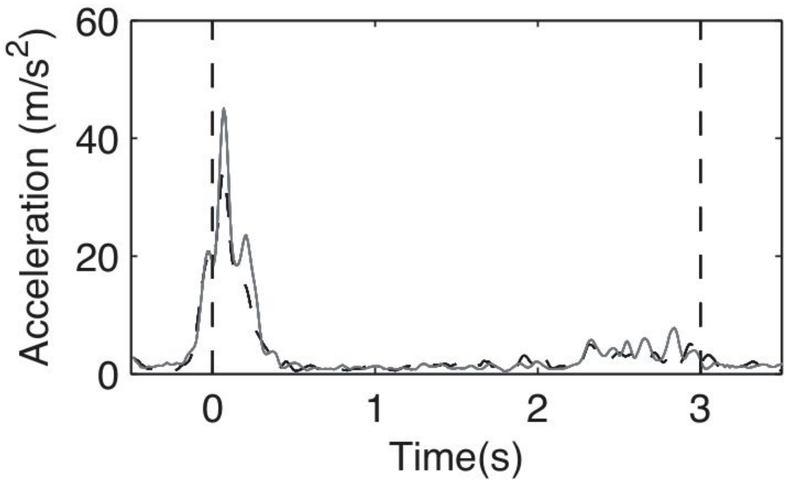
Performer motion

Performance imitation - “air instrument performance”

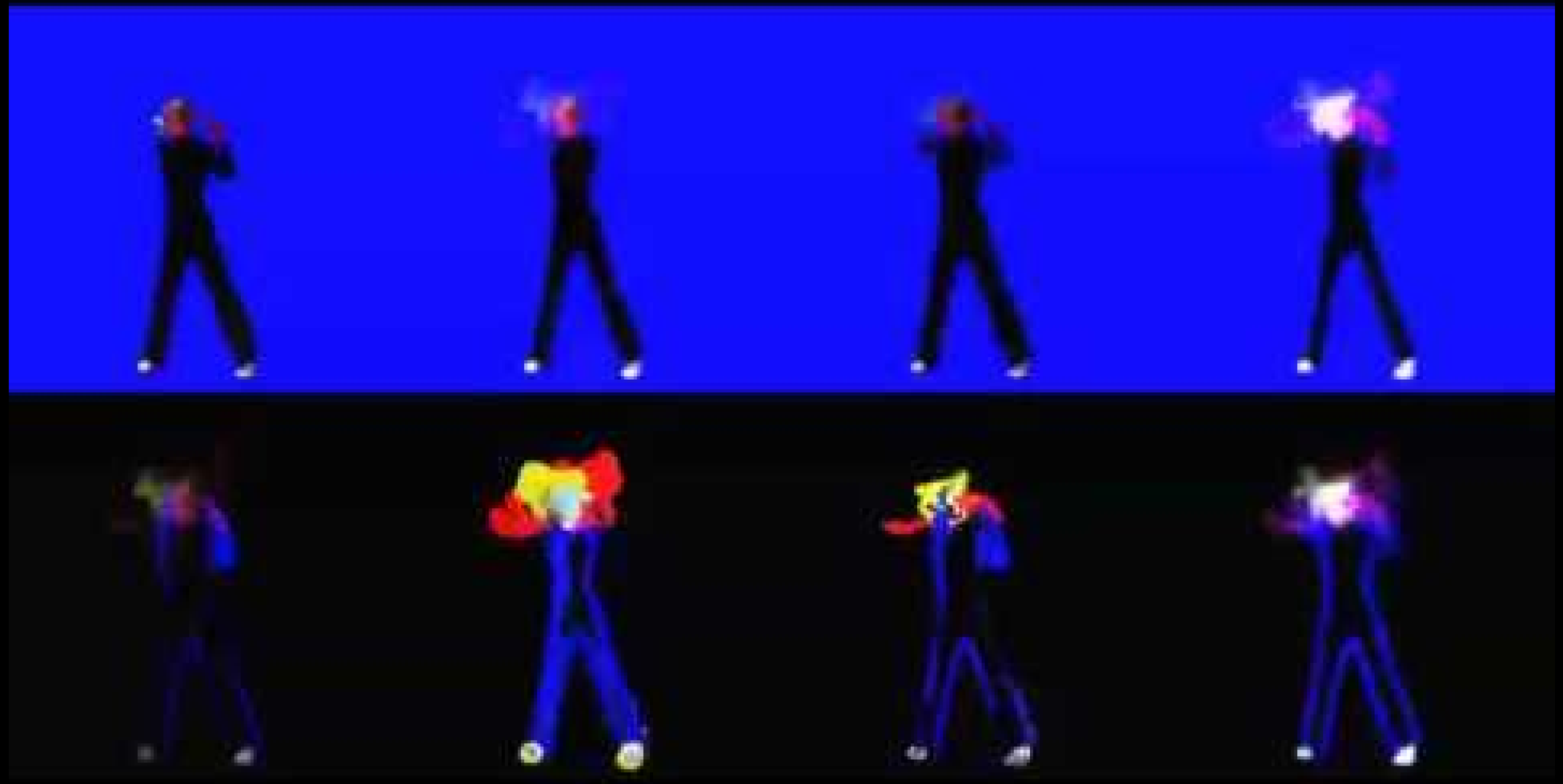
Sound-tracing


Left
Right
Position (m)
z
x
y
1.5
1
0.5
0
−0.5
0
1
2
3
Time(s)


Velocity (m/s)
3
2
1
0
0
1
2
3
Time(s)

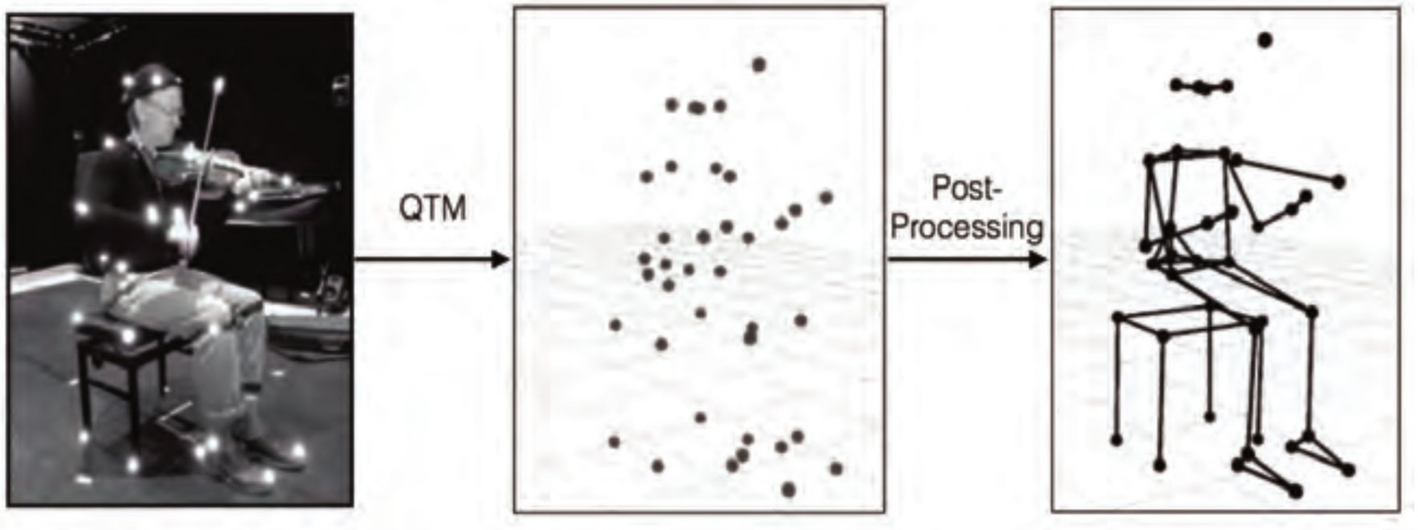

Acceleration (m/s2)
60
40
20
0
0
1
2
3
Time(s)

