Variability in encoding precision accounts for visual short-term memory limitations

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NOTE: We recommend to use the more recent analysis code that accompanied our paper "Factorial comparison of working memory models" (Psych Rev, 2014). That code is mode general and cleaner.

CODE MANUAL

Contents

1. Introduction

This code allows you to fit the IL, SA, EP, and VP models described in our paper to delayed-estimation data. All code is free to use. For bug reports and questions, please contact Ronald van den Berg (nronaldvdberg@gmail.com).

2. File structure

The main folder contains all the required .m files. There are three subfolders:
data/ - contains the data sets
precomputed_tables/ - contains prediction tables for the four models
saved_results/ - this is where results (ML estimates, etc) will be stored

3. How to add a data set

1) copy the data files to a newly created subfolder in data/
2) add experiment information to getExperimentInfo.m
3) add code to read the data to readdata.m
4) create a new folder in saved_results/ for storing results

4. How to fit a particular model to data of a particular subject

The functions named fit_*_model(expnr,subjidx) fit one of the four models to the data of a particular subject. Expnr indicates the number of the experiment (defined in getExperimentInfo.m) and subjidx indicates the subject. E.g., fit_IL_model(1,5) fits the IL model to the data of the 5th subject in Experiment 1. If the tables do not exist yet, they will be created and saved (hence, this is done only once). Note that creating the tables for the VP model can take quite a while.

5. How to fit a particular model to all data of a particular experiment

The function plot_group_fit(expnr,modelnr) fits the specified model to all subjects in the specified experiment and outputs a group plot with summary statistics. The model numbering is as follows: 1=IL, 2=SA, 3=EP, 4=VP. E.g., plot_group_fit(1,3) will produce a plot with the EP fit to data from experiment 1. This function is basically a wrapper function that calls the fit_*_model functions described above and subsequently outputs a plot with summary statistics averaged over subjects, comparable to the plots shown in Fig. 4 of the paper.

6. How to plot Bayesian model comparison results

The function plot_BMC_results(expnr) outputs a bar plot with Bayesian model comparison results for the specified experiment, comparable to figures 5A and 5D in the paper.

7. Result files

After fitting a model to a subject data set, results are stored in a file with a name like the following: saved_results\exp1\results_exp1_1_15_3.mat. The three numbers at the end denote the subject number, the number of steps used to discretize parameter dimensions (15 is the default, but this can be changed, see below), and the model number (1=IL, 2=SA, 3=EP, 4=VP), respectively. This file contains the following data:

L = model likelihood
fitpars = maximum likelihood parameter estimates
parnames = names of the parameters in fitpars
csd_emp = CSD summary statistic for each set size, computed from subject data
csd_fit = model fit to CSD summary statistic for each set size
w_emp = *w* summary statistic for each set size, computed from subject data
w_fit = model fit to *w* summary statistic for each set size

8. Several settings that can be changed

There are several hardcoded settings that can be modified:

- parameter ranges are defined in the create_*_table.m files
- the number of steps used to discretize model parameter dimensions is an additional input parameter for most functions
- the number of MC samples used to compute VP predictions is defined in create_VP_table.m