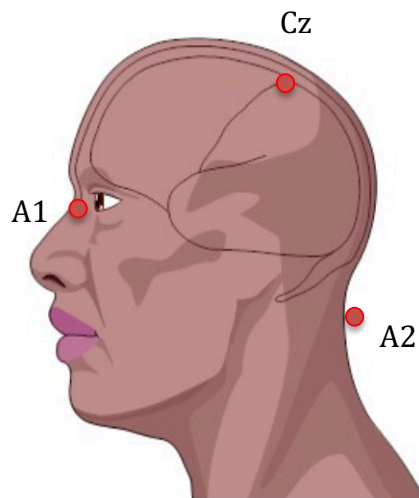## Table of Contents

Running an EEG Experiment:

Before starting the experiment:

Caps and Electrodes:
- Make sure that the cap is not folded and it is stretched.
- Cz should be at the middle of the head, approximately 20 Cm from A1 and 20 cm from A2. (Shown on the picture)

- Add gel and check the Impedance (open g.recorder/tools/impedancecheck), put gel in the ground and channel 1 at first. If you could not get green impedances for all the channels, save a snapshot of the impedance check.
- If you couldn't get green impedance, lift the electrode a little and put gel under it, then fix the electrode.
- Connect the references to the ears. References should have gel too.

To Subject:
- It should be clarified for the subject that: 1. He shouldn't move. 2. He should keep the eyes open during the experiment. 3. He should try to blink between the sentences.

Hiamp Configuration:
- Add 60Hz Notchfilter, 0 to 200 Hz bandpass.
- Add channel 64 as reference.

During the Experiment:

- Open g. Scope block in Simulink model.
- Check the analog channels.
- Check the eye-blinking effect on EEG, check the alpha power increase when the subject closes the eyes or when he is tired.

Between the Experiments:
- Make sure the subject is still concentrated.
- Check the impedances again.

After the Experiment:
- Wash each electrode of the cap separately without separating it from the cap. All the electrodes, wires and the cap are washable.
- Fill out the readme file, remove the unnecessary recorded data, and put all of them on the server.
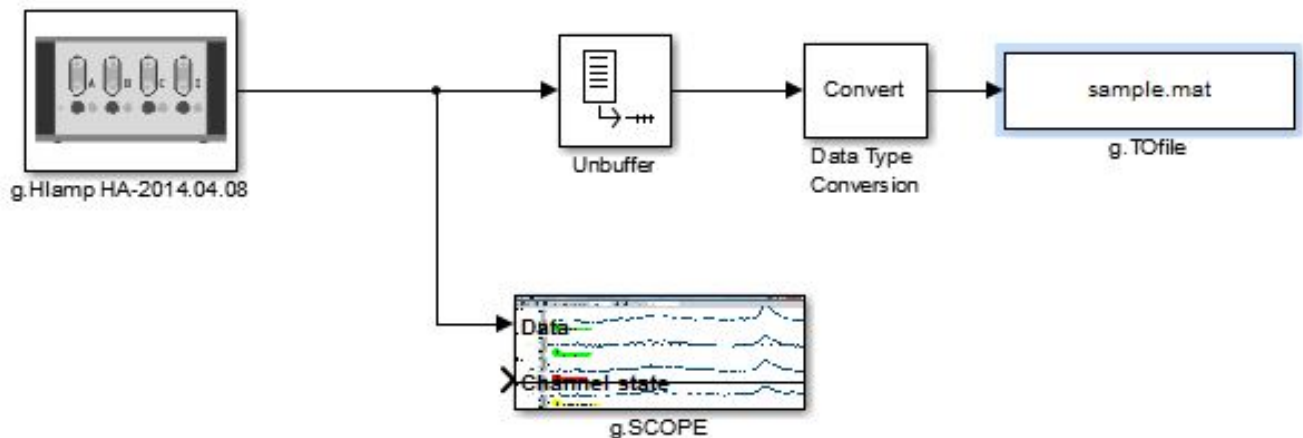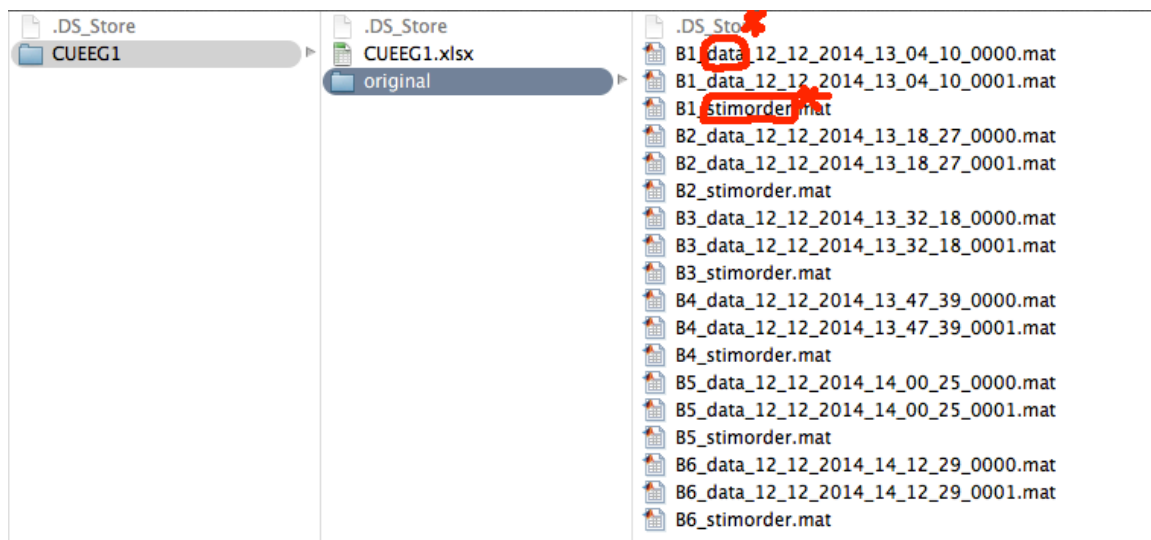

