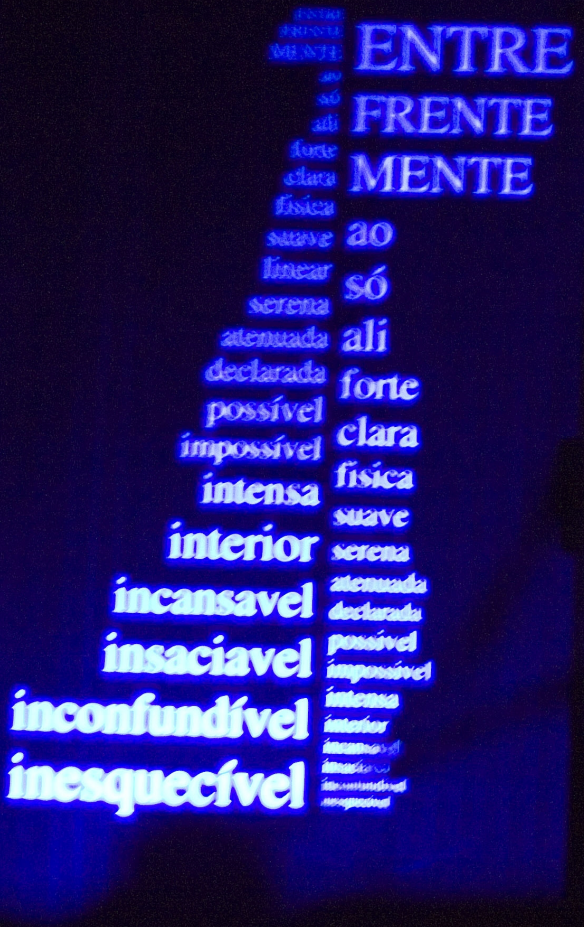
# COMPOSIÇÃO INTERATIVA E MODELOS DERIVADOS DA NEUROCIÊNCIA COMPUTACIONAL

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# RESUMO


- Esta palestra explora a convergência entre conceitos desenvolvidos no entorno da música atual e formulações que surgiram na nossa pesquisa a partir de modelos da neurociência computacional. Apontamos inicialmente que a composição musical evoluiu do uso da notação simbólica para escrita da organização interna do som. Isto pode ser observado nas técnicas instrumentais expandidas e nas estratégias mais recentes que se utilizam de novas interfaces para expressão musical. A possibilidade de operar sobre a dinâmica da organização interna do material sonoro em tempo real, adiciona novas dimensões à informação musical e, consequentemente, introduz possibilidades na aplicação de modelos computacionais como suporte para análise e criação musicais. Em linha com essas idéias, apresentaremos os conceitos expressos em "Computational Modeling of Mind and Music" (Vershure & Manzolli, 2013) e um conjunto de sistema-composições que desenvolvemos recentemente.



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# REFERENCE TEXT

LANGUAGE, MUSIC AND THE BRAIN: A MYSTERIOUS RELATIONSHIP

EDITED BY MICHAEL A. ARBIB

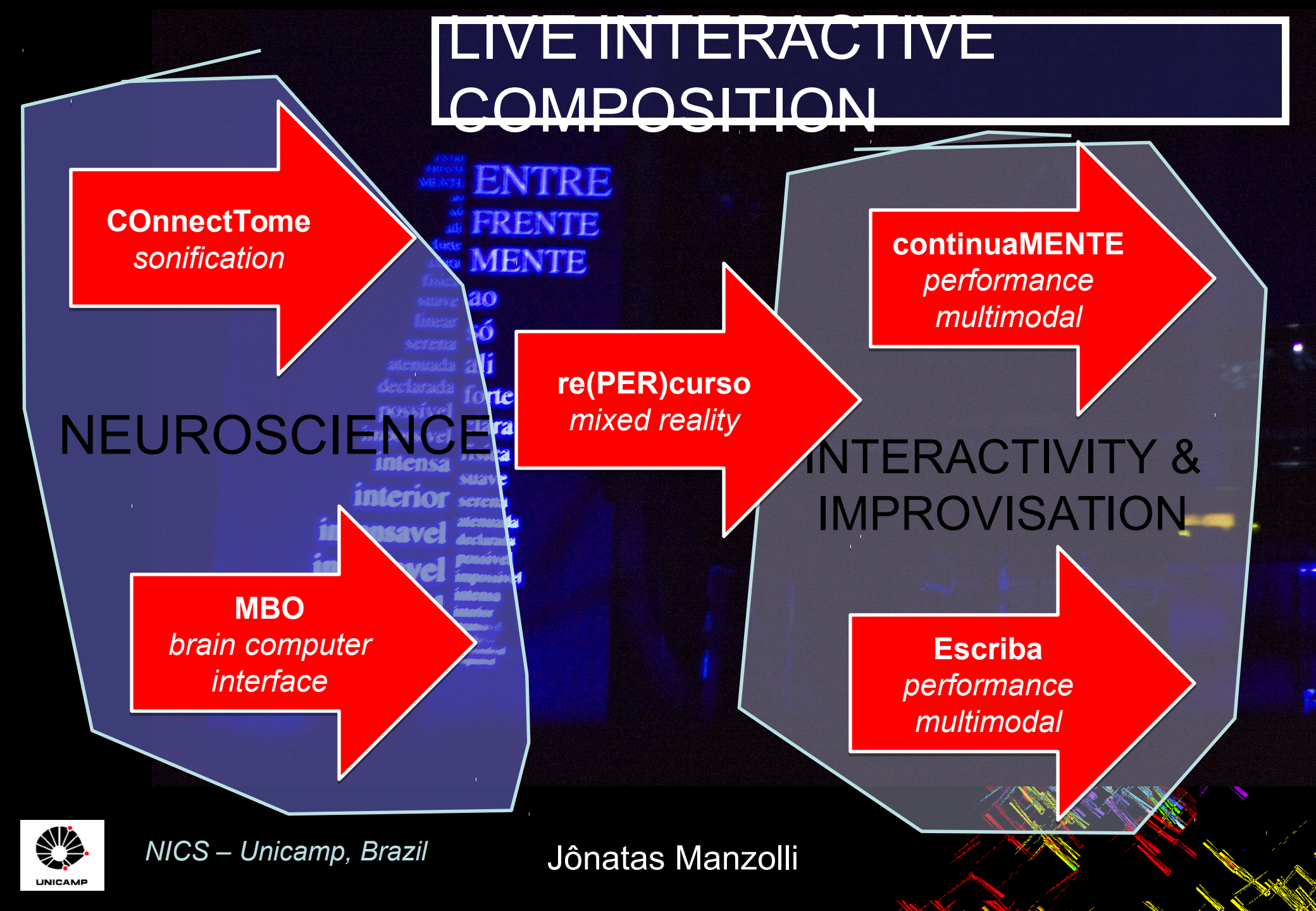
ERNST STRUNGMANN FORUM, VOLUME 10.

