OpenVALE Lite
User's Guide

OpenVALE Lite is a simple framework for researchers to evaluate HRTFs for audio spatialization. The Lite version of OpenVALE removes the need to write experiment scripts and set up an OpenVALE server. Instead, OpenVALE Lite is self-contained and allows researchers to run the most common types of experiments performed in the original OpenVALE. There is still a wide range of options for experiments, most of which can be adjusted during a session.

For the original OpenVALE project, see https://gitlab.com/OpenVALE/OpenVALE.

I. The OpenVALE Lite Package

OpenVALE Lite is distributed in a ZIP file. This contains the executable, configuration information, HRTF files, WAV sound files, and other supporting files. The ZIP should contain the following files and folders:

- MonoBleedingEdge – Folder containing files needed for OpenVALE to run. This should not be modified.
- OpenVALE_Data – Contains supporting files for OpenVALE. The HRTF and WAV files to be used in experiments are stored within this folder. Most of the other files in this folder should not be modified. Editing the HRTF and WAV files is explained in detail in Section III.
- OpenVALE.exe – The main OpenVALE executable. Open this file to run experiments in OpenVALE. Be sure to keep this file in a folder with all the other data in the original ZIP file, otherwise OpenVALE will not run.
- OpenVALEConfig.xml – This contains the default configuration information for OpenVALE. Information about setting up the default configuration is found in Section II.
- README.pdf – This user guide.
- UnityCrashHandler64.exe – File needed for OpenVALE to run. This should not be modified.
- UnityPlayer.dll – File needed for OpenVALE to run. This should not be modified.

If any of the above files or folders are missing from the ZIP file, OpenVALE likely will not run. Download a new copy of the OpenVALE distributable if any files or folders appear to be missing.

To verify OpenVALE is working correctly, try to unzip the ZIP distributable, then from the directory where the ZIP contents are extracted, try to run OpenVALE.exe. Do not try to run OpenVALE.exe from within the ZIP file without extracting its contents first. Do not try to copy OpenVALE.exe out of the ZIP file and running it without its supporting files and folders.

II. The OpenVALE Configuration File

OpenVALEConfig.xml contains the information related to the default OpenVALE configuration. When OpenVALE is first opened, it runs with the settings defined in OpenVALEConfig.xml. All available settings are tagged in this file by default. It is not recommended to delete any of the tags or to set them to any values other than those defined below. The structure containing the list of settings (like the “configuration” and “applicationSettings” tags) also should not be modified.

Note that the values listed in this file are only used for OpenVALE default settings, unless otherwise specified. Settings can be changed again during runtime using the virtual menu screen. See Section V.

Each of the available settings and valid values are as follows:

- WavFile – The name of the WAV file to play during the continuous cue task. By default this is the sample file included with OpenVALE. This can be set to any WAV file in the OpenVALE WAV directory if others are added. Set only the name of the file without the extension or file path. For example, to use a file named “whitenoise.wav,” move it into the OpenVALE WAV directory and set the WavFile attribute to “whitenoise” (without the quotes). This setting can also be set to the name of a directory inside of the OpenVALE WAV directory. This will cause OpenVALE to randomly choose a WAV from within that directory for each trial.
- HMDType – The type of head mounted display to be used with OpenVALE. This setting cannot be changed during runtime. Valid values include “Rift” and “None”. “Rift” should be used when running OpenVALE in an Oculus Rift and is likely the correct setting for real use. “None” can be used to run OpenVALE without a VR headset and control it with the keyboard (WASD keys are used to move the camera in this mode). Note some functionality may not work as intended if running without the VR headset.
- CueMode – The type of task to run. Valid values include “continuous” and “burst”. A continuous cue plays a specified audio source continuously during each trial. A burst cue is a half-second burst of noise that is played at the start of each trial.
- HrtfFile – The name of the SOFA HRTF file to use for the task. Like the WAV file, only use the name of the SOFA file without the .sofa extension. Make sure the HRTF is in the OpenVALE HRTF directory.
- HideResult – Set to “yes” to hide the target speaker location from the subject during a trial. Otherwise, the target speaker location will be shown to the user after each response.
- ResultPath – The full path to a directory where results are to be written. Leave blank to use the default results folder. This is a folder named “TrialResults” that will be placed in the OpenVALE folder when a trial is started. This cannot be changed at runtime.
- NumTrials – The number of trials to run in a session. Default is 10.