Dance motion

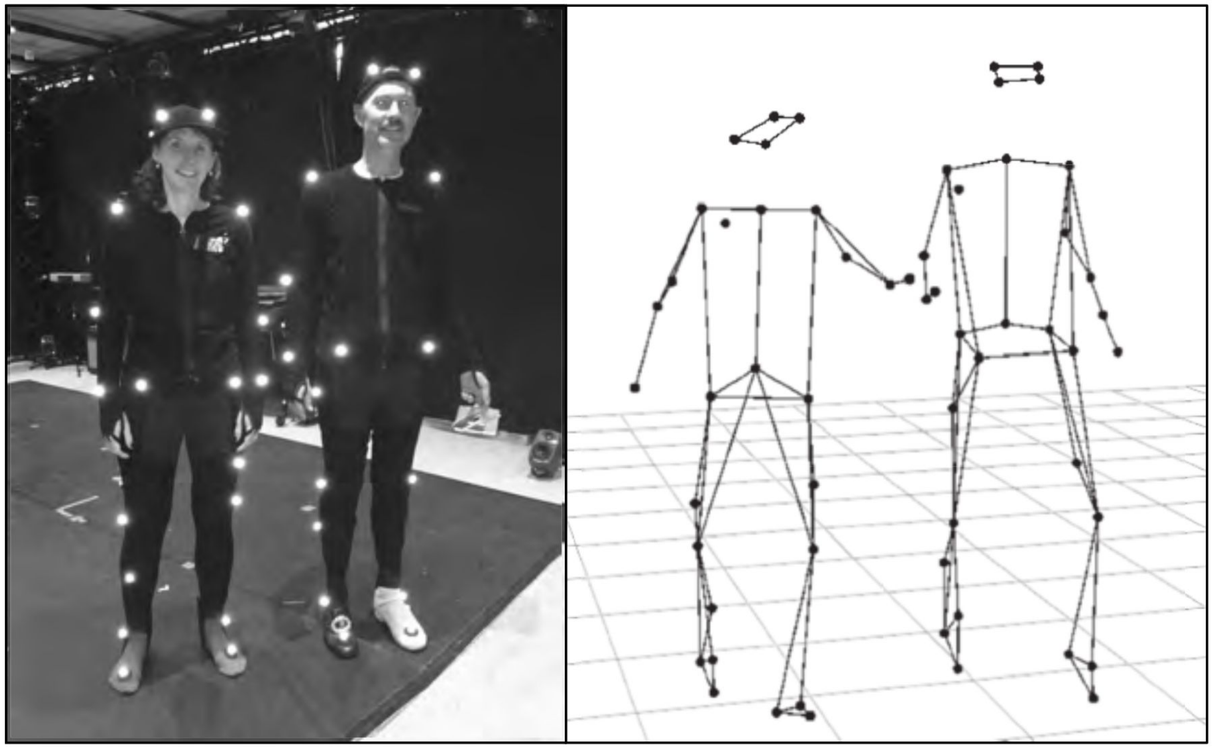



nrk

Musician-Dancer relationships

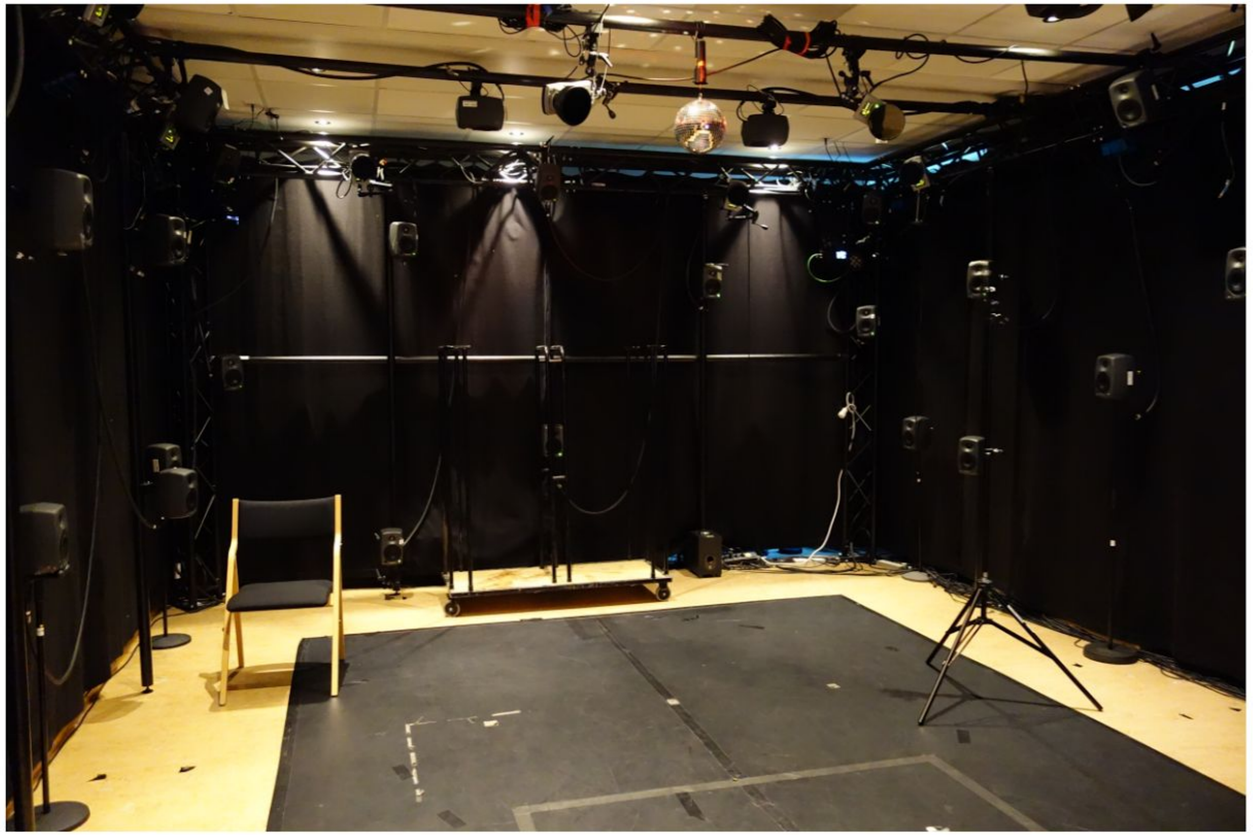


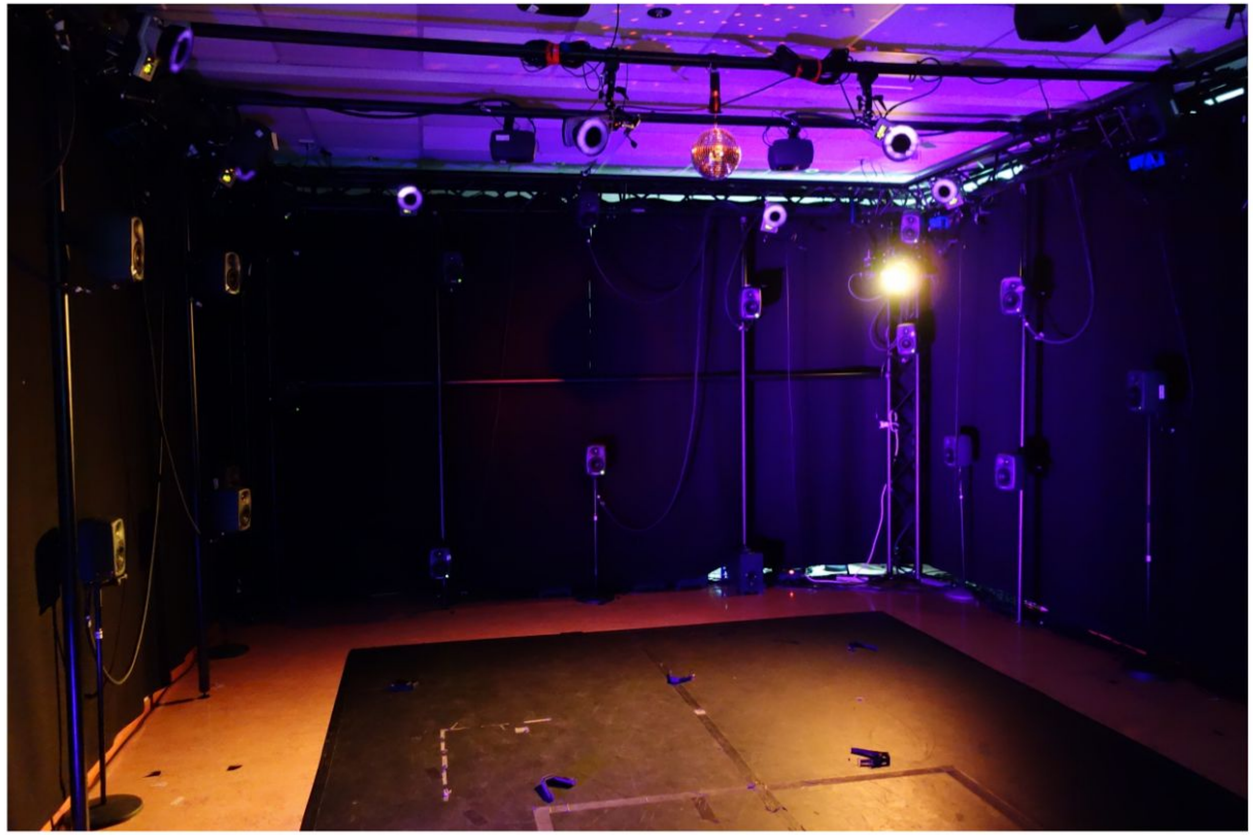
(a) (b)



