# User Manual

## 0.1 CAVE

It is assumed that a CAVE, EyeLink II system and the required PCs have been set up. If more information is required, refer to the included System Manual for specification and set up instructions.

### 0.1.1 Experiment Configuration

Configure the experiment in unity, picking the participant's dominate eye, and drift correction type. If they are a diplopia sufferer, then the dominant eye should be set to the eye that they mainly see out off; the drift correction should be set to monocular. If the participant is normal sighted, then chose which either eye they have stronger vision in, and drift correction to binocular.

Build and run the experiment once correctly configured, the CAVE should now show the environment in 3D and tracking the glasses.

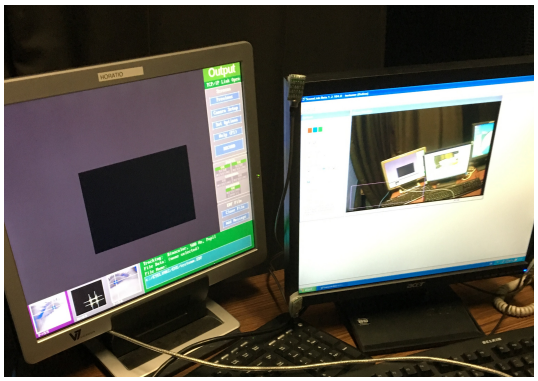


**Figure 1:** Monitor set up. Host PC monitor (left) Experiment PC monitor (right).

Turn on the computer connected to the EyeLink II (host PC) and select the

experiment viewer partition. Once loaded, press 'T' followed by 'enter'. The set up screen shown in figure 1 on should appear on the host PC's monitor.

**Figure 2:** EyeLink II headset & glasses set up

Place the EyeLink II headset on the participant as per the instructions detailed in the EyeLink II User Manual[1], followed by the 3D glasses, as shown in figure 2. Make sure they are comfortable, but there is no slip or movement. Position the cameras such that the participant's pupils are in focus through the lens of the glasses, but they do not occlude the participant's vision as seen in figure 3.

On the experiment PC, run simple.exe. Either press 'C' on either the host or experiment keyboard or click calibrate on the host PC to perform calibration.

The participant should fixate on the marker displayed on the experiment PC monitor. Once the eye movement is stable, press the space bar on either keyboard or press the accept button. The participant should then fixate on the marker as it moves around the screen. Once done, press 'V' or click validate and repeat the process. Once done, select the tracking of both eyes, and then click accept the host PC. Exit out of the calibration program on the experiment PC by pressing Alt+F4.

**Note:** make sure that you get a 'good' calibration on both eyes.

[1] sr-research.jp/support/EyeLink%20II%20Head%20Mounted%20User%20Manual%202-1.14.pdf

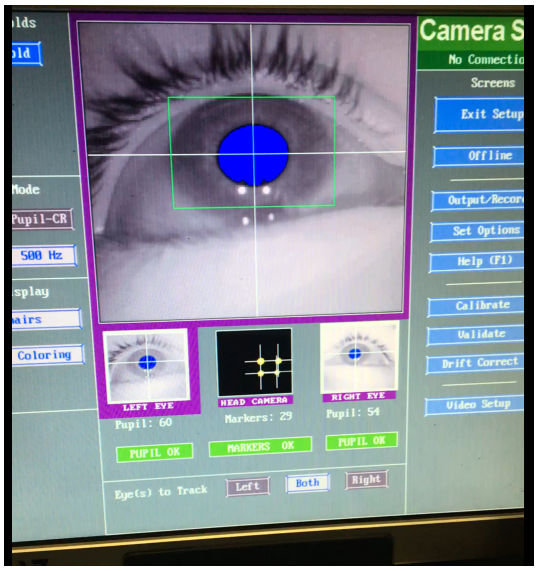


**Figure 3:** Positioning and focusing of EyeLink cameras. The participant's pupil is clearly visible and is as large as possible.

Run simplExample. Data should now be sent to the unity application within the CAVE. Coordinate data should be now updating on the walls.

Now in the cave, a yellow sphere should mark the gaze of the participant's dominant eye. If it is felt that it is not indicating correction, then perform drift correction as needed,

Hold down the trigger, all rotation and correction will cease. The participant should keep their head still and focus on the white spot on the coloured cube in-front. It will be black if binocular was selected as the drift correction mode inside Unity, red/green if monocular[2]. To confirm the correction, release the trigger. To cancel the correction, press the second button along on the wand, and then release the trigger. This will remove all drift correction.

