test_gui

January 5, 2022

The classes in this file implement several kinds of basic 2-alternative forced choice psychophysics exoeriments. A stimulus is played to the user, and based on the user's answer a bigger or smaller stimulus is played, where bigger or smaller depends on the type of experiment.

Here are the classes: * TestGUI: The basic UI for all experiments * Exp2AFC: Adds the Levitt threshold setting paradigm * AudioExp2AFC: A simple pitch JND experiment * TactorExp2AFC: A simple tactor threshold experiment * TactorPhaseExp: Testing whether phase is perceptible

[ ]:

```
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# the License.qqq
```

[1]:

```
# https://ipython.org/ipython-doc/3/config/extensions/autoreload.html
%load_ext autoreload
%autoreload 2
```

[2]:

```
import matplotlib.pyplot as plt

import psycho_gui
```

[3]:

```
# Basic GUI.  Just beep once for each trial number. Trial
# number goes up with each test answer.

test = psycho_gui.TestGui()
test.display_widgets()
```

```
VBox(children=(Label(value='This is the Experiment Title'), Label(value='Click on the button i
```

[4]:
```
# Make another instance to make sure they don't interfere.
test2 = psycho_gui.TestGui()
test2.display_widgets()
```

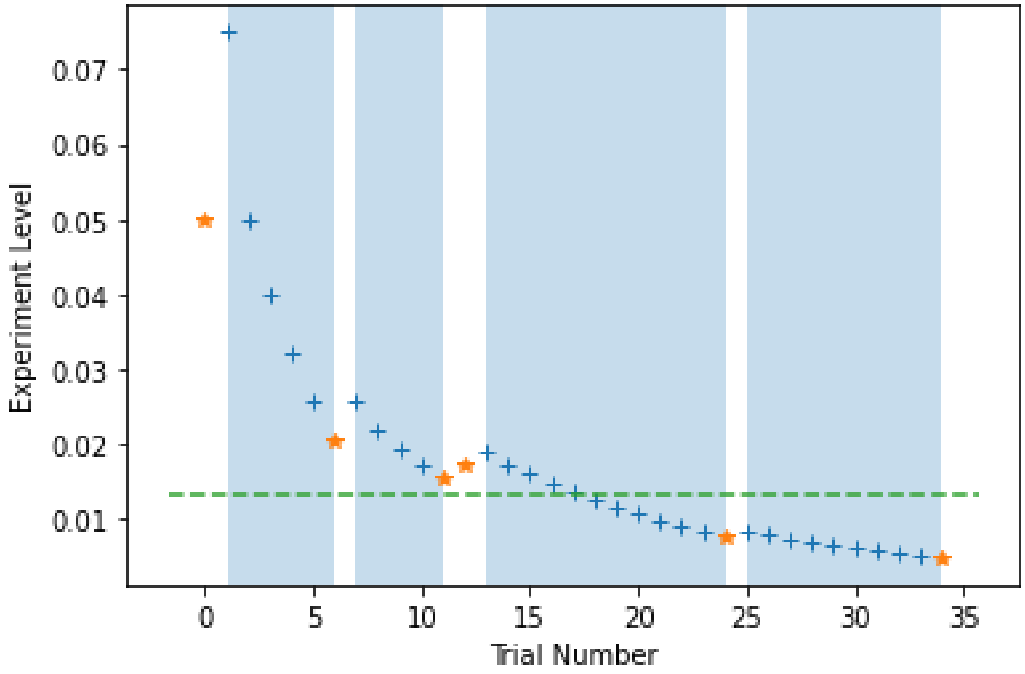
```
VBox(children=(Label(value='This is the Experiment Title'), Label(value='Click on the button i
```

0.1 Now add the 2AFC Logic

[5]:
```
exp = psycho_gui.AudioExp2AFC(button_names=['First (up->down)', 'Second␣
 ↪(down->up)'],
                              title='This is a pitch JND experiment')
exp.display_widgets()
```

```
VBox(children=(Label(value='This is a pitch JND experiment'), Label(value='Click on the button
```