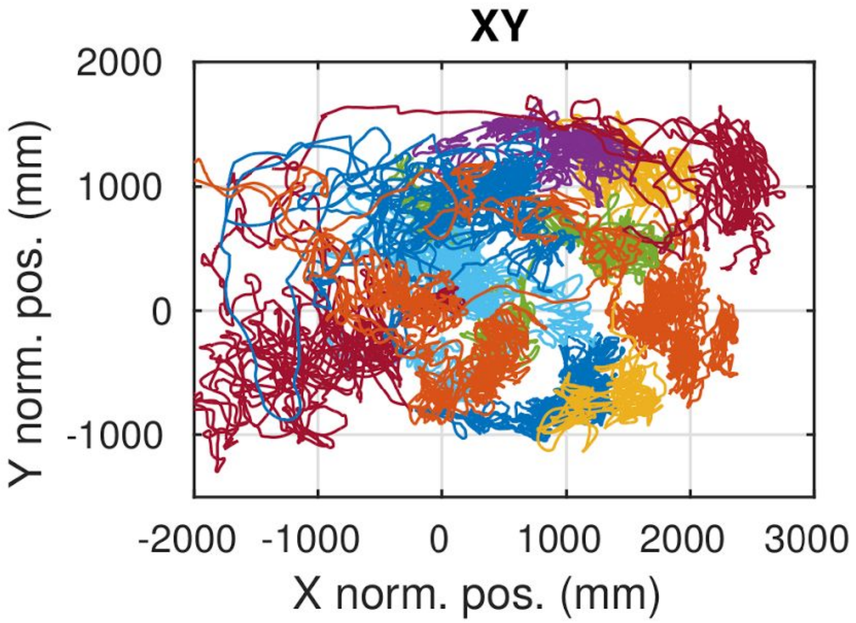
Mari Romarheim Haugen (2014)
Studying Rhythmical Structures in Norwegian Folk Music and Dance Using Motion Capture Technology: A Case Study of Norwegian Telespringar