III. Modifying HRTF and WAV Files

The HRTF and WAV files used by OpenVALE during trials are located in the OpenVALE_Data\StreamingAssets directory. The HRTF files must be placed in the “hrtf”

folder, while the WAV files must be placed in the “wav” folder. The “normhrtf” folder should not be modified. Other files in OpenVALE_Data should also not be modified.

HRTF files must be in a Steam Audio-compatible SOFA format. Most SOFA files should be compatible. Full compatibility details can be found at https://valvesoftware.github.io/steam-audio/doc/capi/guide.html#custom-hrtfs.

All standard WAV files should be compatible with OpenVALE. Directories of WAV files can also be placed in the OpenVALE WAV directory. Any time a directory is chosen in place of a single WAV file, OpenVALE will randomly choose a WAV file from that directory to use for each trial.

IV. Running an Experiment

Once OpenVALE Lite has been configured, running an experiment is as simple as opening the OpenVALE executable (OpenVALE.exe). OpenVALE will immediately launch into the experiment that has been configured. If running in an Oculus Rift, it will also automatically open the Oculus software needed for the experiment to be viewed in the Rift.

When using the Oculus Rift, only the right-hand controller is needed. In OpenVALE, the “fire” button used to select items is the trigger on the back of the Rift controller (the button where the user’s index finger would likely rest). This is used to select speakers and items in the menu. To open the virtual menu, press the “A” button. To close the virtual menu, press the “B” button.

When using a keyboard, use the WASD keys to move the camera. (W moves the camera up, A left, S down, and D right.) Use the spacebar as the “fire” button. This will select the item in the center of the screen. To open the virtual menu, press the “Z” key. To close the virtual menu, press the “X” key.

For best results, using over-ear headphones is recommended.

When a session is complete, the results of each trial will be written to a file in the location specified in OpenVALEConfig.xml (or to the default TrialResults folder if not specified). The results are written as a CSV file titled with the date and time the session started, along with whether the session was run with a continuous cue or a burst cue. The CSV contains the target speaker number, the FLT vector of the target speaker, the response speaker number, the FLT vector of the response speaker, the error distance between the two speakers, the response time (measured from cue onset to user response, in seconds), the HRTF used for each trial, the name of the audio file used for each trial, and the note that has been attached to the trial (if any).

To re-start the session, either close and re-open OpenVALE or open the virtual menu and press the “Reset” button.

V. Using the Runtime Menu

Several settings can be changed during a session through the runtime menu. This allows for adjustments midway through a session that are applied to remaining trials. These settings include:

- Trial Note – When set, this note will appear in the result file alongside trial data.
- WAV Source – The WAV file to use as the continuous cue. The list of files provided here will match the files in OpenVALE's WAV folder (see Section III). Any directories in the WAV folder are marked with a "(D)" before the folder name. When a directory is selected, OpenVALE will randomly select a file from this folder for each trial.
- HRTF – The HRTF file to be used. The list of files provided here will match the files in OpenVALE's HRTF folder (see Section III).
- Cue – Used to select a continuous or burst cue. Note that changing the cue type will restart the session.
- Show Target? – Whether to show or hide the correct target location to the subject after each trial. If hidden, only the response location will be shown.
- Trials – The number of trials to perform in each session.

To save changes to the settings, press the Save button. All changes will be saved and the menu will close.

To discard changes to the settings, press the Cancel button. This will close the menu.

To reset the current session trial count, press the Reset button. This will close the menu. Note this will also discard any changes made to settings while in the menu.

VI. Licensing Information

OpenVALE was developed in Unity. Libraries used in this project include:

- Oculus SDK – https://developer.oculus.com/licenses/oculussdk/
- Steam Audio – https://github.com/ValveSoftware/steam-audio/blob/master/LICENSE.md
- HDF.PInvoke – https://github.com/HDFGroup/HDF.PInvoke/blob/master/COPYING
- VRKeys – https://github.com/campfireunion/VRKeys/blob/master/LICENSE

OpenVALE is licensed under The Unlicense. Find more information at https://unlicense.org/.

VII. Building From Source

The OpenVALE Lite source is available at https://gitlab.com/OpenVALE/OpenVALE-Lite. The project was developed in Unity version 2021.1.9f1. Compatibility with newer versions is not guaranteed. The OpenVALE scene built for distribution is located in Assets → 0 Scenes → OpenVALE. OpenVALE has only been confirmed to work on Windows. To run development builds in the Rift, remember to install XR Plugin Support for Unity (in Edit → Project Settings → XR Plug-in Management) and enable Oculus support.