## CHAPTER 16

COMPUTATIONAL MODELING OF MIND AND

PAUL VERSCHURE & JÔNATAS MANZOLLI

# LIVE INTERACTIVE COMPOSITION





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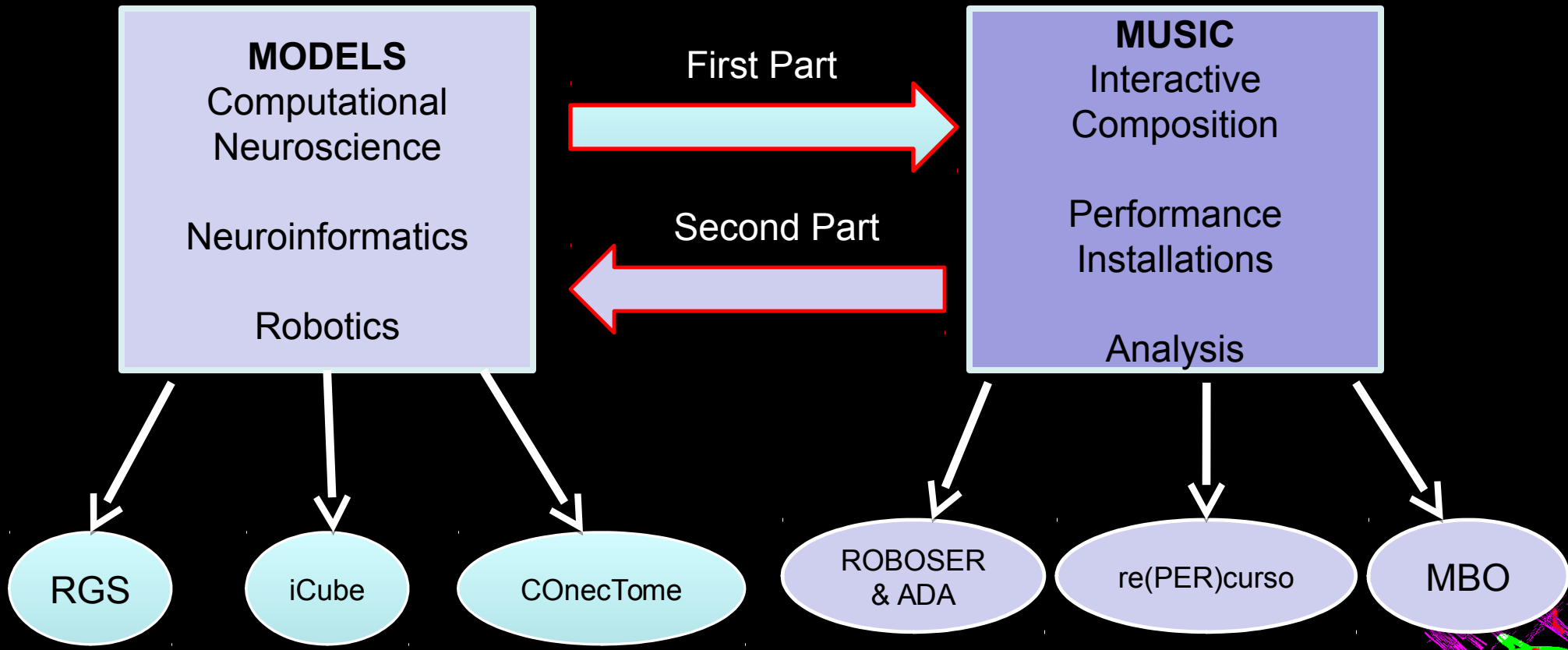
# Views of the presentation





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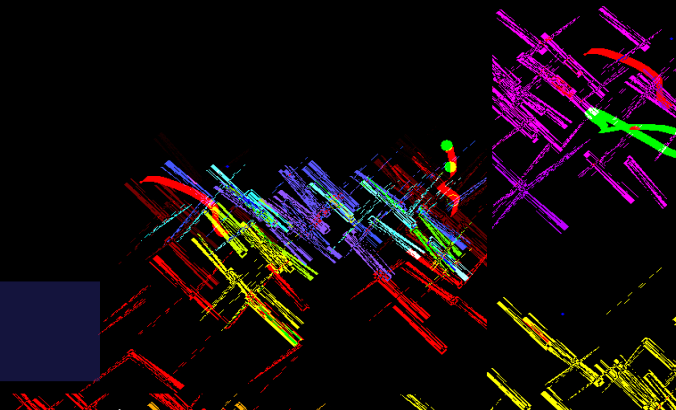
Models from computational neuroscience applied to music