A simple simulink model

1. Preparing the data:

1. Create a folder named "CUEEGxx", xx is the subject ID.
2. Put "CUEEGxx.xls" (information file) in the generated folder.
3. The name of the raw data should be "Bxx_ ...", xx is the block number.
4. Create a subfolder "original", put the raw data and stimulus order in "original" folder.

.DS_Store	.DS_Store	.DS_Store
CUEEG1 ▶	CUEEG1.xlsx	B1_data_12_12_2014_13_04_10_0000.mat
	original ▶	B1_data_12_12_2014_13_04_10_0001.mat
		B1_stimorder.mat
		B2_data_12_12_2014_13_18_27_0000.mat
		B2_data_12_12_2014_13_18_27_0001.mat
		B2_stimorder.mat
		B3_data_12_12_2014_13_32_18_0000.mat
		B3_data_12_12_2014_13_32_18_0001.mat
		B3_stimorder.mat
		B4_data_12_12_2014_13_47_39_0000.mat
		B4_data_12_12_2014_13_47_39_0001.mat
		B4_stimorder.mat
		B5_data_12_12_2014_14_00_25_0000.mat
		B5_data_12_12_2014_14_00_25_0001.mat
		B5_stimorder.mat
		B6_data_12_12_2014_14_12_29_0000.mat
		B6_data_12_12_2014_14_12_29_0001.mat
		B6_stimorder.mat

* "stimorder" and "data" in the name of the .mat files are the cues of finding the data and stimorder, so remember to mention them in the name of your .mat files.

- Stimorder is a cell array containing the sounds names in the order that were played.

