THE ORIGINS OF DAFX AND ITS FUTURE WITHIN THE SOUND AND MUSIC COMPUTING FIELD

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ABSTRACT

DAFX is an established conference that has become a reference gathering for the researchers working on audio signal processing. In this presentation I will go back ten years to the beginning of this conference and to the ideas that promoted it. Then I will jump to the present, to the current context of our research field, different from the one ten years ago, and I will make some personal reflections on the current situation and the challenges that we are encountering.

1. ORIGINS OF DAFX

The International Conference on Digital Audio Effects is celebrating its 10th anniversary. None of the researchers that more than ten years ago were involved in the creation of the conference would have ever expected to be celebrating this anniversary. In the name of the promoters of DAFX I would like to thank all the participants to these conferences for supporting it and especially I want to congratulate the organizers of these ten meetings for making it happen.

The DAFX was started as part of a European project for cooperation and scientific transfer, named Digital Audio Effects, which lasted from 1997 to 2001. The project was coordinated by the French researcher Daniel Arfib and its main objective was to provide a synthesis of what can be done in the digital processing of sounds, and its application to music. The project resulted in two successful initiatives, the DAFX book [1] and the DAFX Conferences (more information can be found in http://www.dafx.de/).

The DAFX book, edited by Udo Zölzer, came out in 2002 and in a short time it became a major reference. It covers the main topics of digital audio effects, such as the basics for digital filters, modulations, non-linear processing, spatial effects, the more advanced topics in audio processing based on time-segment, time-frequency, source-filter, spectral analysis, time-frequency warping and also a topic on control issues and another on the new techniques of bitstream processing. One of the main reasons for its success lies in its practical approach and in all the MATLAB code, which makes it easy for someone getting into the filed to try out the algorithms while understanding the theory behind them. Udo Zölzer did a great job in promoting a unified style from all the contributors and also in carrying out a careful overall editing.

The DAFX conference was started as an international meeting of researchers interested in the theory and practice of digital sound processing and its applications. The goal of the conference was to offer both an overview of the field and an in-depth discussion of current research and future directions. The first scientific committee of the conference included the partners of the EU project. I became the chairman of the DAFX-98 in Barcelona, and since then the chairmen have been: Jan Tro (DAFX-99, Trondheim), Davide Rocchesso (DAFX-00, Verona), Mikael Fernström (DAFX-01, Limerick), Udo Zölzer (DAFX-02, Hamburg), Mark Sandler (DAFX-03, London), Gianpaolo Evangelista (DAFX-04, Naples), F. Javier Casajús (DAFX-05, Madrid), Philippe Depalle (DAFX-06, Montreal) and Sylvain Marchand (DAFX-07, Bordeaux). Each organizer has taken the previous conference a step further and thus this year conference is quite different from the first one.

Going back to the beginning, the first major discussion within the scientific committee was in defining the scope of the term Digital Audio Effects. With a narrow perspective it would only include what is commercially known as "Digital Audio Effects Processors" and the technologies behind them. But we found it more appropriate to widen the perspective, including all the digital processes that have a sound as input and their output is a signal useful for audio and music applications. We decided that topics that could be covered in the conference included: Filtering, Modulation, Delay, Non linear processing, Time/Frequency scaling, Spatialisation, Sound analysis, Spectral processing, Audio coding, Hardware, and Software implementations. We were particularly interested in the new research development, that are extending the traditional low level sound processing found in most commercial products towards higher level processing techniques, techniques that could be described by the term "Content Based Processing".

Looking at the call for papers and the final proceedings of all the ten conferences we can observe that it has evolved. The scope of the conference has expanded, new topics have been incorporated and new challenges are being tackled. It is important that DAFX reflects the state of the art of the field and it continues to evolve by being sensitive of its context.

2. SOUND AND MUSIC COMPUTING CONTEXT

The topics being presented and discussed at DAFX can be considered part of what is now called Sound and Music Computing (SMC). A good overview of this research field is the Roadmap funded by the EU and elaborated by the S2S2 consortium [2]. The Roadmap document covers quite a number of issues but one of the main contributions is the definition of the actual field of research. In the Roadmap it is stated that the SMC research approaches the whole sound and music communication chain from a multidisciplinary point of view, and that by combining scientific,

technological and artistic methodologies it aims at understanding, modeling and generating sound and music through computational approaches.