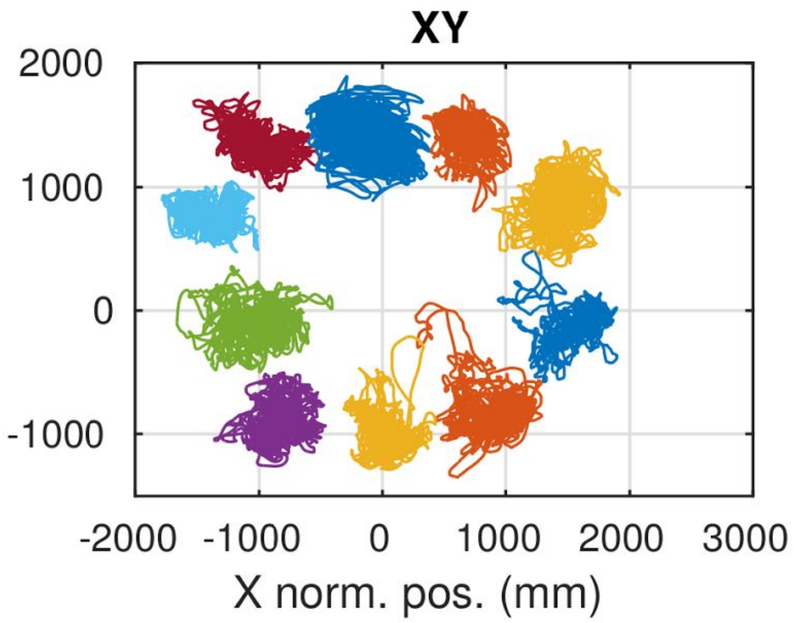
Group dancing

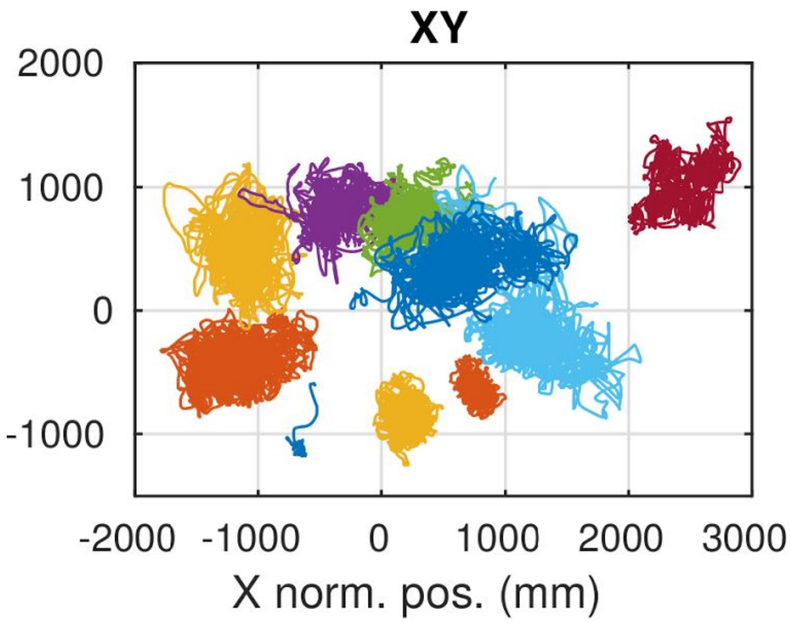




Solberg, Jensenius (2016). **Pleasurable and Intersubjectively Embodied Experiences of Electronic Dance Music**. *Empirical Musicology Review*


XY
2000
1000
0
-1000
Y norm. pos. (mm)
-2000 -1000 0 1000 2000 3000
X norm. pos. (mm)


XY
2000
1000
0
-1000
-2000 -1000 0 1000 2000 3000
X norm. pos. (mm)


XY
2000
1000
0
-1000
-2000 -1000 0 1000 2000 3000
X norm. pos. (mm)

Mari

Research

Research projects

MICRO - Human Bodily Micromotion in Music Perception and Interaction

- About
- Images
- News

MICRO - Human Bodily Micromotion in Music Perception and Interaction

Norwegian

How and why does music make us move? This project will investigate how music influences what we may call micromotion, such as the tiny motion observed when people try to stand still.

Contact

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Financing

The Project is financed by The Research Council of Norway.

Duration

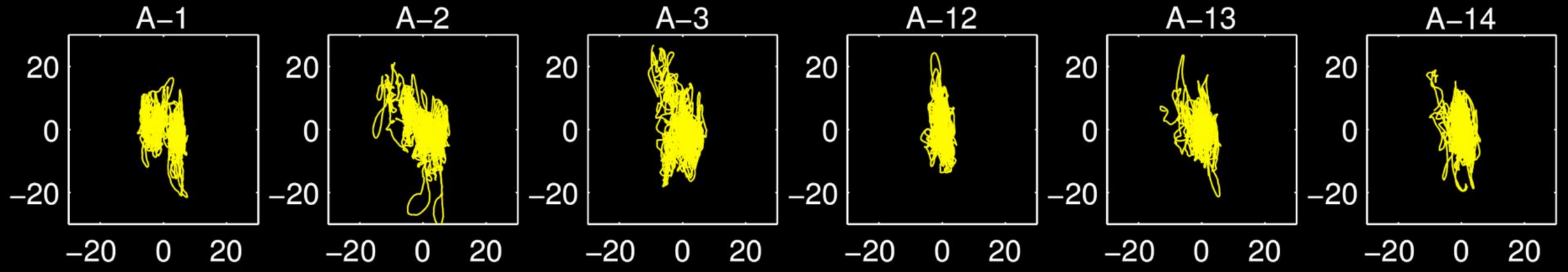
2016 - 2020

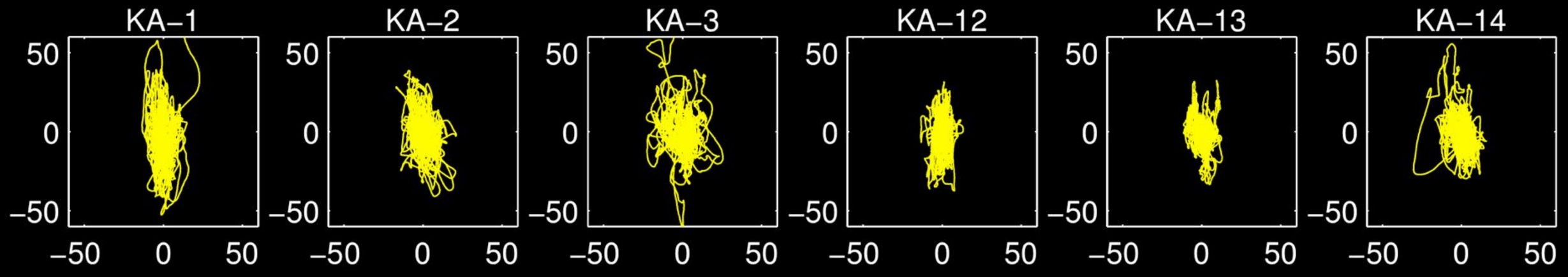
Participants

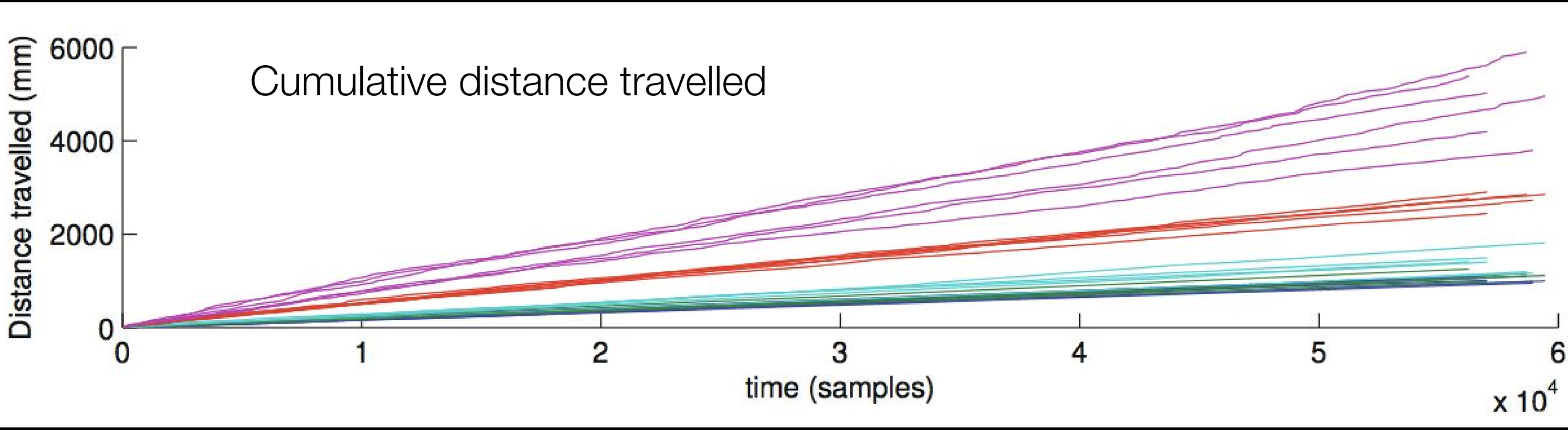
- Alexander Refsum Jensenius
- Victor Evaristo Gonzalez Sanchez
- Agata Żelechowska

