**Olfactometry and software**

**MEROD Project**

**Lyon Team**

The software is designed to monitor the olfactometer, particularly the flow rates and stimulus duration. In addition, it allows several signals to be acquired or sent as mentioned above. A National Instruments board is used, and the software is written with LabVIEW 10.0.

The program is in the form of a multi-panel interface. The first panel is dedicated to file selection and subject identification and the last panel to parameters and options, including acquisition frequency, thresholds and scales. Between these, two panels are dedicated to olfactometer settings (“Respiratory signal calibration” and “Pretesting”), and two other panels allow **experimental protocol** variants to be run (“Event related mode protocol” and “Block mode protocol”). These four panels are detailed below.

**“Respiratory signal calibration” panel and odor delivery.**

To obtain a respiratory signal with enough amplitude but without saturation, the user can run an acquisition calibration test. The graph is drawn in real time so that the user can inspect the respiratory signal to determine the inhalation and expiration phases. A threshold is automatically computed for each subject, but can also be adjusted manually. By default, the algorithm consists in searching the midline between the inspiratory phase and the expiratory phase by computing the area under the curve of both respiratory phases. The threshold is used to trigger odor delivery. To ensure that the odorant is present at the beginning of the inspiration phase, odorant delivery starts at the beginning of the expiration phase.



**Figure 1**

**“Pretesting” panel.**

This panel allows the user to prepare odorant stimulations before implementing the experimental protocols. Here, each of the 15 odors can be calibrated according to the air carrier / odor valve flow ratio, and also stimulus duration. In the graphic interface, the user can provide various parameters for each odor (air carrier, aspiration flow, odor flow and duration), select the odor channel and run the pre-test. Thus, one may calibrate each odor with specific flow and duration during the experiment.

**“Event-related mode protocol” panel (figure 2a).**

This mode is used for event-related design protocols. The odor is delivered at regular intervals, with a period of rest. The protocol can include a variety of trials that differ in odorant stimulation.

For each trial, every 20 s (typical duration of an inter-stimulus interval, ISI, although this can be made be shorter or longer), participants are visually instructed to breath naturally, and odorants are diffused according to the subject’s nasal respiration. Typically a few seconds later, another instruction asking the participant to rate the odor (e.g., according to intensity, pleasantness or familiarity, etc.) is presented. All information concerning the trials (flow per each valve per trial, duration, instructions, questions) are read from an input **Protocol ASCII file**. Sniffing data, subjects’ responses on the button box and related information (odor valve, TR synchronization, response time) are stored in an output results ASCII file.

An important characteristic of this design is that odor delivery depends on the subject’s nasal respiration. Here, stimulus delivery starts during the expiration phase that follows the end of the ISI period, so that the subject perceives the odor immediately at onset of the inspiration phase.

**“Block mode protocol” panel (Figure 2b)**

This mode is used for block-design protocols. The odor is delivered during “ON” blocks, which may differ in duration. Rest periods (“OFF” blocks, without odor delivery) are also included. All information concerning the blocks (flow per valve per trial, duration, instructions, questions) are stored in an “input” **Protocol ASCII file**. Here, odor diffusion does not depend on the subject’s nasal respiration. This type of mode may be useful for olfactory experiments that use velopharyngeal closure respiration.



**Figure 2**