

Lesson 06: fMRI: Constructing a design matrix

Experiment parameters:

- ☐ TR = 3
- ☐ Experimental onsets are a text file 'onsets.txt'

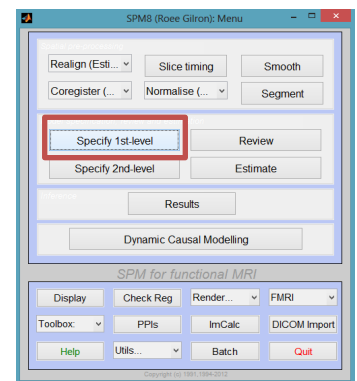
A. Create a 'multiple conditions' onsets file for matlab

1. Download 'data folder' from Moodle
2. You will find the onsets (in volumes) for the experiment in the text files 'onsets.txt' in the zipped data folder on Moodle.
3. Save a *.mat file with the experimental onsets with these variables:
 - a. names={'blank','draw'}
 - b. onsets = { blank,draw}; % where blank and draw are row vectors with onset times in TRs
 - c. durations = {[3],[2]} % the durations in TRs of each condition

B. Specificy First Level

The goal in this step is to specific the model for our first level GLM analysis.

1. Create directory (outside matlab) where you will house your first level results
2. Choose the 'specifiy 1st level button'
3. Under directory choose the directory you created in step 1
4. Under 'Timing Paramaters' choose 'scans' (choose seconds only if design does not conform neatly to TRs.
5. In interscan interval – enter TR (in seconds) Leave microtime resolution as default value – this is only used with extremely long TR's.
Microtime onset is also used for longer TR's.
6. Double click Data & Design:
 - a. This module is used to define the experimental design. Most of our work will be here. Note, that you can replicate – subject / session here to add more than one functional run for each subject.
 - b. Scans – select all images that have been pre-processed already in the '550_preprocessed' folder. Note that 'wrar' prefixes of each *.nii file that tell you that this data has been motion corrected ('r'), slice time corrected ('a'), co-registered to an anatomical image ('r') and normalized to a template brain ('w').
 - c. Other notes:
 - i. Note that you want to make sure this folder has the same name for each subject. You should have the correct number of images (so, in our case 164).
 - ii. Also, make sure you filter them properly (e.g. use ^ to specify following letter should be first in the file name and the * symbol to specify that what follows isn't critical. In our case I already uploaded only the wrar^*.nii files to save space, but when you do that data analysis make sure you upload all files.
7. Under 'Conditions' you can enter the onsets for each condition manually – but this is error prone and may take a long time if you have a different design for each subject (and you should at least counterbalance!).
8. Click – 'multiple conditions' and upload the file you created in section A.



9. Now we want to add the estimated motion parameters as regressors. Click – ‘multiple regressors’ and upload the file ‘rp_*.txt’ that was created in the preprocessing motion correction step. You will find it in the same folder of the scans of your run. Copy the .m code to a script (in the batch editor go to View -> show .m code). Add the following command at the end of the script and run the script:

```
spm_jobman('run' , matlabbatch);
```

10. Look at the design matrix that is displayed in the graphic window and check your design.

B. Model Estimation

1. In the menu window, choose ‘Estimate’ and choose the SPM.mat file that was created in the previous stage. Leave other values with their defaults.
2. Now use the ‘green triangle’ to run the design.