→ Detailed list of participants

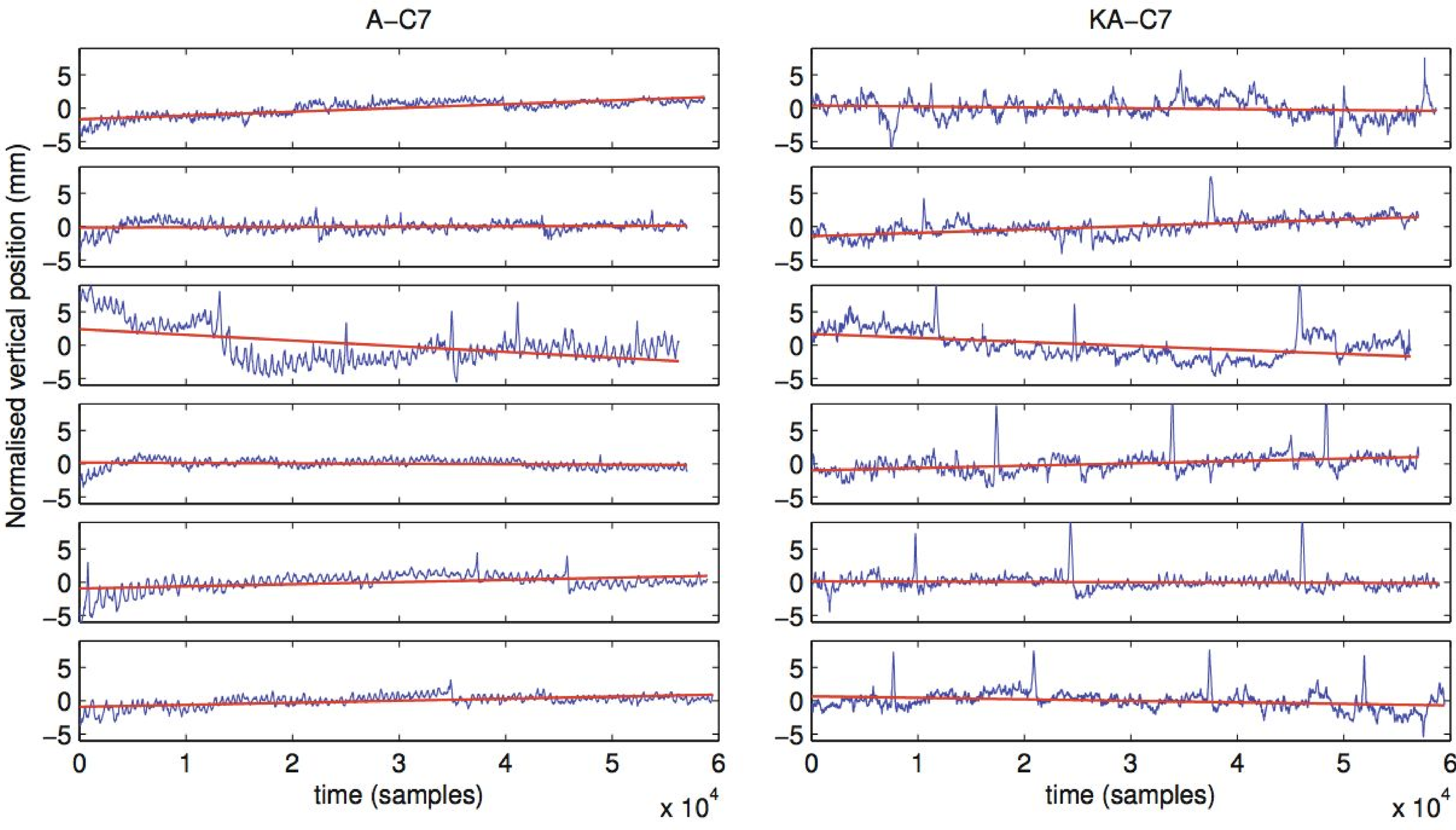
Standstill


A–1
A–2
A–3
A–12
A–13
A–14
20
0
–20
–20
0
20


KA–1
KA–2
KA–3
KA–12
KA–13
KA–14
50
0
–50
–50
0
50



Jensenius, A. R. and Bjerkestrand, K. A. V. (2012).
Exploring micro-movements with motion capture and sonification.
In Brooks, A. L., editor, *Arts and Technology, Revised Selected Papers*, volume 101 of LNICST, pages 100–107. Springer.


A–C7
KA–C7
Normalised vertical position (mm)
5
0
−5
0
1
2
3
4
5
6
time (samples)
x 10^4

ca 7 mm/s

SVERM

Research

Research projects

MICRO - Human Bodily Micromotion in Music Perception and Interaction

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- Images
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MICRO - Human Bodily Micromotion in Music Perception and Interaction

Norwegian

How and why does music make us move? This project will investigate how music influences what we may call micromotion, such as the tiny motion observed when people try to stand still.

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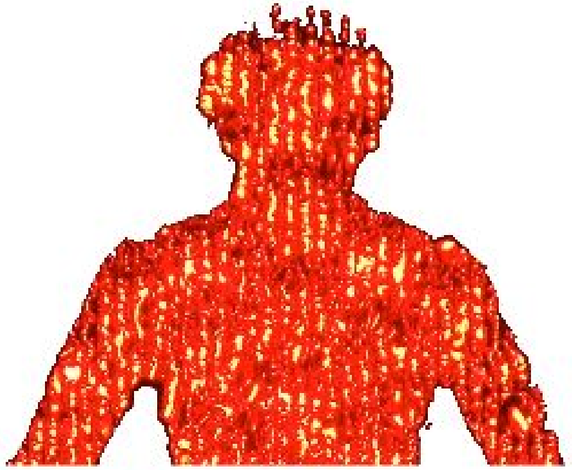
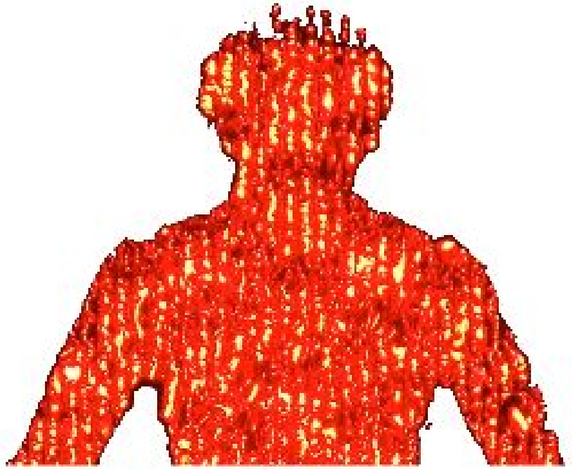


NM i Stillstand



NM i Stillstand

Next: Oslo, March 2018!

The musical influence on people's micromotion when standing still in groups

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[a.r.jensenius, agata.zelechowska, v.e.g.sanchez]@imv.uio.no

ABSTRACT

The paper presents results from an experiment in which 91 subjects stood still on the floor for 6 minutes, with the first 3 minutes in silence, followed by 3 minutes with music. The head motion of the subjects was captured using an infra-red optical system. The results show that the average quantity of motion of standstill is 6.5 mm/s, and that the subjects moved more when listening to music (6.6 mm/s) than when standing still in silence (6.3 mm/s). This result confirms the belief that music induces motion, even when people try to stand still.

