

GUEST EDITORS' NOTE

Special Issue on New Trends in Audio Effects

With the ubiquitous diffusion of computers and dedicated digital audio hardware, digital audio effects have acquired a paramount relevance. In the process, related scientific communities, such as DAFx, produced a wealth of very advanced results. DAFx started as an European Union cooperation project, with the first conference being held in 1998.

The yearly DAFx meetings are the connecting events for this community, which combine signal processing with audio applications. The crossbreeding of several disciplines from mathematical and numerical methods to physical models, the inclusion of audio processing and sound modeling has shown broad innovation in research and applications. In recent years, in particular, through the use of machine learning approaches, new and surprisingly effective methods have been designed. Through the use of virtual circuits, digital replicas of vintage analog electronics audio equipment can be realized. New models for sound spatialization are being discovered with particular attention to virtual reality applications and beyond. Numerous other developments exist.

For the second time in a row, because of the coronavirus pandemic, a DAFx conference in the 2020s had to be realized as virtual, although it was conceived to be held in person—hence the acronym DAFX20in21. Still, the conference was able to demonstrate that, in spite of the circumstances, the DAFx community has grown to be a tight and strong one.

The conference focused on topics such as

- Virtual Analog,
- Analysis and Manipulation,
- Audio Processing and Effects,
- Physical Modeling,
- Spatial Audio and Artificial Reverberation,
- Synthesis, and
- Machine Learning and Music Information Retrieval.

DAFx20in21 was chaired by Prof. Gianpaolo Evangelista of the University of Music and Performing Arts (MDW), Vienna, and organized by a team of people spanning several institutions in Vienna where active research on Sound and Music Processing and Acoustics is performed:

- The Institute for Composition, Electroacoustics and Sound Engineers' Education (IKE) at MDW,
- The Institute for Music Acoustics (IWK, Wiener Klangstil) at MDW,
- The Acoustics Research Institute (ARI) at the Austrian Academy of Science, and

- The Numerical Harmonic Analysis Group (NuHAG) at the Vienna University.

The members of the local (but virtual) organizing committee were as follows:

- Gianpaolo Evangelista (MDW),
- Peter Balazs (ARI),
- Monika Dörfler (NuHAG),
- Nicki Holighaus (ARI),
- Adrián Artacho Bueno (MDW),
- Tommsch Mejschtrik (UniVie),
- Konstantin Ulitsch (ARI), and
- Piotr Majdak (ARI).

We invited participants of DAFX20in21, especially the authors and winners of the best papers awards, to submit to this special issue in the Journal of the Audio Engineering Society. We welcomed both original research papers and tutorials in one or more of the following topics:

- Capture and analysis of audio and music,
- Representation, transformation, and modeling of audio Signals,
- Audio transmission and resynthesis,
- Effects and manipulation of sound,
- Perception, psychoacoustics, and evaluation,
- Spatial sound analysis, coding, and synthesis,
- Sound source separation,
- Physical modeling, virtual acoustic and analogue models,
- Sound synthesis, composition and sonification,
- Hardware and software design for audio effects, and
- Music information retrieval and intelligent audio engineering.

Submissions were judged based on the academic quality, novelty, and relevance to the topic of digital audio effects.

CONTENT OF THIS SPECIAL ISSUE

This special issue contains 11 articles that focus on very diverse aspects of music audio, ranging from physical models to sound source separation, from sparse signal representations to additions to the theory of bandlimited signals, from equalization to special effects, and from non-linear processing to machine learning:

- “Dynamic Grid: Time-Varying Parameters for Musical Instrument Simulations based on Finite-Difference Time-Domain Schemes” by Silvin Willemsen, Stefan Bilbao, Michele Ducceschi and Stefania Serafin,

- “Conditioned Source Separation by Attentively Aggregating Frequency Transformations with Self-Conditioning” by Woosung Choi Yeong-Seok Jeong, Jinsung Kim, Jaehwa Chung, Soonyoung Jung, and Joshua D. Reiss,
- “Nyquist Band Transform: An Order-Preserving Transform for Bandlimited Discretization” by Champ Darabundit, Jonathan Abel, and Dave Berners,
- “Antialiasing for Simplified Nonlinear Volterra Models” by Christopher Bennett and Stefan Hopman,
- “The Fast Local Sparsity Method: A Low-Cost Combination of Time-Frequency Representations Based on the Hoyer Sparsity” by Maurício do Vale Madeira da Costa and Luiz Wagner Pereira Biscainho,
- “Style Transfer of Audio Effects with Differentiable Signal Processing” by Christian J. Steinmetz, Nicholas J. Bryan, and Joshua D. Reiss,
- “Loudspeaker Equalization for a Moving Listener” by Joel Lindfors, Juho Liski, and Vesa Välimäki,
- “Phase-Aware Transformations in Variational Autoencoders for Audio Effects” by Mateo Cámara and José Luis Blanco Murillo,
- “Deep Audio Fx for Snare Drum Recording Transformations” by Matthew Cheshire, Jake Drysdale, Maciej Tomczak, Sean Enderby, and Jason Hockman,
- “Word Embeddings for Automatic Equalization in Audio Mixing” by Satvik Venkatesh and Devon Plymouth, and
- “A Comparative Study of Music Mastered by Human Engineers and Automated Services” by Mitchell Elliott and Son Hui Chon.

The first three articles are extended versions of papers presented at DAFx20in21. In particular, the first paper by Silvin Willemsen et al. is an extended version of the combo submissions that won the best paper award at DAFx20in21.

CONCLUSIONS

This special issue features a broad sample of the ongoing research in the field of digital audio effects. We hope that this collection will stimulate further research in this growing field and will contribute to broaden the active participation in the annual series of DAFx conferences. This year, an in-person edition of DAFx, DAFx20in22, will take place in Vienna (for more info, please see <https://dafx2020.mdw.ac.at/>). In 2023, DAFx will land in Copenhagen.

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