university of groningen

faculty of behavioural and social sciences

SR Research EyeLink®

Eye tracking

Leuphana workshop Day 3

https://osdoc.cogsci.nl/leuphana2021

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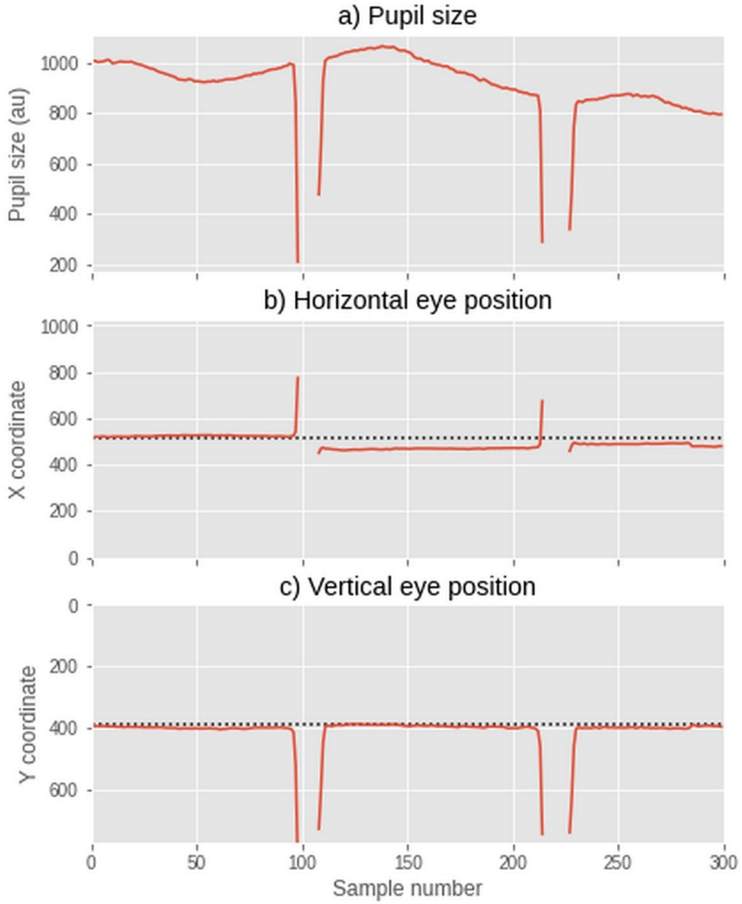
Today (day 3)

- Before the break
  - A general introduction to eye tracking
  - Working on a self-paced reading task
- After the break
  - Gaze-contingent self-paced reading
  - Continue working on your own experiment
  - Q&A
  - Workshop end!

