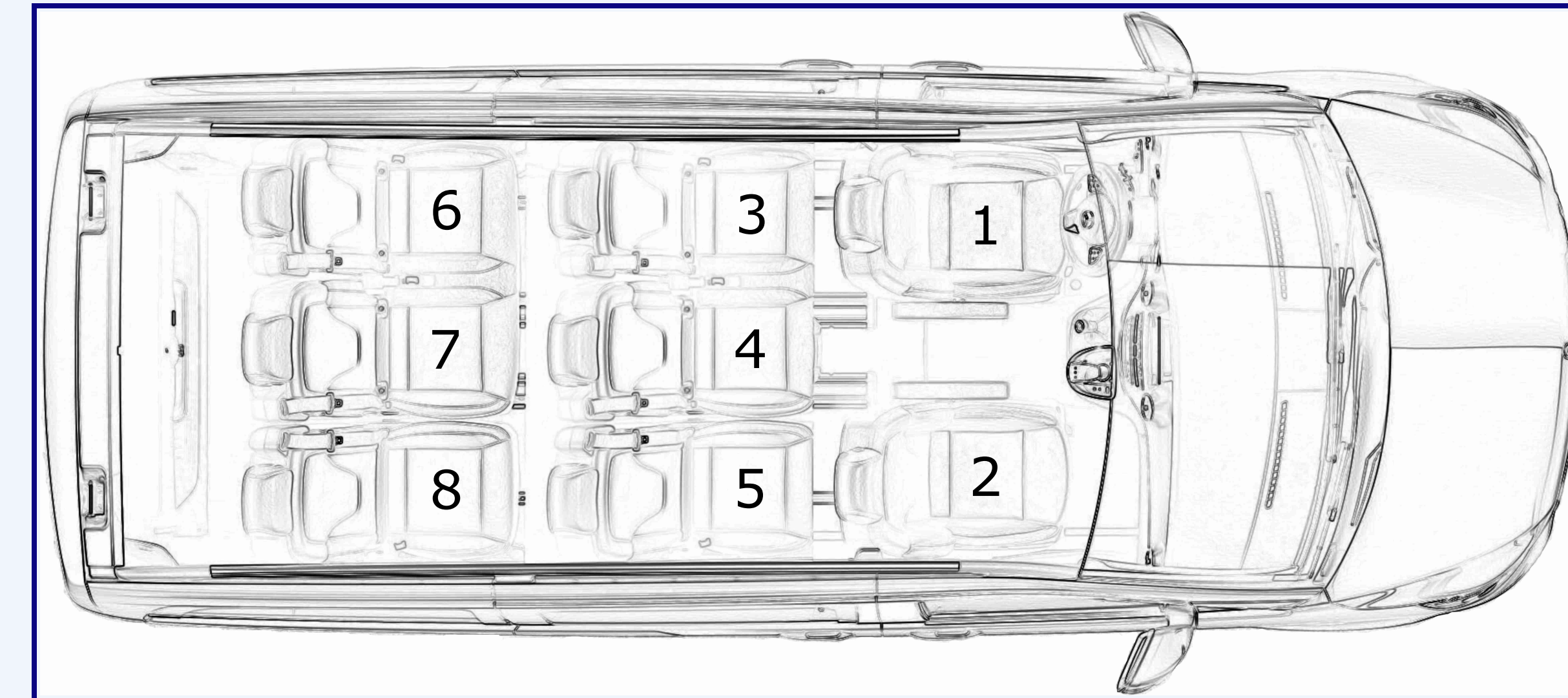


A Background Noise and Impulse Response Corpus for Research in Automotive Speech and Audio Processing

Overview

- ▶ Automotive Noise and Impulse Response (ANIR) Corpus provides background noise recordings and impulse responses inside automotive vehicles (currently in a Daimler V Class)
- ▶ Current state enables simulation and evaluation of hands-free or in-car communication systems
 - ▷ System and Head-And-Torso-Simulator (HATS) loudspeakers/microphones in up to 8 zones
 - ▷ Loudspeaker/microphone positions available for simulating, e.g., array processing
 - ▷ Synchronized multi-channel background noise recordings for 33 driving conditions
 - ▷ 682 impulse responses to model acoustic signal paths inside vehicle



Indication of zones in a Daimler V Class according to ITU-T Rec. P.1150.



