The Spherical Glitch Studies

Timothy Schmele
Multimedia Technologies Unit
Eurecat. Centre technòlogic de Catalonia
Barcelona, Spain

Institut für Musikwissenschaft and Musikinformation (IMWI)
Hochschule für Musik
Karlsruhe, Germany
Contents

• Spherical Glitch Study I (2016) & II (2018)
• Spatial sound synthesis techniques
• Spatial Synthesizer
“Spatial composition”

• Primary focus on external physical space

• Compositions that incorporate related aspects of sound into the compositions process: direction, location, extent, envelopment, room acoustics, etc…

• Varèse’s Poème électronique

• Stockhausen’s Gesang der Jünglinge

• Nono’s Prometeo
Spherical

- Full listening sphere around the listener
- Ambisonics & VBAP
Glitch

• Taken from “popular music” culture

• Kim Cascone: *post-digital*, focus on failure and looking *behind* a technology:
  
  “The medium is no longer the message in glitch music: the tool has become the message.”

• Feedback loops to amplify a system’s specific characteristics
Study

- Most famously used in Stockhausen’s *Studie I & II*

- A title that suggests that the piece was done with the purpose of practice and investigation of a particular technique or approach
Spherical Glitch Studies

• Intended to investigate space as a compositional parameter and the technologies associated with it

• Basic starting sound material: sine tone, noise,…

• Sound design through spatial manipulation

• Space (sensation) creation through feedback

• Performative or installation pieces (drone aspects)
Background

- Hemispherical Glitch Study (2013)
- Indirect result of my master’s thesis from 2011
- Created by “breaking” the rapid panning modulation synthesis (RPMS) technique
RPMS

- Pair-wise, two dimensional panning at audio rate (<20kHz)

Fig. 1. Curves showing loss vs. shaft rotation of a typical two-circuit differential junction network. The cross-over point for the two losses is at -3 db.
Gestural synthesis

- At ~2-3 rotations per second, movement is usually difficult
- At ~5-15 rotations per second sound is omnipresent
- Sound is constantly decorrelated
- Patterns in space emerge as constructive overlap occurs in specific directions
Spatial Synthesis

• Spectral Distributors: Kim-Boyle (2008), James & Hope (2013)


• Oli Larkin (2017) Microsound Synth

• Environmental sound synthesis (Verron et. al. 2010)
Spatial Synthesis

- Marnix de Nijs & Edwin van der Heide (2010) *Spatial Sounds (100dB at 100km/h)*
- Schumacher & Bresson (2010) *Spatial sound synthesis in computer-aided composition*
- Ryan McGee (2015) *Spatial modulation synthesis*
Spherical Glitch Study I

- Rotation of a sine tone (~50Hz) at high angular velocities up to 20000 rotations/s
  - around 3 axes
  - second detuned sine tone introduced at 180° offset
- Feedback a discretized representation back into the encoded ambisonic stream
  - Rotate before feedback
Spherical Glitch Study I

- **Rapid Rotation Modulation Synthesis (RRMS)**
- A modification of RPMS, where rotation matrices are implemented in audio rate
Spherical Glitch Study I

- Compositional approach done using “snapshots” using Max’ `pattr` system
- Interpolation between saved parameter configurations
- Non-linear exploration of parameter space
Spherical Glitch Study I

- Feedback implemented by re-encoding each discretization point along the sphere
- Feedback amplifies rotation and discretization artifacts
Spherical Glitch Study I

- Snapshots predefined and ordered
- Introductory structure, easing the audience into the method and composition
- Performance interpretation based on
  - base frequency adaption to room/system
  - interpolation through parameter space based on room acoustic behavior
Spherical Glitch Study II

• Conceptually orthogonal to the first study
  • pure tone – white noise
  • continuity – discreteness
  • cohesive – modular
  • predefined snapshots – stochastic processes
  • human control – automated progression
  • …
Spherical Glitch Study II

- Exploration of noise and spatialization
- Personal challenge to make white noise interesting (using spatialization)
- Modularity breaks composition up into micro-compositions
- Work in progress… forever?
- Playground to test new ideas on the subject
Spherical Glitch Study II

• Predefined by a single second of white noise
  • Written into central buffer
  • Any random number taken from buffer in strict sequence
  • Any audio played from buffer exclusively
  • Dichotomy between the random and the predetermined
Spherical Glitch Study II
Spherical Glitch Study II

- Modularity
  - Modules define their own time
  - Time grid (bpm) fixed
  - Never overlap
  - Modules share spatialized sources
- Mostly decide
  - Spatialization
  - Buffer read position, length and speed
Spherical Glitch Study II
Spherical Glitch Study II
Spherical Glitch Study II

Mic Feed

Single Speaker Decoding

VBAP

RMS Measure

Multichannel Out

Positioning
Spatial Synthesizer

RPMS → RRMS → Virtual Loudspeakers → Spatialized Parameters
References


Jeschke, Lydia “Prometeo: Geschichtskonzeptionen in Luigi Nonos Hörtragödie”, Franz Steiner Verlag, Stuttgart, Germany, 1997


McGee, Ryan.“Spatial modulation synthesis” in Proceedings of the International Computer Music Conference (ICMC), Denton, TX, USA, September 25th – October 1st 2015