Variables – StimOrder

⊘ StimOrder

{} StimOrder <1x220 cell>

	1	2	3
1	ms1_common75_16k.wav	ms1_common32_16k.wav	ms1_common62_16k....
2			

- Raw data (for example: B1_data_12_12_2014_13_04_10_0000.mat) contains variable y(channel*time)
    - y(2:63,:) EEG data
    - y(64:65,:) references
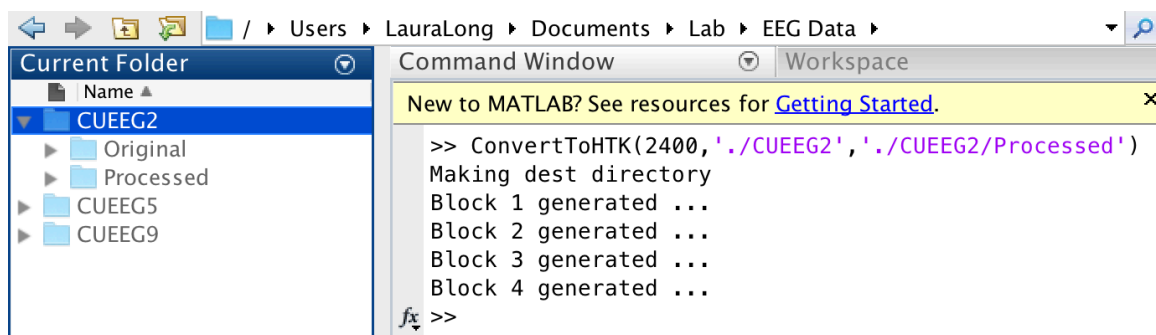   - y(66,:) analog channel -> recorded audio using hiamp

2. ConvertToHTK

Go to "CUEEGxx" folder and run ConvertToHTK(fs). The default Sampling rate is 2400Hz.
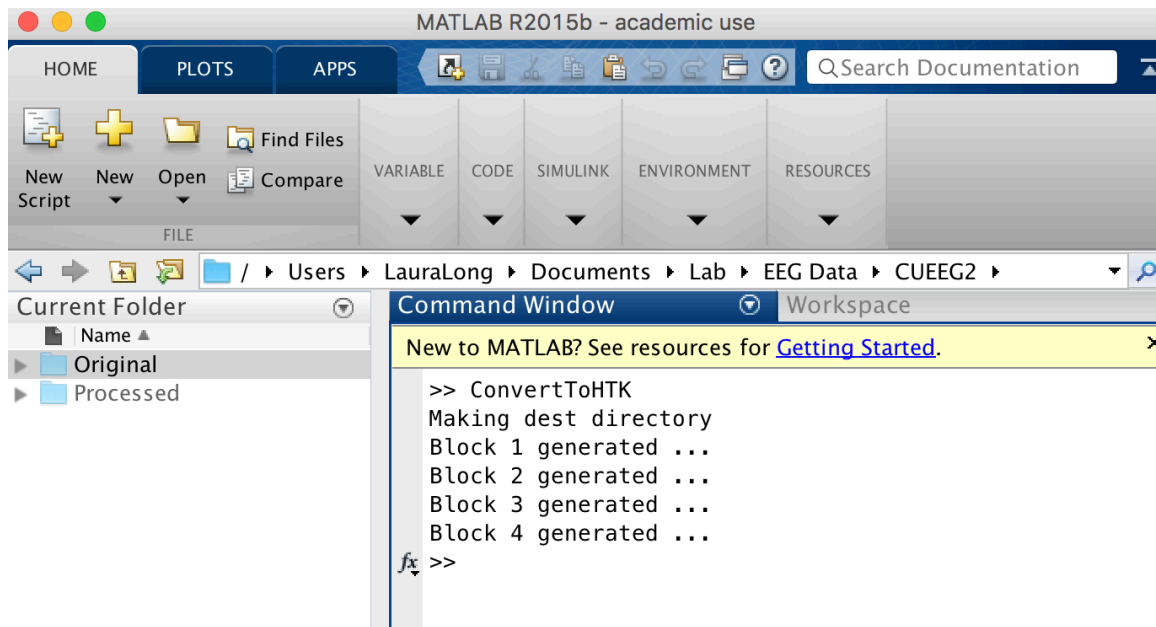
Or specify the original and destination folder:

