Environment, Locomotion and Sensor Structure Interact to Structure Odor-tracking Behavior.

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Perhaps the most remarkable olfactory task achieved by insects is that of locating distant resources using airborne chemical cues. At minimum this requires two pieces of information; the presence of an attractive chemical and the direction that the wind is blowing. Whether the odor tracking insect is walking or flying determines how this information is acquired from the environment. The goals of the work presented here are to understand the behavioral and physiological mechanisms that enable walking and flying insects to use information provided by specific chemicals and wind, and other information from their environment, to locate distant resources including mates, food and territories. Furthermore, we have used simulated and robotic agents to both test our hypotheses of how insects control their navigation behavior and develop odor-guided control algorithms for terrestrial and airborne robots.