The sound and music communication chain covers all aspects of the relationship between sonic energy and meaningful information, both from sound to sense (as in musical content extraction or perception), and from sense to sound (as in music composition or sound synthesis). The disciplines involved in SMC cover both human and natural sciences. Its core academic subjects relate to musicology, physics (acoustics), engineering (including computer science, signal processing and electronics), psychology (including psychoacoustics, experimental psychology and neurosciences) and music composition. Most SMC research is quite applied and current areas of application include digital music instruments, music production, music information retrieval, digital music libraries, interactive multimedia systems, auditory interfaces and augmented action and perception (e.g. bionic ears, digital prosthesis and multimodal extensions of the human body).

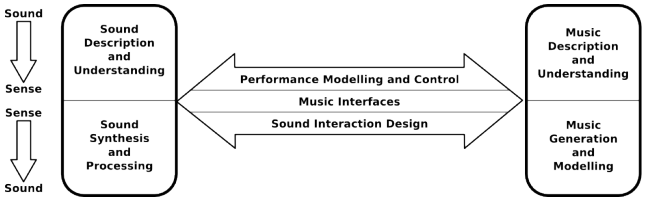

Figure 1: *SMC research areas (from [3]).*

Figure 1 depicts the relationships between the different SMC research areas. It makes a basic distinction between research that focuses on sound (left hand side), research that focuses on music (right hand side) and the research fields that address the interaction between the two. For each research field, there is an analytic and a synthetic approach. The analytic approach goes from encoded physical (sound) energy to meaning (sense), whereas the synthetic approach goes in the opposite direction, from meaning (sense) to encoded physical (sound) energy. Accordingly, analytic approaches to sound and music pertain to analysis and understanding, whereas synthetic approaches pertain to generation and processing. In between sound and music, there are multi faceted research topics that focus on interactional aspects. These are performance modeling and control, music interfaces, and sound interaction design.

DAFX covers quite a big part of the SMC field, and together with the International Computer Music Conference (ICMC), the International Conference in Music Information Retrieval (ISMIR) and the International Conference on New Interfaces for Musical Expression (NIME), DAFX represents quite well the core of the SMC research community.

The development of audio systems cannot be approached just from a signal processing perspective and the needed inderdisciplinarity approach to solve the problems discussed at DAFX is quite clear. The disciplines involved in SMC range from the natural sciences like physics and acoustics through mathematics, statistics and computing, all the way to physiology, psychology and sociology. The increased recognition of SMC and of the multidisciplinarity fields in general should help DAFX to position itself as a research conference with a specific personality.

3. SOME CHALLENGES

The SMC Roadmap identifies two broad research challenges: (1) To design better sound objects and environments and (2) To understand, model, and improve human interaction with sound and music.

The first challenge relates to the fact that many current electronic devices, not just the audio ones, incorporate sound systems in them and thus the improvements in the sounds produced by all these devices present in our environment will enhance our quality of life. Thus our society will benefit from the development of new musical instruments, new technologies for delivering sounds, new sound modeling strategies, new sonic spaces, an also from a better control of the environmental sound and its pollution consequences. The DAFX community should be proactive in developing the core technologies to face this challenge.

The second challenge is concerned with the issue that truly useful and rewarding machine-mediated sonic environments and services will require a better understanding of human interaction with sound and music in all its breadth, including perceptual, cognitive, emotional, bodily and social aspects. We need to develop computational models of auditory perception and cognition, new perception paradigms and technologies for bridging the semantic gap in music. We also need to better understand the expressive issues of sound communication and the relation between perception and action.

The SMC Roadmap also identifies more contextual challenges of relevance here. Beyond the research issues, the DAFX community needs to worry about education, social aspects and also about technology transfer. The increasing need for specialists in our field requires a decisive growth in the size and quality of existing educational programs and the creation of appropriate new ones. Thus we need to appropriately educate our future researchers. Also social concerns have to play an important role in our research decisions. For example we must be able to empower users, putting the relevant choices and decisions into the hands of the individual. Finally the improvement of the technology transfer requires especial efforts. A large part of our research is devoted to applications that can be directly exploited in the arts, in industry and in society at large. Proper knowledge transfer can lead to successes whose size and impact are bound to be very large.

4. CONCLUSIONS

DAFX and its community have played an important role in the development of the Sound and Music Computing field and it definitely has the potential for continuing to do so. This 10th anniversary is a good moment to reflect on what we are, on our role within the larger research community and on the challenges that we have in front of us. I have tried to give my personal view on this and I just hope to have triggered some discussion within our research community.

5. REFERENCES

[1] Zölzer, Udo. Ed. *DAFX - Digital Audio Effects*. John Wiley & Sons, 2002. ISBN: 0-471-49078-4

[2] X. Serra; M. Leman, and G. Widmer, Eds., *A Roadmap for Sound and Music Computing*. 2007 ed. The S2S Consortium. http://www.soundandmusiccomputing.org/roadmap/.