1. INTRODUCTION

It is commonly assumed that listening to musical sound, and particularly dance music with a clear pulse, "makes" us move. This assumption is to some extent supported by the literature in embodied music cognition [1,2], and there are also empirical studies of music-induced motion [3, 4] or motion enhanced by music [5, 6]. Many of these former studies have mainly focused on voluntary and fairly large-scale music-related body motion. As far as we know, there is little empirical evidence of music actually making people move when they try to remain at rest.

Our aim is to investigate the tiniest performable and perceivable human motion, what we refer to as *micromotion*. Such micromotion is primarily involuntary and performed at a scale that is barely observable to the human eye. Still we believe that such micromotion may be at the core of our cognition of music at large, being a natural manifestation of the *internal* motor engagement [7].

In our previous studies we have found that subjects exhibit a remarkably consistent level of micromotion when attempting to stand still in silence, even for extended periods of time (10 minutes) [8]. The measured standstill level of a person is also consistent with repeated measures over time [9]. These studies, however, were carried out on small groups of people (2–5), so we have been interested in testing whether these findings hold true also for larger groups.

In this paper we report on a study of *music-induced micromotion*, focusing on how music influences the motion of people trying to stand still. In order to answer that question, it is necessary to have baseline recordings of how much people move when standing still in silence. More specifically, this paper is aimed at answering the following questions:

- How (much) do people move when trying to stand still?
- How (much) does music influence the micromotion observed during human standstill?

To answer these questions, we have started carrying out a series of group experiments under the umbrella name of the "Norwegian Championship of Standstill." The theoretical background of the study and a preliminary analysis have been presented in [10]. This paper presents a quantitative analysis of the data from the 2012 edition of our experiment series.

Figure 1. The setup for the "Norwegian Championship of Standstill." Each subject wore a reflective marker on the head, and one static marker was recorded from a standing pole in the middle of the space as a reference.

2. THE EXPERIMENT

The experiment was carried out in the fourMs motion capture lab at the University of Oslo in March 2012 (Figure 1).

2.1 Participants

A little more than 100 participants were recruited to the study, and they took part in groups consisting of 5-17 participants at a time (see Figure 1 for a picture of the setup). Not every participant completed the task and there were some missing marker data, resulting in a final dataset of

Exploring the Myo Controller for Sonic Microinteraction

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Kari Anne Vadstensvik Bjerkestrand
Oslo, Norway
ka@bodymindflow.com

ABSTRACT

This paper explores sonic microinteraction using muscle sensing through the Myo armband. The first part presents results from a small series of experiments aimed at finding the baseline micromotion and muscle activation data of people being at rest or performing short/small actions. The second part presents the prototype instrument MicroMyo, built around the concept of making sound with little motion. The instrument plays with the convention that inputting more energy into an instrument results in more sound. MicroMyo, on the other hand, is built so that the less you move, the more it sounds. Our user study shows that while such an "inverse instrument" may seem puzzling at first, it also opens a space for interesting musical interactions.

Author Keywords

EMG, micromotion, biosignals, microinteraction

ACM Classification

H.5.5 [Information Interfaces and Presentation] Sound and Music Computing, H.5.2 [User Interfaces] Input devices and strategies.

1. INTRODUCTION

This paper is concerned with very small human motion, and how we can use such *micromotion* in electronic instrument design. We here use micromotion (typically shorter/smaller than 10 mm/s) to denote human motion on the boundary between the voluntary and involuntary. Consequently, *sonic microinteraction* may be seen as the level of control between the conscious and the unconscious [3]. While sonic microinteraction is common in music performance on acoustic instruments, there are fewer examples of the systematic usage of micromotion in electronic instrument design.

The lack of micro-level control in many digital musical instruments may be blamed on technological constraints, but today's interaction technologies are certainly capable of detecting human micromotion [9]. Rather we believe that there may be some self-imposed conceptual restrictions among digital musical instrument designers. It is also a problem that we lack theories and methods for talking about and using the micro-level systematically in digital musical instruments.

NIME'17, May 15-19, 2017, Aalborg University Copenhagen, Denmark.

Figure 1: The Myo armband with the sensor numbering according to Thalmic Labs.

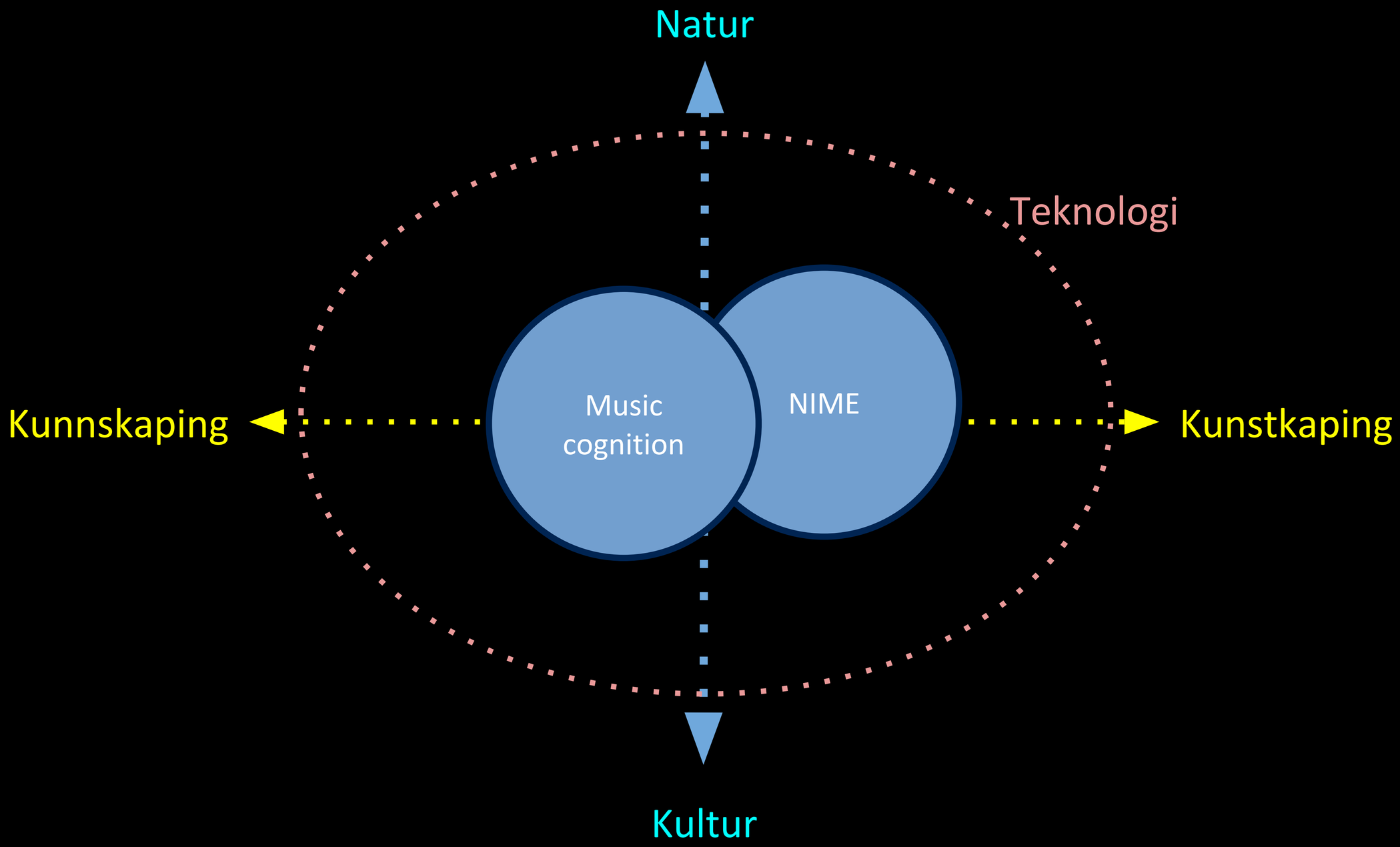
In this paper we continue our exploration of human micromotion in general, and sonic microinteraction in particular. While our previous research, to a large extent, has been based on motion capture data [3], this paper is focusing primarily on surface muscle activity, using electromyography (EMG) as the sensing method. Even though acquisition of EMG has become widespread in recent years across a number of research fields, the cost, portability and accessibility associated with existing systems limit their use in interactive applications. Still, there are several examples of using both motion and muscle activity signals for controlling electronics in general [11, 4, 5, 7], and also in musical interaction [6, 1, 10, 8, 9]. Most of these examples, however, are based on recognizing fairly large-scale motion sequences, actions and gestures, and there are fewer studies that have focused on micromotion.