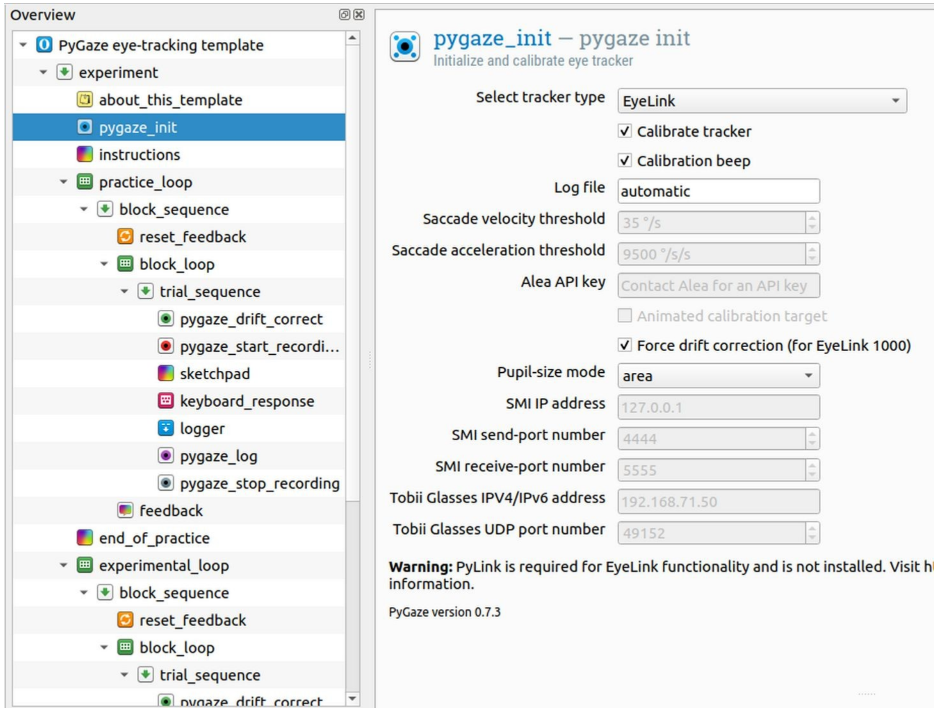
Eye tracking

- What do eye trackers record?
- Always: gaze position (time series)
  - x, y coordinates
  - Relative to a display
  - Or relative to a world camera
  - Or uncalibrated
- Usually: pupil size (time series)
  - In arbitrary units
  - Or in millimeters of diameter
- Usually: an event log
  - Timestamped messages



Eye tracking

- Eye tracking is not standardized
  - Different log-file formats
  - Different sampling rates
  - Different software-development kits (SDKs)
  - Technical idiosyncrasies
  - No standard analysis pipeline
- Attempts at standardization
  - Building experiments
    - PyGaze/ OpenSesame
    - iohub/ PsychoPy
  - Analyzing data (script-based)
    - gazeR
    - python-eyelinkparser



Overview

```
PyGaze eye-tracking template
  experiment
    about_this_template
    pygaze_init
    instructions
    practice_loop
      block_sequence
        reset_feedback
        block_loop
          trial_sequence
            pygaze_drift_correct
            pygaze_start_recordi...
            sketchpad
            keyboard_response
            logger
            pygaze_log
            pygaze_stop_recording
        feedback
    end_of_practice
    experimental_loop
      block_sequence
        reset_feedback
        block_loop
          trial_sequence
            pygaze_drift_correct
```

pygaze_init — pygaze init

Initialize and calibrate eye tracker

Select tracker type: EyeLink

☑ Calibrate tracker

☑ Calibration beep

Log file: automatic

Saccade velocity threshold: 35 °/s

Saccade acceleration threshold: 9500 °/s/s

Alea API key: Contact Alea for an API key

□ Animated calibration target

☑ Force drift correction (for EyeLink 1000)

Pupil-size mode: area

SMI IP address: 127.0.0.1

SMI send-port number: 4444

SMI receive-port number: 5555

Tobii Glasses IPV4/IPv6 address: 192.168.71.50

Tobii Glasses UDP port number: 49152

Warning: PyLink is required for EyeLink functionality and is not installed. Visit h
information.

