

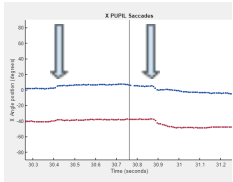
MATLAB

1. Open the MatLab file 'plot_video.m' located in ibaby/Downloads/saccade_detector.
2. Change the paths on lines 25-27, 239, and 244 to fit subject code and date accordingly.
3. Click 'Run'.
4. Wait about 10 seconds for a 'Continue' button to come up, and click that. A video will pop-up in a new window. You can minimize the window, but do not close or resize the window, because an error will occur.
 - a. You will know the program is finished running when the video stops playing. At that point, you can close out of the window and MatLab
 - b. If continuing on the **same** video another day, you do not need to reload the video through MATLAB, just start at Anaconda (Step 5)
5. Open Anaconda
 - a. Type 'cd Downloads' and hit enter.
 - b. Type 'cd saccade_detector' and hit enter.
 - c. Type 'conda activate sac_det' and hit enter.
 - d. Type 'python sac_det2.py F:\InfantSceneData(3_22_23)/**2023_03_27/khfn**/exports/000/' and hit enter. ***change this to match the subject code and date**
 - e. *To view the changes to the plot made based on the annotations, repeat steps a-c, then type 'dynamic_plot_script.py' and hit enter*

CODING TOOLS

- 3 cameras:
 1. World camera, shows what the subject sees as well as head movements (if video appears to tilt, the head tilted)
 2. Right eye pupil tracker (on left in video), with red dot in center and dark blue outer circle
 3. Left eye pupil tracker (on right in video), with red dot in center and dark blue outer circle
- Top "Y pupil" graph = vertical movements
- Bottom "X pupil" graph = horizontal movements
- **Red** line = right eye
- **Blue** line = left eye
- When red and blue lines running parallel = binocular data (both eyes picking up movement)
- When only red or only blue line = one eye's data lost (**record untrackable in respective eye**)
- Dot on video = manually calibrated to align with the target location, represents gaze estimate of where eyes are fixating

1. Start at beginning of video (on the slow setting)
 - Might take a few seconds to get the cameras aligned/ data to show up, so wait for red and blue lines to appear on the graphs to the right
2. Watch the red and blue graphs on the right at the same time as watching the world dot in the video. Code movements based on the following criteria by starting and stopping the recording measure based on when the movement begins and ends.



- If dot is staying still and world camera is not moving, most likely a **fixation...** the blue and red lines should be parallel since the eyes are not moving and are staring straight ahead at a point

****Fixating on an object is when the eyes hold one point of focus w/o moving the head*

- If dot is staying still and world camera is moving, most likely **VOR...** the blue and red lines should be sloping this time since the eyes are moving as the head rotates (very possible the horizontal graph will be the only one moving since most VOR is from side to side)

****To understand VOR, hold thumb out in front and turn head from L to R*

This keeps the object steady while the head and eyes move in opposite directions

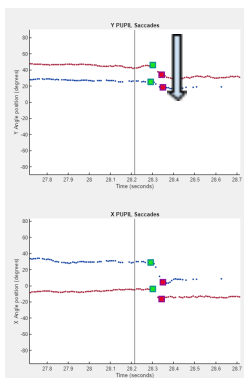
- If dot jumps from point A to point B, most likely a **saccade...** the blue and red lines will slope up or down since they are changing positions. If the code correctly picked up the saccade, it will appear with a green square at the start and a red square at the end on the graphs. If only one eye was picked up, there will be a green and red circle at the start and end of the movement respectively. If it was correctly caught binocularly, **score** the saccade with the buttons under the graph and select 'Both' since both eyes picked it up. If it was only detected as a unilateral jump, select either 'Right' or 'Left' depending on the eye that was picked up. You can jump forward to the next predicted saccade by clicking the 'Next' button, and return to the previous one by clicking the 'Prev' button. In addition, code it as a saccade in the middle button section.

**** To understand a saccade, hold out both thumbs about a foot apart in front of you.*

Without moving your head, jump your eyes from one thumb to the other

- If dot jumps even a tiny amount and it corresponds with a small slope on either graph, this is still a saccade, it just might have been too small for the machine to pickup on it. Record as undetected **saccade** in the center.
- If dot AND the red and blue lines disappear most likely a camera or tracking error. Click the **record untrackable** button on the far left, as well as the eye that was lost. If both eyes were lost (ie. no red or blue lines), click the both button rather than just R or L eye.
- If dot disappears but red and/or blue lines still picking up data on the graphs, grade the movement based on the graphs alone, since the world camera is still showing corresponding head movements to confirm the graphed eye movements.
- If blue and red lines cross horizontally, most likely a **vergence movement**. Dot will appear stationary (like fixation or VOR), but there should be something bringing the focus in towards the face of the subject ie. a toy or hand getting closer to the face.

**** To understand vergence, start with thumb out in front of face and bring it in towards the eyes. The eyes will "cross" as the object nears the face*



- If world camera is moving in correspondence with dot, and graphs are sloping up or down, most likely a **pursuit** (tracking) movement. Most likely will occur at the beginning of video when calibration toy is being used.

**** To understand pursuit movements, hold thumb out in front of you and move it up, down, left, and right while tracking it with your eyes but without moving your head*

- If slopes on graph appear as scooped “waves” that dip up and come back down to the starting position rather than jumping directly from one point to another, this is most likely a **gaze** movement. Confirm by observing the world camera– the head should move to follow the eyes’ initial gaze shift. As opposed to a saccade where the head is not moving, a gaze movement will be accompanied by the head following the eyes to realign them in primary position.

**** To understand gaze movements, hold out both thumbs in front of you and focus on the left one with your head also pointed left. Like you would with a saccade, switch focus to the right thumb, but now move your head to the right to keep the eyes looking straight*