IGT Open Manual

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Introduction

Thank you for your interest in this software. As a reminder, this is open-source software that is

licensed under GNU GPL (V3) and any uses of the software should reflect this license. This manual will provide ways to use the software in an experiment, including details on the available parameters. The software is written to use either the Matlab or Octave interpreter.

Matlab generally can be acquired for a fee, but can be counted on for fairly reliable system performance, including timing, with this software on Linux (Ubuntu), Mac OSX, and Windows Systems. Octave is free and should give reliable timing for Linux (Ubuntu) and Mac, but does not have (as of the writing of this sentence) reliable timing because it generally must be run on some middle-layer process that provides a unix-style shell (e.g., CygWin). Given this software is built to use the psychtoolbox libraries (there is more detail on this in the next section), you can find out more on system requirements on the psychtoolbox website, http://psychtoolbox.org/requirements/.

Getting Started

The interpreter

As mentioned in the previous section, this software is built to be run within the Matlab or Octave interpreter. To use Matlab, users will have to obtain a software license (which will likely incur a cost). If users want to use the software completely free (**assuming they do not already have access to a Matlab license**), they will need to install Octave. The IGT-Open software relies heavily on psychtoolbox libraries; thus, IGT-Open within Octave will likely only work reliably in a MAC OSX or Linux environment [see http://psychtoolbox.org/requirements/].

If a user needs to use Octave and has a Windows operating system, the author recommends installing Ubuntu to run the software. The Psychtoolbox libraries have been tested against this distro and Ubuntu is fairly friendly to those new to linux. To get Octave on Mac or Linux, the user can navigate to the official website and follow instructions [https://www.gnu.org/software/octave/] or use some installation management system (e.g., brew for mac osx or using the apt-get command for Ubuntu). As an example, for Ubuntu one may use the command "sudo apt-get install octave *[VERSION]*" to install Octave to your system.

Installing Psychtoolbox

Psychtoolbox is essentially a set of libraries that can be used to build accurate and precise software for behavioral experiments and data analysis. The IGT-Open software uses these libraries to display visual stimuli and accurately time the display of these stimuli. We will install Psychtoolbox using the instructions below. These instructions are directly from the official Psychtoolbox website, thus the user may wish to consult the official instructions (http://psychtoolbox.org/download/) to ensure they have the correct instructions for the most recent version of Psychtoolbox.

Mac

Mac OS X < 10.5 Leopard only: Download Subversion installer manually

Subversion (Choose your platform as "Community Binaries" select suitable Mac OS X version).

Mac OS X Mountain Lion users also can install the "Command Line Tools" from

https://developer.apple.com/downloads

1. Skip this step on OS X 10.5 Leopard or later iff you have Apple's XCode development tools installed, as Subversion (`svn`) is then already installed on your system by default.

2. Download the Psychtoolbox installer **to your desktop**.

3. Open Octave or Matlab and type the following in the command window:

    ```
    >> cd ~/Desktop >> DownloadPsychtoolbox
    ```

4. The second command will take a long time and generate a lot of output. Please be patient.

5. If the download fails, read below on Download Problems. If you want to know more, see DownloadPsychtoolbox (or `help DownloadPsychtoolbox` in the Matlab command window.)

6. If you intend to use multi-media functions, you must install the 64-Bit GStreamer-1.0 runtime from gstreamer.freedesktop.org. Make absolutely sure that you install all offered packages. Read `help GStreamer` carefully for this purpose, *before downloading and installing GStreamer*.

Linux

Packages

Psychtoolbox for Linux has been packaged by the NeuroDebian team and is available in the following repositories:

Up to date, tracks most recent official PTB beta releases - recommended:

[NeuroDebian](#) ([Octave](#) or [Matlab](#))

NeuroDebian provides installation instructions on its website when you click on the links for Octave or Matlab above.

Usually somewhat outdated versions, GNU Octave only, no Matlab:

[Debian archive](#) (package `octave-psychtoolbox-3`)

[Ubuntu archive](#) (package `octave-psychtoolbox-3`)

The packages in the main Debian and Ubuntu archives only ship with GNU Octave support, hence the package to install is **`octave-psychtoolbox-3`**. *Use the script*`DownloadAdditionsForNeuroDebian` *after the package installation to post-install our Matlab versions of the binary MEX routines as well, should you need Matlab support. In general using the NeuroDebian repo above is more convenient and provides up to date packages for Octave and Matlab.*

The advantage of the above repositories is that third-party dependencies are automatically installed by the package manager.

Subversion-based installation

Alternatively, you can perform the regular installation via our `DownloadPsychtoolbox.m` script. The following will install Psychtoolbox by checking out the Subversion repo to the specified local directory.

1. Get the `subversion` package from your Linux distribution's archive (i.e. `apt-get install subversion`, or `yum install subversion`, et al.).

2. Start Octave or Matlab, `cd` into the folder that you saved the`DownloadPsychtoolbox.m` script in, and run

```
>> DownloadPsychtoolbox('/home/foo/toolbox')
```

However, Octave mex files from this download will only work out of the box with Octave 3.8 on a fairly recent distribution like Ubuntu 14.04-LTS. All required dependencies like GStreamer-1, libdc, etc. need to be manually installed in this case. Go for the NeuroDebian installation instead if you are on Debian or Ubuntu flavors.

