The Project Audio-Miner
Adaptive signal representations
Time-frequency Multipliers
Sparsity and structured representations

Music processing at NuHAG

Dörfler, Monika [1]
monika.doerfler@univie.ac.at

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[1] Funded by Locatif (FWF Austria) and Audio.Miner (WWTF Vienna)

LOCATIF & AudioMiner

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LOCATIF: Local aspects of time-frequency analysis.

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Investigation of analysis systems (frames) that allow for local adaptation, e.g. nonstationary frames, quilted frames.

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AudioMiner: Applications of results in MIR:
Detection, classification and processing of sound objects

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Mathematics $\longleftrightarrow$ MIR - both ways!

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- Central question: Can mathematics help improve methods in MIR & can "feed-back" from MIR improve mathematical models.

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- Three central mathematical themes:
  - Adaptive signal representations
  - Time-frequency Multipliers
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- Particular focus on identification and extraction of sound objects from (polyphonic) audio
- Three central mathematical themes:
  - Adaptive signal representations
  - Time-frequency Multipliers
  - Sparsity and structured representations
- MIR tasks: identification, extraction & classification of sound objects

Audio-Miner

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- Project duration: 3 years (2010-2012)

- Partners: Digital Music group at Queen Mary University, London (Simon Dixon)
  LATP University Marseille (Bruno Torresani)

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- Project duration: 3 years (2010-2012)
- One PostDoc (mathematician) at Nuhag, one PostDoc at OFAI
  - Martin Gasser (OFAI): 2010 (Music Similarity, Hubs)
  - Gino Velasco (NuHAG): January-July 2010 (Adaptive representations)
  - Ewa Matusiak (currently: Technion, Haifa): September 2010-2012 (Theoretical aspects of adaptivity)
  - Thomas Grill (currently at Ircam): 2011, 2012 (half-time) (spectro-temporal aspects of similarity, textures)
  - Arthur Flexer (similarity, classification)
  - Kai Siedenburg (structured sparsity in audio)
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Adaptive signal representations

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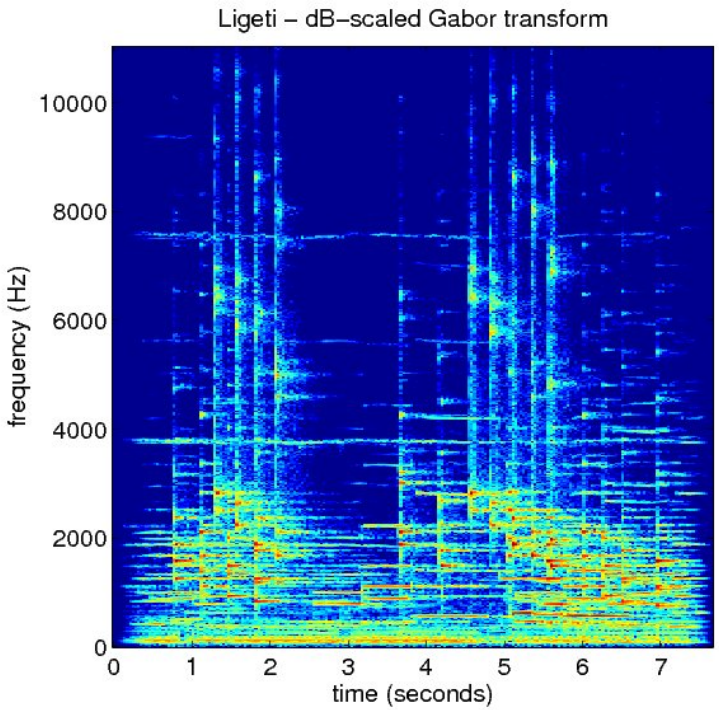

