A bio-inspired robot accounts for insect behavior

Julien Serres, Franck Ruffier, Nicolas Franceschini

A bio-inspired robot accounts for insect behavior

J. Serres, F. Ruffier, and N. Franceschini
Biorobotics dept., Institute of Movement Science – UMR6233 (CNRS / Aix-Marseille Univ.)
163 avenue de Luminy (CP938) – 13009 Marseille, France
E-mails : {julien.serres, franck.ruffier, nicolas.franceschini}@univmed.fr

Based on a biorobotic approach developed in our laboratory over the past 25 years, we have built several terrestrial and aerial vehicles controlled on the basis of Optic Flow (OF) cues [Rev. Franceschini, 2009, Acta Futura, 3, 15-34]. The LORA III robot is a miniature hovercraft that perceives the environment by means of neuromimetic OF sensors. To understand how honeybees may follow a wall [Serres et al., 2008, Naturwissenschaften, 95(10), 1181-1187], center along a corridor and adjust their speed to the corridor width [Srinivasan et al., 1996, J. Exp. Biol., 199, 237-244], we developed a vision-based autopilot, which consists of a *dual OF regulator* controlling the hovercraft's *translations* [Serres et al., 2008, Autom. Rob., 25(1-2), 103-122]. Yaw disturbances introduce adverse *rotational* OF component, which do not depend on the distance to obstacles. The robot's gaze therefore requires to be stabilized in yaw to make sure the robot will measure only the *translational* OF component, as suggested by several insects [Wagner, 1986, Phil. Trans. R. Soc. Lond. B, 337, 527-551] [Boeddeker & Hemmi, 2010, Phil. Trans. R. Soc. Lond. B, 277(1685), 1209-1217] [Zeil et al., 2008, Current Biol., 18(8), 320-323]. Our biorobotic approach allowed us to better appreciate the fundamental role of gaze locking in flying animals.