Stimulation device for cognitive research

The presented stimulation device is based on ARM Cortex microcontroller unit and can present visual stimuli, auditory stimuli and combination of these.

Outputs:

- **Visual stimuli** - simple LED diodes, LED panels, patterns presented on small LCD displays or any images in the defined format presented on normal LCD monitor.
- **Auditory stimuli** - simple tones of various frequencies, any sound saved in wav file.
- **Synchronization output** - for synchronizing events with measuring device. Can be also used as GPIO (general purpose input/output).

Inputs:

- **4 response buttons -** can be assigned to any visual or auditory stimulus, all buttons have internal debouncing circuits.

FEATURES:

3 modes of stimulation:

1. sequential stimulation - stimuli are presented sequentially with adjusted probability, the subject can response to any stimulus by touching response button, average reaction time can be evaluated at the end of stimulation process This mode is suitable for evoking ERP components in cognitive research.
   Stimulation parameters:
   - inter-stimulus interval,
   - probability of stimulus occurrence,
   - inter-stimulus jitter,
   - stimulus relationship - e.g. the target stimulus has to be followed by the number of non-target stimuli. A relationship can be set up for any stimulus except of the first stimulus,
   - output code for stimulus (used for synchronization with measuring device).

   Stimulation can be controlled manually (start/stop button) or automatically (by setting the number of runs, the number of stimuli in each run and pause duration between the runs).

2. simultaneous stimulation - visual stimuli are presented simultaneously (up to 4 independent stimuli) with corresponding frequencies. This mode is suitable for evoking standard VEP or SSVEP.
   Stimulation parameters:
   - frequency of each stimulus (0-20 Hz, step 0.5 Hz),
   - duty cycle.

3. stimulation with waiting for a response button - visual or auditory stimuli are presented and touching a response button is awaited. This mode is suitable for experiments requiring reaction time measurements.

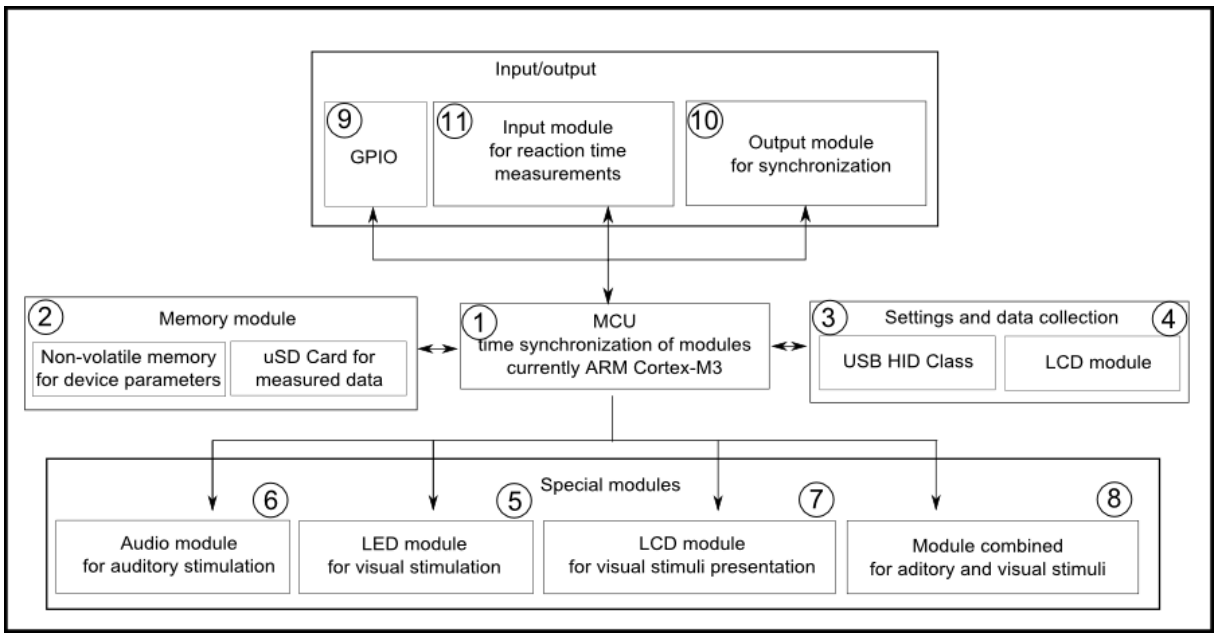
Setting of stimulation parameters and presentation of results can be done:

- internally - by using touch LCD display
- externally - by using PC connected via USB port

Synchronization with measuring devices:
- 8 synchronization pins (CMOS level),
- selectable pulse width,
- selectable rise/fall edge.

Other features:
Up to 20 configurable universal GPIO pins for other functions (CMOS 3V3, 5V tolerant)
Internal memory for storing parameter presets
Internal temperature and voltage sensing

Block scheme of stimulation device



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