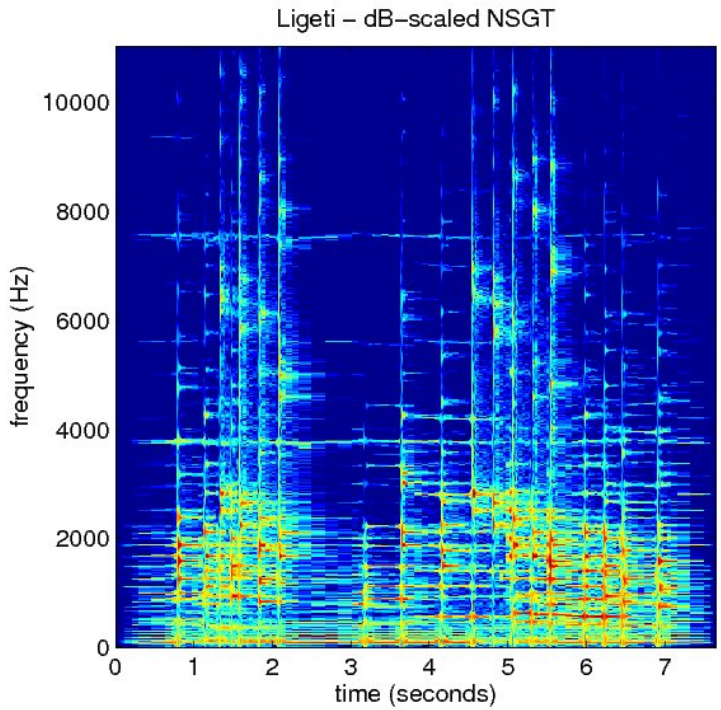

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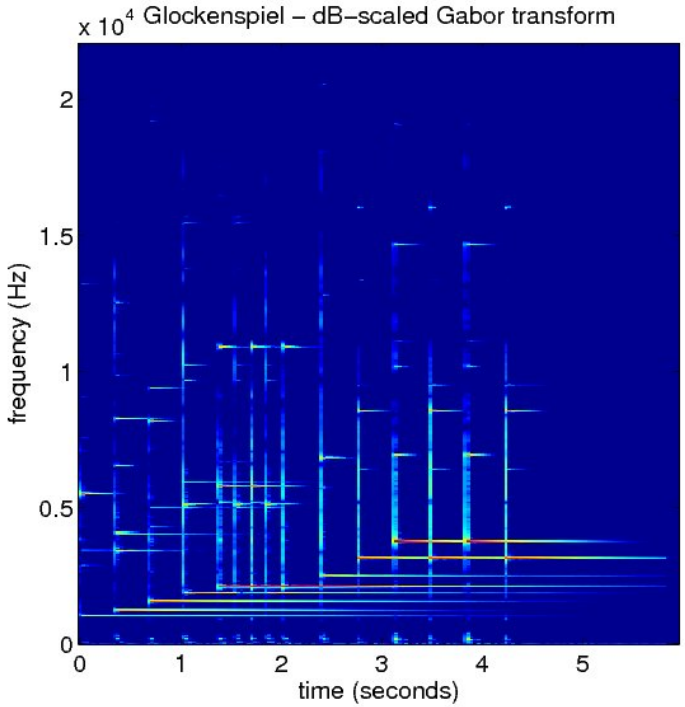

