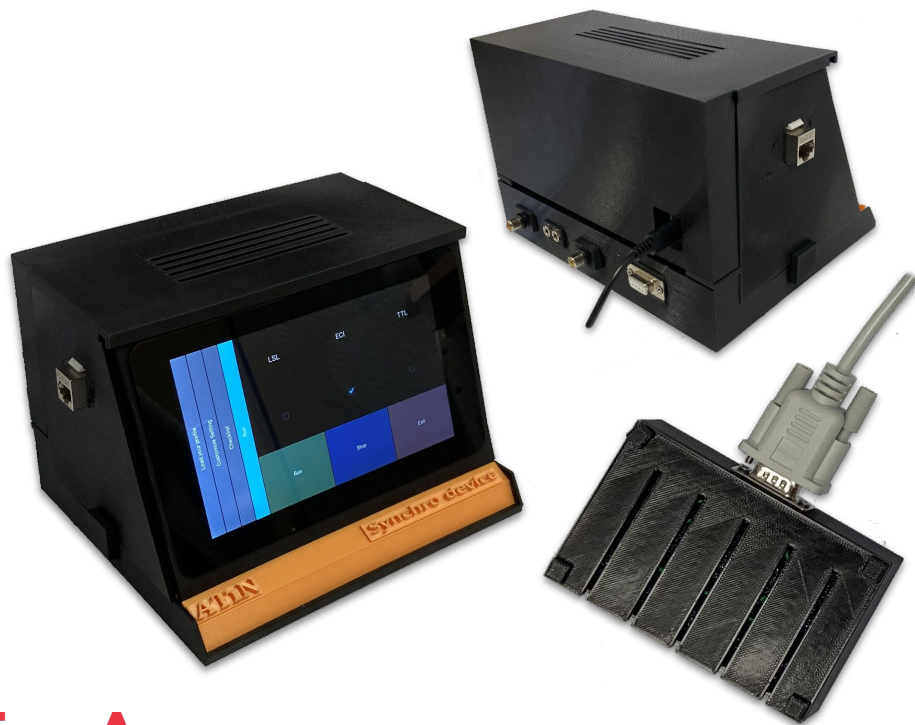


The synchrodevice 1.0 prototype

Vlastimil Koudelka & Jan Hubeny
National Institute of Mental Health in Klecany



- Independent time synchronization device for neuroscience applications
- Implemented lab streaming layer protocol
- Raspberry pi 4 environment with Touch screen and GUI
- USB keyboard emulator
- Four buttons response pad, one audio input, one photodiode input for LCD screen, one photodiode input for data projector
- Modular system with python o C based environment for SDK

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This project was supported by grant no. TP01010062.

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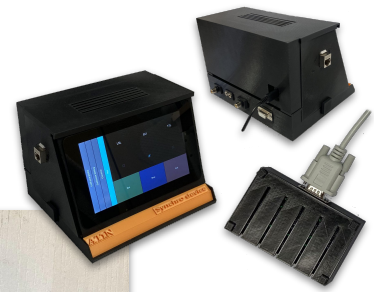
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Program **Gama**

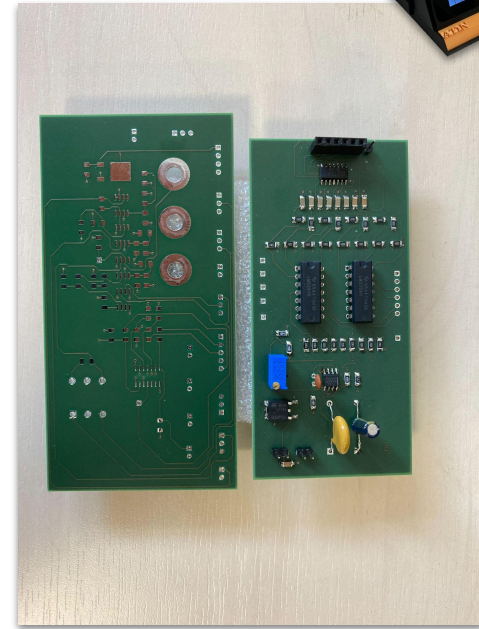
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HW solutions - input circuits



- New unique PCB design and new production technology implemented (inner layers included)
- Stable time response (all inputs <math><1\text{ms}</math>)
- More stable and predictable time response compared to reference solution (EGI solution)
- IP: Utility model (documentation in progress)



