

Software design of the CASP model

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1 General info

- The project is hosted on Sourceforge, project name “caspmode1”
- The software is licenced under the GPL version 3.0 license.
- The homepage is hosted at Sourceforge.

2 Goals of the software

- High quality code: Easy to read and maintain
- High quality documentation in the code: This is the best place to keep the documentation, as it is easier to keep up to date when the code changes. The documentation can be extracted in HTML and T_EX formats.
- Simplicity: Eliminate unnecessary configuration options. Always choose the simplest possible solution. This makes it much easier to read and modify the code.

3 Directory structure

- Each directory must contain a `Contents.m` file parsable by `mat2doc`.
- Each directory must contain a `directoryinit.m` file (so the toolbox directory contains the `toolboxinit.m`) file. See the `mat2doc` documentation for details on this.

3.1 toolbox

This directory contains a general toolbox relevant for building auditory models etc. Example contents:

- Filters: Gammatone, roex.
- Conversion between auditory scales: ERB, Mel, Bark

3.2 models

Model stages and full models

3.3 humandata

Function returning recorded (and published) human data

3.4 testing

Test scripts

3.5 reference

There are generally two categories of files that go here:

1. Very simple implementations of concepts that are easy to read, but perhaps very slow or not general enough etc.
2. Old code that is trusted but not necessarily easy to read or efficient.

3.6 experiments

Descriptions of experiments.

4 Definition of the input to the model

An acoustical signal is represented by a column vector of numbers. The numbers are obtained by sampling the air pressure of the acoustical signal at a constant sampling rate. The numbers are scaled such that an acoustical signal with a level of 100 dB SPL corresponds to a digital signal with an RMS value of 1.

XXX Is this sufficiently strict for a binaural model?

5 Data structures

- A mono-signal is a column vector.
- A stereo-signal is a 2-column matrix.
- A multi-channel signal stemming from a filterbank has time as first dimension, channel number as second, and original signal channel (left/right) as third dimension.
- The output from the modulation filterbank has time as first dimension, frequency channel number as second, modulation channel number as third and original signal channel (left/right) as fourth.
- General rule: Time is always first, mono/stereo is always last.

6 General coding standards

- The same parameter should have the same name across all files. See the section on common variable names.
- A variable should never have the same name as an already existing function in Matlab. This makes the code easier to read and less prone to errors.
- All function names in Matlab should be lowercase. This avoids a lot of confusion because some computer architectures respect upper/lower casing and others do not.
- Variable names are allowed to be both lower and upper case. Use it for making long variable names easier to read. This convention is called *camel casing*, see <http://en.wikipedia.org/wiki/CamelCase>.
- It is not allowed to use underscores in variable or function names. They are reserved for structural purposes, i.e. as in `demo_gammatone` or `test_dau96`.
- Models are named after the paper in which they first appeared, as in `dau96`.
- *As much as possible*, functions are named after the function they perform, rather than the algorithm they use, or the person who invented it.
- No global variables. Global variables makes it harder to debug, and the code cannot be parallelized.
- Global configuration switches must not alter the output of functions. This introduces bugs if people give the code to each other and they forget to tell what options were used. Such bugs can be very hard to find. They should only be used for harmless things like altering the appearance of plots.

7 Variable names

The following is a list of common variables.

<code>insig</code>	Input signal
<code>outsig</code>	Output signal
<code>inoutsig</code>	Some simple functions modify the signal in place, so the signal is both input and output. This may save some memory and processing time. Please write 'insig' and 'outsig' in the documentation, as the user should not care about this detail.
<code>fs</code>	Sampling frequency.
<code>siglen</code>	Length of signal

`fc` Center frequency/frequencies of filter/filter-bank.
`flow,fhigh` Generic low, high frequencies determining a range of frequencies.
`a,b` Filter coefficients to IIR filters.

8 Style of m-files

All m-files should be parsable by `mat2doc`. See the `mat2doc` documentation or the already existing function in the `caspmmodel` project for examples on how to write this.

Generally look at following files as examples on how to write your functions:

-
-
- ...

9 Anchors

An anchor is a capitalized word in the code, that can be extracted by a script.

Each file should contain the following anchors:

AUTHOR The line following this anchor indicates who the authors are.

TESTING The line following this anchor indicates in which routine this particular function is tested, or if testing is not needed / not applicable / not done yet.

For debugging it is possible to insert `XXX`, `FIXME`, `BUG`, `TODO` into the code, followed by a description of the problem.

• References