# PART 1 – MODELS FROM C.N. TO MUSIC



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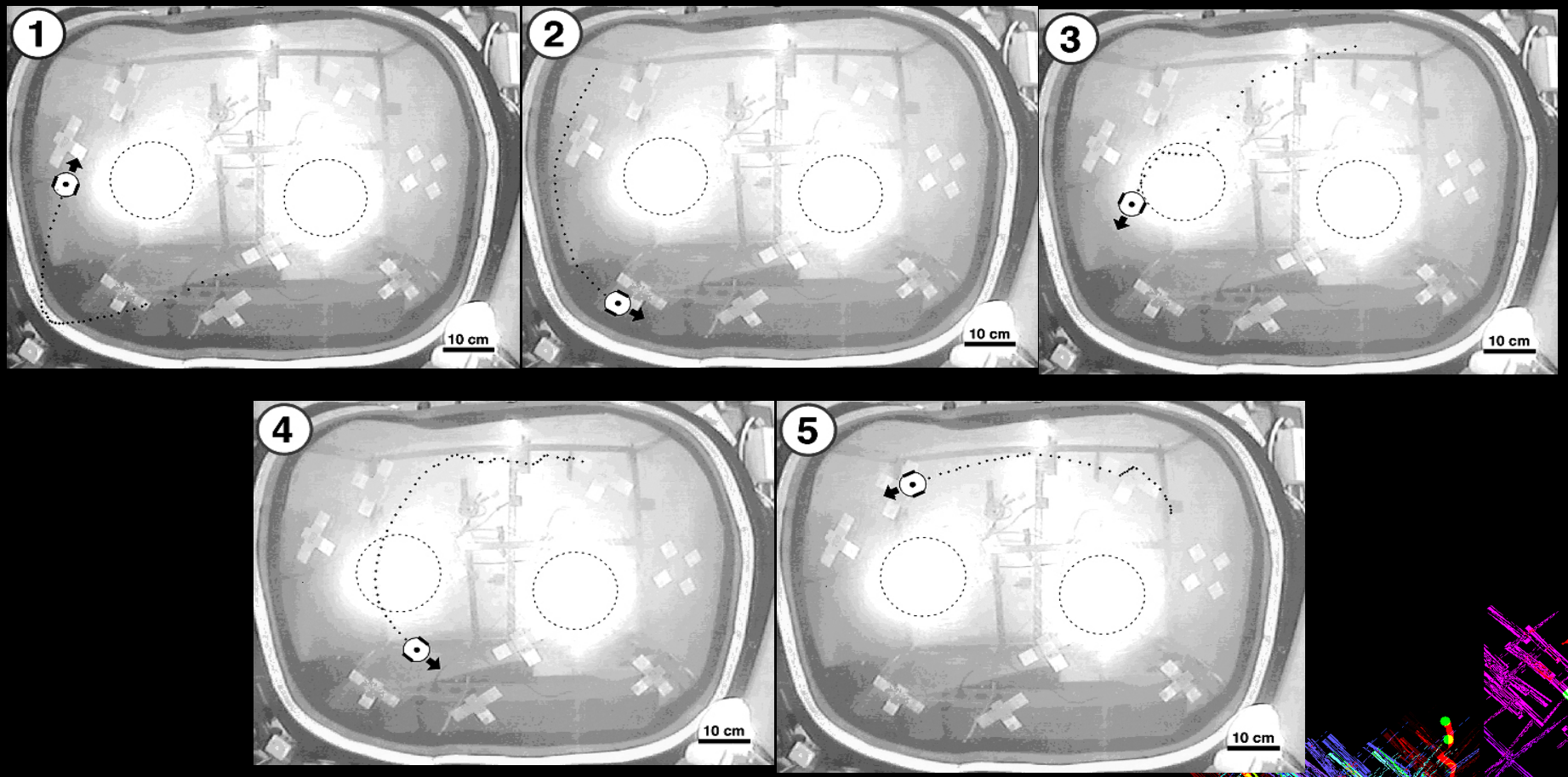
# ROBOSER(1998) – Manzolli & Verschure

## Collaboration with INI/ETHZ

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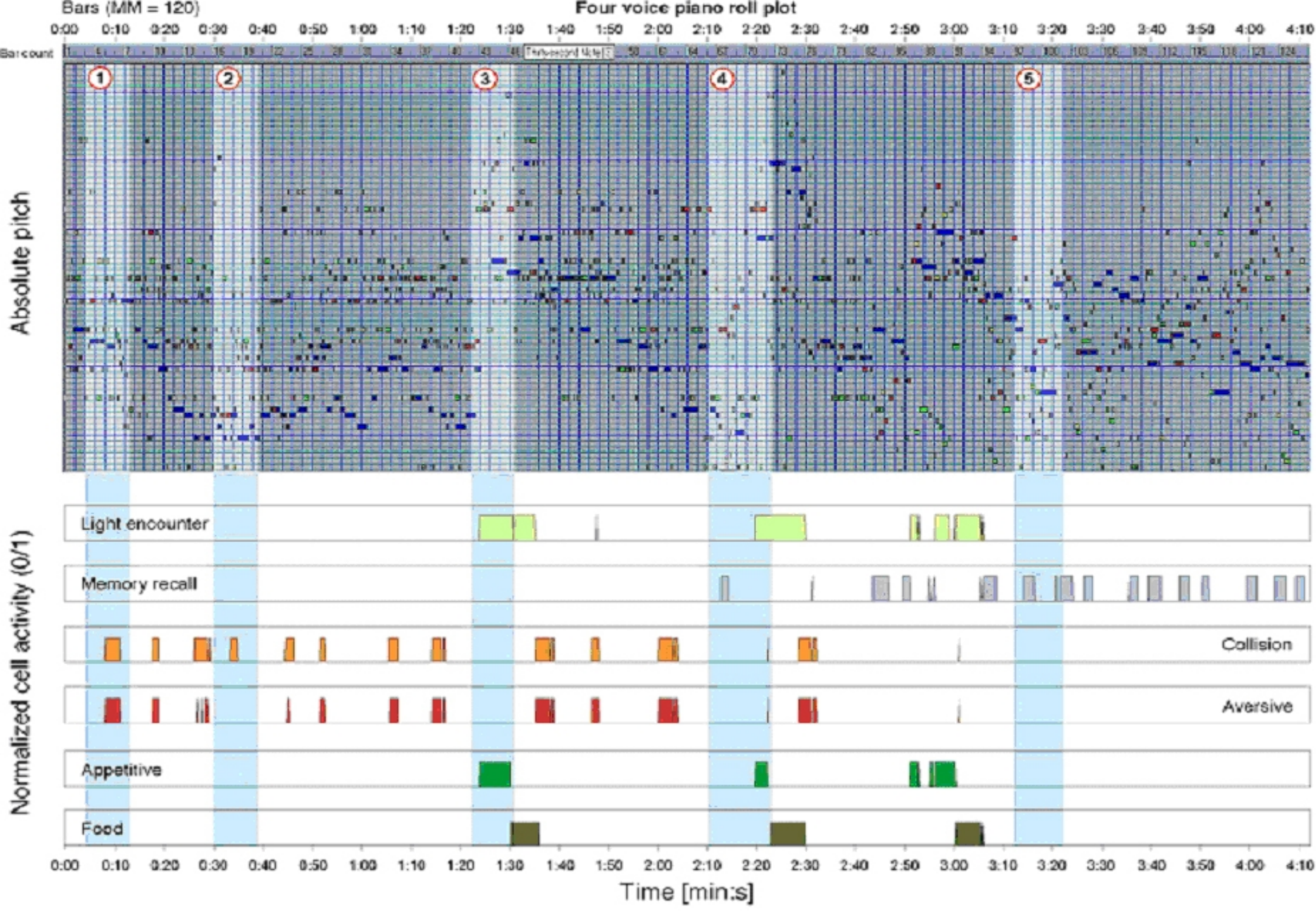
Bars (MM = 120)
Four voice piano roll plot
Bar count
Absolute pitch
1
2
3
4
5
Normalized cell activity (0/1)
Light encounter
Memory recall
Collision
Aversive
Appetitive
Food
0:00
0:10
0:20
0:30
0:40
0:50
1:00
1:10
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1:50
2:00
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2:30
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2:50
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3:20
3:30
3:40
3:50
4:00
4:10
Time [min:s]