[6]:
```
exp.levitt_exp.plot_response()
threshold = exp.levitt_exp.calculate_threshold()
plt.plot(plt.xlim(), [threshold, threshold], '--');
```



[7]:
```
exp.levitt_exp.calculate_threshold()
```

[7]:
```
0.013310083047508922
```

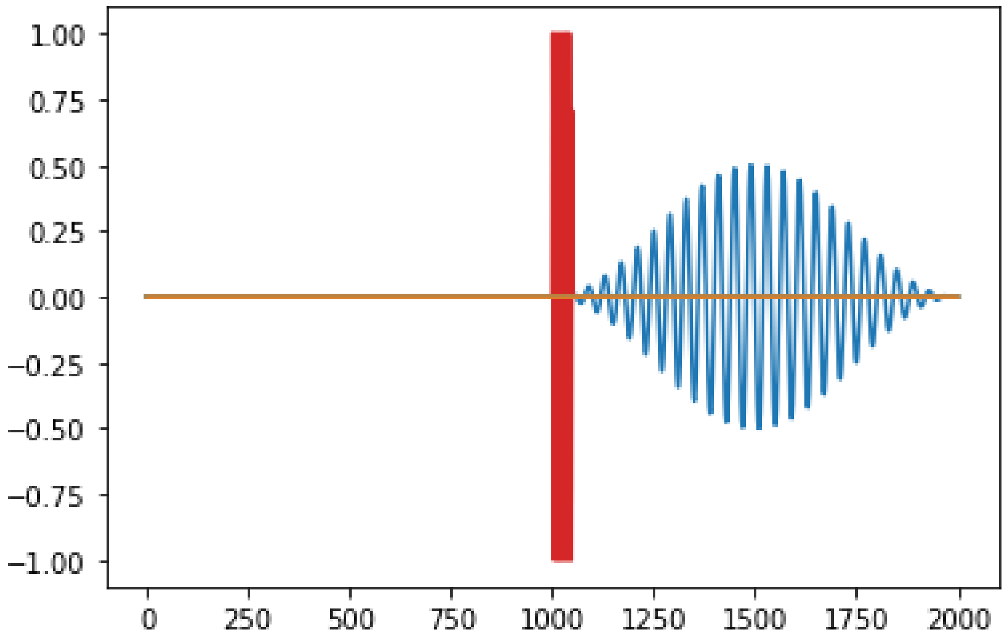
[8]:
```
# Create a set of experiments at a range of stimulus frequencies.
audio_exp = {}
for f0 in [220,440]:
    audio_exp[int(f0)] = psycho_gui.AudioExp2AFC(button_names=['First␣
 ↪(up->down)', 'Second (down->up)'],
                                                 title=f'This is a {f0} pitch␣
 ↪JND experiment',
                                                 f0=f0)
    audio_exp[int(f0)].display_widgets()
```

```
VBox(children=(Label(value='This is a 220 pitch JND experiment'), Label(value='Click on the bu


VBox(children=(Label(value='This is a 440 pitch JND experiment'), Label(value='Click on the bu
```

0.2 Now try it with the Tactors

[10]:
```
t = psycho_gui.TactorExp2AFC(f0=50, initial_level=0.5)
t.create_stimulus()
plt.plot(t.test_signal);
```



[11]:
```
tactile_exp = {}
for f0 in [62.5, 125, 250, 500]:
    tactile_exp[int(f0)] = psycho_gui.TactorExp2AFC(title=f'This is a {f0}␣
 ↪Tactor JND experiment',
                                                    f0=f0,
                                                    initial_level=0.5)
    tactile_exp[int(f0)].display_widgets()
```

```
VBox(children=(Label(value='This is a 62.5 Tactor JND experiment'), Label(value='Click on the l
```

```
VBox(children=(Label(value='This is a 125 Tactor JND experiment'), Label(value='Click on the bu
```

```
VBox(children=(Label(value='This is a 250 Tactor JND experiment'), Label(value='Click on the bu
```

