Automatic Detection of Cognitive Load

from Pupil Dilation in Real world Scenarios

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purpose

detect the user's cognitive load
when working with the app
only using eyetracker data

find the biggest problems
in the tested system or
perform A/B comparison

method

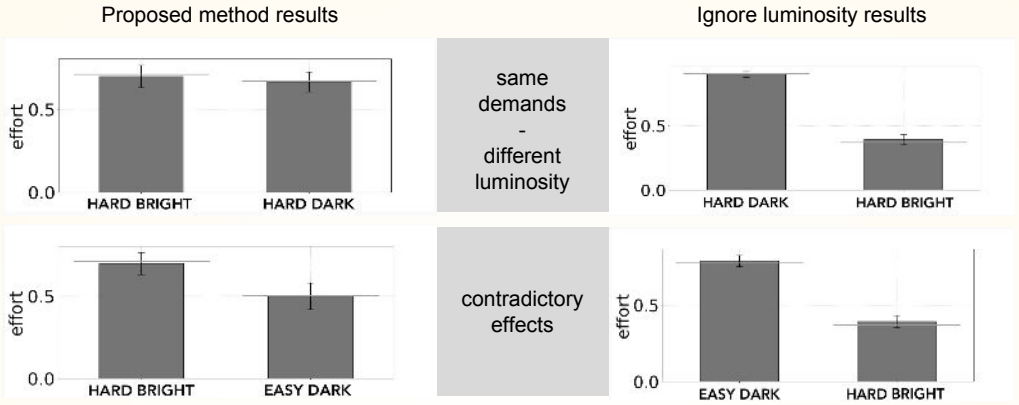
1. calibrate pupil reactions model
2. perform continuous
   detection of cognitive load

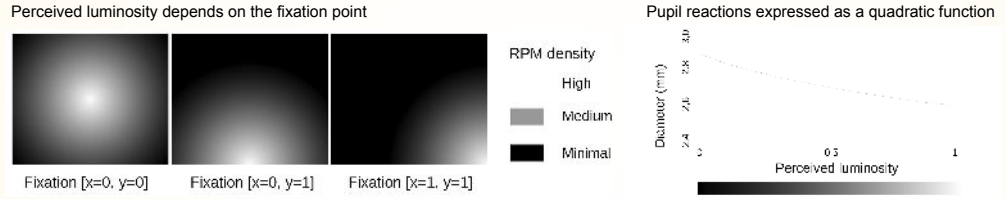
calibration
light induced pupil reactions
environment luminosity
retina distribution (screen distance)

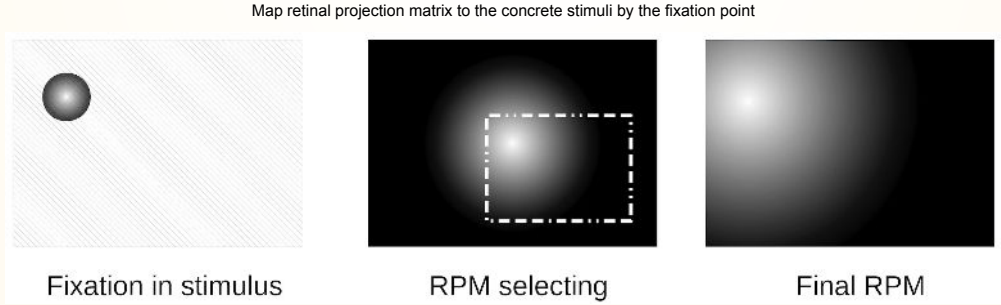
explicit calibration
use prepared stimuli
exact but distracting

implicit calibration
use experiment data
approximate but not distracting

iterative load detection
1. analyse perceived luminosity
2. predict the pupil diameter
   - respect current luminosity
   - respect reactions delay
   - respect reactions velocity
3. compare to actual diameter



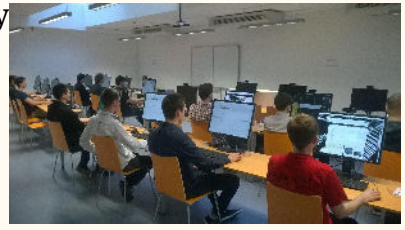




research activity

In order to the correct design of the pupillary response model, we had to perform several experiments in which we tested up to 260 participants on various tasks.

These experiments resulted in a final experiment with other 21 participants.



PeWe@FIIT
personalized web group

experiment

21 participants performed
a series of cognitive tasks
at the forefront of real websites

- three levels of cognitive demands
- four levels of screen luminosities
- cartesian distribution of tasks
- randomized order (72 tasks)

results & conclusion

- we are able to detect multiple cognitive load levels
- similiar cognitive load levels of the similiar tasks can be detected under various luminosity levels
- a significantly higher cognitive load can be detected at the first occurrence of the new task type
- neglecting the influence of luminosity on websites with different luminosity results in an error
- explicit and implicit calibration produced similar results