# ADA (2002): intelligent space

## Collaboration with INI/ETHZ

# Live Soundscape Composition Based on Synthetic Emotions

Klaus C. Wassermann, Kynan Eng, and Paul F.M.J. Verschure
*Institute of Neuroinformatics, University of Zurich and Swiss Federal Technical University*

Jônatas Manzolli
*University of Campinas, Brazil*

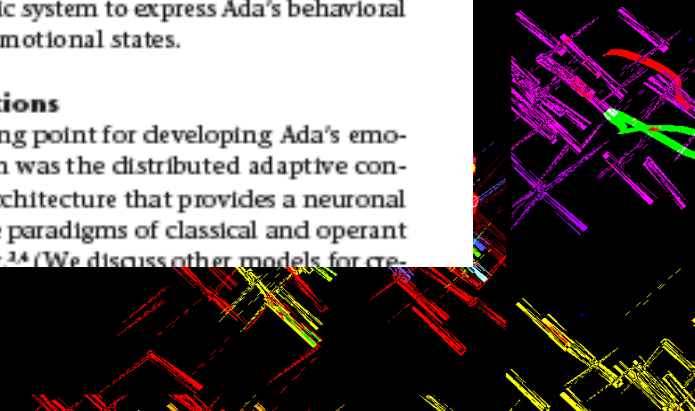
vas surrounding the space, called Bigscreen (see Figure 2), and the real-time music composition and performance system Roboser.[2] (To hear examples of Ada using Roboser, visit the official Ada Web site, http://www.ada-exhibition.ch.)

We integrated Ada's sensory information and controlled her behavior with a hybrid software architecture based on concepts derived from the computational neurosciences. This software architecture comprised a spectrum of implementation methods, ranging from standard procedural to agent-based methodologies and large-scale neuronal simulations.[3]

A central component of Ada's control system was a model of emotions operating in real time. We gave Ada the means to communicate via computer graphics and a musical soundscape. The goal was to use visual and auditory cues to induce visitors to adjust their behavior to Ada. This article focuses on the application of the Roboser music system to express Ada's behavioral modes and emotional states.

### Ada's emotions

The starting point for developing Ada's emotional system was the distributed adaptive control (DAC) architecture that provides a neuronal model of the paradigms of classical and operant conditioning.[3,4] (We discuss other models for re-



