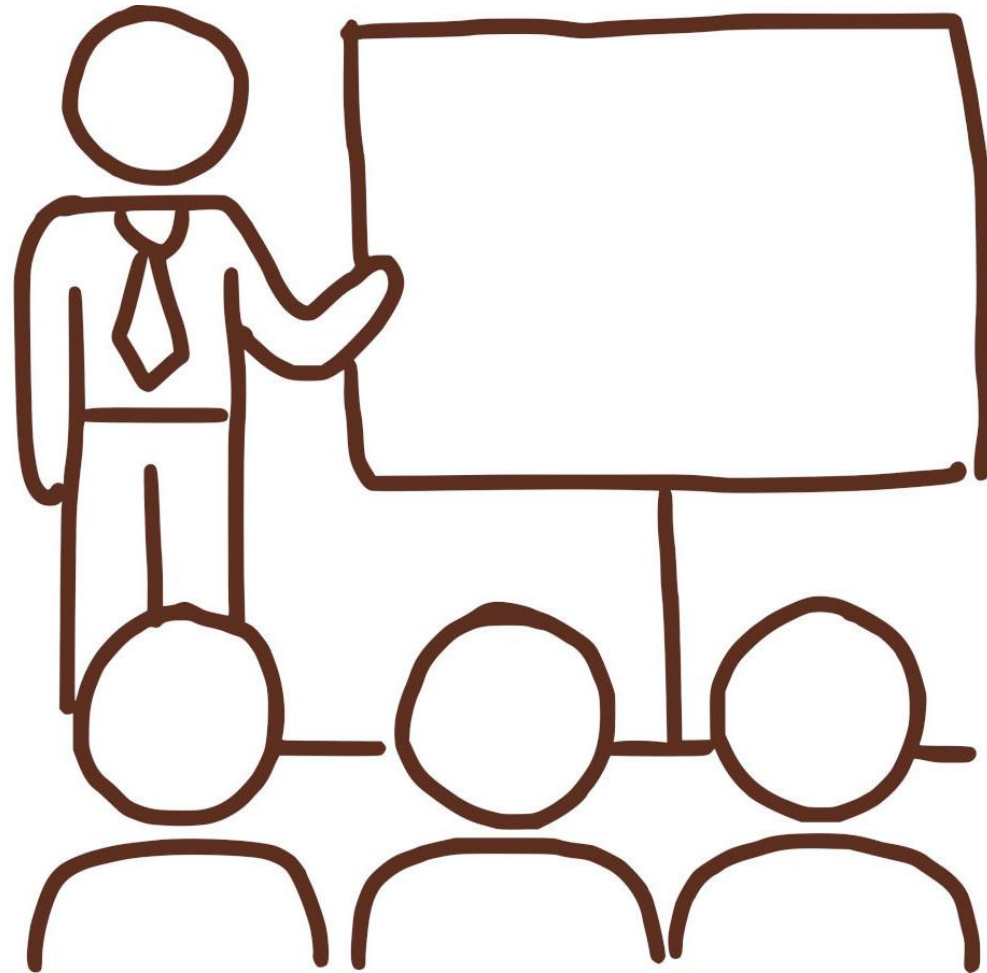




IMPLEMENTATION

Krzysztof Kutt, PhD
PSAW course, WFAIS UJ

IT'S TIME FOR PRESENTING YOUR EXPERIMENTS (FROM PREV LAB)





HOW TO LAUNCH THESE PROTOCOLS?

A.K.A. REQUIREMENTS



REQUIREMENTS

"Methodological":

- Group assignment (double blind? randomization?)
- Stimuli randomization
- Instructions
- Calibration (for baseline signals)
- Training (not recorded at all)
- ...

REQUIREMENTS

"Methodological":

- Group assignment (double blind? randomization?)
- Stimuli randomization
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- ...

