

Master Thesis

## Production of sound stimuli and elaboration of a listening test to study the influence of rooms on singers

In the framework of a research project going on at the Audio Communication Group of TU-Berlin on the ability of singers to adapt to different room acoustics, the acoustical impressions made at the audience is a crucial point. When performing in various rooms, singers tend to modulate subtle characteristics of the way they sing, and the audibility of these variations by the audience needs to be investigated.

It has been shown [1] that it is possible to quantify the variations of the same singing program, performed in various rooms, in terms of basic audio features which can be related to musical features conveying a musical meaning [2]. This framework can be used to run a listening test for sound discrimination [3] in order to determine to which extent the variation of each musical feature can be heard in the audience. In addition, verbal data as well as rating scales can be used to obtain both qualitative and quantitative information.

The first step of this project is the production of sound stimuli, based on recordings of singers in an anechoic room, possibly convolved with measured and simulated binaural impulse responses. The second step is the elaboration of the listening test itself, along with its analysis. The structure of the test (AB, AB-X, ...) will be discussed according to the requirements of the present experiment as well as the modality of presentation (in the lab or as an online survey). In addition, a questionnaire will be elaborated for the subjects of the listening test to acquire their subjective impressions using both words and rating scales.

### Literature

- [1] P. Luizard, E. Brauer, S. Weinzierl, and N. Henrich, "How singers adapt to acoustical conditions," in *Proc. Institute of Acoustics, International Conference on Auditorium Acoustics, Hamburg, 4-6 Oct, 2018*.
- [2] S. Weinzierl and H.-J. Maempel, *Zur Erklärbarkeit der Qualitäten musikalischer Interpretationen durch akustische Signalmaße [On the explicability of qualities of musical interpretation by means of acoustic signal measures]*, H. von Loesch and S. Weinzierl, Eds. Schott, Mainz et al., 2011, 213–236.
- [3] J. Sundberg, F. Lã, and E. Himonides, "Intonation and expressivity: A single case study of classical western singing," *Journal of Voice*, vol. 27, no. 3, 391–e1, 2013.

### Requirements

- Basic knowledge in experimental psychoacoustics
- Basic knowledge in statistical analysis
- Experience with Matlab software

### Supervisors

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