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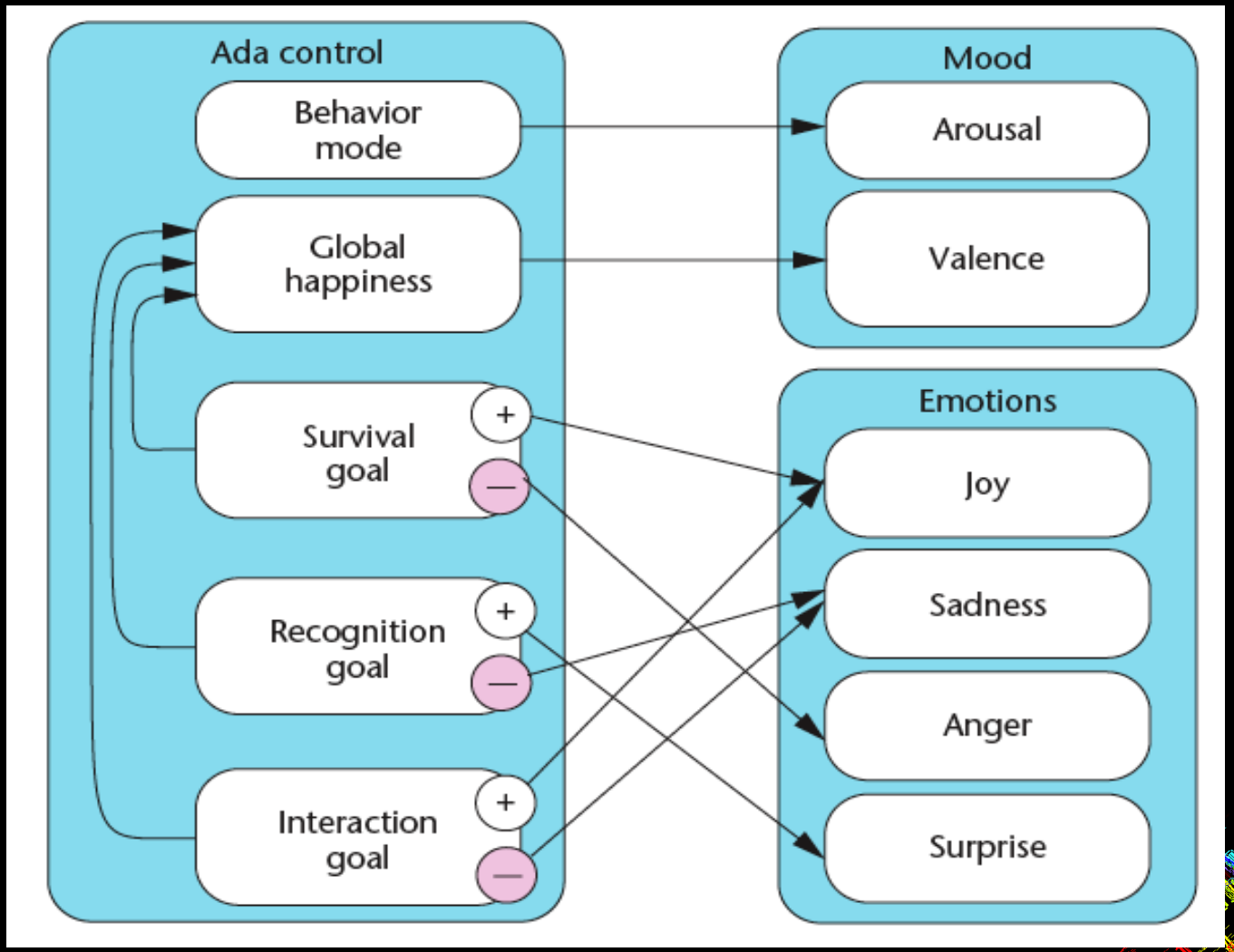
# Ada's Behavioral Model

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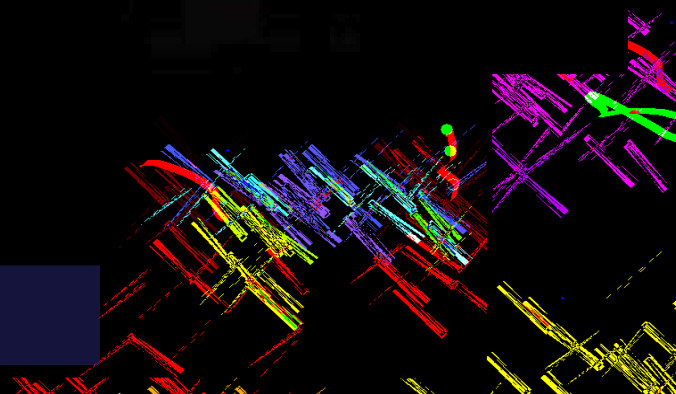
ROBOSER (1998)

Ada: Intelligent Space (2002)



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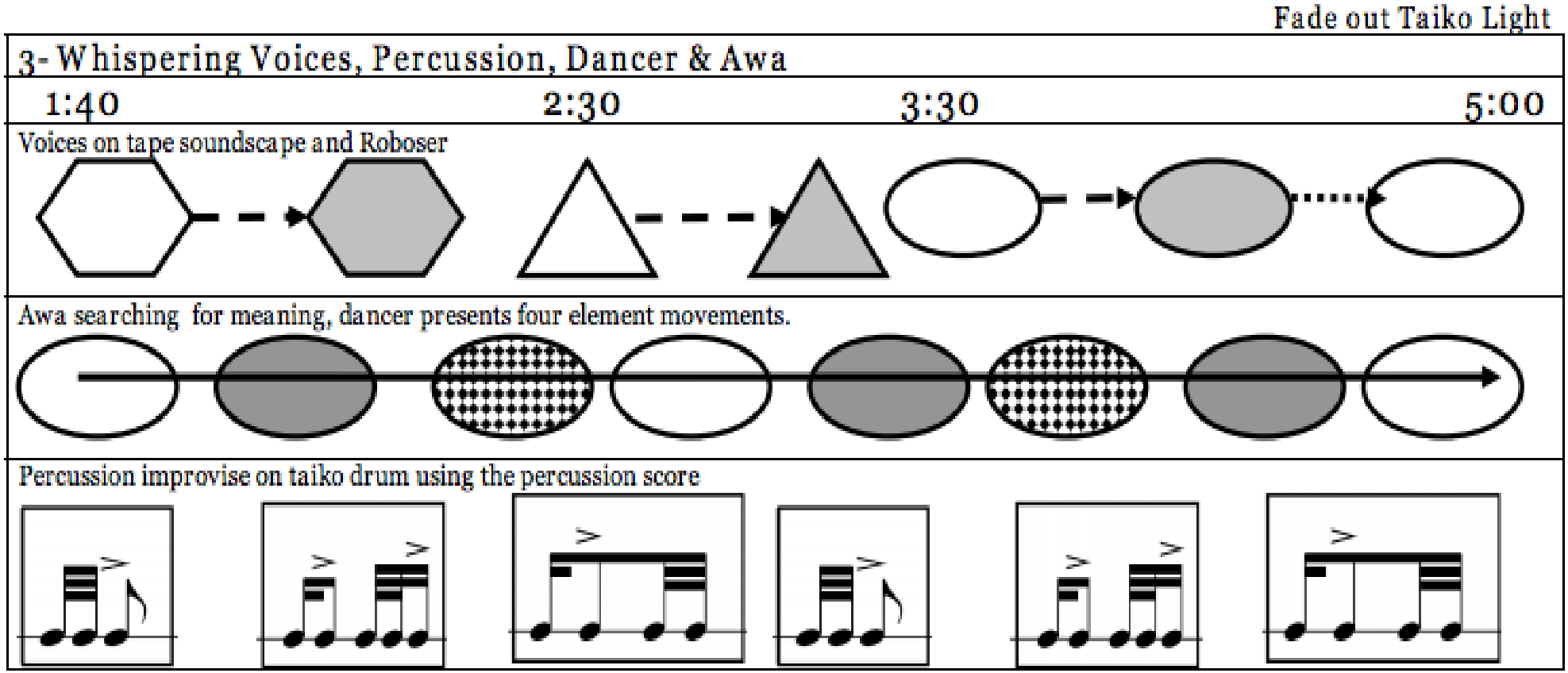
# re(PER)curso: mixed reality chronicle

