

Sound Studies and Sonic Arts

Summer Term 2018

Module Focus Lecture

Course Title Psychoacoustics, Sound Creation and Coding

Course Times and Location Friday, 3-7 p.m. / Saturday 10 a.m. – 2 p.m. / LIE 314

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Office Hours and Location upon request, LIE310

Course Description

This lecture covers three topics which are closely related:

Psychoacoustics is a discipline which aims to describe the perception of sound. In contrast to the physiology of hearing it does not target to explain the function of the ear and its parts, but to measure the whole auditory sense, that is what we are able to hear, to distinguish and to rank. In this lecture the principles of one- and two-ear listening are explained and demonstrated with audio examples. An important topic will also be the assessment of perceived quality via listening tests and measurement systems modelling the human perception. In the second part, we will cover sound creation, where we will look into the basis of speech, organ pipes and strings. Starting with natural physical systems, we will also explain some basics about computer models for sound creation.

The third part will conflate the chapters *creation* and *perception*. Speech coders, like those found in mobile phones, and audio codecs, like MP3 and AAC, exploit both properties of the source and the receiver. This part will also give advice for the dos and don'ts of producing audio that may be coded.

Format: This is a lecture with some additional experiments to give hands-on experience. Students are invited to contribute with questions, observations and sharing of personal experience.

Requirements for attending

This lecture will be interesting for everybody who wants to understand the human auditory sense and those producing audio and using coding schemes. The lecture will sometimes make use of mathematical equations, but understanding these is only necessary if you want to program yourself. The knowledge conveyed will also benefit those who solely use mixing consoles or audio workstations.

Attendance

The lectures will build onto each other. Therefore it is necessary to attend regularly.

Exam / Credit Points

2 CP (not graded): There is no exam, but regular attendance is necessary. If you miss more than one lecture an oral exam might be required. However, if you are eagerly participating in the lectures (see above) this can be counted as an oral exam.

Module

2 CP: Theory, Free Focus

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Schedule

Fri	April 27	3-7 p.m.	Introduction, digital audio
Fri	May 4	3-7 p.m.	Psychoacoustics I
Sa	May 5	10 a.m.-2 p.m.	Psychoacoustics II
Fri	June 15	3-7 p.m.	Psychoacoustics III
Sa	June 16	10 a.m.-2 p.m.	Psychoacoustics IV and Audio Quality
Fri	June 22	3-7 p.m.	Sound Creation
Sa	June 23	10 a.m.-2 p.m.	Speech and Audio Coding

Supporting Media

Blauert, Jens. *Spatial hearing: the psychophysics of human sound localization*. MIT press, 1997.

Kahrs, Mark, and Karlheinz Brandenburg, eds. *Applications of digital signal processing to audio and acoustics*. Vol. 437. Springer Science & Business Media, 1998.

Roginska, Agnieszka, and Paul Geluso, eds. *Immersive Sound: The Art and Science of Binaural and Multi-channel Audio*. Taylor & Francis, 2017.

Zwicker, Eberhard, and Hugo Fastl. *Psychoacoustics: Facts and models*. Vol. 22. Springer Science & Business Media, 2013.

The presentation slides of this lecture will be made available to students subscribed to this lecture only.