PyGaze version 0.7.3

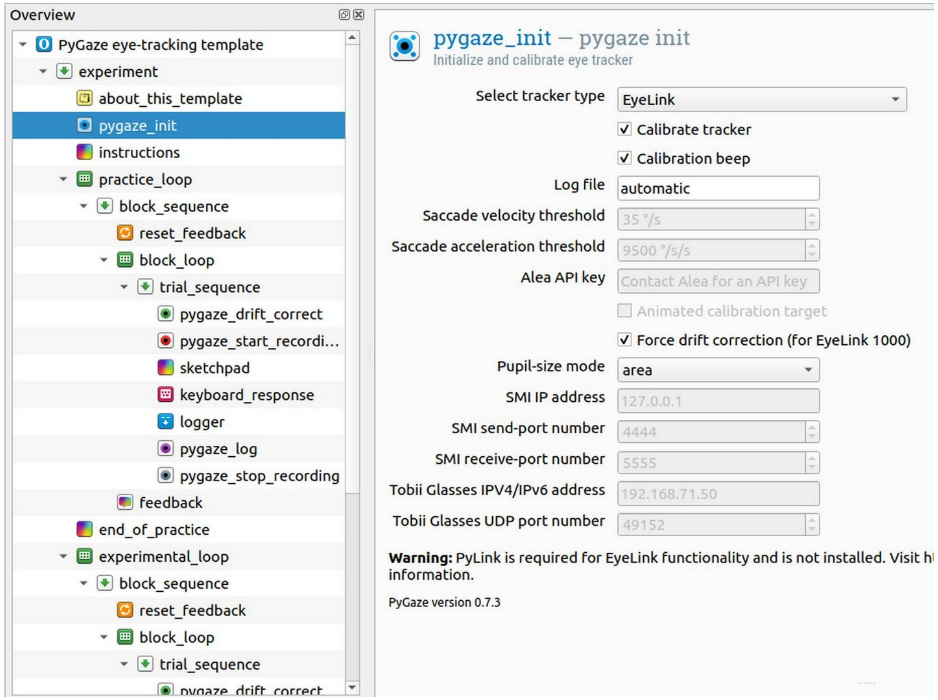
Eye tracking

- An eye-tracker setup consists of
  - Experiment PC: runs the experiment
  - Recording PC: connected to eye tracker
  - Bi-directional communication
- For some eye trackers the experiment and recording computers are the same

EyeLink 1000 setup
Source: SR Research

PyGaze

- PyGaze is a Python library for eye tracking
  - Supports different brands
  - Integrates with OpenSesame
- We will use PyGaze to implement a fancy gaze-contingent, self-paced reading experiment
  - But we'll start slow



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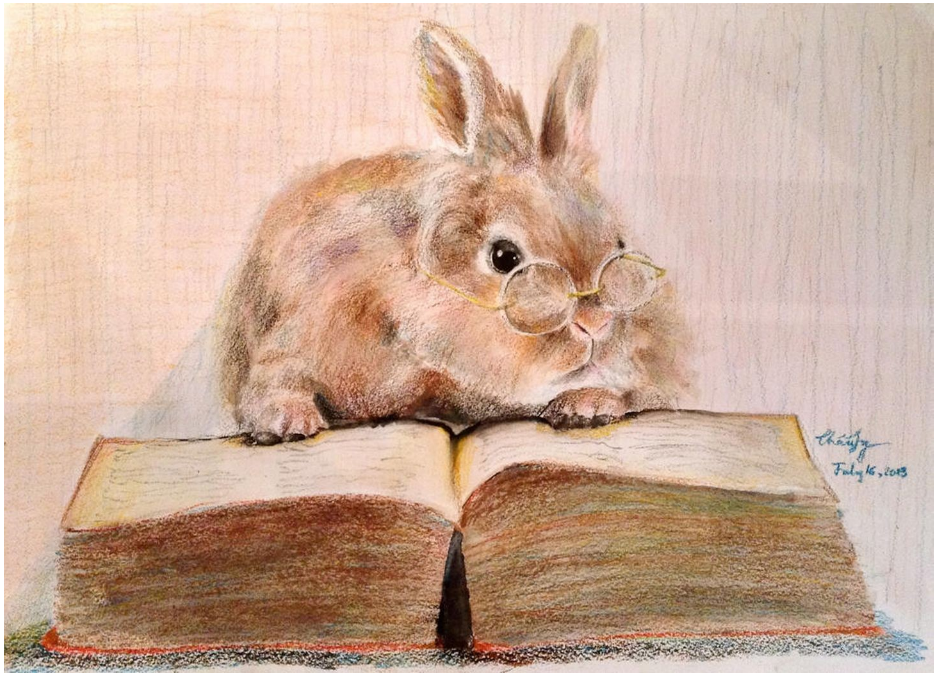
Hands-on workshop