"Technical":

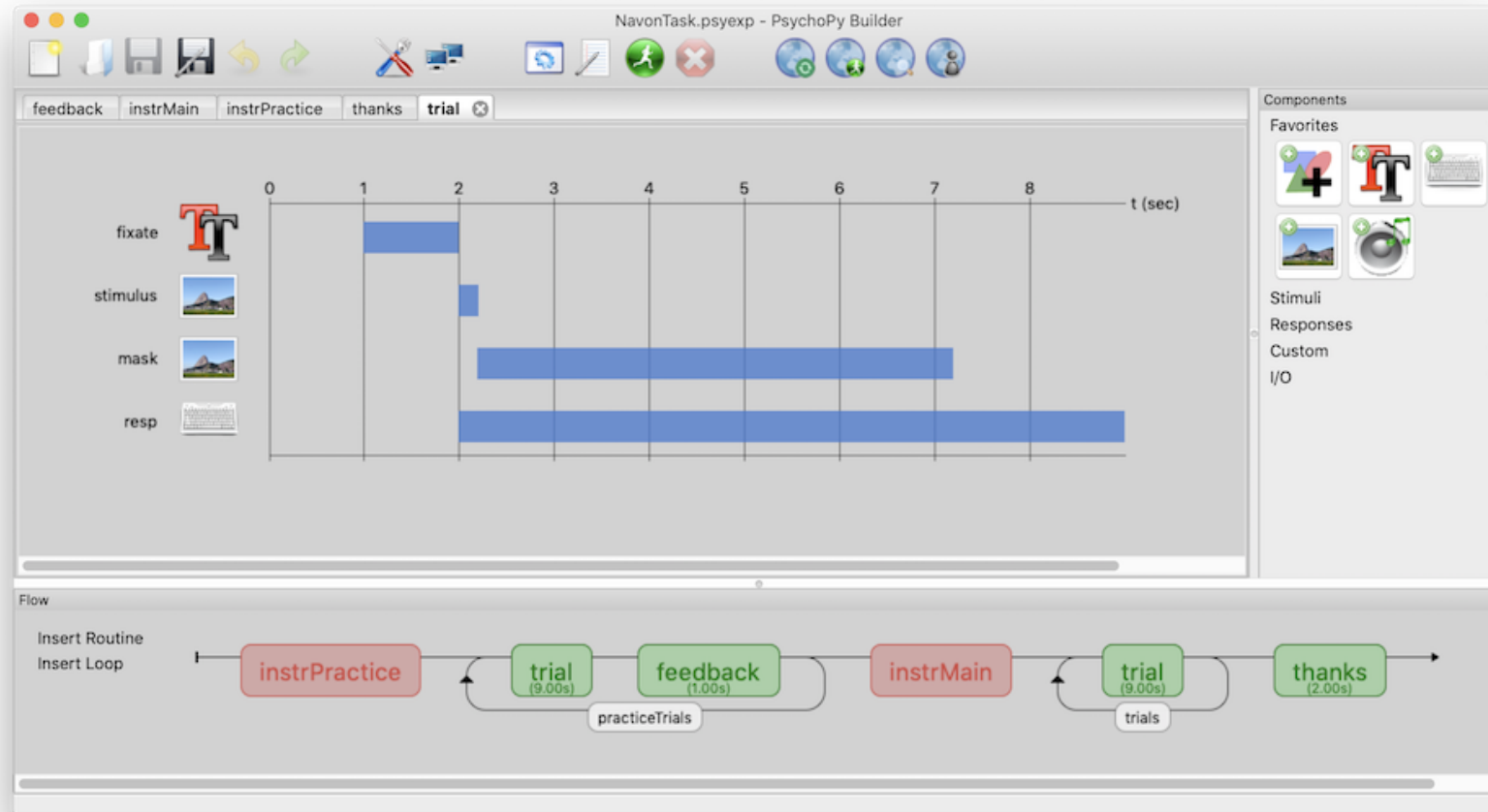
- **Timing and Synchronization**
(more details at the end of the lecture)
- Desktop vs On-line (vs Mobile)?
- Operating system / Web browser?
- ...



FRAMEWORKS

THIS WORK HAS ALREADY BEEN DONE...