## Collaboration with SPECS/UPF, Barcelona




A. Mura, J. Manzolli, P. F. M. J. Verschure, B. Rezazadeh, S. Le Groux, S. Wierenga, A. Duff, Z. Mathews, and U. Bernardet. **RePERcurso: a mixed reality chronicle.** SIGGRAPH, Los Angeles, (April 2175)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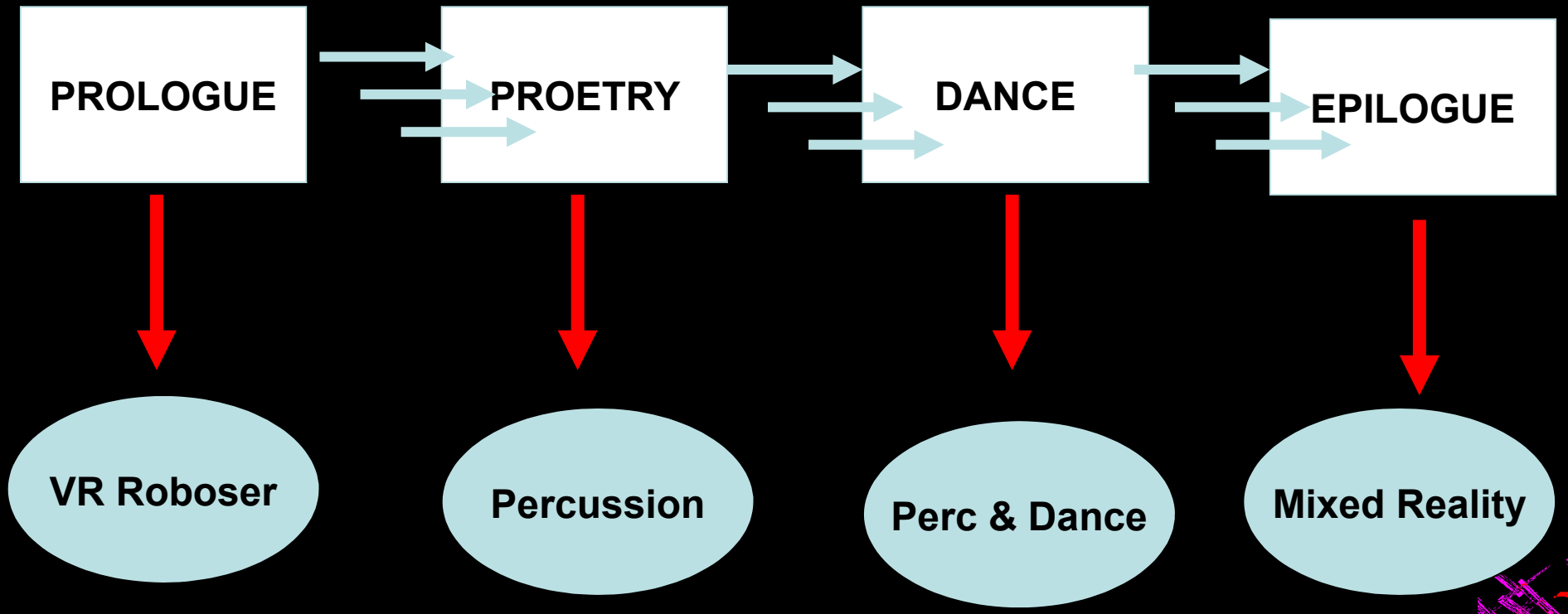
# re(PER)curso: Storyboard



# re(PER)curso(2007)

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# Multimodal Brain Orchestra (2009)
## Collaboration with SPECS/UPF, Barcelona

Conference: Science Beyond Fiction, Prague

Groux, S.L., Manzolli, J., Verschure.
Disembodied and Collaborative Musical Interaction in the Multimodal Brain Orchestra.
Proceedings NIME 2010

**Disembodied and Collaborative Musical Interaction in the Multimodal Brain Orchestra**


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# Multimodal Brain Orchestra (2009)

## Collaboration with SPECS/UPF, Barcelona


Groux, S.L., Manzolli, J., Verschure. Disembodied and Collaborative Musical Interaction in the Multimodal Brain Orchestra. Proceedings NIME 2010.

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# Multimodal Brain Orchestra (2009)


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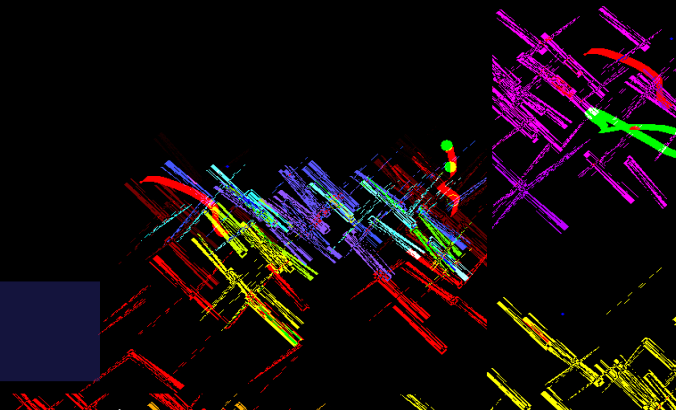
From music/sound to applications of computational neuroscience