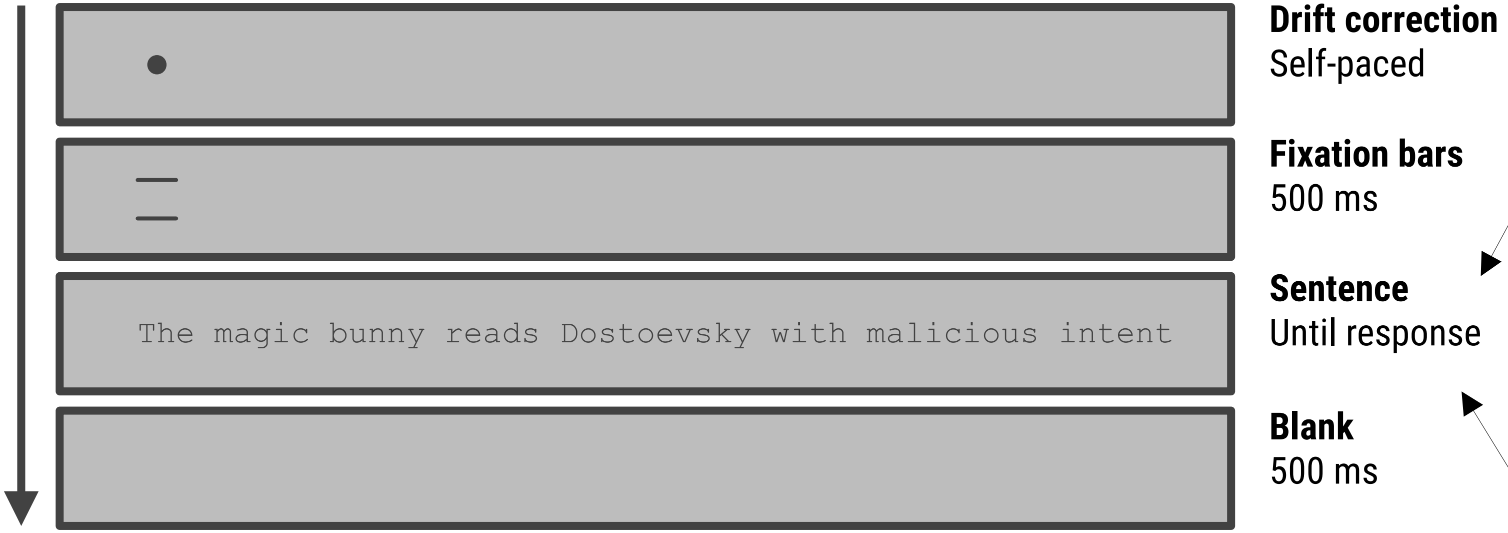
- As said: We'll implement a self-paced reading task
- I'll suggest some pointers
- But of course the details are up to you!



Source: MagicFlyingBunnies at deviantart

Hands-on workshop

Independent variable: sentence complexity (?)