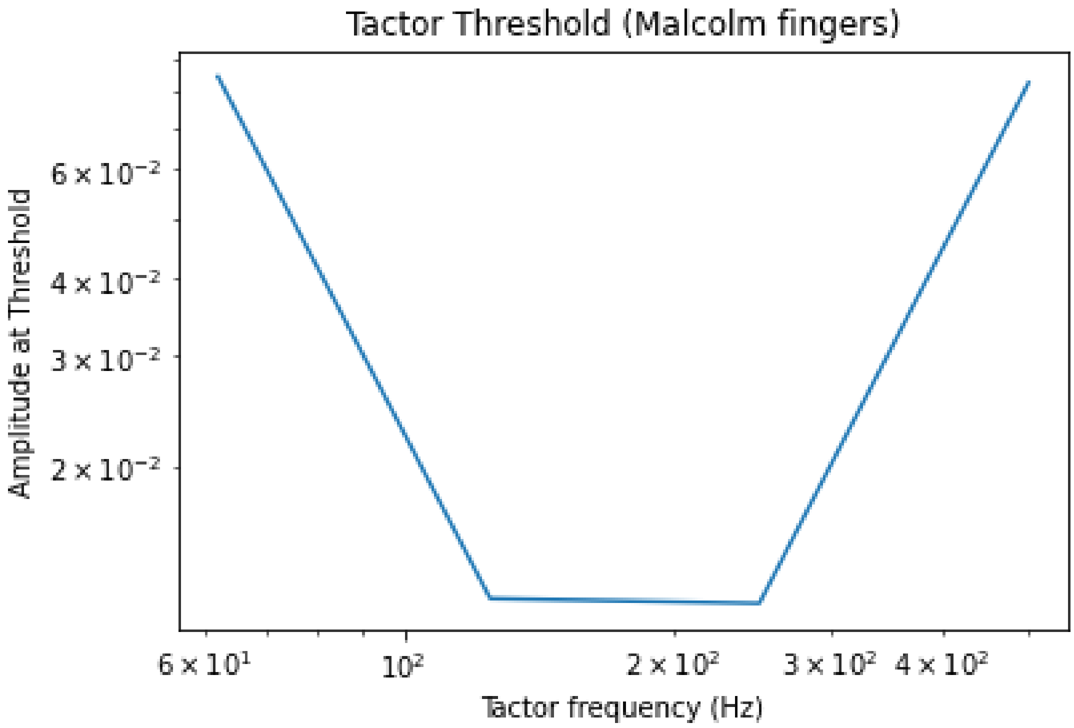
```
VBox(children=(Label(value='This is a 500 Tactor JND experiment'), Label(value='Click on the bu
```

[32]:

```
tactor_f0s = sorted(tactile_exp.keys())
tactor_results = [tactile_exp[f0].levitt_exp.calculate_threshold() for f0 in␣
 ↪tactor_f0s]
```

[34]:

```
plt.loglog(tactor_f0s, tactor_results)
plt.title('Tactor Threshold (Malcolm fingers)')
plt.xlabel('Tactor frequency (Hz)')
plt.ylabel('Amplitude at Threshold');
```



[43]:

```
tactor_exps = {}
for f0 in [62.5, 125, 250, 500]:
    tactor_exps[int(f0)] = psycho_gui.TactorExp2AFC(initial_level=0.5,
                                                    f0=f0,
                                                    title=f'Which segment at␣
 ↪{f0} has the texture?',
                                                    mask_level=0,
                                                    click_channel=2,
                                                    stim_channel=4,
                                                    mask_channel=5)
    tactor_exps[int(f0)].display_widgets()
```

```
VBox(children=(Label(value='Which segment at 62.5 has the texture?'), Label(value='Click on th


VBox(children=(Label(value='Which segment at 125 has the texture?'), Label(value='Click on the


VBox(children=(Label(value='Which segment at 250 has the texture?'), Label(value='Click on the


VBox(children=(Label(value='Which segment at 500 has the texture?'), Label(value='Click on the
```