**Note:** Drift correction might be needed to be performed several times during the experiment as movement of the headband is bound to happen. If the gaze marker is still incorrect after correction, the EyeLink may need to be re-calibrated and experiment restarted.

After drift correction is performed, view plane orientation is resumed. The

[2]If monocular selected, the participant should focus with each eye individually on the marker, and press the first button along the wand, that eye will now be corrected and the marker for the other eye will be shown. Release the trigger to complete correction of this eye.

gaze of the participant should now correctly alter the orientation of the view planes displayed to their submissive eye, allowing for fusion of the images for diplopia sufferers. Normal sighted participants should not see a change.

Data can be logged once the it is felt that drift has been sufficiently corrected for. This can be done by pressing the third button along on the wand.

Once enough data has been collected, press the space bar on the experiment PC, followed by escape on the rending PC. This will stop the sending of EyeLink data to the Unity application and end the Unity application respectively.

## 0.2 HMD

### 0.2.1 Experiment Configuration

The HMD solution has two different experiments, texture shifting or camera shifting. Texture shifting is the $(x,y)$ translation of the View Plane of the participant's submissive eye, while camera shifting is the rotation and translation of the camera corresponding to the submissive eye. The flag 'Shift Texture' on the 'ModePicker' script indicates whether View Plane translation or camera translation & rotation is performed.

The texture shift experiment will yield data of the correctional shift required to align objects in a CSV format. The camera shift will not.

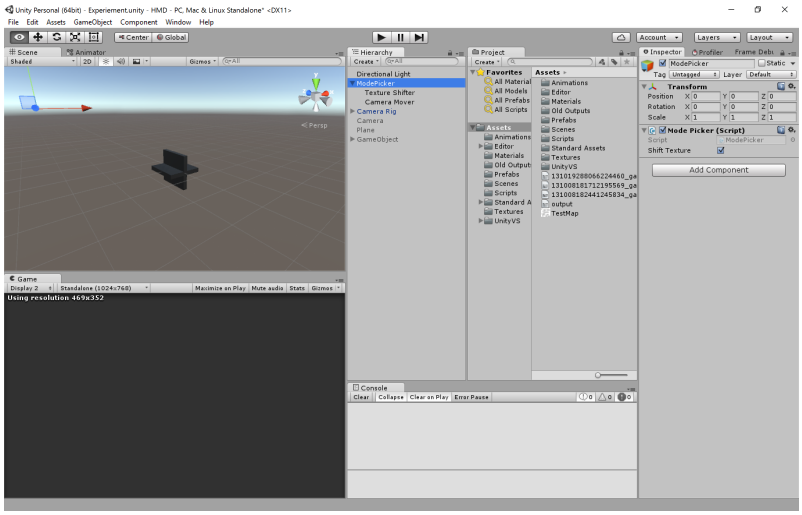

**Figure 4:** Selecting of HMD experiment

### 0.2.2 Set Up

These experiments can be run directly within the editor. Once the experiment is running, give the HMD to the participant, and task them with aligning the cross presented to each eye using the following controls:

### 0.2.3 Controls

#### Texture Shifting

**Brief:** Align the images of the cross in the eye. The images represent a cross at the same depth and position in 3D space.

- Hold down 'W' and press any of the following keys to alter the alignment of the image:
  - 'Up' and 'Down' keys for vertical movement
  - 'Right' and 'Left' keys for horizontal movement

  Hold down 'Left Ctrl' and press any of the following keys change the incremental value the image is shifted by:
  - 'Up' and 'Down' keys to double or half the value
  - 'Right' and 'Left' to increase or decrease the value by 10%
- Press 'Space' to confirm the alignment. The cross will then move to a new $(x, y)$ position and depth
- Press 'Left shift' to change the depth but keep the same $(x, y)$ position of the cross, and not confirm the alignment
- Press 'Enter' to change the $(x, y)$ position and depth of the cross, but not confirm the alignment
- Press 'R' to reset the image alignment

## Camera Shifting

**Brief:** Align the images of the cross in the eye. The images represent a cross at the same depth and position in 3D space.

- Hold down 'W' and press any of the following keys to move the camera:
  - 'Up' and 'Down' keys for vertical movement
  - 'Right' and 'Left' keys for horizontal movement
- Hold down 'E' and press any of the following keys to rotate the camera:
  - 'Up' and 'Down' keys for vertical rotation
  - 'Right' and 'Left' keys for horizontal rotation

  Hold down 'Left Ctrl' and press any of the following keys change the incremental value the image is shifted by:
  - 'Up' and 'Down' keys to double or half the value
  - 'Right' and 'Left' to increase or decrease the value by 10%
- Press 'R' to reset the image alignment