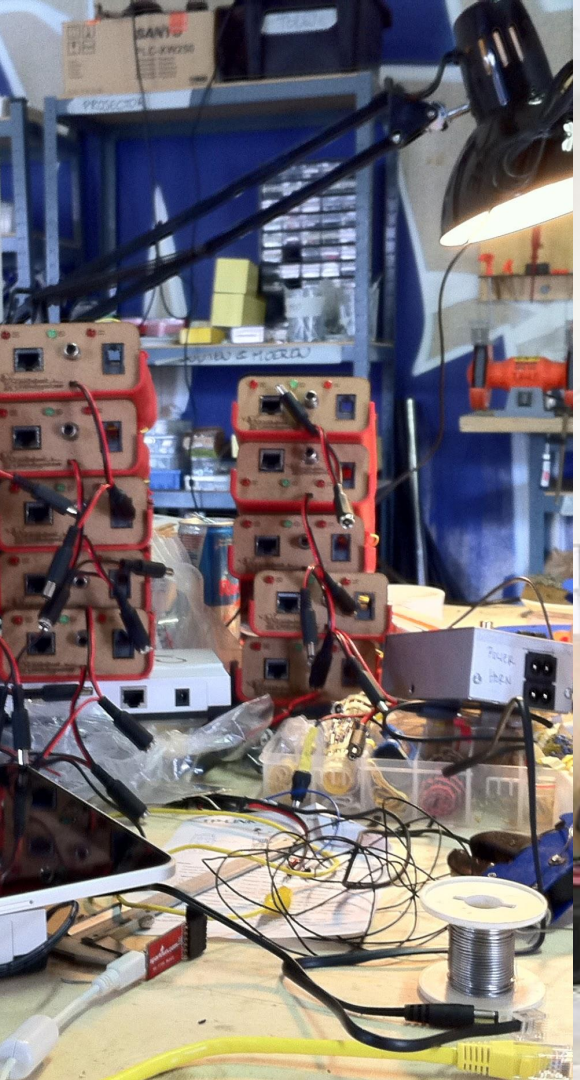
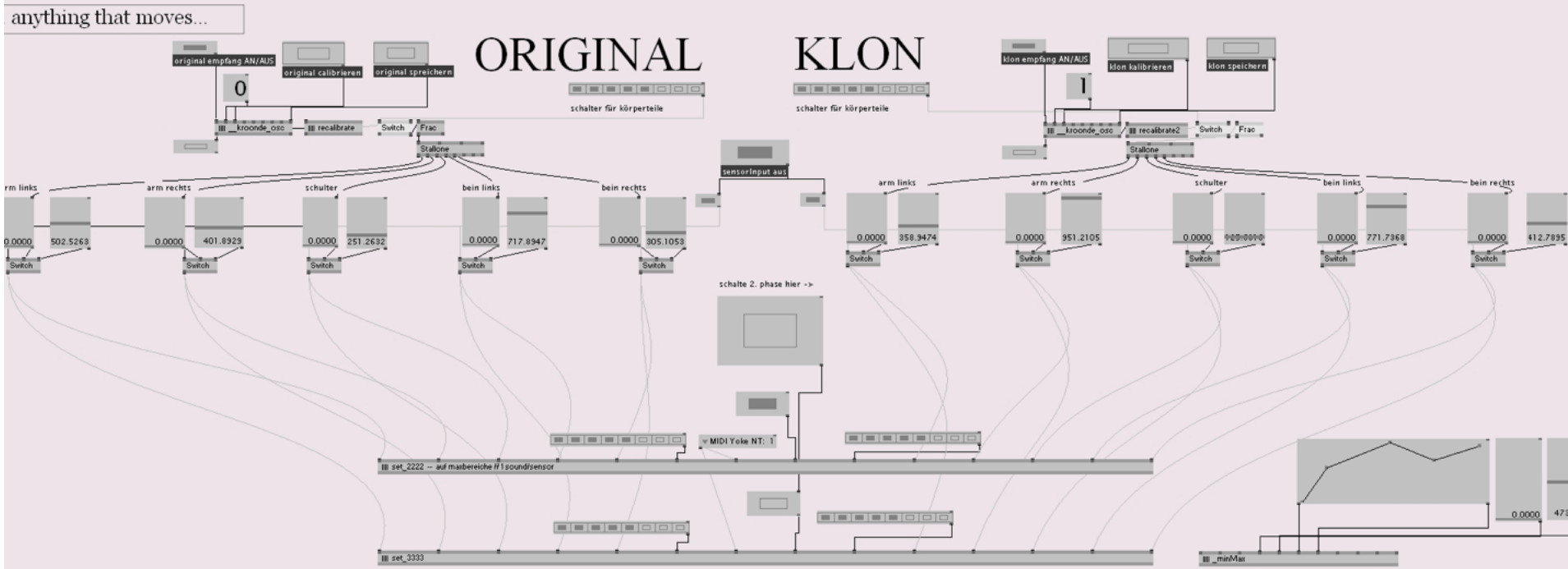
bodysensor