We first present a set of experiments aimed at finding the baseline muscle activity for human micromotion, in different static and dynamic positions, using the Myo armband from Thalmic labs Inc.[1] This commercially available device contains 8 EMG sensors, evenly spaced in a ring around the arm of the user, as well as an inertial measurement unit containing a 3D accelerometer and a 3D gyroscope (Figure 1). Next we present the prototype instrument MicroMyo, and evaluate its usefulness in musical interaction.

2. ANALYSING MICROMOTION AND MICROACTIONS

This section describes two series of small experiments aimed at (1) finding baseline data of micromotion and microactions, (2) examining the precision with which the activity from particular muscles is detected by Myo's electrodes.

[1] `https://www.myo.com/`


Natur
Teknologi
Kunnskaping
Kunstkaping
Music cognition
NIME
Kultur

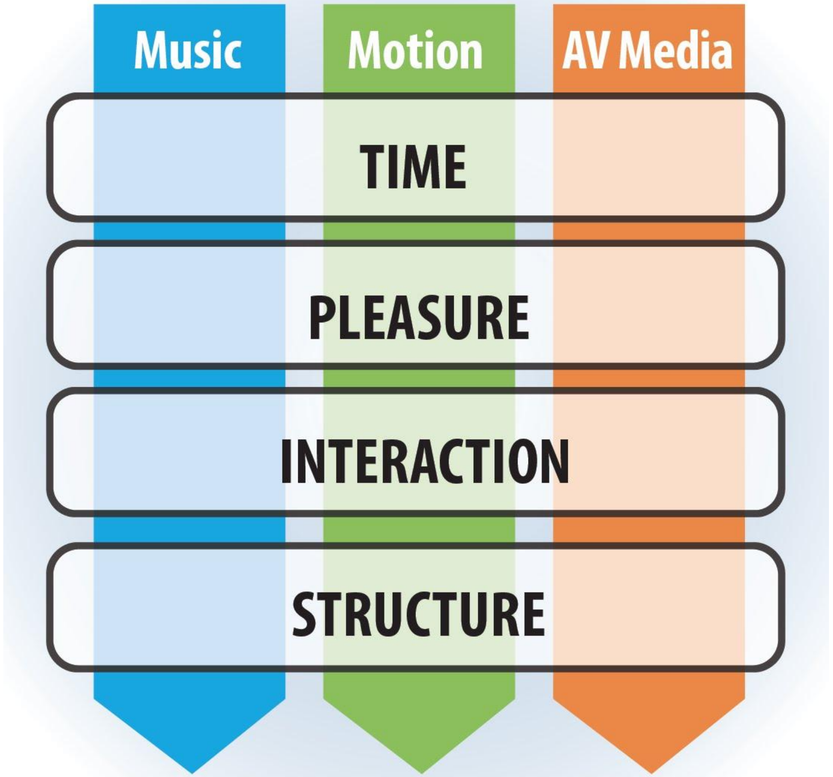
RITMO

Centre for Interdisciplinary Studies in Rhythm, Time and Motion

CENTRE DIRECTORS: Professor Anne Danielsen (years 1–5) • Assoc. Professor Alexander Refsum Jensenius (years 6–10)

UiO • University of Oslo

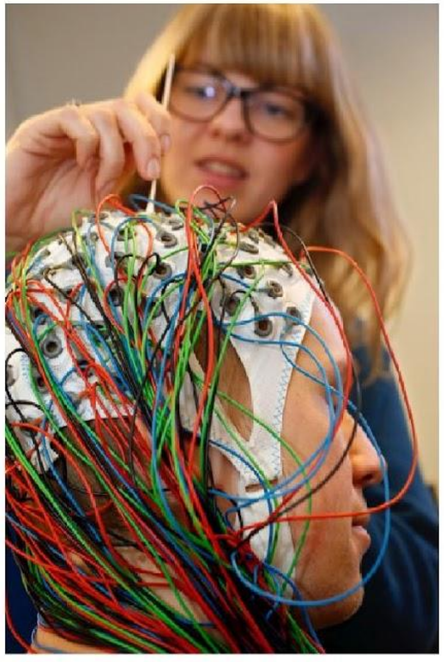
HUMAN RHYTHM



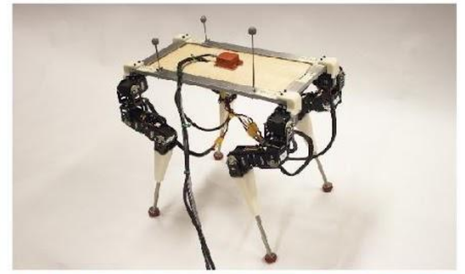
VISION:
CHANGE OUR VIEW OF
HUMAN COGNITION

