

Plotting USV calls and freezing together

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Goal: plot USV and freezing together in a same plot for selected rats

In order to do that, you first need to create the Excel files as they should be to be read by the script, then you can use the script 'plotUSVFreezing.m'

Summary

1. Create file_freezing.xlsx using 'scoreAny.m'
2. Create file_USV.xlsx
3. Plot from both files using 'plotUSVFreezing.m'

1. Create file_freezing.xlsx using 'scoreAny.m'

'scoreAny.m' permits to score behaviours on a video. By pressing keys of your keyboard, you score the time spend in every behaviour studied.

14	2	ISI1	1,3488485	5,8488884
15	2	ISI1	6,9390921	10,8087107
16	2	ISI1	36,7090907	40,4592655
17	2	ISI1	51,7286545	52,8985582
18	2	CS2	1,5568622	2,1965852
19	2	CS2	4,3068452	17,2470734
20	2	CS2	22,365922	23,415898
21	2	CS2	25,0955003	26,1858598
22	2	CS2	27,4357715	31,8159207
23	2	CS2	33,3955269	35,4252961
24	2	CS2	36,365404	47,5457298
25	2	CS2	48,6958018	50,8858784
26	2	CS2	52,0254915	60
27	4	preCS	3,2365089	4,8547025
28	4	preCS	18,4053011	20,4854426
29	4	preCS	22,1446043	28,5142757
30	4	preCS	46,8546754	48,9046409
31	4	preCS	49,6146999	51,51482
32	4	preCS	52,3350623	60
33	4	CS1	1,7114868	2,3812037
34	4	CS1	11,2509228	11,6414615
35	4	CS1	16,1110357	21,4213797
36	4	CS1	22,8006363	26,1124999
37	4	CS1	27,2394931	39,5198199
38	4	CS1	47,0193508	53,1702838
39	4	CS1	54,659896	60
40	4	ISI1	1,4000103	16,5778803

Figure 1

the same time.

- a. Put the **name of the file** you would like the scoring to be recoded as workingfilename. Here, 'file_freezing.xlsx'.
- b. After each name file, you can choose the colour of freezing and USV respectively in the final graph by filling '**color_f**' and '**color_USV**'. See Figure 2 for principal colour codes. The value can be both a string (for example 'b' for blue) or a vector (for example [0 0 1] for blue).
- c. Put the number of parameters you would like to score as NKeys. Here, only freezing so **NKeys=1**.
- d. Fill the 'behaviours' array with the behaviour you are recording, here Freezing so behaviours={'Freezing'}
- e. Precise that you would like to add a column to put more the name of your phases by putting the Boolean descriptor to true or false. Here, you are recording in a certain phase so **descriptor=true**. When you record for one phase precise the name of it in apostrophies (').
- f. Precise more informations, such as the total time of the trial, here 60 seconds so **totTime=60** and if you would like a countdown precise how long.
- g. Run the script and follow the instructions. Once you press enter, the recording will last 60 seconds and you can watch the video at

Make sure that you file is empty before starting the first recording. You can record as much phases for as much rats as you want. Everything will be written in the same file and be added at the end of the columns. The final Excel file should be composed of 4 columns as following:

A	B	C	D	E	F
#Rat	Freezing	#Phase	Time Start	Time End	Duration
...	...	...	...	...	...

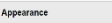
Color Name	Short Name	RGB Triplet	Hexadecimal Color Code	Appearance
'red'	'r'	[1 0 0]	'#FF0000'	
'green'	'g'	[0 1 0]	'#00FF00'	
'blue'	'b'	[0 0 1]	'#0000FF'	
'cyan'	'c'	[0 1 1]	'#00FFFF'	
'magenta'	'm'	[1 0 1]	'#FF00FF'	
'yellow'	'y'	[1 1 0]	'#FFFF00'	
'black'	'k'	[0 0 0]	'#000000'	
'white'	'w'	[1 1 1]	'#FFFFFF'	
RGB Triplet		Hexadecimal Color Code		Appearance
[0 0.4470 0.7410]		'#0072BD'		
[0.8500 0.5250 0.0900]		'#D95319'		
[0.9290 0.6940 0.1250]		'#EDD120'		
[0.4940 0.1840 0.5560]		'#7E27BE'		
[0.4660 0.6740 0.1880]		'#77AC30'		
[0.3810 0.7450 0.9330]		'#4D8EEE'		
[0.6350 0.0700 0.1840]		'#A2142F'		

Figure 2

One line defines one "freezing" and is composed of 4 columns:

- The name of the rat that froze #Rat
- The behaviour, here freezing for all of them
- The phase in which the rat was at this moment
- and E. The start and end times of the freezing in seconds from the beginning of the recording,
- F. the duration (E-D)

Remarks:

- You can record the rats in the order you want. For example, you could record preCS for Rat 4 and then ISI1 for Rat 4 and come back to CS2 for Rat 2. You can also record rats that you won't plot. In this case, you will have a warning message when running plot_USV_Freezing telling you that you have a difference between names in your file and in your vectors. Just make sure that it is due to that and not a typing error in the file (that would means that one line will not be valid).
- The script to plot will consider that if you record freezing for:
 - PreCS: 2' before CS1
 - CS: during the all minute
 - ISI and postCS: right after the end of the corresponding CS

2. Create file_USV.xlsx

	A	B	C
1	Event	Start Time	End Time
2	preCS	000:00:00.85000:00:00.86	
3	preCS	000:00:13.28000:00:13.30	
4	preCS	000:00:14.20000:00:14.21	
5	preCS	000:00:15.17000:00:15.20	

Figure 3

The vocalizations are obtained from Sonotrack.

- Open the session for the rat of interest on Sonotrack.
- Save all the recorded vocalizations in a text file.
- Transfer the data to one sheet of the 'file_USV.xlsx'. One line corresponds to one recording.
- Add a column A and name the header on A1 'Event'.
- By looking at the start time (column B), specify the phase in which every recording was emitted based on your experiment timeline.
- Name the current sheet by the **name of the corresponding rat**. For example, for rat 2 the name of the sheet will be '2', for rat 5B, the name would be '5b'.
- Do that for every rat.

Remarks:

- The order of the sheets in the Excel file doesn't matter but the name does. Name it with the name of the rat you used in the SRats array, else you will have a warning message.
- Make sure that your phases in the file have the same name than the names you put in the array 'events', else you will have a warning message.
- Note that from the Sonotrack data, the start and end times are in hours in the form hh:mm:ss. It will be treated to be plot but take it into account if you want to do other manipulations.

3. Plot from both files using 'plot_USV_freezing.m'

Now that you have both your files, you can finally plot them. The plot consists of one graph for every phase, composed of one line for every rat. See example on Figure 3. Depending on your experiment, you can have more or less CS and then more or less phases to plot and so you need to specify it.

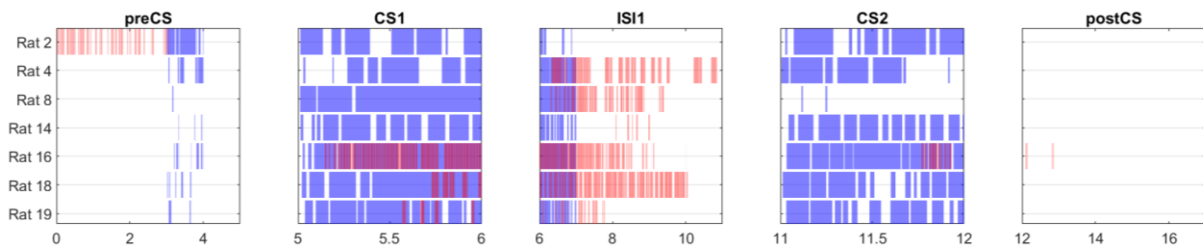


Figure 4 : Experiment composed of 2 CS with $preCS=5'$, $CS1=1'$, $ISI1=5'$, $CS2=1'$ and $postCS=5'$ which gives a total time of the experiment = 17'. Red: Negative USV calls (around 22kHz), Blue: Freezing. (Data from E.Cahill Lab, experiment 5bii test)

- Fill '**file_freezing**' and '**file_USV**' with the names of your own files.
- Fill '**Nphase**' with the number of phases you have in your experiment. For the example on Figure 3, Nphase=5.
- Fill the vector '**end_phase**' with the time, from the beginning of the experiment, in minute, at which every phase ends. Make sure that you have as much element in end_phase as you said you have in Nphase. If you have 5 phases, you should have 5 end times. Else you will have an error message. For the example on Figure 3, end_phase=[5,6,11,12,17].
- Fill '**SRats**' with the names of the rats you want to study. It should be the same names than in both Excel files. For the example on Figure 3, SRats={'2' '8' '4' '14' '16' '18' '19'}.
- Fill 'events' with the name of your phases. It should be the same names than in both Excel files. For the example on Figure 3, events={'preCS','CS1','ISI1','CS2','postCS'}.

Then you can run the script, you will see a pop-up window, such as on Figure 4, that opens up and show you the progression on a wait bar. If you want to stop the computation, you need to press Ctrl+C. If you close the window with the red arrow, it will also stop the computation and show you a message error.

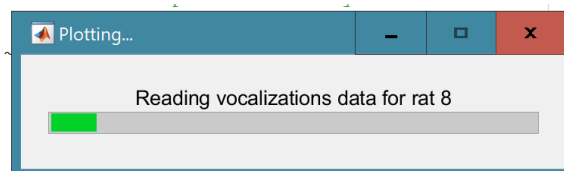


Figure 5

Remarks:

- Make sure that you saved both your Excel files before running the script.
- Note that freezing was only scored on periods of 1' compared to USV that is scored on the all experiment.