Universidade de São Paulo
Brasil

Catálogo de disciplinas

Course Catalogue

Discipline **PSI5720**
Spatial Audio Signal Processing

Concentration area: 3142

Creation: 09/09/2019

Activation: 09/09/2019

Credits: 8

Workload:

Theory (weekly)	Practice (weekly)	Study (weekly)	Duration	Total
3	0	7	12 weeks	120 hours

Professors:

Miguel Arjona Ramirez

Wesley Beccaro

Objectives:

This course introduces various signal processing techniques that can help to understand, extract both the informational, locational and emotional information content of audio signals, which includes speech as a special case.

Rationale:

This course is designed for those students involved in Signal Processing and who seek a closer understanding and practice of Spatial Audio signals to enhance their expertise. It is also useful for those students in Acoustics, Multimedia and Robotics who seek practical knowledge of Spatial Audio and Signal Processing.

Content:

1. Perceptual models of audio/speech: peripheral, neural and cognitive; loudness, pitch, timbre, HRTF/HRIR, binaural hearing, dichotic listening, etc.
2. Generative models of speech/audio: LTI model, TV model, sinusoidal model, waveform synthesis, reverb synthesis.
3. Signal Analysis: Short-time Fourier transform (STFT), Linear Prediction (LP) of speech/audio, lattice filter, AM-FM decomposition, time-scale/pitch-scale modification.
4. Sound source localization: Near-field Vs Far-field, beam forming, sound source motion, Doppler tracking, acoustic reflectors.
5. Multi-channel Audio: Audio mixing, stereophony, quadraphony, ambience synthesis. multi-channel LP, reverb suppression.
6. Applications: Spatial Audio coding (MP3, MP4), water-marking (spread spectrum), HuBot interaction, overview of microphones and Loudspeakers.

Type of Assessment:

Students will be graded based on homework, classwork, project and an exam. The report of exercises and project is based on actual spatial audio measurements mad

Bibliography:

[1] Jens Blauert, Spatial Hearing: The Psychophysics of Human Sound Localization, MIT Press, Cambridge, Massachusetts, 1997.
[2] William M. Hartmann, Signals, Sound and Sensation, American Institute of Physics AIP-Press, East Lansing, Michigan, 1998.
[3] Thomas F. Quatieri, Discrete-Time Speech Signal Processing: Principles and Practice, Prentice-Hall PTR, Upper Saddle River, 2002.
[4] Francis Rumsey, Spatial Audio, Focal Press, Oxford, 2012.

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