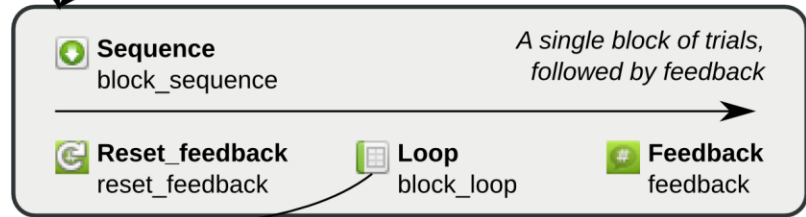
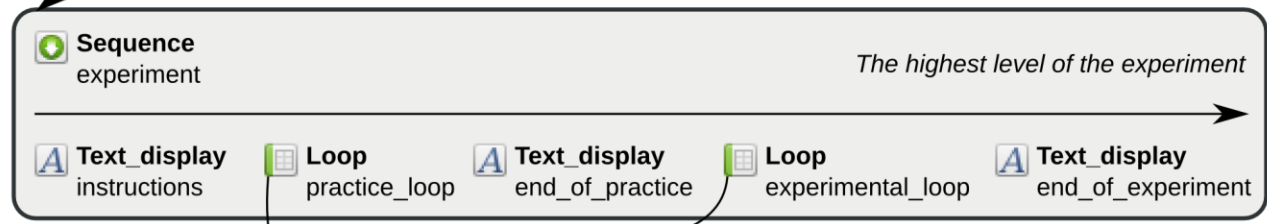




PsychoPy

- GUI builder (with Python snippets) & Pure Python
- Cross-platform (Win, Linux, Mac)
- Desktop & On-line
- Free & open source with huge community (and many additional materials)
- Pavlovia.org – shared repository of experiments

General properties
Tutorial 2: Gaze cuing



OpenSesame

- GUI builder with Python/JS scripts
- Cross-platform (Win, Linux, Mac)
- Desktop & On-line
- Android support (only runtime; [click here for docs](#))
- Free & open source
- Fully reliable GUI-based builder (in opposition to PsychoPy), but there is no possibility to export the whole protocol to pure Python

E-Prime

- Desktop (only Windows)
- GUI builder
- Scripting: E-Basic (Visual Basic dialect)
- Paid

- Support for (almost?) all professional devices (incl. MRI scanners, various sensors, input/output gadgets)

The screenshot displays the SoundRT - E-Studio software interface. The main window shows the Experiment Explorer with a tree view of the experiment structure, including components like User Script, SessionProc, Instructions, BlockList, BlockProc, TrialList, TrialProc, Fixation, Stimulus, AudioStim, Feedback, Goodbye, Full Script, and Unreferenced E-Objects. The Properties window for the selected AudioStim object is visible, showing various settings such as Buffer Size (5000), Buffer Mode (Streaming), Position Time Format (MilliSeconds), Start Offset (0 ms), Stop Offset (0 ms), Loop (No), Stop After (Yes), Stop After Mode (NextOnsetTime), and End Sound Action (none). A Properties dialog box for AudioStim is also open, showing fields for Filename, Buffer Size (5000), Buffer Mode (Streaming), Position Time Format (MilliSeconds), Start Offset (0 ms), Stop Offset (0 ms), Loop (No), Stop After (Yes), Stop After Mode (NextOnsetTime), and End Sound Action (none). The dialog box also includes checkboxes for Volume Control and Pan Control, and a Volume field. The interface includes a menu bar (File, Edit, View, E-Run, Tools, Window, Help) and a toolbar with various icons. The status bar at the bottom shows 'Ready' and 'NUM'.

SoundRT - E-Studio

File Edit View E-Run Tools Window Help

Experiment Explorer

Experiment (SoundRT.es3)

- User Script
- SessionProc
- Instructions
- BlockList
- BlockProc
- TrialList
- TrialProc
- Fixation
- Stimulus
- AudioStim
- Feedback
- Goodbye
- Full Script
- Unreferenced E-Objects