Additional tips for installing and using Psychtoolbox on Linux.

Windows

Filesystem locations given here are examples. You could choose other disc drives or folders of your liking instead:

1. Download Subversion installer

o **Windows:** Subversion 1.7.x command-line client
2. Download the Psychtoolbox installer **to your desktop**.

3. Open the **My Computer** icon (it is either on the desktop or in the Start Menu).
4. Double-click on the **C: drive** icon.
5. Create a new folder called `toolbox`. This assumes you want to install into the `toolbox` folder.
6. Move the Psychtoolbox installer (`DownloadPsychtoolbox`) from the Desktop to the new `toolbox` folder.
7. If you intend to use multi-media functions, you must install the 64-Bit GStreamer-1.0 runtime from gstreamer.freedesktop.org. Make absolutely sure that you install all offered packages. Read `help GStreamer` carefully for this purpose, *before downloading and installing GStreamer*.
8. You also need to install the Microsoft Runtime Libraries for MSVC 2010. You can find installers for these at Microsoft's site beforehand. Otherwise when our installer aborted half-ways, follow the instructions it prints to the console.
9. Open Matlab as administrative user (for Windows 7, right-click Matlab shortcut and Run As Administrator) and type the following in the command window:

```
>> cd C:\toolbox >> DownloadPsychtoolbox('C:\toolbox')
```

The second command will take a long time (~10 min in some cases) and generate a lot of output. Please be patient (and make sure your computer is not going to go onto standby while installing). You may get the command line reappear before the installation is finished - so don't

assume the command line reappearing means that installation has hung. The installer will tell you when it is finished.

If the download fails, read below on [Download Problems](#).

If you want to know more about the downloader, see [DownloadPsychtoolbox](#) (or `help DownloadPsychtoolbox` in the Matlab command window.)

Using the Software

There are two ways to use IGT-Open: via the supplied user-interface, where you can visually modify certain parameters and via calling the function (*igt_open)* with specific parameters. The former simply calls the latter function with the supplied parameters set by the user. Both must be initially called from within the interpreter command-line. However the user-interface allows one to not have to commit specific parameter order to memory, while the more direct command line method may allow one to use the interpreter history to make a *igt_open* function call with only 1-2 different parameters (e.g., changing the SID for a particular experiment run).

Before we have a short overview of the methods themselves, it may be more useful to go over the specific parameters. Ultimately, using both methods you must set these parameters (or allow the default parameters that are already set to an agreeable value).

IGT-Open Parameters

group – **int**, This parameter can be used for between-group experiment conditions. In the experiment for which this software was originally developed, there were three groups, so each participant was run with either a 1, 2, or 3. The group setting is reflected in the output file as the second number in the file (e.g., m-1-99.txt would reflect a subject in group 1).

sid – **int**, This is the unique ID for the subject you are running through the experiment. In the past, numbers have been used with this (e.g., 1, 2, 3, 4, …, n subjects).

savePath – **str**, This should be the Path to the directory where you would like your subjects files output. For example, you may want a "../save" folder that holds the behavioral results produced during the experiment.

mORf – **str,** This should be a string that is either the value 'm' or 'f' to specify whether the participant is a male or female. This string is reflected in the output file. (see the group definition).

penaltyFunStr – **str**, This is the name of the function that will return deck and win-loss distribution information. Look into the base directory at the penaltyDist function file that will give an example function that can be used here.

igtHomeDir – **str**, This should be the main directory where your *igt_open* function file is located.

imageDir – **str**, This is the path to the directory that contains the images that will be used in the software. For an example folder structure, look at the images folder.

breaksLength – **1X4 array (e.g., [2 3 4 0]**, This will be used to specify how long different phases of the experiment will last. The 1st parameter tells the software how long to show the flipped card (e.g., in some past Iowa Gambling Task setups a green card is "flipped" when the selection results in a net gain and a red card is shown when the selection results in a net loss).

comport – **str (OPTIONAL)**, This is a parameter to be used to connect the software with an ISCAN eye tracker. The comport you have to use will depend on your system (you'll need to lookup the port specification for the connected serial port for your Operating System).

simulation – **int (0 for false, 1 for true; OPTIONAL)**, This represents a Boolean value that tells the software whether this is a simulation using a model of some kind. It assumes you will have another model communicate with the software using the JSON protocol over TCP, port 8088.

numTrials – **int (OPTIONAL; default is 100)**, This tells the software the number of trials that it should run.

Via User-Interface

Using the user-interface is fairly straightforward. The UI allows you to more easily see the parameters you are changing (and see the default parameters that will be used if you choose to not change that specific parameter. Change any parameter that will affect your experiment (see the previous section for information on parameters) and click the "Run Experiment" button.

Via Command Line

igt_open(1, 999, 'm', 'PenaltyDist', '.', '.', 'images', [4,4,4,0])

The function call above show the igt_open function called with default parameters. Using the interpreter command line in this way can be useful as the interpreter history should hold past calls, allowing you to make easier updates to changing parameters between subjects when the parameter values are different than the majority of default values.