Tales from my study upstairs

"Whoever you are, no matter how lonely,
the world offers itself to your imagination,
calls to you like the wild geese, harsh and exciting -
over and over announcing your place
in the family of things."

- from 'The Geese' by Mary Oliver

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Wednesday, 30 July 2014

Running eye-tracking experiments with PsychoPy and Tobii: A step-by-step guide for technophobes and novices

Over the past 2 years of my PhD I've found myself edging around the boundaries of my comfort zone - often dipping my toes in the distinctly uncomfortable - on many occasions. There has only been one situation that has left me feeling so utterly incapable that I didn't think I'd be able to make it through, and that was most recently, when trying to set up a new eye-tracking experiment using PsychoPy, with Tobii as my eye-tracking interface.

There are numerous reasons why I wanted to do this - mainly because it was on every count better than the only other option I had - but I won't go into them here. All I'll say is that, after the Leeds Multimodality Conference, during which I attended an excellent Tobii workshop with Dr Tim Holmes of Acuity Intelligence and found out about PsychoPy, I was convinced that this would be the solution to the many problems I had been facing. I could say that it was also the start of a new set of problems, and I wouldn't be lying if I did, but the slant that I prefer is that it was the start of a (very) steep learning curve, one which I am very happy to be nearing the top of, and one which I can confidently say has changed my technophobic ways for the better.

Armed with some helpful user guides, words of encouragement from Tim and a few very kind and highly intelligent neighbours and colleagues, I finally got to the stage where I was able to run my full experiment through PsychoPy as I had hoped I would. Part of my problem was a lack of information online for people who really do know nothing about coding - I am (was?) one of these people, and while I see now that I got myself quite far using only information sourced from the excellent PsychoPy User Group, life would have been much easier, and a large amount of time would have been saved, if I'd had access to a simple step-by-step guide to setting up a simple experiment in PsychoPy that was able to talk to Tobii.

So, here is that step-by-step guide, and if one other computing novice out there benefits from it then it will all have been worthwhile! I may have missed out some obvious issues, and I may be using a non-technical language that is insulting to anyone who knows anything about this stuff: for this I apologise in advance, and welcome any comments, suggestions or advice on this topic.There are still some technical issues, and if these get resolved I will most happily post further information as I acquire it. People much smarter than me have helped and still are helping with this at every stage, and I should say that none of them have found it easy or obvious - one small fact that I have consoled myself with on a number of occasions!

Please note that this guide is tailored to Windows computers only. If you are on Mac or Linux then let me know and I can send some more specific information :)

First thing to note: you need to find out what bitness your computer is, as this is important for everything you do from hereon-in. You can find that out here, if you don't already know.

1. Build experiment in PsychoPy Builder.

2. Add a code component into your experiment. This will enable communication between PsychoPy and the eye-tracker. A simple code can be copied from the *Stroop for eye-tracking* demo, which can be found in the materials from an ECEM workshop, located here (under 'Previous Events'). On page 17-19 of the PDF Py4ET you can find a code for the Stroop demo. This can be copied and then amended to suit the purposes of your own experiment. Don't forget to make sure that the code is aligned exactly as it is in the Stroop

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demo: if you miss out an indentation it will not work!

For the purposes of my experiment I only needed PsychoPy to talk to the eye-tracker; no response was required from the participants in terms of mouse-clicks or keyboard-presses, so I deleted these sections from the Stroop demo code. If you leave them in it will still work, but you will find code in your data that specifies when you clicked the mouse to start, or pressed Escape to finish.

3. Now you need to set up the iohub. This took me a while as it wouldn't work and I couldn't work out why. Iohub is a package for use with Python, and enables the use of external devices and the monitoring and coding of events through these devices.

First, you need to make sure that you have Python installed on your computer. Iohub is now merged with PsychoPy, so if you have an updated version of PsychoPy (1.74 or higher) you will already have iohub installed by default. However, there are a few more packages that need to be installed before PsychoPy will talk to the iohub. These can be found here.

So, before you start, it's worth getting a few things in order on your C: drive. Make sure that Python has a folder on the C: drive – `C:\Python27`. Then make sure that your experiment is saved in this drive, under `…\Lib\site-packages`.

Now you want to download all of the iohub dependencies for the version of Python that matches the version in your C: drive, and save them all to the `\site-packages` folder. This makes sure that everything is in the right place for your experiment – if it isn't in the right place, PsychoPy won't know where to retrieve the files from.

