Evaluation and Prediction of Sound Quality and Speech Intelligibility
Auditory modeling

The Project Group for Hearing, Speech and Audio Technology of the Fraunhofer IDMT develops measuring methods and models that describe human auditory perception. The research conducted by the project group examines the factors that influence speech intelligibility and subjectively perceived sound quality. In close cooperation with the fundamental research taking place at the University of Oldenburg and in the cluster of excellence “Hearing4all”, the scientists in the group are working on methods for taking into account current findings on binaural hearing, psychoacoustic aspects and the characteristics of impaired hearing in order to better predict hearing perception.

Prediction and enhancement of speech intelligibility

The intelligibility of speech depends greatly on ambient conditions such as room reverberation and background noise. Technical transmission of speech signals, e.g. via the telephone or a public address system, can also impair sound quality. In order to already optimize communication environments in the planning stage, the hearing researchers use models that predict speech intelligibility, the perceived loudness and the effort required for understanding speech. In addition, the project group offers software solutions for real-time monitoring of speech intelligibility and signal processing algorithms that considerably improve speech intelligibility in the presence of background noise.

Evaluation of sound quality

Current methods from the Oldenburg-based hearing research are also used in product development: Evaluation and quality assurance of control and operating noise by means of so-called acoustic fingerprints is increasing in importance in production and development processes. In addition to technical characteristics, psychoacoustic parameters, e.g. for loudness, tonality or roughness, are also used to describe sound. It is thus possible to reliably determine how variations in product characteristics affect the perceived sound quality. The project group develops application-specific evaluation models and software solutions on behalf of customers.
Modular software solution

With the “Speech Intelligibility and Quality Prediction Toolbox”, the project group has integrated a wide selection of current, model-based evaluation methods into a standard, intuitive user interface. In addition to standardised measures of speech intelligibility such as the articulation index, speech intelligibility index or speech transmission index, the toolbox also contains extended models for binaural hearing and hearing impairment. The available methods for assessing sound quality extend from simple technical measurements such as the signal-to-noise ratio through to psychoacoustically motivated models such as PEMO-Q. The toolbox offers users transparent signal representation as well as a fast comparison of different methods. The modular software solution can be easily adapted to individual requirements.

Measurements and hearing studies

If reliable and reproducible prediction is not possible with existing models for complex sound scenarios, the project group also offers development of application-specific evaluation measurements. On the basis of artificial head measurements and subjective hearing tests, it is determined which perception variables are decisive for the desired sound quality. The scientists can make use here of an outstanding technical infrastructure and a database containing almost 2,000 test persons with normal and impaired hearing.

Contract research

- Technical and hearing-oriented measurements
- Hearing studies with test persons with normal and impaired hearing as well as expert listeners
- Psychoacoustically motivated evaluation methods for sound quality in product development
- Evaluation methods for speech intelligibility in communication environments and technical systems
- Development and evaluation of algorithms for enhancement of speech signals

On the basis of current scientific findings on auditory perception, the Project Group for Hearing, Speech and Audio Technology offers application-oriented development services and software tools for evaluation of speech intelligibility and sound quality.

On the basis of cooperations at the Oldenburg location, the project group has access to numerous laboratories, hearing test booths and special rooms for technical measurements and hearing tests. These facilities include two anechoic rooms, a large reverberation room and a wind tunnel. The communication acoustics simulator in the “Haus des Hörens” allows simulation of the acoustic characteristics of a wide range of different rooms such as offices, concert halls, cathedrals or railway station concourses. photo: Hörzentrum gGmbH
Project Group for Hearing, Speech and Audio Technology of the Fraunhofer IDMT

The Project Group for Hearing, Speech and Audio Technology of the Fraunhofer IDMT was founded in Oldenburg in August 2008 and combines the globally recognized Oldenburg hearing research with the competencies and technologies in the area of digital media developed at the Fraunhofer IDMT. As a partner in the cluster of excellence "Hearing4all", it is the goal of the project group to implement the scientific findings from university fundamental research in new technologies. With their research specialities, the scientists address the needs of customers in the fields of telecommunications, multimedia, health, transport and security technology.