

# **Analysis of (Authentic) Movement:** Establishing Scientific Evidence for the Body-Mind Connection

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## **Scientific Theatre International Workshop:**

### *Multidisciplinary Approach to Designing Intelligent Environments (SciT'11)*

“Art, performance, and creative work are, in general, subjective which makes them very risky as a business. However, they are powerful tools, capable of influencing and affecting peoples' views, mind, life, and the future.

- Is it possible to predict a spectators' reaction, or to positively and therapeutically influence their life style, health, and spirit?
- Can we investigate how humans perceive music, art, choreography?
- How do differing characteristics (frequency, loudness, direction, power, etc.) induce given emotions?
- How do external signals such as sound, light, and information interfere with and affect humans' biological processes and signals such as heart rate or brain activity?
- And vice versa, how can humans' internal activity change the external world?”

## 2. Context

# The Watching Dance Project



Taking a multidisciplinary approach to investigating Kinesthetic Empathy

<http://watchingdance.ning.com/>

# Agenda

1. Legend |----*personal background*
2. Context |----*movement research*
3. Questions |----*curiosity & scientific evidence*
4. Outline |----*research platform*
5. Technical issues |----*multidisciplinary approach*

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6. Summary



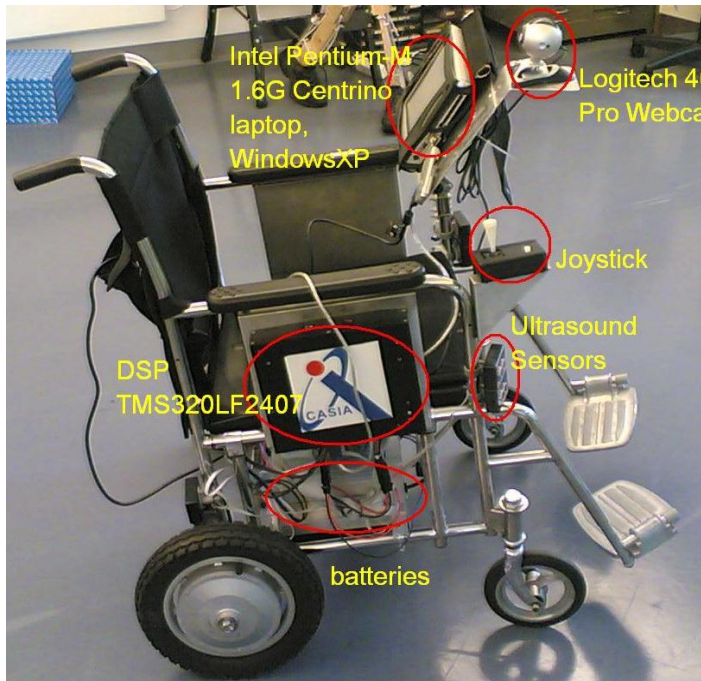
## 1. Legend



# Embedded and Intelligent Systems Research Group



- French/UK project SYSIASS:  
SYStème Intelligent et Autonome d'aide aux Soins de Santé  
Autonomous and Intelligent Healthcare System



The intelligent wheelchair

<http://www.sysiass.eu/>

ICmetrics Technology

- 3. Questions
- 5. Technical issues

## Features in signals:

- Unique
- Patterns

## 1. Legend

# Centre for Psychology of Movement and Creative Self-expression

Dance, Psychology, Art Therapy, Movement Therapy



2. Context

4. Questions

Switch off your brain!

?

#### 4. Outline

- body-mind connection, decision-making
- therapeutic influence, health awareness
- initiate, perform, control, imagine, observe, perceive, imitate, project movement
- mirror neurons, decomposition: LMA
- cognitive psychology, movement analysis, neuroimaging techniques (PET, TMS, fMRI, MEG), biological signal processing (EEG, ECG, EMG, etc.), statistical analysis and machine learning, electronics.

## 4. Outline

### Task:

Analysis of multimodal cues in space and time  
(facial expressions, head and body movement,  
various vocalizations, biological signals, etc.)

finding patterns, non-linear correlations ...

1. Legend
5. Technical issues

# Brain-Computer Interfaces Research Group



- » EEG analysis (preforming, imagining, observing movement)
- » EEG measuring (on the move)
- » Biofeedback

1. Legend
5. Technical issues

FortiTo™



- » Minimization, convenience, reliability (signal/noise ratio)
- » Embedded systems, sensors, SoCs
- » Buzz Boards™ - pluggable modules to create a variety of hardware application platforms

<http://www.fortito.com/>

“divide & conquer” = modularisation



Mezzanine ARM

Processor Base *Buzz Board*

Audio-SD *Buzz Board*

Manual Control *Buzz Board*

Environmental Sensing *Buzz Board*

Navigation *Buzz Board*.

Inter-board Extension *Buzz Board*

Inter-board Right Angled *Buzz Board*

3 Way Inter-board *Buzz Board*

Development *Buzz Board*

Prototyping *Buzz Board*

Keypad *Buzz Board*

LED Display *Buzz Board*

Medical *Buzz Board*

MIDI *Buzz Board*

Navigation *Buzz Board*

Network/232 *Buzz Board*

Quantum *Buzz Board*

RFID *Buzz Board*

Robot *Buzz Board*

Robot-Lite *Buzz Board*

Bluetooth *Buzz Board*

GPRS *Buzz Board*

WiFi *Buzz Board*

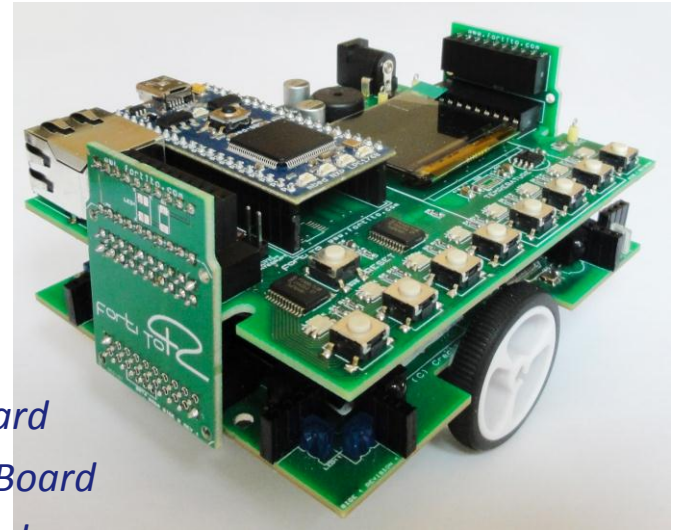
Range Finder *Buzz Board*

Supplementary Range Finder *Buzz Board*

Infrared Beacon *Buzz*

Battery *Buzz Board*

Test Point *Buzz Board*



*Buzz*  
Boards

# Summary

- Platform for studying the body-mind connection
- Intelligent performances to support human health and treat disorders
- DMT in official health care systems
- Multidisciplinary approach
- Biological signal processing techniques
- Efficient, reliable, and convenient sensing system



Thank you!