# PART 2 – FROM MUSIC TO APP. CN.



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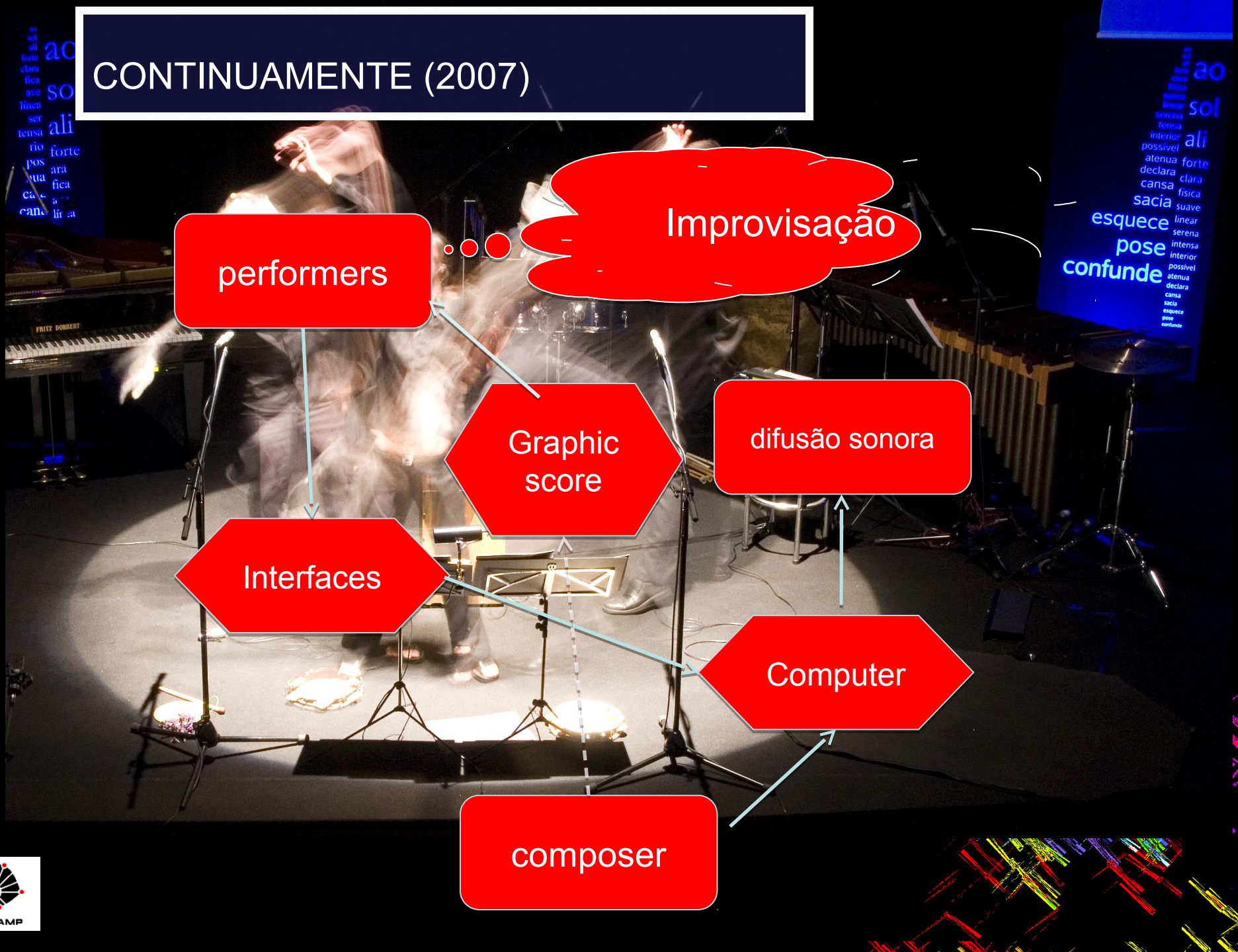
# CONTINUAMENTE (2007)



# CONTINUAMENTE (2007)

Traldi, C.A. *Percussão e Interatividade, Prisma: um modelo de espaço instrumento auto-organizado.* Tese Doutorado em Música, Unicamp, 2009.

Campos, C.S. *Modelos de recursividade aplicados à percussão com suporte tecnológico.* Tese Doutorado em Música, Unicamp, 2012.

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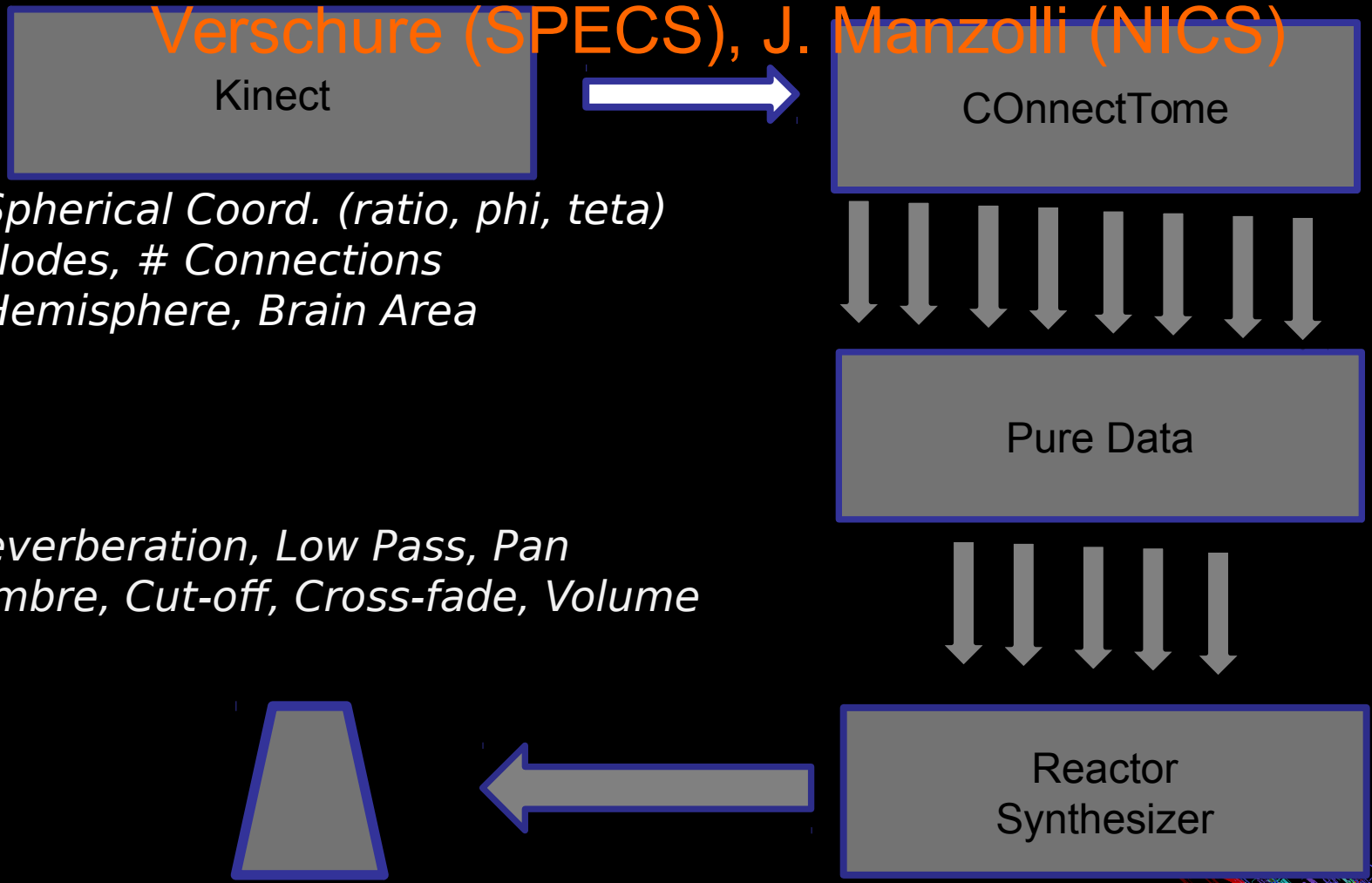
# Connectome Tomographic Simulation

