AVOKE: an open-source web-based experimentation toolbox for evoking audiovisual responses

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Background

Web-based experimentation opens doors for researchers with less resources, adding millions of potential participants.

Recently, tools like jsPsych & WebGazer have made the transition to web-based experiments easier (De Leeuw, 2015; Papoutsaki et al., 2016).

However, many open-source web-based methods can be lacking in customization and documentation, making them very intimidating.

Goals

Provide a flexible and accessible web-based foundation for inexperienced researchers.

Improve upon existing web-based eye-tracking calibration methods (Saxena et al., 2022).

Foster future growth of eye-tracking methods and audiovisual experimentation in web-based open-source software.

Video Capture Extension & Setup Plugin

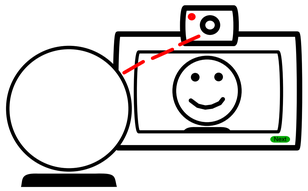

Figure 1. Participants choose a video input device from a drop-down menu created by the plugin, updating the preview on-screen with the video output captured by the extension.

Important Parameters and Data Output

- Video files can be downloaded locally or uploaded to a server via an experiment management software such as JATOS.
- Video files can be split into smaller, more manageable chunks.
- Essential webcam device parameters such as resolution, frame rate and other video-related specifications will be collected.

Smooth Pursuit Calibration Plugin

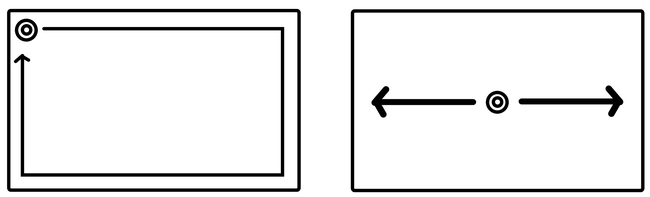

Figure 3. A target is presented. Upon a key press from the participant, the target will move along the path (outlined path is not shown to participants). The trial will end when the target finishes travelling along the path.

Important Parameters and Data Output

- The target's motion may be initiated through participant input or begin automatically after a short time delay.
- The target can start at any location, complete any number of repetitions along the path in any time duration.
- Data provides timestamps synced with coordinates reflecting the target's travel progress, useful for mapping eye-tracking recordings.

Audiovisual Button Response Plugin

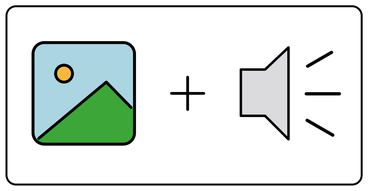

Figure 2. Audio and visual stimuli are presented simultaneously for participants to observe and respond to. Participant responses may be recorded through an array of button choices.

Important Parameters and Data Output

- The included parameters allow for custom image and audio files, adjustment of trial duration, visual stimulus size, time delay before participants can proceed and more.
- Data includes accurate timestamps for stimuli onset, stimuli offset, stimuli duration, participant response and more.

Fix Point Calibration Plugin

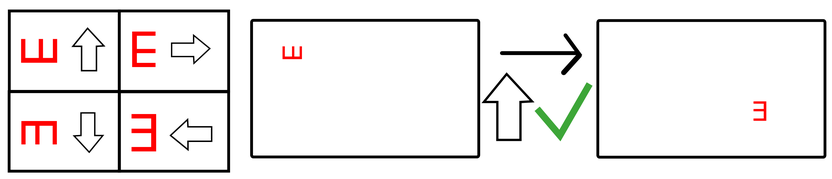

Figure 4. A target stimulus (E) appears randomly in one of four orientations at different coordinates (9 or 16 locations based on parameters), waiting for a participant response. In the figure, an "up" response is required to proceed.

Important Parameters and Data Output

- The target stimulus can be manipulated to any different letter or size.
- Each participant response will be collected alongside a timestamp.
- Additional data collected by this plugin: The number of incorrect responses that were made until a valid response was reached, and each target's coordinates and orientation.

YouTube Button Response Plugin

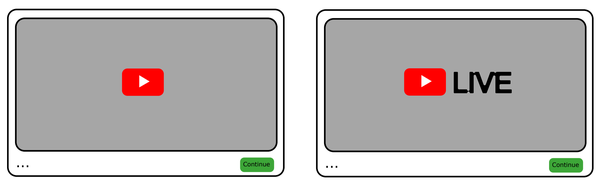

Figure 5. A YouTube video or live stream is displayed for participants to watch and respond to. Participant responses can be recorded through button prompts displayed below the video player.

Important Parameters and Data Output

- Changing the stimulus is as easy as grabbing any YouTube iframe link.
- Experimenters can limit the amount of control the participant has over the video player (volume, play/pause, etc.)
- Trial can end after a certain duration or wait for participant response.
- Data records any changes in the video player's state (playing, paused, buffering, etc.), changes in quality and a variety of timestamps for easier mapping to participant's recorded video.

Limitations and Future Additions

Adapting for use outside of jsPsych requires additional expertise (De Leeuw, J. R., 2015).

Add more custom parameters to maximize ease of use.

Bundling future deep-learning eye-tracking extensions for improved accuracy over current methods (Saxena et al., 2023).

Further usability studies on AVOKE to provide real-world data regarding accessibility.

Validity

All plugins are validated and have been used in other studies (Saxena et al., 2022).

AVOKE code will be validated in the open-source JavaScript testing framework, Jest.

References

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Visit the AVOKE GitHub repository at
https://github.com/beatlab-mcmaster/AVOKE

Test out the features of AVOKE at
https://beatlab-mcmaster.github.io/AVOKE/