Avoiding collision leads to common routes

November 19 2015

Temnothorax rugatulus. Credit: Arizona State University

Ants, when walking around in cluttered environments, are known to follow a limited number of common routes. Research published in *PLOS Computational Biology* and led by Olivier Bertrand (Bielefeld University, Germany) shows that similar routes emerge when an algorithm for collision avoidance, based on the apparent motion of obstacles, is combined with a target direction.

The number of robots in our surroundings is increasing continually. They are used to rescue humans, inspect hazardous terrain, or clean our homes. Over the past few decades, they have become more autonomous, safer, and cheaper to build. Every autonomous robot needs to navigate in complex environments without colliding with obstacles along its route.

Flying insects are able to solve this task by mainly relying on vision, extracting object distances from the motion of the environment on their retina when moving. However, trying to accomplish the extraction of distance with movement detectors found in the animal kingdom is tricky because they do not provide unambiguous velocity information, but are much affected also by the textural properties of the environment.

In the article a parsimonious algorithm to avoid collisions in challenging environments solely based on bio-inspired so-called elementary motion detectors has been introduced. Moreover, the trajectories resulting from the coupling of this algorithm with a goal direction leads to an interesting goal-directed behavior, namely the formation of a small number of routes, like those observed in navigating insects.

More information: Bertrand OJN, Lindemann JP, Egelhaaf M (2015) A Bio-inspired Collision Avoidance Model Based on Spatial Information Derived from Motion Detectors Leads to Common Routes. *PLoS Comput Biol* 11(11): e1004339. DOI: 10.1371/journal.pcbi.1004339