[37]:

```
tactor_masks = {}
f0 = 125
for mask_channel in [5, 7]:
    tactor_masks[mask_channel] = psycho_gui.TactorExp2AFC(initial_level=0.5,
                                                          f0=f0,
                                                          title=f'Which segment␣
 ↪{f0},{mask_channel} has the texture?',
                                                          mask_level=0.25,
                                                          click_channel=2,
                                                          stim_channel=4,
                                                         ␣
 ↪mask_channel=mask_channel)
    tactor_masks[mask_channel].display_widgets()
```

```
VBox(children=(Label(value='Which segment 125,5 has the texture?'), Label(value='Click on the 


VBox(children=(Label(value='Which segment 125,7 has the texture?'), Label(value='Click on the 
```

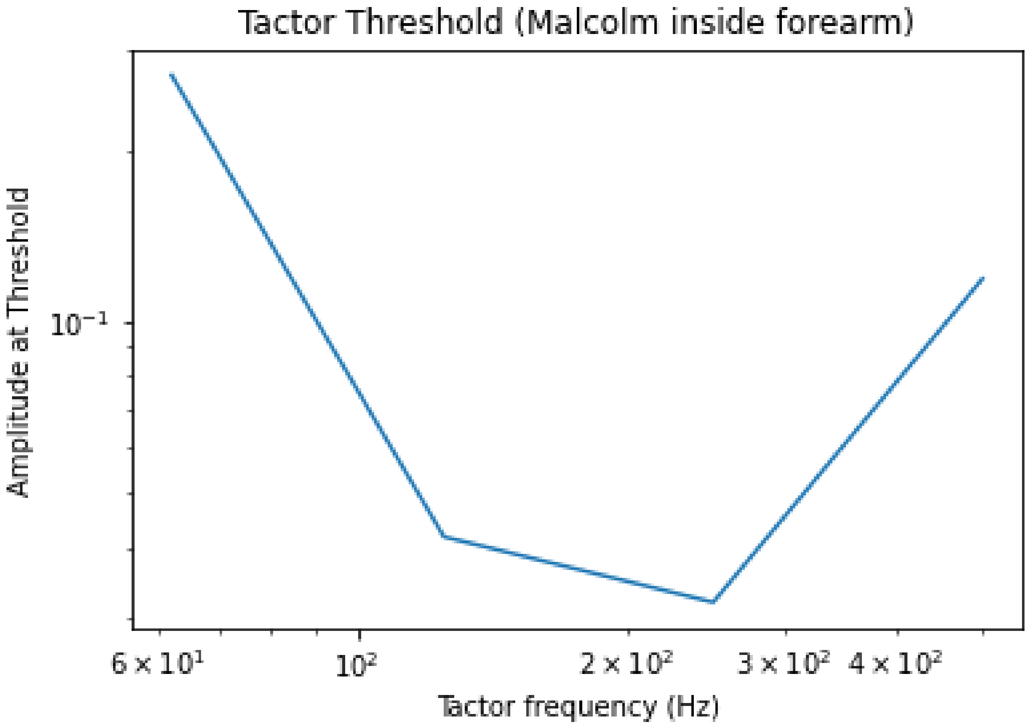
[195]:

```
tactor_masks[12] = tactor_exps[f0]
```