Using bio-feedback in VVVV

Just to say ‘hi’ :-)

Antoni Rayzhekov a.k.a Zeos
Jens Alexander Ewald a.k.a jens.a.e

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#0 – The Workshop

Time plan:

- Overview
- How To
- A Challange
- Conclusion

#1 – The Field

1.1 The technical field

- What are bio sensors
- In particular sensestage
- Make technical workings of sense/stage transparent (there are multiple options)
- open source / commercial
- Sensors types

1.1.1 What are bio sensors

Electronic devices attached to the human body capturing electro, acoustic, chemical or motion data

1.1.2 Platforms

http://sensestage.hexagram.ca

OpenHardware/OpenSource platform

http://marcodonnarumma.com/works/xth-sense

Xth Sense by Marco Donnarumma

http://medicarduino.net/?tag=biosignals

or build your own kit with arduino

1.1.2 Sensor types

Hear Rate sensor

measures the skin contrast change due to blood circulation using photodiod circuit or **ECG** - the electrical activity of the heart muscle is typically between 60 and 100BPM in rest

GSR - Galvanic Skin Response

measures the skin conducatance (slow)

EMG - Electromyography

measures the electrical charges of muscles

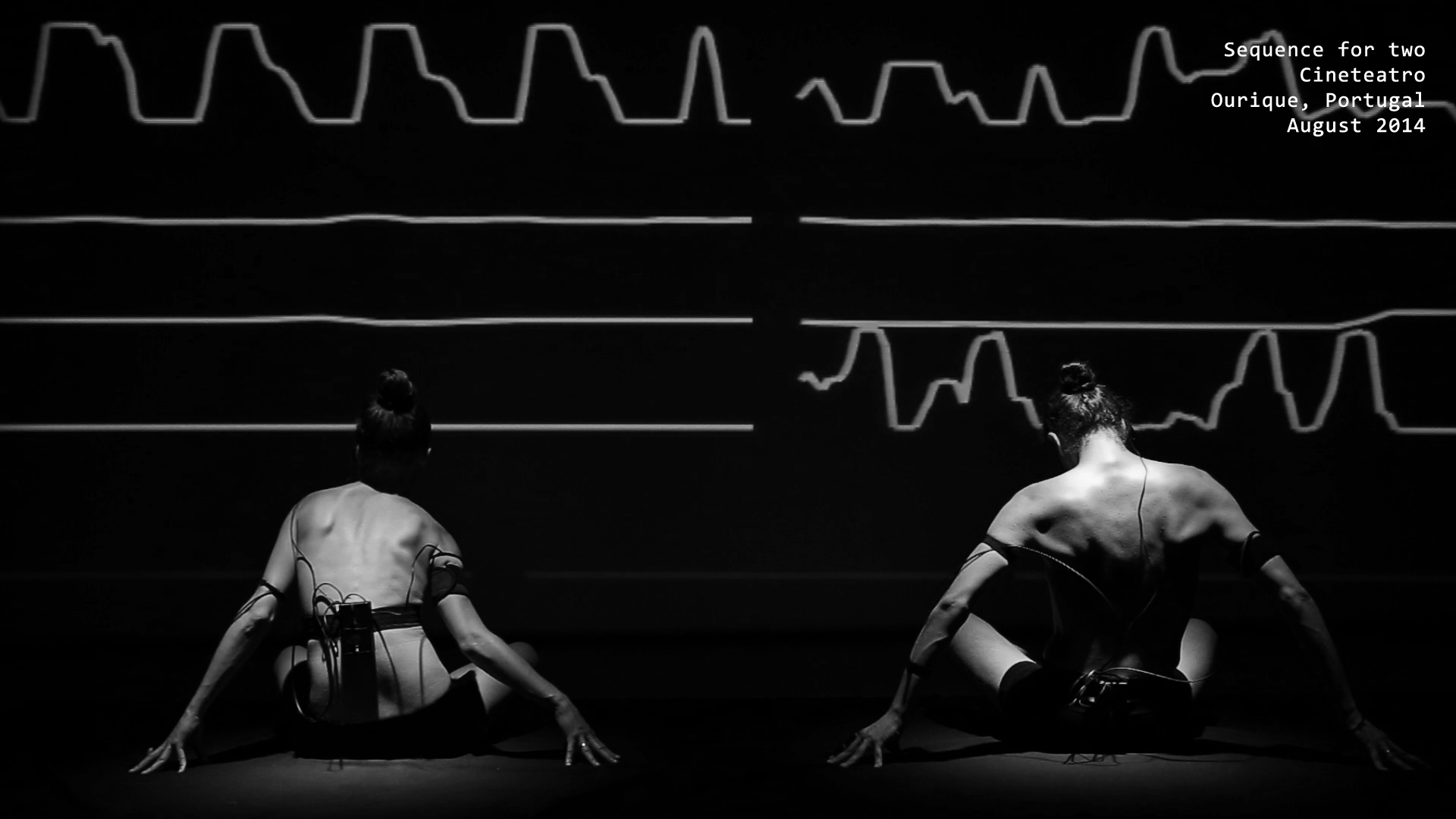
BMI - Brain Machine Interface

measures the electrical activity of the brain

Motion sensors - accelerometer, gyroscope

1.2 The field of use

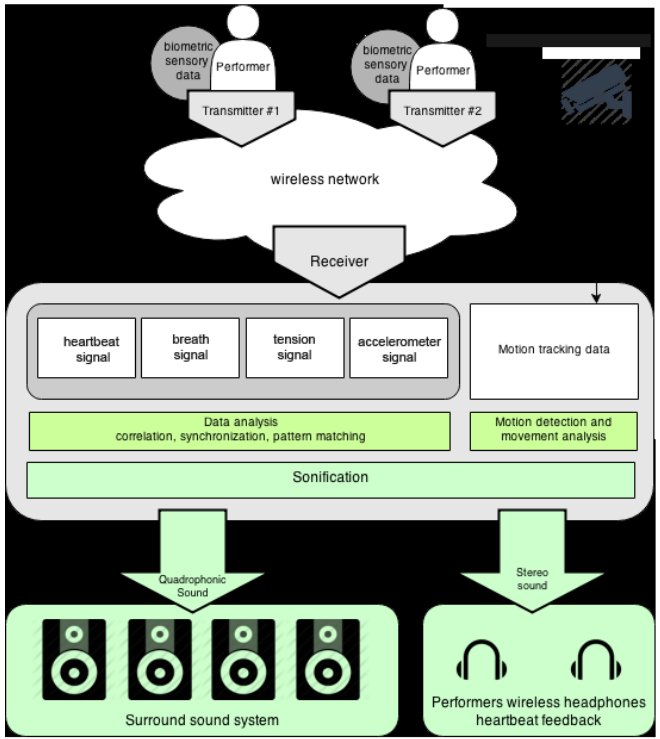
- applications in design & art
  - Introduction to 10VE Project
  - User interaction: eye tracking, gestural navigation,
- medicine, products & cognitive science
  - Brain Machine Interface
  - FitBit, Quantified Self Hype