P. Papachristodoulou (SPECS), E. Martinez (SPECS),
Verschure (SPECS), J. Manzolli (NICS)

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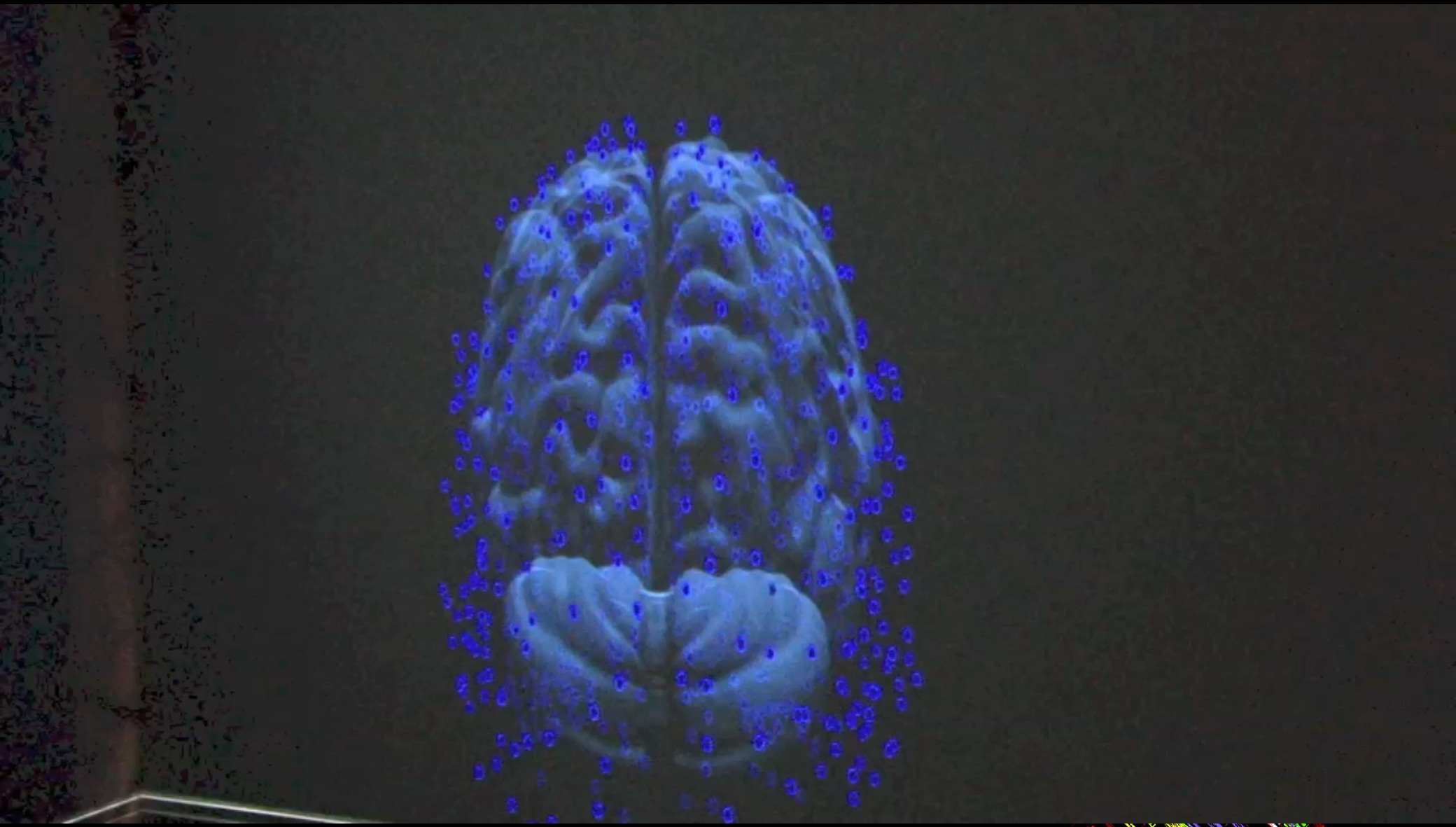
# Topomorphic Sonification, Interactive Sound Navigation (2013)



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