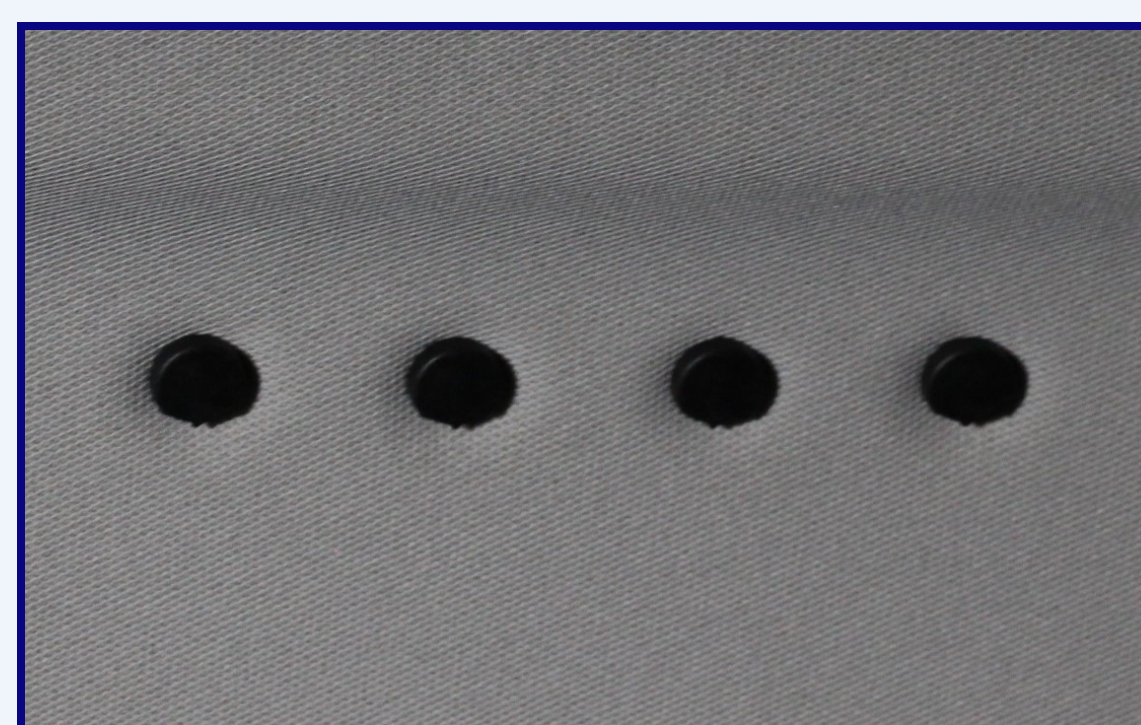
[Link](#) to corpus.

Measurement Setup

- ▶ HATS according to ITU-T Rec. P.58 or Head acoustics BHS II in zones 1, 2, 3, 5, 6, 8
- ▶ Mechakustik EBM1 microphones mounted to inside of roof
 - ▷ Single in zones 1, 2, 3, 5, 6, 8
 - ▷ Arrays between zones 1/2 and in zones 4 and 7
 - ▷ Add. single on B-pillar in zone 1
- ▶ Pairs of custom headrest loudspeakers in all 8 zones
- ▶ HELIX V EIGHT DSP MK2 to route to the 4 built-in car loudspeakers
- ▶ Total of 31 microphone and 22 loudspeaker positions in corpus



HATS and headrest speakers.



Microphone array.

Background Noise

- ▶ 11 driving speeds (0-200 km/h) combined with 3 AC intensities
 - ▷ Covers all user scenarios required by ITU-T Rec. P.1150
- ▶ 31 synchronized channels with a duration of 30 s at 48 kHz in each of the 33 conditions
- ▶ Microphone calibration included
 - ▷ Calibration using a gauged 1 kHz calibrator
 - ▷ 114 dB SPL correspond to an unweighted digital power level of -10 dB
- ▶ Ear-microphone equalization included
 - ▷ Linear-phase filters for constant group delay
 - ▷ Compensation of group delay to maintain synchronicity
- ▶ Visualization of the time-domain signals, power spectral densities, and spectrograms available alongside the time-domain signals in 32-bit IEEE float format

Impulse Responses

- ▶ Measured between all available loudspeaker/microphone pairs using the NLMS algorithm at 48 kHz
- ▶ SPL at microphones according to background noise calibration convention
- ▶ For standard-conforming testing: Speech excitation of -26 dBov results in an average sound pressure of -1.7 dBPa at the mouth-reference-point of a corresponding HATS
- ▶ Both ear-microphone and mouth-loudspeaker equalization included
 - ▷ Linear-phase filters for constant group delay
 - ▷ Compensation of group delay
- ▶ Removal of measurement equipment delay included
- ▶ Visualization of impulse responses, magnitude responses, and energy decays available alongside binary impulse response files in float format