3. NeuralFindEvent

```
1 -     DataPath = './';
2 -     Subject = 'CUEEG2';
3 -     Blocks = {'B1' 'B2' 'B3' 'B4'};
4 -     SoundPath = '~/Documents/Lab/EEG Data/Task_Sounds/CUSounds';
5 -     evnt = NeuralFindEvent(DataPath, SoundPath, Subject, Blocks);
6 -     save(['evnt_' Subject '.mat'],'evnt')
7
```

generated evnt:

📇 evnt   *1x259 struct*

```
>> evnt(1)

ans =

            name: 'fs1_hankThree1_16K.wav'
      confidence: 0.6646
    syncPosition: 32608
       startTime: 13.5867
        stopTime: 21.4654
         subject: 'CUEEG2'
           block: 'B1'
           trial: 1
        DataPath: './Processed/'
        StimPath: '~/Documents/Lab/EEG Data/Task_S…'
```

4. NeuralGenOut

```
1 -    DataPath = './';
2 -    Subject = 'CUEEG2';
3 -    cond = {'htkraw'};
4 -    load(['evnt_' Subject '.mat']);
5 -    elects = 1:62;
6 -    befaft = [0.5 0.5];
7 -    dataf = 100;
8 -    specflag = 'Auditory';
9 -    datatype = 'EEG';
10
11 -   out = NeuralGenOut(evnt,DataPath,cond,elects,befaft,dataf,specflag,datatype);
12 -   save(['out_' Subject '_' cond{1} '.mat'], 'out')
13
```

Generated Out:

out(1, 1) <1x1 struct>	
Field ▲	**Value**
name	'fs1_common10_16k'
sound	<114785x1 double>
soundf	16000
dataf	100
duration	7.1742
befaft	[0.5000,0.5000]
type	'EEG'
resp	<62x717x60 double>
aud	<128x717 double>
trial	<1x60 double>

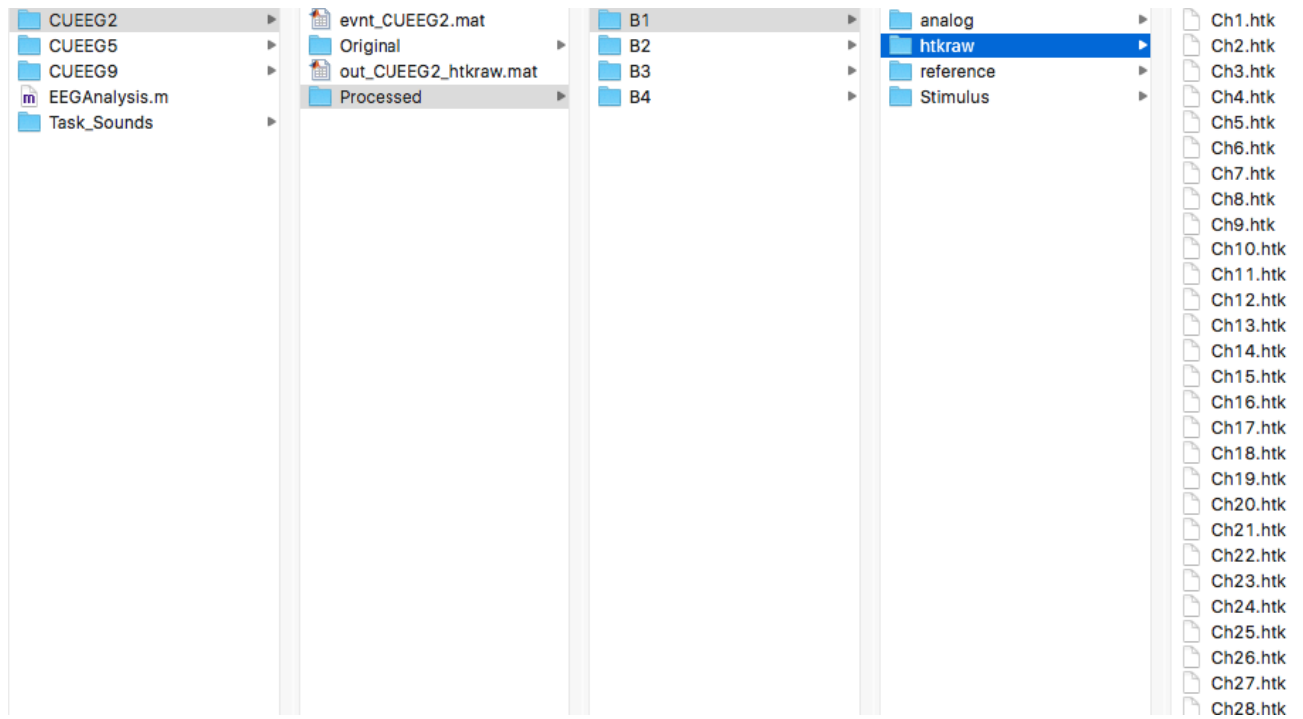**aud** is the auditory spectrogram
resp is channel*time*trial
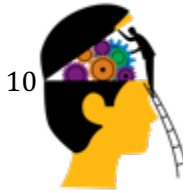**trial** contains the corresponding indices of trials in evnt
befaft is the added silence before and after the sound
- sound doesn't contain the silence, resp and aud does.

