MEDIZINISCHE PHYSIK PSYCHOAKUSTIK & AUDITORISCHE MODELLIERUNG

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

Stephan D. Ewert Medizinische Physik, Universität Oldenburg, Germany, stephan.ewert@uni-oldenburg.de

Overview & features

is a free, versatile, and highly flexible tool to design and run psychoacoustic measurements in MATLAB. In addition to measurements with ww 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

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- 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

AFC top level function afc (`session', 'subject', 'sessionName') afc (`main', 'subject', 'expName', [optional args], 'boothID') AFC core afc_main Loads configs, default setup afc_work While (threshold not reached) Wait for response afc_control Calls measurement procedure Modifies tracking variable Hardware & interfaces afc_sound Call sound command extern_hardware Interface to hardware afc_win Response window Model module (optional) model_expname_cfg	Blo	ck diagram
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	afc_win Response window	Model module (optional) model_expname_cfg
Experiment definition	Experiment definition	Experiment-dependent model settings
expName_cfg model_init Procedure, independent variables, response window function, Called once before run starts	expName_cfg Procedure, independent variables, response window function,	model_init Called once before run starts Initialize the model
expName_set model_main Called once before run starts Called after each response Setup the experiment Run model for current stimulus and	expName_set Called once before run starts Setup the experiment	model_main <i>Called after each response</i> Run model for current stimulus and
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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

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)

Vowel identification (1 out of 5)

in gated background noise

The Party

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taht

Method of constant stimuli Identification tasks



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

You have started a n Press any key	Subject Information		Experiment Selection	
	SubjectD	Subj		HL Measure
	ImplantEarR	Right		MCL measure
	ImplantD	10000		Loudress Balance
		1.4		Pitch Matching
	imponicat.	Los.		ITD sensitivity
	ImplantID	10000		BIC operiment
(Decrease)				

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

Upper L2 Concentration (L2 India) L2 C Bett Benefit and press of bit labels Bett Benefit and press of bit labels No. mmit eff with Benefit and Benefit Norder and Benefit and Benefit and Benefit Norder and Benefit and Benefit and Benefit Norder and Benefit and Benefit Benefit

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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