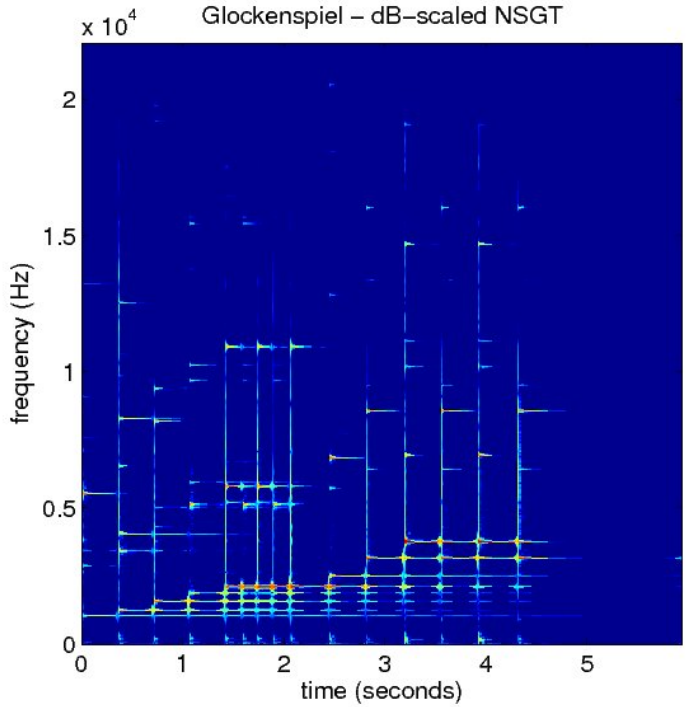

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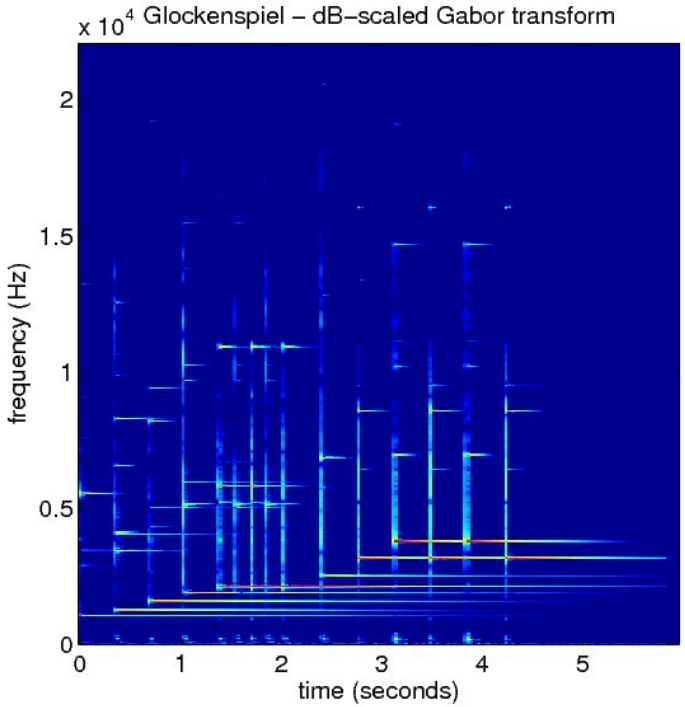