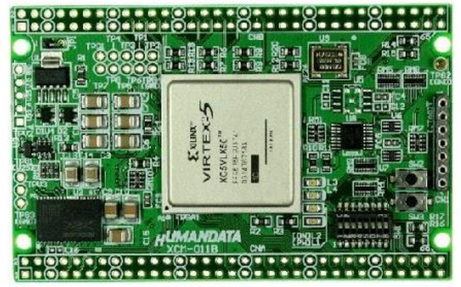
RITMO

Psychology

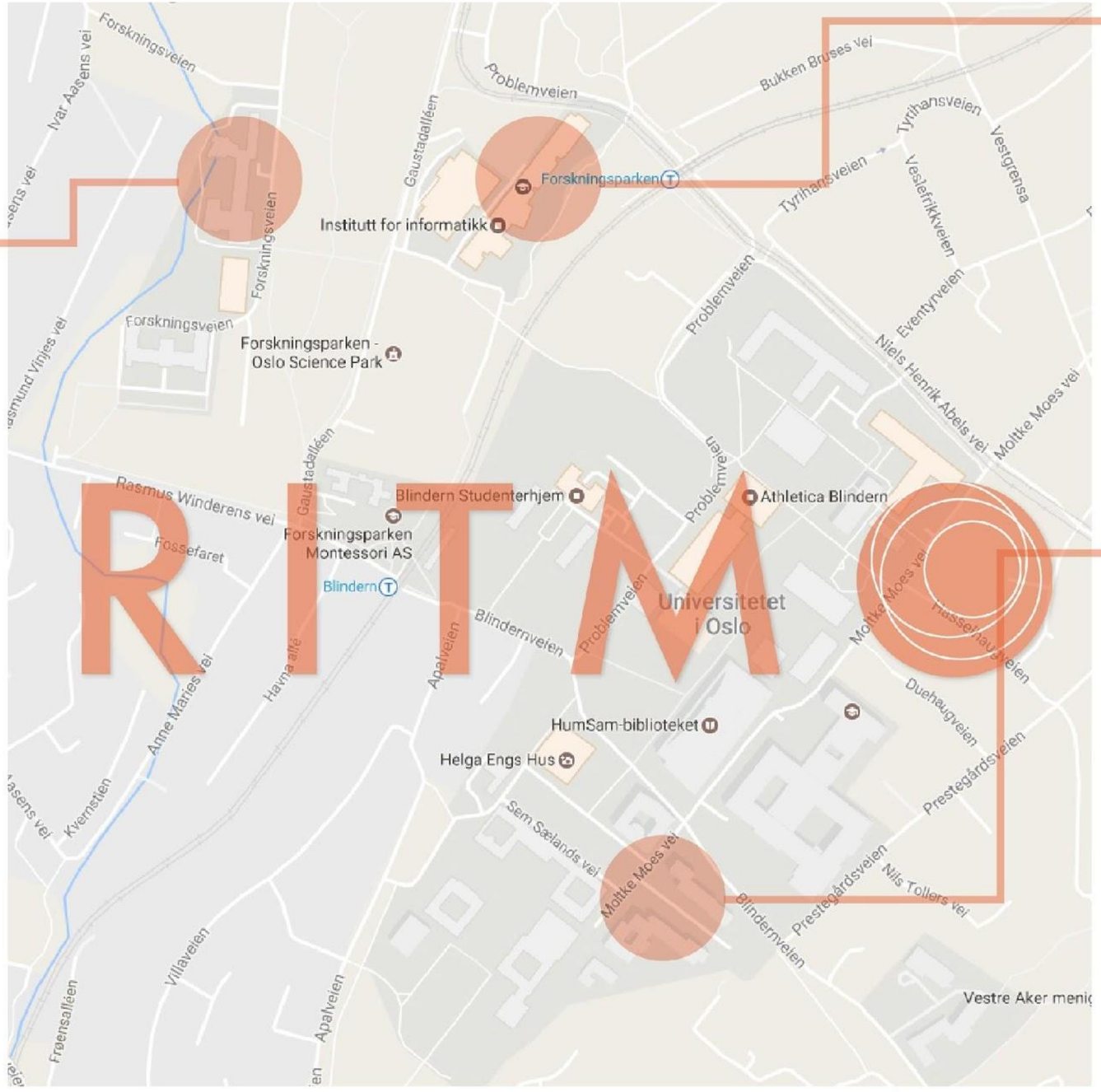


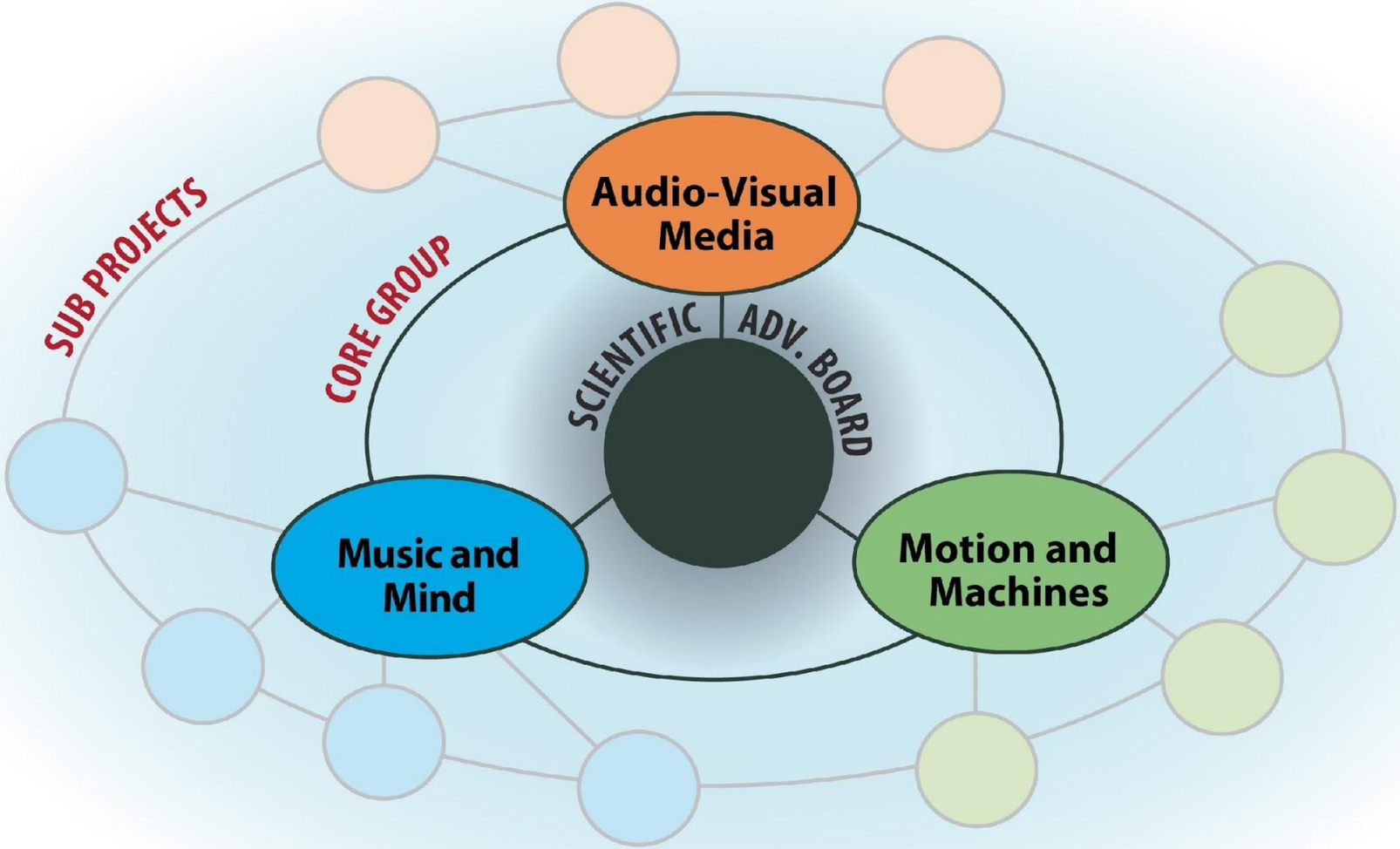
Informatics





Musicology




SUB PROJECTS
CORE GROUP
Audio-Visual Media
SCIENTIFIC
ADV. BOARD
Music and Mind
Motion and Machines


MUSIC MOVES

Music Moves @ Futurelearn
Starts 4 September 2017

You have to:

- Register for the course
- Do all the activities each week
- Write minimum 3 comments per week, and present these comments at next lecture