4. Once the iohub is installed you need to install the SDK. This is a language binding, which means it enables communication between various coding software and Tobii. It works with Python, and so can be used with PsychoPy, but is also compatible with EPrime and Matlab. SDK simply stands for software development kit, and Acuity Intelligence has created it to be fully integrated with Tobii, so it's very easy to run.

Before installing the SDK you need to make sure you have Bonjour downloaded on your system. This is a device which locates any eye trackers that are connected to your computer either through a USB or through a network.

You'll also need Microsoft Visual C++ 2008 SP1 Redistributable Package, which can be downloaded here.

Now it's time to install the SDK, which comes as a zip file, and should be unpacked to the C: drive. As well as the SDK files you'll find some information on how to build experiments through the SDK (as opposed to using iohub) and some demos, too.

5. Next you need to add the appropriate eye-tracker to the code and make sure that all of the relevant information is provided in PsychoPy. In 'Experiment Settings' at the top of the PsychoPy screen you will find some blank boxes for 'Experiment info'. Create a field for the eye tracker called Eye Tracker (or similar) and under default type in tobii_std.yaml. When you run the experiment this should come up in the dialogue box before you start.

Now we need to return to the ECEM materials folder to locate the .yaml file which will tell PsychoPy all of the necessary information about the eye tracker. Go to the Stroop demos folder (with eye tracking) and you will find four .yaml files all labelled in relation to various eye-trackers. Copy the tobii_std file and paste it into the site-packages folder.

6. Now it's time to set a path for the experiment so that all of the packages can talk to one another. This is most easily done in the Environment Variables settings of your computer. In Windows 8 this can be found under **Control Panel > System and Security > System > Advanced System Settings > Advanced**. Click on the 'Environment Variables' button and then click on 'New...'. Under Variable Name type PYTHONPATH, and set the variable to the Modules folder in the unzipped SDK folder. So, if the modules folder can be found under `C:\...\tobii-analytics-sdk-3.0.83-win-x32\tobii-analytics-sdk-3.0.83-win-Win32\Python27\Modules`, you need to set the variable up as `%PYTHONPATH%;C:\Users\Catherine\Documents\tobii-analytics-sdk-3.0.83-win-x32\tobii-analytics-sdk-3.0.83-win-Win32\Python27\Modules`.

Now if you try to run your experiment in PsychoPy it should work!

7. Finally, we have to get Tobii ready to start tracking eye movements while PsychoPy is

running the actual experiment. This bit is easy! Just set up a new experiment and add the 'Screen Record' icon from the media toolbar to the timeline. Now you are ready to run the experiment!

To run your experiment, begin recording in Tobii and calibrate the participant as you would normally. When the calibration is finished, start the experiment in Tobii as normal – this will enable the eye-tracker to get data on the participant's eye movements – and then run your experiment in PsychoPy. When the experiment is over, just press 'Esc' (or the equivalent key to finish running the experiment in Tobii) and screen recording will stop on the eye tracker.

Good luck! And please provide any feedback: both positive and negative comments are welcome!

Posted by Catherine at 12:21

2 comments:

Vinuthna L 4 August 2014 at 10:04

Hello I am working with tobii machine for eytracking . When I am running the stroop.psyexp, after pressing the keys i am getting output as
Error Error ion framebuffer activation
Warning rameBufferObject not supported on graphics card

can you help me out in solving this problem
Thanks in Advance !

Reply

Catherine 11 August 2014 at 13:30

Hi there, thanks for your comment!

It looks like this is a problem with your graphics card - maybe try it on a different computer to see if there is any improvement?

I'm afraid I'm unable to provide support for any problems like this as I am very much an amateur myself, but good luck in working it out! Try the PsychoPy user group as there is some great stuff on there.

Good luck!

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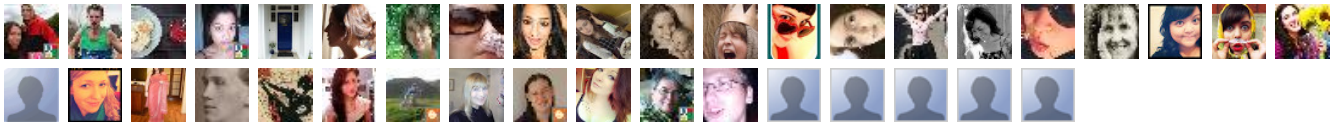

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