GROMA
Programming a Permanent Multichannel Sound Installation

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7th Linux Audio Conference
Parma, April 19th, 2009
GROMA
Outline

1. Introduction

2. Artistic Concept of GROMA

3. Technical setup

4. Implementation
GROMA
Permanent Multichannel Sound Installation

- Permanent sound installation in Cologne *Rheinauhafen* area
- Combining ancient texts with environmental sounds of partner cities of Cologne
- Inaugurated in May 2008
- Done by
  - Cologne based artist Michael Scholz (idea and artistic director)
  - Judith Nordbrock (concept and sound engineering)
  - Martin Rumori (concept and programming)
  - And numerous supporters, helpers, providers, …
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Origin of the Title

- Ancient roman measuring instrument
- Used by the so called *Agrimensors* when founding a new settlement
- In the case of Cologne: still existing historical central crossroads: *Hohe Straße* and *Schildergasse*
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Measuring Instrument
Rheinauhafen
Rheinauhafen
Rheinauhafen
Rheinauhafen
Parking Lot
Underneath Rheinauhafen
Parking Lot
Underneath Rheinauhafen
Parking Lot
Underneath Rheinauhafen
Staircase
TR 5.02
Environmental sound situations of partner cities of Cologne

Two staircases (currently), corresponding to sounds from
  - TR 5.02: Rotterdam (Netherlands)
  - TR 7.02: Liège (Belgium)

Combined with ancient texts
  - Roman antiquity, for example *Ten Books on Architecture* by *Vitruvius*
  - Texts from Ancient Greece, such as *Plato*
  - Even older texts, for example from Ancient Near East
Location-specific installation
Multichannel sound projection
  ■ 12 channels for TR 5.02 (Rotterdam)
  ■ 8 channels for TR 7.02 (Liège)
Permanent installation in a recent urban development area
automatic/algorithmic arrangement of score elements
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Recording Environmental Sounds: Rotterdam Europort
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Recording Equipment

- Schoeps M/S Set
- Sanken CSS-5
- Binaural Microphones (OKM)
- Hydrophone DPA 8010 and DPA 8011
- Accelerometer Brüel and Kjær 4370
- DAT Recorders, Sounddevices Solid State Recorders
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Recording Environmental Sounds: Aquarium
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How to Organise the Sounds?

- Permanent installation
- Public space
- Commercial and residential neighbourhood
- Regular and occasional passers-by
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Development of the Score

- Sounds are categorised according to *urban functions*
  - Public space
  - Urban infrastructure
  - Nature space
  - Economic space
  - … (7 categories in total, plus subcategories)

- Category associations for texts

- Define score elements
  - *Texte* (texts)
  - *Klanginseln* (“sound isles”): stereophonic, seamlessly loopable
  - *Trajekte* (“trajectories”): full channel, static compositions
  - *Schlagwörter* (“keywords”): text fragments
Two major score states
  - Cycle of texts and *Klanginseln*
    strict algorithmic rules, but most variable in actual appearance
  - *Trajekte*
    fixed, static multichannel compositions, narrative structure

Transition between the two states:
  - *Schlagwort-Explosion* ("keyword explosion")
  - Reflects fragments of most recently played text or following text
  - Transition from “organised” to “chaotic” and vice versa
  - Affects ordering and spatial position of text fragments
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Synthetic Example Score
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Technical Setup

- 2 PC computers running 64Studio (2.x)
- RME Audio Cards, ADAT to analogue converters, multichannel amplifiers
- Optical network connection due to distance
- Racks on wheels, all pluggable connections:
  - High water risk
  - Parking lot is constructed for being flooded
- Speakers: custom design (colour issues, robust, ...)
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Rack in TR 7.02
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Speaker Layout
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Speaker by Audiance®  http://www.audiance.net
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Software Implementation Requirements

- Permanent installation: reliable and stable
- Site-specific installation: fine tuning is only possible on-site
- Flexibility for fine tuning and changes
Supercollider: stable, flexible, performant
Text-based, high level, object oriented language
→ easy implementation of algorithmic score rules
Site-specific installation:
  setup, corrections, fine tuning have to be done on-site
... possibly in winter ...
Implementation needs to provide flexibility for fine tuning and changes
→ versatile routing system corresponding to score elements
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Routing System

Trajekt player

Trajekt slot synth

Klanginsel player

Klanginsel slot synths

Text player

Text slot synths

Master synth

Loudspeaker synths

1 2 3 4 5 6 7 8 9 10 11 12
Routing

Signal processing: gain, filtering, ...

Dynamically adjustable and exchangeable at runtime

Settings of the synth graph can be saved and restored

Example: simple gain adjusting loudspeaker slot synth

```
SynthDef('gr_speaker_std', { 
    arg gain, out, in;

    Out.ar(out, gain * In.ar(in, 1));
}).writeDefFile;
```
More complex example: text slot synth with deesser

```plaintext
SynthDef('gr_slot_te_deesser', { 
    arg gain, out, in, 
    matrix = #[ 0, 0, 0, 0, 0, 0, 0, 0, 
                 0, 0, 0, 0, 0, 0, 0, 0 ], 
    preGain = 1.0, sideGain = 1.0, 
    sideFreq = 5000, compThresh = 0.5, 
    compRatio = 0.25, compAttack = 0.002, 
    compRelease = 0.01; 

    Out.ar(out, matrix * Compander.ar( 
        in: preGain * In.ar(in, 1), 
        control: HPF.ar(In.ar(in, 1), 
                         sideFreq, sideGain), 
        thresh: compThresh, slopeBelow: 1.0, 
        slopeAbove: compRatio, 
        clampTime: compAttack, 
        relaxTime: compRelease, 
        mul: gain)); 
}).writeDefFile;
```
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Soundfile Playback

- **GrTrack** and **GrPlay** classes
- **Based on DiskIn unit generator**, extended by a looping function
- **play method** provides database lookup for soundfile class, available slots, duration, ...

```plaintext
play { arg name, slot = 0, start = 0.0, 
     env = nil, duration = nil, 
     fadeTime = 0.1, loop = 0, run = true, 
     action = nil; 

... 
```
Score rules implemented using *Patterns* and *Streams*

Algorithmic series of soundfiles

Weighted random functions for selection processes

*Schlagwort-Explosion*

- Two streams: one organised, one chaotic stream of text fragments
- random selection with gradually changing weight
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Realtime Score vs. Pregenerated Score

- Realtime score implementation possible and easy
- ..., as long as there is only one machine!
- Synchronisation issues are non-trivial
- → pregenerated score
- conceptually (maybe) different, phenomenologically ...
  probably not too much ...
- Eternity?
THANK YOU!

http://www.groma-net.de