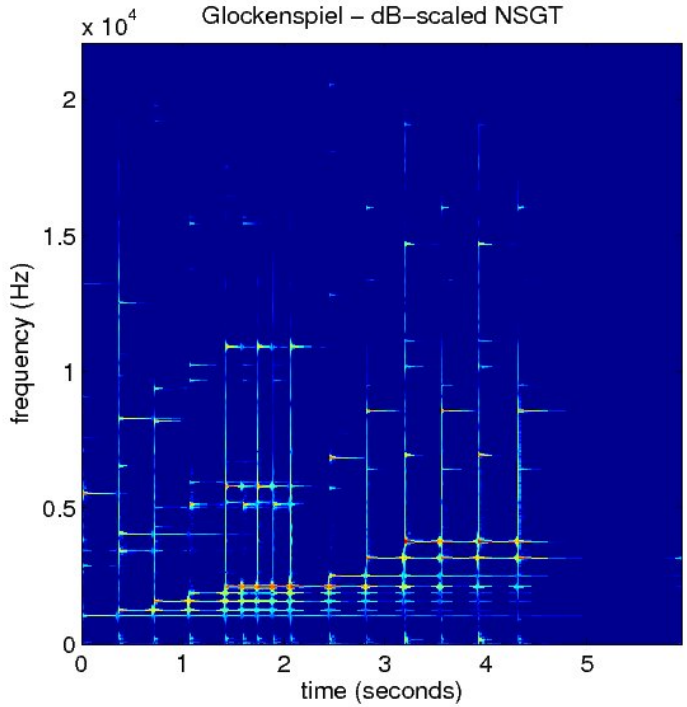

Time-frequency Multipliers

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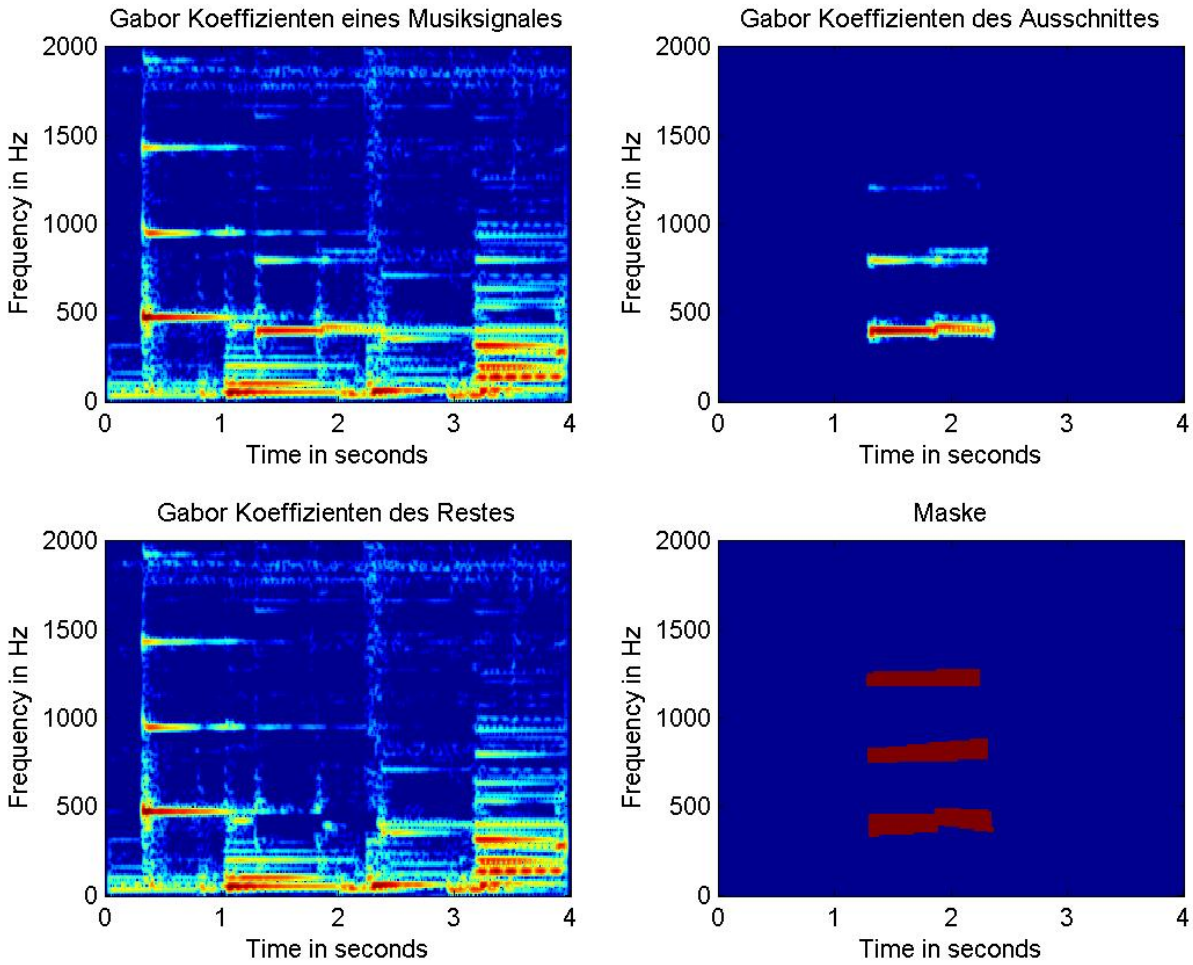

(*Listen!*)

Sparsity and structured representations

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`http://homepage.univie.ac.at/monika.doerfler/StrucAudio.html`

Kai Siedenburg and Monika Drfler: *Structured Sparsity for Audio Signals*, DAFx-11, Paris (2011)

- Regression problems with mixed-norm priors on time-frequency coefficients lead to structured, sparse representations of audio signals.
- Systematic formulation of thresholding operators allows for weighting in the time-frequency domain
- Related iterative algorithms are evaluated on synthetic and real-life audio signals in the context of denoising and multi-layer decomposition.
- Results on the influence of the shape of the weighting masks