5. Final Structure

CUEEG2 ▶	evnt_CUEEG2.mat	B1 ▶	analog ▶	Ch1.htk
CUEEG5 ▶	Original ▶	B2 ▶	htkraw ▶	Ch2.htk
CUEEG9 ▶	out_CUEEG2_htkraw.mat	B3 ▶	reference ▶	Ch3.htk
EEGAnalysis.m	Processed ▶	B4 ▶	Stimulus ▶	Ch4.htk
Task_Sounds ▶				Ch5.htk
				Ch6.htk
				Ch7.htk
				Ch8.htk
				Ch9.htk
				Ch10.htk
				Ch11.htk
				Ch12.htk
				Ch13.htk
				Ch14.htk
				Ch15.htk
				Ch16.htk
				Ch17.htk
				Ch18.htk
				Ch19.htk
				Ch20.htk
				Ch21.htk
				Ch22.htk
				Ch23.htk
				Ch24.htk
				Ch25.htk
				Ch26.htk
				Ch27.htk
				Ch28.htk

6. Upload to Server

Upload the subject file containing the above structure (Original, Processed, evnt, and out) to the server in the appropriate task folder:

filename	Size	Modified
📄 BlockName.txt	64 B	11/6/15, 11:45 AM
▶ 📁 ECoG	--	Today, 1:55 PM
▼ 📁 EEG	--	5/20/15, 2:01 PM
▶ 📁 original	--	12/17/14, 11:07 AM
▶ 📁 PhoneticRest	--	5/20/15, 2:01 PM
▶ 📁 processed	--	12/17/14, 10:01 AM
⬛ story	0 B	3/6/15, 2:47 PM
▼ 📁 TaskStory	--	Today, 3:09 PM
▼ 📁 CUEEG2	--	Today, 3:18 PM
📄 evnt_CUEEG2.mat	15.6 KB	Today, 3:18 PM
▶ 📁 Original	--	Today, 3:13 PM
📄 out_CUEEG2_htkraw.mat	150.1 MB	Today, 3:19 PM
▶ 📁 Processed	--	Today, 3:17 PM
▶ 📁 CUEEG3	--	4/17/15, 5:02 PM
▶ 📁 CUEEG4	--	3/6/15, 2:47 PM
▶ 📁 CUEEG5	--	4/22/15, 6:53 PM
▶ 📁 CUEEG9	--	5/18/15, 1:33 PM
▶ 📁 CUEEG10	--	5/19/15, 5:48 PM
▶ 📁 CUEEG11	--	5/26/15, 2:10 PM
▶ 📁 CUEEG12	--	6/1/15, 8:08 PM
▶ 📁 CUEEG13	--	6/16/15, 10:24 AM
▶ 📁 soundfiles	--	6/16/15, 10:23 AM
▶ 📁 Soundobject	--	5/20/15, 2:01 PM

Path bar: /q/nimalab/h1/data

q/nimalab/h1/data/EEG/taskfolder/CUEEGxx