

The Hearpiece database of individual transfer functions of an openly available in-the-ear earpiece for hearing device research

Documentation



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Last update: 14.04.2020

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The database contains Head-related transfer functions (HRTFs), driver responses and feedback paths of the Hearpiece, one-size-fits-all in-ear earpiece for hearing device research. Technical details on the database are given in

Florian Denk and Birger Kollmeier (2020) [The Hearpiece database of individual transfer functions of an openly available in-the-ear earpiece for hearing device research](https://arxiv.org/abs/2004.06579), arXiv:2004.06579

Please cite this paper when you report on research using this database. Details on the Hearpiece can be found here:

Florian Denk et al. (2019) [A one-size-fits-all earpiece with multiple microphones and drivers for hearing device research](#), Proc. AES Conference on Headphone Technology, San Francisco, USA.

Hoertech, InEar, University of Oldenburg (2019) [Hearpiece – Technical Documentation](#)

Organisation and naming of files

The data is provided both as .MAT files as well as in the dedicated .SOFA format. For more details on the SOFA format, visit <https://www.sofaconventions.org/>.

HRTFs and driver responses are stored in appropriate folders, one file for each subject and insertion of the device that contains both ears. The files contain the impulse responses for all relevant microphone locations for all measured incidence directions (HRTFs) and drivers of the earpiece (driver responses). HRTF and driver response files are named as follows:

```
<type>_<subjectID>_<deviceID><tel>_<rep>.<fileformat>
```

With the possibilities:

- <type>: DriverResponse or HRIR
- <subjectID>: Anonymous code of the subject, or KEMAR. All subject IDs are listed in the file `c_subjects`.
- <deviceID>: Serial number of the Hearpiece used (Other devices than DV0001 are only available for KEMAR), or ED for eardrum measurements at the open ear (HRTF only).
- <tel>: Indicator, whether a telephone was held next to the right ear (`_wTel`) or not (no entry). Measurements with the telephone next to the ear were made upon every for every insertion for the driver responses, once for the HRTFs with the Hearpiece inserted (fifth insertion), and once with the open ear (ED).

- <rep>: Repetition index of the measurement, 1–5. Before each repetition, the hearpiece was reinserted. Not applicable for HRTFs of the open ear
- <fileformat>: MAT or SOFA

Contents of files

MAT file entry	SOFA file entry	Description
M_data	Data.IR Dimensions in SOFA files are per SOFA convention, Description regards MAT files.	Matrix containing the data as impulse responses (1 st dim.), for all sound sources (2 nd dim,) and recording channels (3 rd dim.) Sound sources in HRTFs: incidence directions, see M_dirs_sph (given in spherical coordinates) Sound sources in Driver Responses: 1/2: Inner Driver, Left/Right 3/4: Outer Driver, Left/Right See also: c_outchannel_names Recording Channels: 1/2: Eardrum, Left/Right 3/4: In-Ear Microphone, Left/Right 5/6: Entrance Microphone, Left/Right 7/8: Outer Vent Microphone, Left/Right 9/10: Concha Microphone, Left/Right See also: c_inchannel_names
M_dirs_sph	SourcePosition	Source incidence directions in spherical coordinates [Azimuth Elevation] in degrees, HRTF files only
n_delay_common	Data.Delay	Negative-time samples in impulse responses, 44
srate	Data.SamplingRate	Sampling rate in Hz, 44100
c_readme	GLOBAL_Comment	Brief description of data
S_HeadPosData	ListenerPosition, ListenerView See SOFA documentation for details, Description regards MAT files	Head positioning data during HRTF measurements, only in HRTF files. M_posdata: positioning data as matrix for full measurement of HRTF set c_posdata_sepdirs: positioning data for each incidence direction separately in cell entries (ordered as in M_data) c_legend_posdata: legend for the columns of the positioning data
c_inchannel_names	GLOBAL_ReceiverDescription	Recording Channel names, see in M_data
c_outchannel_names	GLOBAL_EmitterDescription	Output channel names, see in M_data, only in DriverResponse files
s_subjectID	GLOBAL_ListenerShortName	Subject code
S_deviceID	GLOBAL_SourceModel	Serial number of Hearpiece, or “Eardrum”
meastime	MeasurementDate	Time when the measurement was conducted, only HRTF files.

Further information

The file Known_Data_issues.pdf lists files and channels with known issues.
Information about the subjects is summarized in the file Subjects_data.pdf.