Properties

AudioStim SoundOut

(Name)	AudioStim
(About)	
(Property Pages)	
BufferSize	5000
DataLogging	(none)
Duration	1000
EndSoundAction	(none)
Filename	
GeneratePostRun	Inherit
GeneratePreRun	Inherit
HandlesConditionalE	Yes
JumpLabel	
LoadTimeStatsEnabl	No
Loop	No
Notes	
OffsetSync	(none)
OnsetDelayStatsEna	No
OnsetSync	(none)
OnsetToOnsetStateE	

Properties: AudioStim

Common General Duration/Input Task Events Sync Logging Experiment Advisor

Filename:

Buffer Size: 5000 ms

Buffer Mode: Streaming

Position Time Format: MilliSeconds

Start Offset: 0 ms

Stop Offset: 0 ms

Loop: No

Stop After: Yes

Stop After Mode: NextOnsetTime

End Sound Action: (none)

Volume Control
Volume:

Pan Control
Pan:

OK Cancel Apply

<http://www.pstnet.com>

Ready NUM

OTHER FRAMEWORKS

- *Expyriment* – free, Win / Linux / Mac / Android
- *Psychtoolbox* – free, cross-platform (for Matlab/Octave & Python)
- *Inquisit* – paid, Windows & on-line
- *NBS Presentation* – paid, Windows & mobile (Android & iOS)
- *Testable* – paid, on-line

- Many JavaScript-based libraries for web experiments (most of them rely on responsive design which simplifies mobile experiments): *PsychoJS* (on-line part of PsychoPy), *jsPsych*, *Lab.js*, ...

- And more!