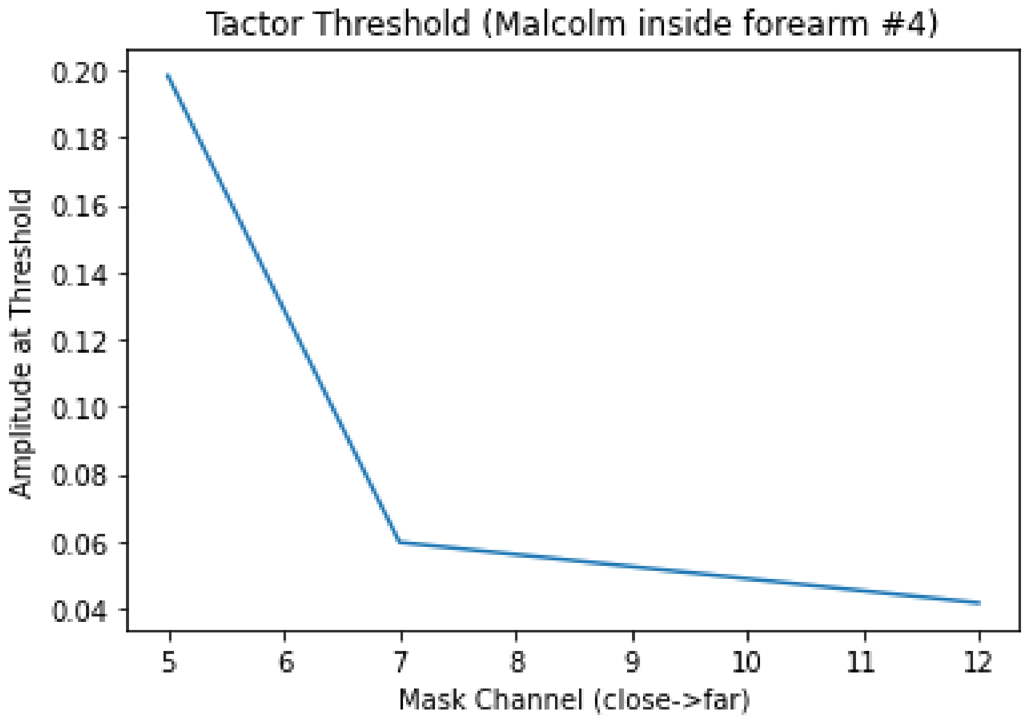
[200]:

```
f0s = sorted(tactor_exps.keys())
f0_results = [tactor_exps[f0].levitt_exp.calculate_threshold() for f0 in f0s]
```

```
plt.loglog(f0s, f0_results)
plt.title('Tactor Threshold (Malcolm inside forearm)')
plt.xlabel('Tactor frequency (Hz)')
plt.ylabel('Amplitude at Threshold');
```



[203]:
```
mask_channels = sorted(tactor_masks.keys())
mask_results = [tactor_masks[channel].levitt_exp.calculate_threshold() for␣
 ↪channel in mask_channels]
plt.plot(mask_channels, mask_results)
plt.title('Tactor Threshold (Malcolm inside forearm #4)')
plt.xlabel('Mask Channel (close->far)')
plt.ylabel('Amplitude at Threshold');
```



0.3 Tactor Phase Experiment

[35]:

```
phase_exps = {}
for f0 in [32, 125, 500]:
    phase_exps[int(f0)] = psycho_gui.TactorPhaseExp(initial_level=0.5,
                                                    f0=f0,
                                                    stim_channel=2,
                                                    stim2_channel=7,
                                                    mask_level=0)
    phase_exps[int(f0)].display_widgets()
```

```
VBox(children=(Label(value='Are the two signals the same or different?'), Label(value='Click o
```

```
VBox(children=(Label(value='Are the two signals the same or different?'), Label(value='Click o
```

```
VBox(children=(Label(value='Are the two signals the same or different?'), Label(value='Click o
```

[12]:

```
exp = psycho_gui.TactorPhaseExp(stim_channel=2, stim2_channel=7,␣
 ↪initial_level=0.5)
exp.play_widget()
```

```
HBox(children=(FloatSlider(value=32.0, continuous_update=False, description='F0:', max=250.0,
```

[ ]:

```
```