Supplementary Information for

Humans navigate with stereo olfaction

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This PDF file includes:

Other supplementary materials for this manuscript include the following:

Movie S1
Dataset S1

Supplemental Experiment

To get a rough idea of the upper limit for inter-nostril concentration ratios in natural settings, we measured vapor phase concentrations around a strong odor source, an open 40 ml jar containing 10 ml of 10% v/v isoamyl acetate in propylene glycol, with two calibrated miniature photo-ionization detectors (miniPIDs, Aurora Scientific, Canada) placed 3.5 cm apart – approximately the distance between the regions sampled by the two human nostrils (1). Phenylethyl alcohol was not used as the tracer as it has a high ionization threshold. Note that vapor phase concentration ratios are related but not equivalent to liquid phase concentration ratios, which we referred to in the main text. Specifically, airflow rate was controlled at 0.5 m/s. The two miniPIDs were placed downstream of the source and formed an angle β of either 0°, 30°, 45°, 60°, or 90° with the flow direction, with the closer miniPID being 2, 3, 5, or 8 cm away from the source (Fig. S1A). Overall, concentration ratio, as calculated from the signals of the two miniPIDs, decreased with the distance from the odor source (Fig. S1B). Although odor plumes are filamentous and sporadic (2) (Fig. S1C), the concentration ratios we recorded over 1,600 measurements (each comprised a recording of the vapor phase concentrations for 1s – the duration of a short sniff) never exceeded 15:1. In reality, face contour likely affects the dispersion of odor plumes and could further limit inter-nostril concentration ratios. Hence, presenting an odor to only one of the two nostrils, while maximizing binaral intensity disparity, is unlikely to represent an ecologically valid scenario.

As an aside, the above miniPID measurements were not designed to identify strategies to track odor sources using fluctuating odor plumes. The issue has been examined in studies with insects and rodents, where the importance of bilateral inputs has also been noted (3-7).

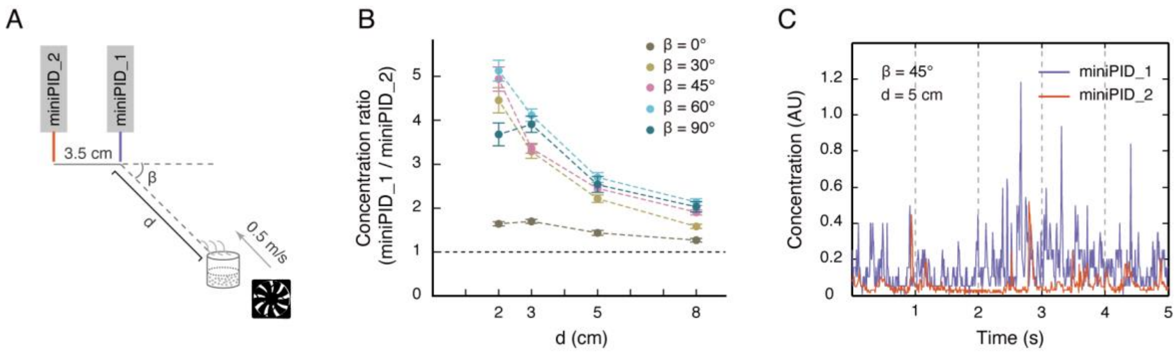

Fig. S1. Quantification of inter-nostril concentration ratios around a strong odor source. (A) Measurement setup. Two miniPIDs were placed 3.5 cm apart, downstream of the odor source, and formed an angle β with the flow direction, with the closer miniPID at a distance of d away from the source. (B) Concentration ratios, as calculated from the signals of the two miniPIDs, at different β and d values. Each marker represents the mean of 80 measurements. Error bars: SEMs. (C) A sample recording showing the vapor phase concentrations (in arbitrary unit, AU) recorded by the two miniPIDs over a 5 s period at β = 45° and d = 5 cm.

Movie S1 (separate file). The visual optic flow stimuli were made up of 1,800 moving white dots (coherence level = 75%) that simulated the self-motion of the observer toward a cloud of points at 5 m/s. The center of expansion indicates the heading.

Dataset S1 (separate file). Behavioral data obtained in Experiments 1-6.

SI References

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