TIMING & SYNCHRONIZATION



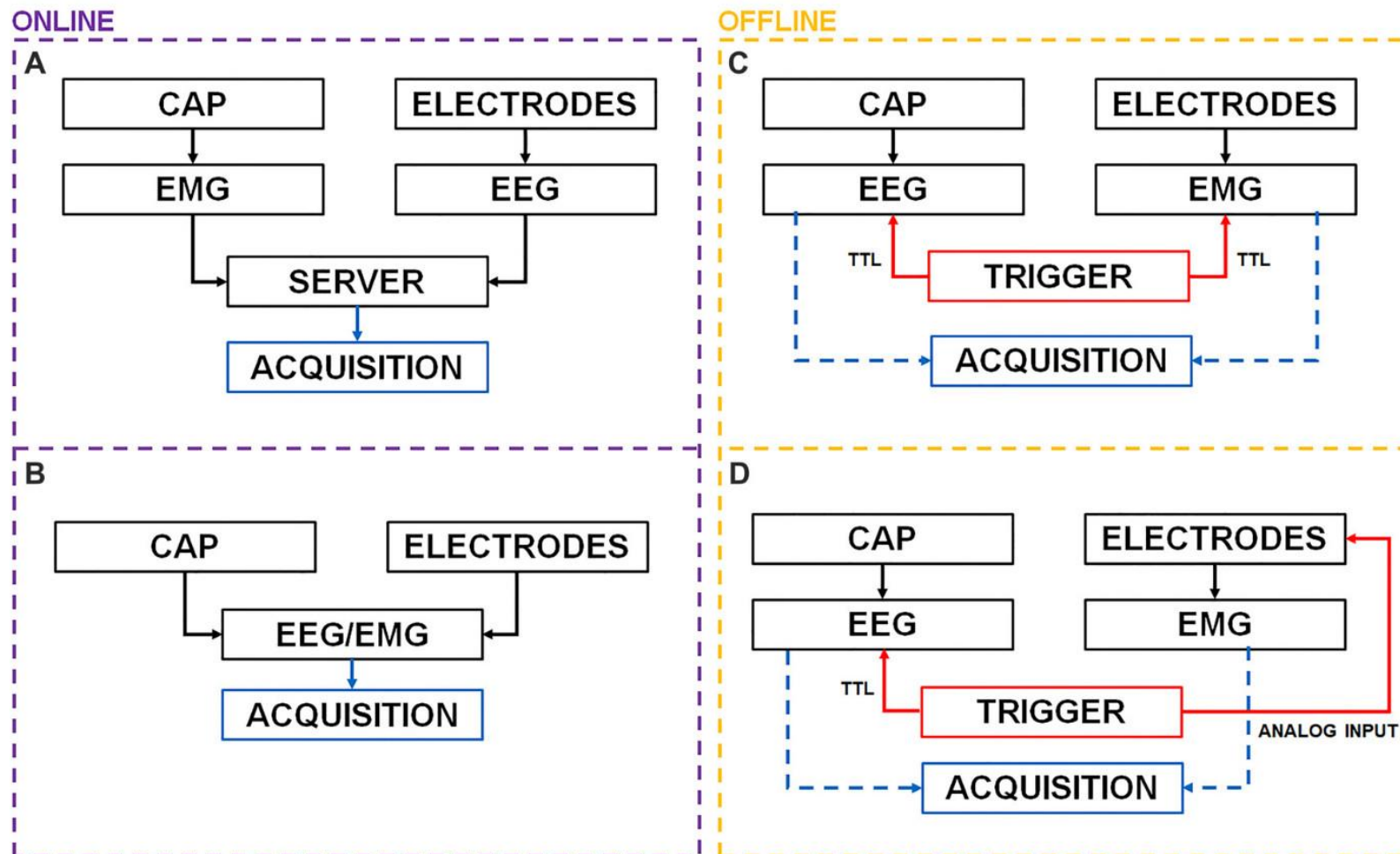
TIMING & SYNCHRONIZATION

- We need to know ***exactly*** when the stimuli occurred and when the subject responded
- Data streams must be ***accurately synchronized*** to infer about actual underlying physiological mechanisms
- Operating System is very important as ***timing strictly rely on low-level OS time mechanisms!***

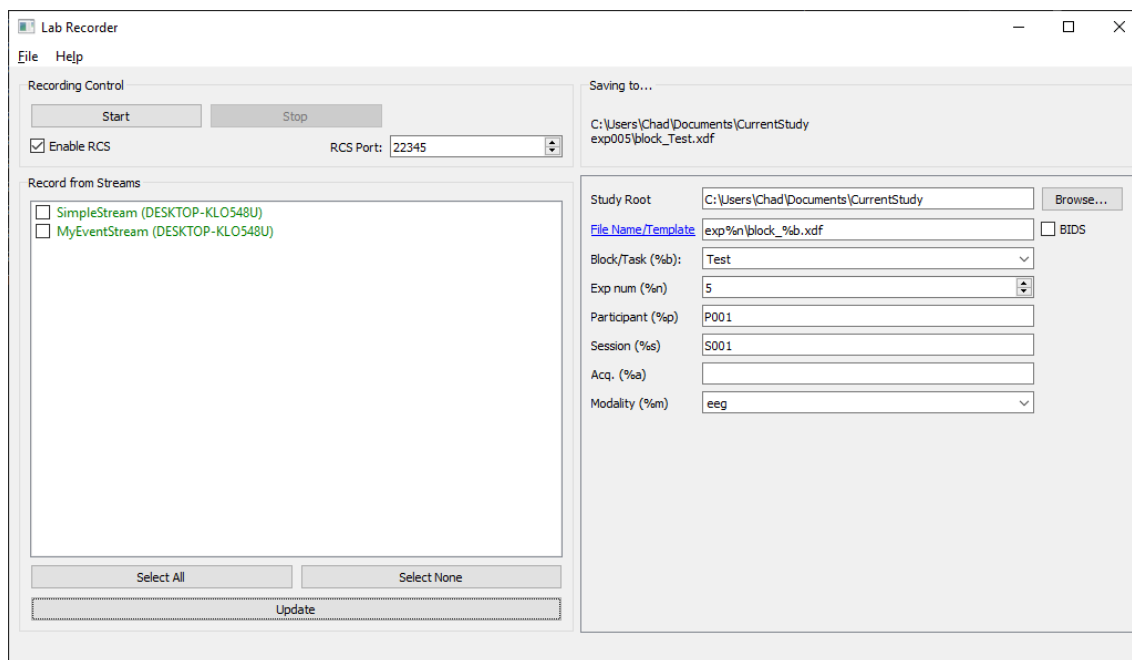
Package	Platform	Mean precision (ms)	Reaction times		Visual durations		Visual onset		Audio onset		Audiovisual sync	
			Var (ms)	Lag (ms)	Var (ms)	Lag (ms)	Var (ms)	Lag (ms)	Var (ms)	Lag (ms)	Var (ms)	Lag (ms)
PsychToolBox	Ubuntu	0.18	0.31	12.30	0.15	2.05	0.18	4.53	0.17	-0.74	0.11	-5.27
Presentation	Win10	0.29	0.35	11.48	0.23	-1.83	0.34	7.07	0.31	0.56	0.19	-6.51
PsychToolBox	macOS	0.39	0.44	22.27	0.12	-2.15	0.41	21.52	0.53	0.09	0.43	-21.43
PsychoPy	Ubuntu	0.46	0.31	8.43	1.19	3.49	0.34	4.71	0.31	-0.71	0.16	-5.43
E-Prime	Win10	0.57	0.53	9.27	0.18	2.51	0.18	4.41	0.98	5.08	0.97	0.67
PsychToolBox	Win10	0.67	0.42	10.49	0.75	2.24	0.19	4.56	0.99	0.77	0.98	-3.79
PsychoPy	Win10	1.00	0.35	12.05	2.42	-1.97	0.35	7.10	0.96	0.85	0.93	-6.25
PsychoPy	macOS	2.75	0.40	22.02	11.56	1.00	0.55	18.24	0.70	0.54	0.52	-17.70
Open Sesame	macOS	3.14	0.54	21.21	1.65	18.94	0.79	18.10	6.40	9.46	6.30	-8.64
Open Sesame	Ubuntu	3.41	0.45	9.68	9.16	32.29	0.50	2.35	3.45	2.05	3.48	-0.30
Open Sesame	Win10	4.02	1.22	8.27	1.12	17.04	0.72	3.85	8.56	47.24	8.50	43.39
Expyriment	Win10	6.22	2.90	10.76	0.55	-0.08	0.19	5.98	13.72	106.83	13.72	100.85
Expyriment	Ubuntu	7.75	2.73	23.45	8.31	12.08	0.73	16.75	13.49	118.67	13.50	101.92
Expyriment	macOS	9.05	4.84	33.83	7.04	-1.13	4.82	29.02	13.84	42.81	14.72	13.79