Drift correction
Self-paced

Fixation bars
500 ms

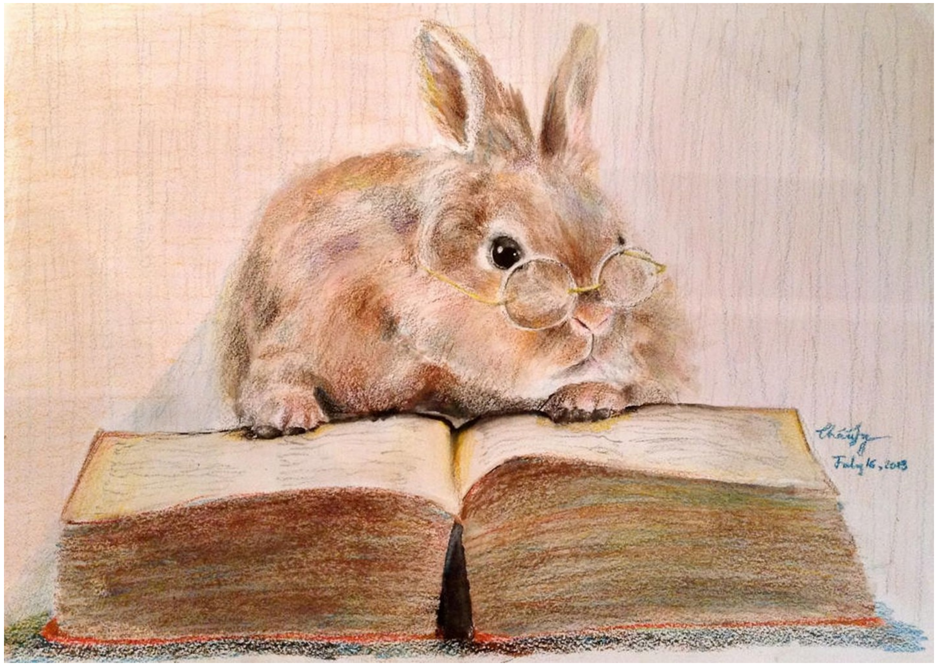
Sentence
Until response

Blank
500 ms

Dependent variable: response time

Hands-on workshop

- Start from the *Default template*
- At the start of the experiment
  - **pygaze_init** → initialize the eye tracker in advanced dummy mode
- At the start of each trial
  - **pygaze_drift_correct**
  - **pygaze_start_recording**
- At the end of each trial
  - **pygaze_log**
  - **pygaze_stop_recording**

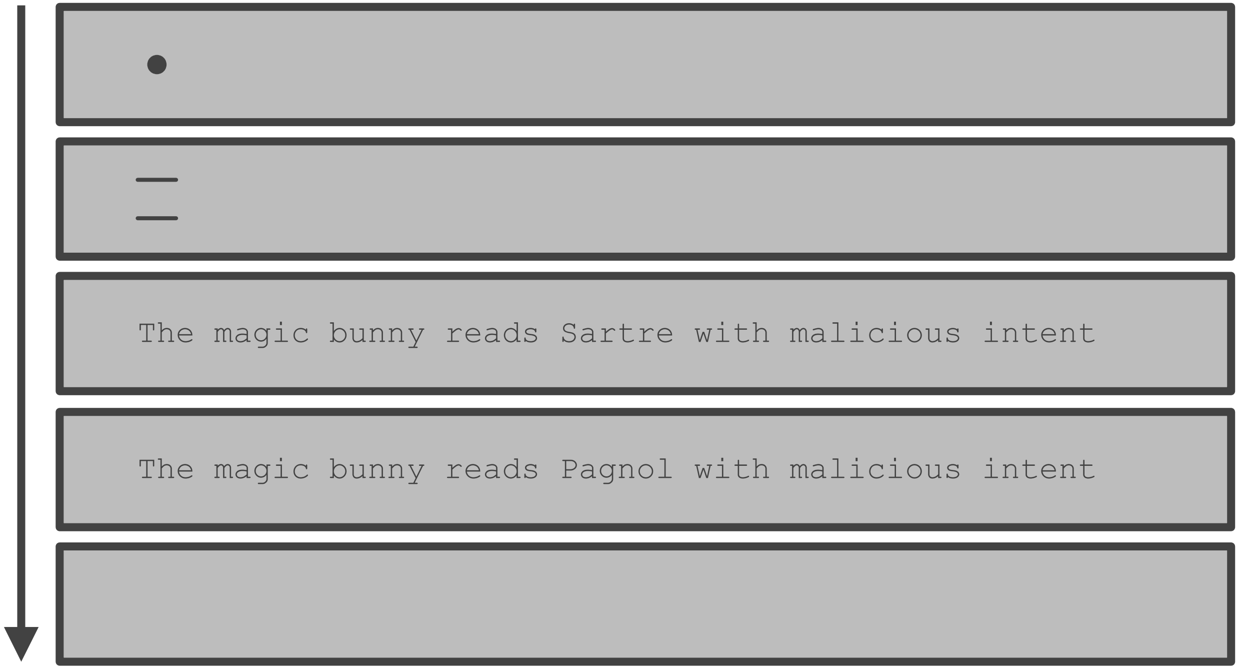


Source: MagicFlyingBunnies at deviantart

Let’s get to work!

Slides: https://osdoc.cogsci.nl/leuphana2021

Exercise



The magic bunny reads Sartre with malicious intent

The magic bunny reads Pagnol with malicious intent

Drift correction
Self-paced

Fixation bars
500 ms

Sentence
Hard: Until fixation on fourth word
Easy: Until first saccade

Sentence
Until key press

Blank
500 ms