CARL VON OSSIETZKY universität OLDENBURG

MEDIZINISCHE PHYSIK
PSYCHOAKUSTIK & AUDITORISCHE MODELLIERUNG

AFC - A modular framework for running psychoacoustic experiments and computational perception models

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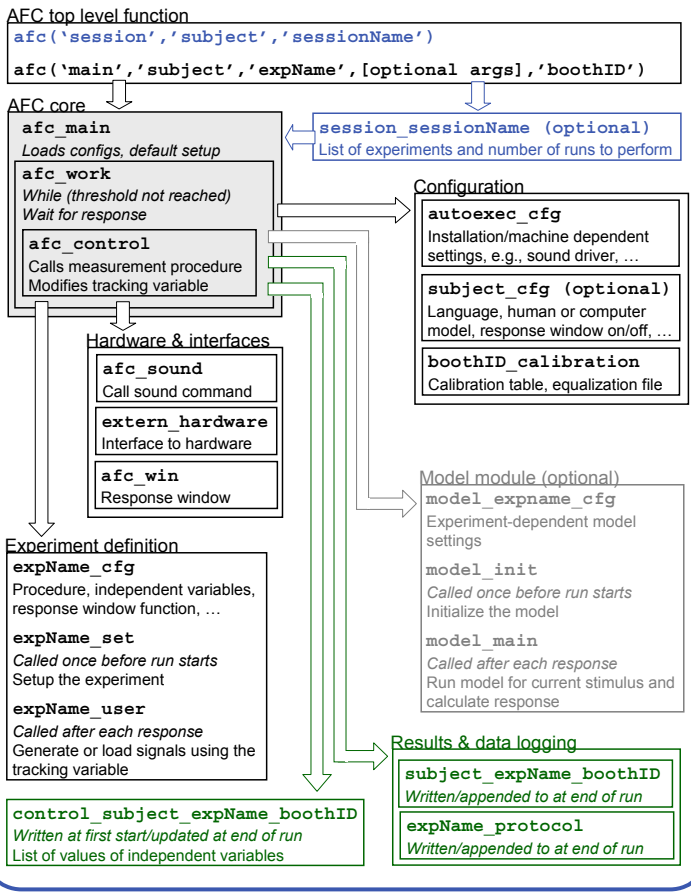
Overview & features

AFC is a free, versatile, and highly flexible tool to design and run psychoacoustic measurements in MATLAB. In addition to measurements with subjects, AFC allows computer models to interface with the measurement core and to conduct exactly the same experiments as in human subjects with the model as artificial listener (e.g., Jepsen *et al.*, 2008). Previous versions of AFC have been used as measurement and modeling tool for over a decade in several highly ranked psychoacoustic research sites and were used for data collection in dozens of scientific papers. Here, an improved version of the software is presented. The improved modular design offers an easy way to overload or add, e.g., measurement procedures, audio drivers, and calibration methods. Use cases involving a number of example experiments and models utilizing different psychoacoustic procedures are presented.

Key features

- Freely adjustable n-interval, m-alternative forced-choice procedure, method of constant stimuli, and identification tasks
- Response collection via keyboard, mouse or touch screen
- Configurable language and feedback settings
- Measurement sessions can be interrupted and continued any time
- Automated data logging and human-readable data formats
- Continuous playback and additive or multiplicative mixing
- Example experiments, including interleaved tracks
- No specific hardware required, runs on MATLAB 5.3 or higher
- Reproducible science: runs all old experiments from 1999 and later

Block diagram

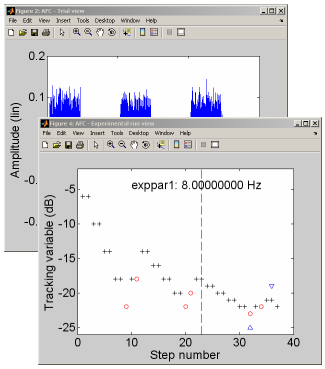


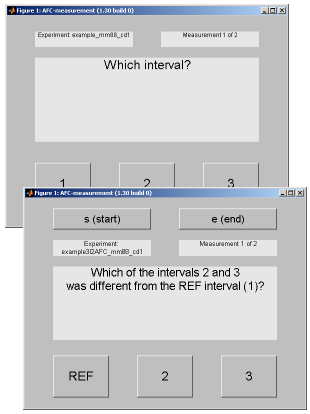
Use cases

Typical applications

Transformed up-down procedure

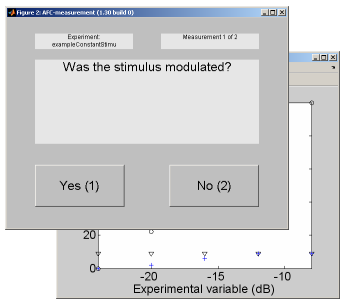
Debugging and teaching tools show, e.g., stimulus waveform and development of tracking variable during measurement



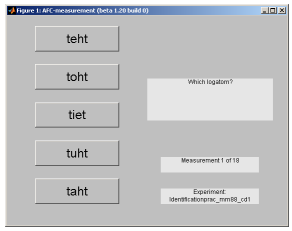


Standard 3-Interval, 3-alternative and 3I-2A response window with reference (AAB comparison)

Method of constant stimuli



Identification tasks



Vowel identification (1 out of 5) in gated background noise

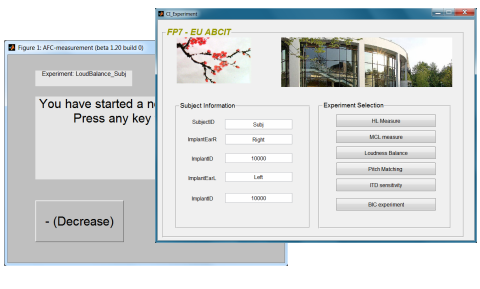
Combined procedures

- Constant-stimuli method following non-converged transformed up-down procedure as in TFS1-test by Moore & Sek (2009)

Customized applications

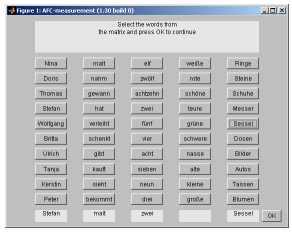
Cochlear implant stimulation via RIB2

- Extern hardware interface is used to communicate with research interface box (RIB2) by MED-EL
- Example: level-adjustment to determine threshold



Sentence intelligibility measurement

- Custom measurement procedure 'MatrixSentenceTest' to perform Oldenburg Sentence Test (Wagener *et al.*, 1999)
- 8-times interleaved measurement
- Continuous 8-channel background babble noise using SoundMexPro



Jepsen ML, Ewert SD, Dau T, (2008) "Modeling spectral and temporal masking in the human auditory system," J. Acoust. Soc. Am. 124, 422-438.

Wagener K, Kühnel V, Kollmeier B (1999) "Development and evaluation of a German sentence test I: Design of the Oldenburg sentence test," Zeitschrift fur Audiologie 38, 4-15

Moore BC, Sek A. (2009). "Development of a fast method for determining sensitivity to temporal fine structure," International journal of audiology, *48*(4), 161-171.

Aknowledgments

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