- Desktop software is better than on-line (browser-based)
- The winning OS depends on your procedure (e.g., desktop Linux is precise, but not Linux web browsers)
- The best are: *PsychoPy*, *Psychtoolbox*, *E-Prime* and *NBS Presentation*

SYNCHRONIZATION



LAB STREAMING LAYER (LSL)



- Streaming & syncing data streams over local network
- Devices synchronization (over NTP protocol)
- Interfaces for Python, Android, C#, Java, Matlab, Unity
- Many experiment-related tools have support for LSL
- Quite good online documentation with examples: <https://labstreaminglayer.org/>



LET'S PRACTICE!

STROOPTASK IN PSYCHOPY



STROOP TASK & STROOP EFFECT

Journal of Experimental Psychology

VOL. XVIII, No. 6

DECEMBER, 1935

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1 control

dog
chair
boat
window
block
fan
wheel
tray
bottle
fence

2 compatible

red
yellow
green
blue
red
blue
yellow
green
blue
red

3 incompatible

red
yellow
green
blue
red
blue
yellow
green
blue
red

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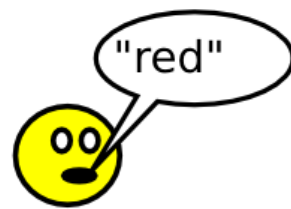
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1	control	2	compatible	3	incompatible
	dog		red		red
	chair		yellow		yellow
	boat		green		green
	window		blue		blue
	block		red		red
	fan		blue		blue
	wheel		yellow		yellow
	tray		green		green
	bottle		blue		blue
	fence		red		red

	Condition A	Condition B
Stimulus		
Response	 <i>fast response</i>	 <i>slow response</i>



**KEEP
CALM
AND
ASK
QUESTIONS!**

GEIST Research Group: <https://geist.re/>
Krzysztof Kutt: <https://krzysztof.kutt.pl/>

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