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pysofaconventions, a Python API for SOFA

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ABSTRACT

Spatial audio is a research field with an active development, motivated by the advances in Augmented and Virtual Reality. One of the main building blocks for spatial audio and acoustic research is the availability of real, measured impulse responses. The SOFA convention (AES69-2015) is a standardized file format for the storage of such data, with a widespread support among the research community. In this work we present pysofaconventions, a full implementation of the SOFA specification for the Python programming language.

1 Introduction

The interest on spatial audio has increased in last years, due to the advent and popularization of Virtual and Augmented Reality (VR/AR) technologies. In this context, the binaural technology [1], which allows to reproduce 3D sound trough headphones, has attracted significant interest from both industry and academy.

Binaural reproduction is based on the so called Head-Related Transfer Functions (HRTFs), which are the filters that model the human anatomic response to sounds coming from different positions around the listener. HRTFs can be combined with *dry* signals by means of convolution, producing realistic sound scenes. Consequently, the availability of such filters is of the outermost importance for the generation of immersive audio through headphones.

HRTFs can be obtained from recordings with human subjects or dummy heads. In order to facilitate data interoperability and reusage, the Spatially Oriented Format for Acoustics (SOFA) convention [2] has emerged as the *de facto* standard for HRTF data and related measurements. SOFA has been also standardized as the AES69-2015 standard [3].

On the other hand, Python is nowadays becoming one of the most popular programming languages [4, 5]. Its popularity is also widespread among scientists and engineers, being for example the most chosen language for the arising Machine Learning field [6]. Therefore, the creation of a Python package which implements the SOFA standard may be of interest for the audio research and engineering community.

2 Implementation

The resulting implementation has been named *pysofaconventions*. For ease of installation, it is integrated in the standard python package manager Pypi. The project website, including the source code and the examples, can be accessed at [7]. At the moment of writing, the library version is 0.1.5.

The library structure is inspired by the C++ implementation by T. Carpentier [8]. It features all functionalities described by SOFA version 1.0, plus the proposed AmbisonicsDRIR convention [9]. The implementation is based on extensive error-checking, to ensure and maintain consistency of the standards.

Several example files are included in the project, which serve as reference implementations. They cover a wide range of usages, including file reading, binaural audio rendering, plotting or file writing.

3 Conclusions

In this article we have presented *pysofaconventions*, a Python API for the SOFA convention. This work has been motivated by the growing interest on spatial audio and binaural reproduction, on the one hand, and the increasing popuparity of the Python programming language, on the other hand.

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