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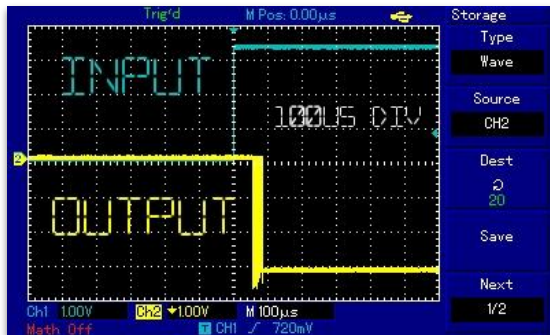
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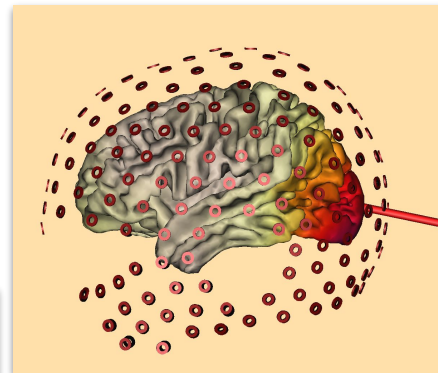
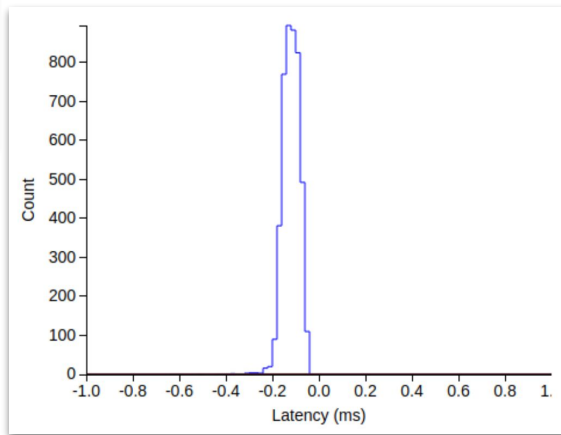
NIMH

Validation

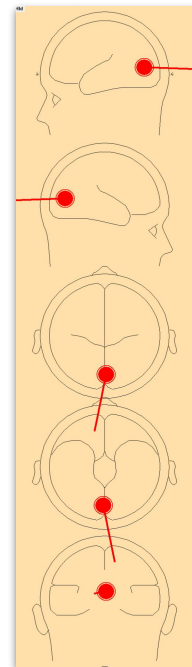


Generator-oscilloscope measurement:
validation of the synchro device response on
the physical layer.

Synchro-device jitter statistical
measurement: validation of the
synchro-device response through the Lab
Streaming Layer measured by a reference
device.



Synchronization in real EEG
studies: the synchronization
device has been constantly
validated on running EEG related
grants and projects in NIMH



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Summary

Authors: Vlastimil Koudelka a Jan Hubený

Abstract: The proposed prototype was designed to test the idea on the market. Currently, the prototype is used to acquire EEG signals in synchrony with video and audio stimuli. Further, the prototype is dedicated to presenting the idea of synchronization to potential commercial partners. The device itself is capable of Lab Streaming Layer (LSL) and Experimental Control Protocol (ECP) synchronization. User interface is equipped with graphical environment and touchscreen. The all functionalities were validated on experiments with event related potentials. Essential part of software is a TCP-IP server capable remote control and smooth integration of the device into various laboratory setups.

Key words: synchronization; EEG; stimulation; event related potentials

Impact: Increase accuracy, reproducibility, and sensitivity of neuroscientific experiments. Decrease time demands coupled with experiment development. Decrease time needed for each experimental session and a number of subjects in studies.

Funding: Technology Agency of the Czech Republic, Program Gama, grant no. TP01010062

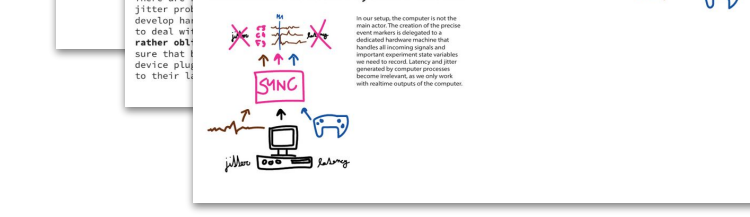
_who we are and what we do
We are two engineers and one neuroscientist from NIMH (National Institute of Mental Health in Czech Republic). We are founders of ATNH (Apply technology and integrate concepts from different areas for solving psych that founded)

_task we face
While designing or altering EEG experimental paradigms we always had to face the same issue, time synchronization. We had to deal with various time synchronization issues that were not just a solution without a repetitive

_who needs this?
We do not think that our quotidian lab tasks and little problems that eat a lot of lab time are something that there are latency and in every situation many samples. We started in our task to address the whole new universe of a common thing. Concerning involving our labors, we were able to deal with our jitter problem rather obtain sure that their device plug to their lab

_our solution
In theory, we could stay oblivious to what are the exact properties of the gear we use for stimuli presentation and behavioural response detection. The exact latencies, jitters and refresh rates does not influence the quality of our markers as these are being generated by a dedicated device, device utilizing an interrupt technology which is capable to react to the input events with a rate faster than a tenth of a millisecond.

setup with dedicated hardware synchro device



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