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COMPUTER SOFTWARE AND HARDWARE FACILITIES FOR MULTI-CHANNEL AUDIO SIGNALS QUALITY CONTROL

Abstract

In the work considers the features of digital hardware-software devices designed to measure the quality of a multichannel sound signal. The use of such methods makes it possible to measure spectral and magnitude distortions, optimally in the processing and recording signals. The use of the multichannel system modules, makes it possible to measure the sound level in surround sound systems.

Keywords:

Multichannel digital devices; digital audio recording; processing and recording of signals; spatial sound systems; python

Nowadays, all existing analog audio recording and reproduction systems require precise control and determination of their quality parameters. The use of computer control devices for sound quality and inter-channel correlation are required for recording and playing audio signals in digital audio devices and combined computer audio systems. [1,2]

However, state-of-the-art software facilities provide extensive capabilities for processing audio signals by algorithmic methods. Dynamic semantics and dynamic linking in python programming language is convenient way for quick application development as well as means of combining existing components. Python supports libraries and module packages, facilitating code scaling and the reuse. The Python interpreter and standard libraries are available in both co-compiled and source form for all major platforms. [4]

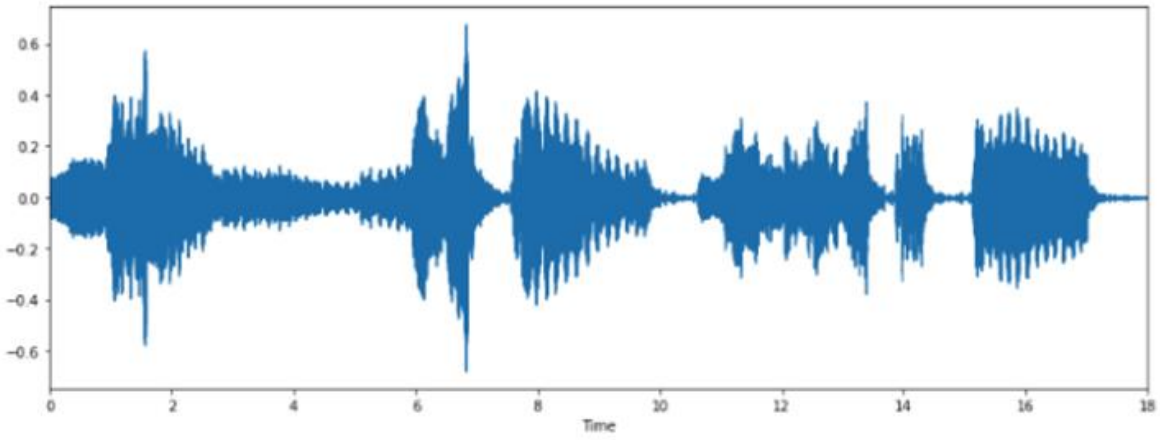
The purpose of the work is to create software tools and methods for measuring the quality of audio in multi-channel systems by using a Python interpreter in conjunction with appropriate libraries and modules.

Research results

There are many powerful libraries for working with Python, such as Librosa or PyAudio, and also it has built-in modules that support basic functionality. Librosa can handle any sound, but it is mainly focused on music. It allows you to create a complete Music Information Retrieval system (MIR). The module is fully documented, and there are many ready-to-use solutions. You can also install the ffmpeg module with many ready-made solutions for converting audio signals. IPython.display.Audio lets you to play audio directly in the Jupyter Notebook. The used code is *librosa.load (audio_path, sr = 44100).* The default value can be changed, for example, to 44.1 kHz. [4]

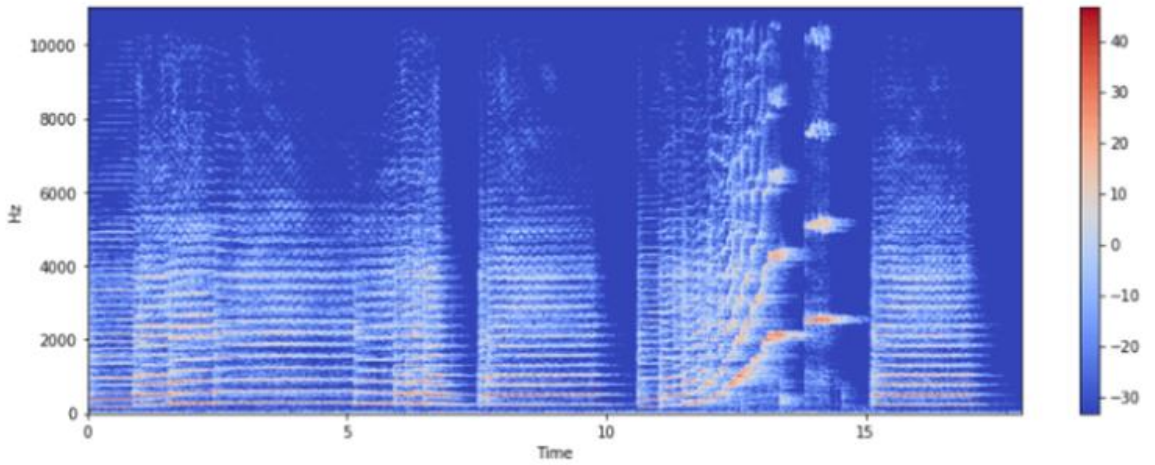
Using *librosa.display.waveplot*, you can visualize an audio array:

```
% Matplotlib inline
import matplotlib.pyplot as plt
import librosa.display
plt.figure (figsize = (14, 5))
librosa.display.waveplot (x, sr = sr)
```



Picture 1 - A visualization of sound signal

The use of *librosa.display.specshow* to create a spectrogram on Python.
X = librosa.stft (x)
Xdb = librosa.amplitude_to_db (abs (X))
plt.figure (figsize = (14, 5))
librosa.display.specshow (Xdb, sr = sr, x_axis = 'time', y_axis = 'hz')
plt.colorbar ()
The vertical axis is the frequency (0 to 10 kHz) and the horizontal axis is the clip time.



Picture 2 – The spectrogram of sound signal

Conclusion

Consequently, considering the basic capabilities of libraries and additional Python language software modules, you can easily develop solutions, facilities that will speed up and make multi-channel audio quality control accurate and convenient, when paired with or instead of hardware facilities.

Another great advantage of this approach is that Python is easy scalable, and that will improve the quality control process by incorporating additional solutions in an already developed projects. This may be a multi-channel implementation of the system, or additional modules for measuring other audio quality parameters.

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