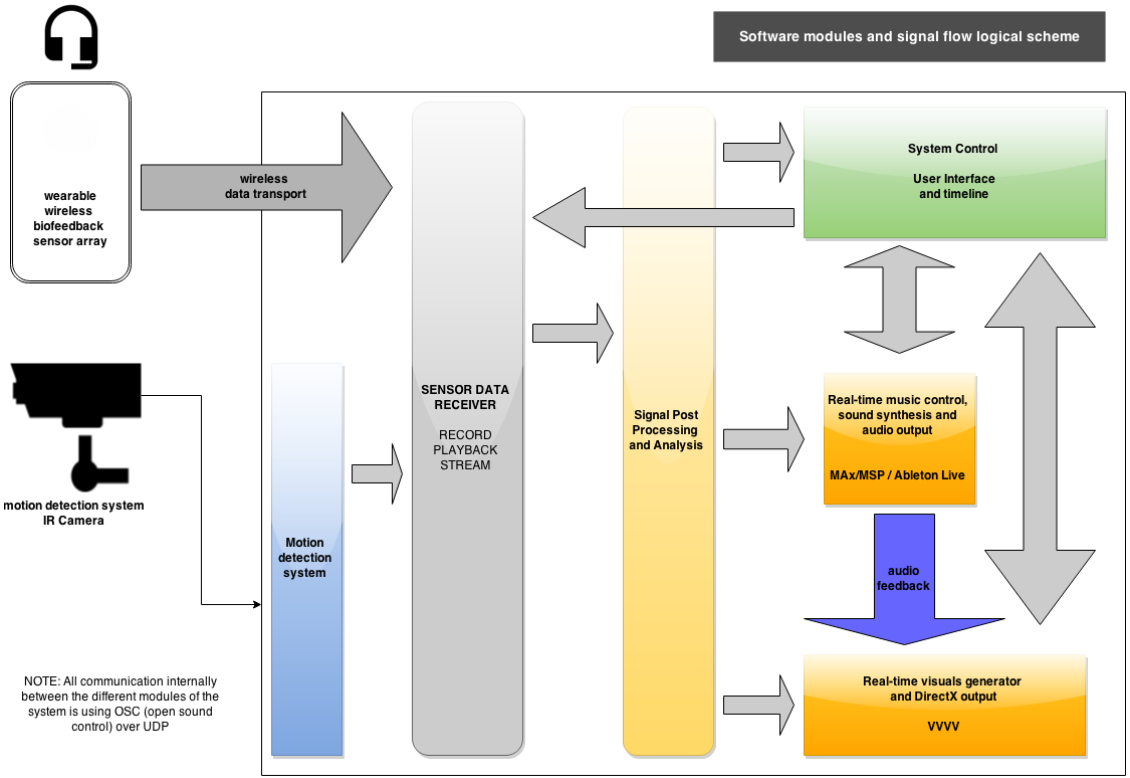

Sequence for two
Cineteatro
Ourique, Portugal
August 2014

1.2.1 10VE

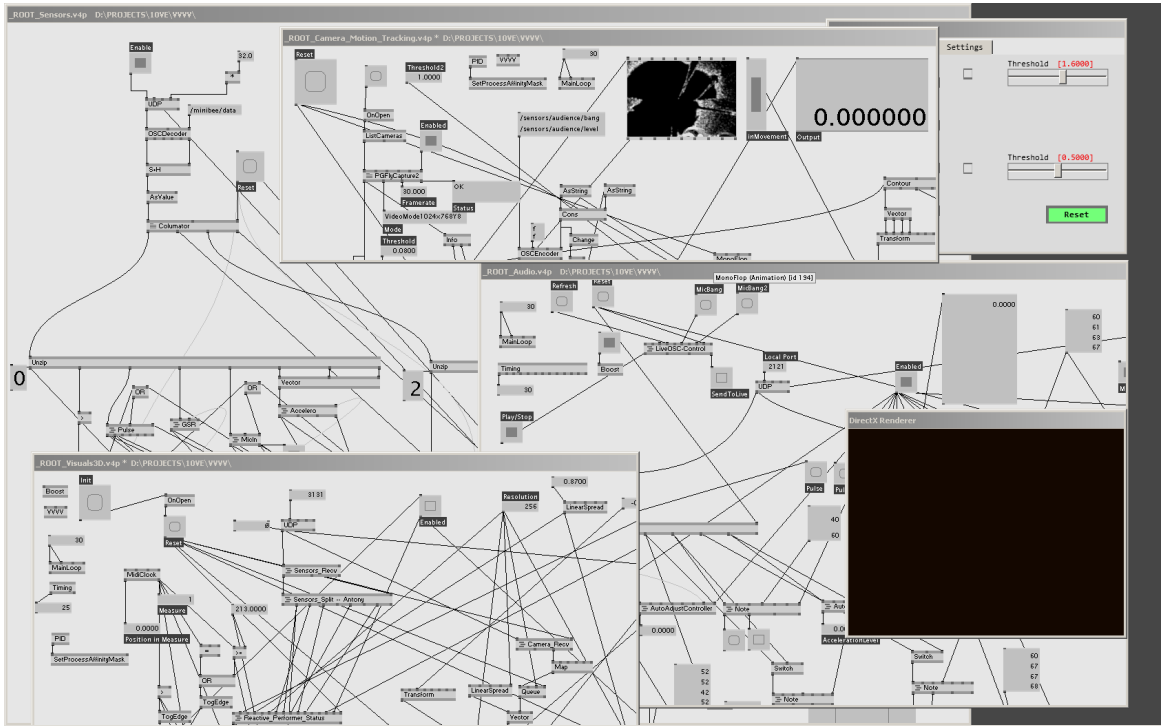
- **Hardware**
  - Wireless Sensestage controller in a DIY box
  - Sensors - heart rate, breath, GSR, 3-Axis Accelerometer, microphone
- **Software**
  - Python, VVVV, Ableton Live, Max4Live

1.2.2 10VE ARCHITECTURE





1.2.3 10VE - Software Prototype



I Layer
Processing of the biofeedback signals

II Layer
IR motion tracking of the audience

III Layer
Gathering & Interpretation of the data and controlling the sound synthesis

IV layer
3D projection mapping and generative motion graphics

#2 – How To

How to Get the Data

How To Filter (the noise)

How To Analyse

Where is all that data

The blackbox - a wearable wireless biofeedback sensor array

The whitebox - a [BioSensorReader] Module

Filters

- Get to know & Taming your signal & sensor
- The ***Hz-Thing***
- Difference of filtering & using the data
- E.g. Framedifference + floating point precession problem
- Don’t always use Damper! Try with envolope

Filter(s)

1. **LowPass** / (**HightPass)** Filter
2. **Mean / RMS** (RootMeanSquare) Moving average of N samples (RMS is always >= 0)
3. **Limiting, Thresholding**

4. **NoiseGate** – Hysteresis
5. **Standard Deviation** amplify the changes in the signal
6. **Normalization** - two simple methods
   a. on demand - using the incoming stream of data to estimate the boundaries of the signal (AutoMap)
   b. calibration - using calibration procedure to capture the min/max boundaries of the signal

Analysis

1. Statistical
   a. Threshold (best normalized signals) / Adaptive Threshold
   b. Trends (heading node)
   c. Dominant Frequency (built in DFT) -> not very high frequencies
   d. Intensity (accumulated changes over time)

2. Pattern / Phrasing
   a. Cross-Correlation (candy)
   b. Peak Detectors & Impulses (beatDetector, peakDetector)
   c. **Segmentation** of the signal - “Phrasing”
   d. $3 Dollar Gesture Recognizer (candy)

let’s have break, but ...

Split into 2 groups

Each group should elect 1 “Performer”

#3 – Going Live

- setup live setup together
- wiring a performer
- broadcast the live signals / recording sample sequences for test/development
- playground for the groups / troubleshooting for us (50 mins)

#4 – So what?

- What are the key take aways?
- What was easy?
- What was hard?
- What do you wish for?